WALLA WALLA DISTRICT HISTORY

PART II 1970 - 1975

U. S. ARMY
CORPS OF ENGINEERS

DEDICATION

To the Memory of

HOWARD A. PRESTON

1903-1976

This recent history of the Walla Walla District is dedicated to the memory of its author, Howard A. Preston, who completed the draft of this volume during his terminal illness. He was also the author of the first volume.

Mr. Preston spent 40 years in the Federal Service from which he retired in 1970 as Chief of Planning Branch of the Walla Walla District. Most of the work he describes reflects his ability as an outstanding planner and engineer, although he was too modest to mention his contributions in the narrative.

His principal concern was service to the world - not power or monetary gain. This was demonstrated by his long-term responsible positions in his church, in several professional societies, and on the Planning Board, School Board, and Community Concert Association in Walla Walla.

This volume is only a small tangible part of his legacy to the physical and spiritual future of the Northwest.

FOREWORD

During the period from 1970 to 1975 the Walla Walla District of the U.S. Army Corps of Engineers constructed locks and dams on the Snake River, completing the final segment of a 465-mile seaway from the Pacific Ocean to Lewiston, Idaho. In 1973 the 717-foot-high Dworshak Dam on the North Fork Clearwater River in Idaho was dedicated.

These multipurpose projects added to the nation's electrical energy resources and provided benefits in flood control, recreation, and wildlife habitat.

Such achievements were not met with universal approval, however. Environmentalists and others were concerned with the effect of the dams on water quality, fisheries, and wildlife habitat. The District became increasingly involved in preparing environmental assessments of projects, past and future. It was a time of adjustment, change, and challenge.

In this second volume author Howard Preston has captured the flavor and tempo of a half decade in the District's 27-year history when construction efforts peaked and operational aspects of completed projects moved into prominence.

NELSON P. CONOVER
Colonel, CE
District Engineer

PREAMBLE

In Chapter 9 of the initial volume of history for this District a brief "look ahead" is taken because of the large volume of unfinished business in 1970. A review of that chapter by the reader may be an appropriate preface to perusing this volume. The initial 22 years of the District were quite considerably oriented toward project evaluation and realization. The trend of studies, evaluation of resources, and the place of water resource projects in the overall "scheme of things" for the people of the Pacific Northwest were seeing some changes by the end of the decade of the 60s.

This trend will become evident in the recounting of events of the 1970 to 1975 period herein. The objective of making Lewiston "Idaho's picture window to the sea" for navigation will see fruition, as well as better control of floods and a major change in the overall regimentation of the Columbia River outside the Walla Walla District.

Environment, limnology, ecology, eutrophication, water quality, "wild rivers", flood plain reservations, nitrogen problems, public needs, and energy demands all augured for some reorientation of the District's priorities and planning efforts.

H. W. Van Loon once commented that "The history of the world is the record of a man in quest of his daily bread and butter." To a good extent the data presented in this and the previous volume reflect the efforts of the people of the Columbia and Snake River Basins to protect and enhance their capabilities - and quest of their daily "bread and butter." In this same theme the Inland Empire of the Pacific Northwest as well as southern Idaho and the upper Snake River Basin play an important role in the nation's ever evolving economic and natural resource development. The Walla Walla District of the Corps of Engineers, as an integral part of that Inland Empire, continued its active participation in the region's growth during this five-year period, with considerable left to be done in the subsequent years.

My special thanks go to Bertram W. Hoare, retired Chief of the Construction Division, who edited carefully, and made several suggestions and amplifications for the construction work covered by this volume. His intimate knowledge of the projects assisted greatly.

THE AUTHOR

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PART I

"THE STORY - CONTINUED"

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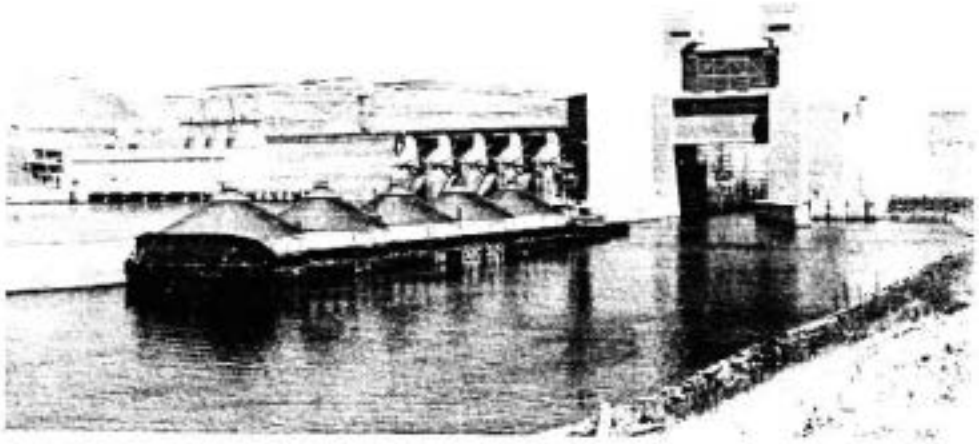
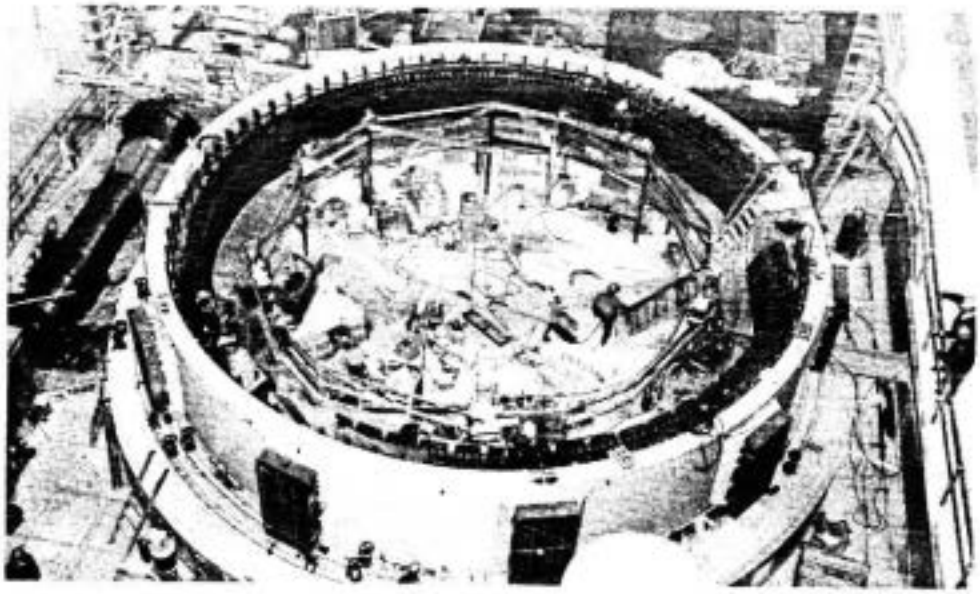
NAVIGATION





HYDROELECTRIC
POWER

1970-75 ACTION AND TRANSITION

REVIEW

As an introduction to this second volume of the District's history, covering the period of 1970 through Fiscal Year 1975, it may be well to inventory the construction work and authorized project studies underway, the developing maintenance facets, and the water resource problems needing attention.

Active navigation work "on the books" included completion of the John Day project dam and reservoir features on the lower Columbia River, together with the construction at Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Locks and Dams on Snake River, thus making Lewiston, Idaho, available for slack-water barge traffic to and from tidewater at Portland, Oregon. Flood control storage works underway included the Dworshak Dam on the North Fork Clearwater River and the Ririe project on Willow Creek in eastern Idaho above Idaho Falls. Six storage and flood detention reservoirs were authorized and under study for tributary streams in Idaho, Washington, and Oregon. Several channel flood control projects and flood plain evaluations were authorized and under consideration.

Water quality, flood plain utilization, and environmental analyses are demanding increased attention, as will be recounted. The operation of the navigable waterway of the Columbia-Snake River system is an expanding part of the District activity, as is the operation and maintenance of the many regional storage and local flood control projects throughout the District. These many facets, as well as administrative actions and natural phenomenon, made this five-year period an interesting, active, and changing one for the District.

THE ONGOING ACTIVITIES

John Day Lock and Dam on Columbia River at the mouth of John Day River had a rousing dedication in September 1968, and the project was operating in a very satisfactory shape for navigation on the river. Twelve power units had been installed and were working by mid-1970. Construction on four more units was underway as well as miscellaneous work to be finished in the reservoir area. Development of recreation sites around the reservoir was receiving special attention. The completion of slack water on the lower Columbia River augured for changes in the pattern of barge traffic on the river, as well as anticipation for completion of the lower Snake River system.

Similarly, Little Goose Lock and Dam, the third unit in the Lower Snake River Project, was placed into operation early in 1970, adding 37 miles of navigable waterway to the system. Installation of the first power unit had been completed and two more were under construction.

Lower Granite Lock and Dam, the fourth and final unit of the lower Snake River system, on which construction work had been held in abeyance for three years, became active in mid-1970 when the contract for the main dam structure was awarded. This renewal of work initiated a very active five years of relocation and development work in the 35-mile reach of river from the dam to Lewiston and Clarkston at the mouth of Clearwater River.

The McNary project received minor modifications, and the Ice Harbor project received three additional power units. The Lower Monumental project was the scene of some research work in the interest of fish survival.

Dworshak Dam and Reservoir, the major flood control project in the Clearwater Basin at Orofino, Idaho, had been underway for five years and this project with several "firsts" was completed. Its realization is destined to have a major impact on this section of Idaho, not only for the control of floods but opening up of the interior "White Pine country" and the raising of steelhead trout and other species at the major hatchery at the mouth of the North Fork.

The other flood control project with an important impact on its local drainage area is the Ririe project on Willow Creek above Idaho Falls, Idaho. Early activities toward authorization and funding augured well for an expeditious realization. After several detailed studies and deferments, site preparation monies were forthcoming for a construction start in June 1967. Funding delays postponed actual dam construction until mid-1970. Some difficult foundation conditions demanded careful attention during the subsequent building process.

A brief review of salient construction activities on the major projects of the District through this five-year period will be made as an indication of the overall workload, and to some extent the over-riding preoccupation for the District and its staff. More details on the individual projects will be recounted in Part II of this volume.

Storage and channel flood control works as well as emergency flood conditions dictated continuous attention to the many tributary streams of Snake River. Funded project studies and corrective works were underway on six authorized projects in Idaho, two in Oregon, and two in Washington. Chapter 9 of the initial history volume left many projects and problems "on the table" with the observation that "there is much unfinished business to attend to." This second volume will outline activities on many fronts, with still much unfinished business and problems for future periods.

CHANGE IN COMMAND

Concurrent with the entry into the period of this volume was the change in assignment of District Engineers for the District. As recounted previously, the doughty Colonel Robert J. Giesen retired 1 September 1970, to be succeeded on that date by Colonel Richard M. Connell, an Engineer Officer with wide experience and training. The District had a wide variety of ongoing programs, moving at a rapid pace, with a fiscal budget the largest in its history. Colonel Connell, an Officer with a keen sense of political acumen and interest in resource development, remained with the District until June 1973 when he was assigned to the Continental Army Command at Ft. Monroe, Virginia. He later was made Division Engineer, South Pacific Division, San Francisco, California.

As a part of his District staff, Colonel Connell was fortunate in retaining Major Harold L. Matthias as his Deputy for six months to assist in his transition into a very active civil works program. Major Matthias, a Mechanical Engineer with graduate work in nuclear engineering, came to the District after service in Vietnam. He reported to the Office, Chief of Engineers in March 1971. The Deputy District Engineer's position was then filled by Major Carlos W. Hickman, a very capable engineer also with a Master's Degree in Mechanical Engineering. He worked with Colonel Connell for the remainder of his tour of duty, both leaving the District in mid-1973.

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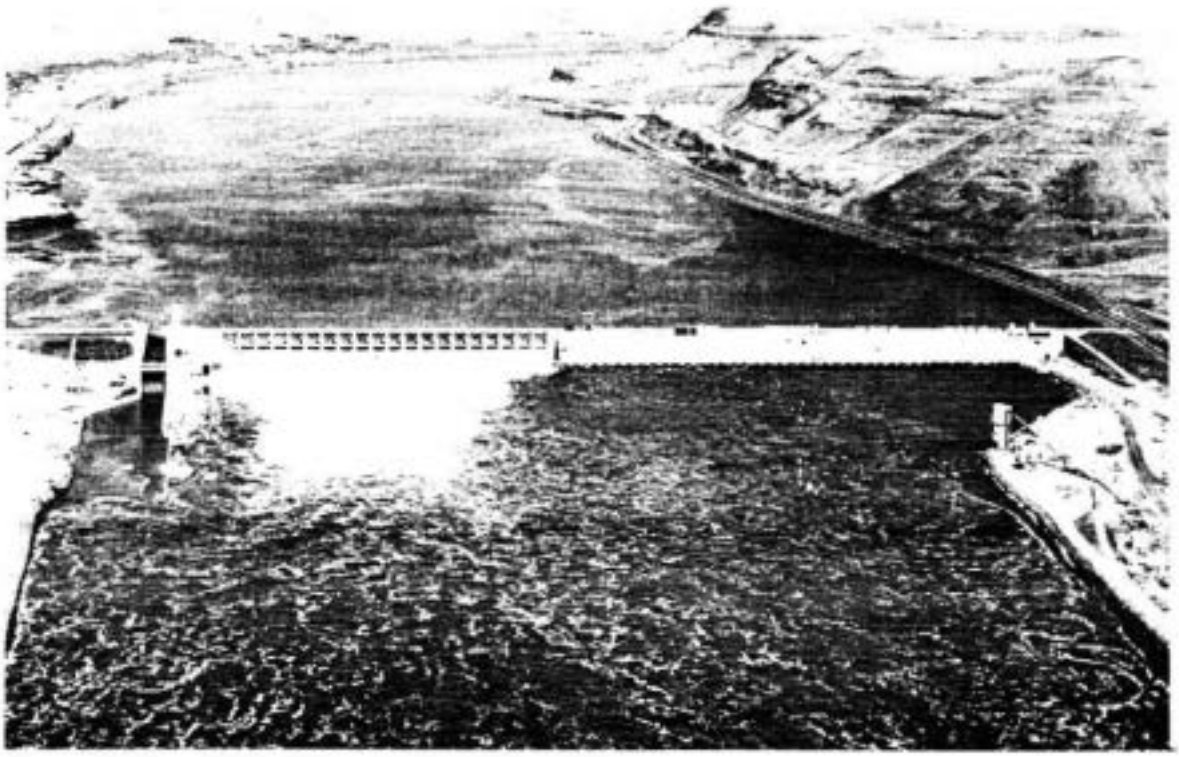
CONSTRUCTION

THE JOHN DAY PROJECT

The dam, navigation lock, and power facilities had been well integrated into the operational phases by 1970 which were being directed by the Portland District as a coordinated unit with The Dalles project downstream; however, construction and installation of additional hydroelectric generating units were still underway by this District. Units 13 and 14 were placed into operation in November and December 1970, generating unit 15 was placed on the line in September 1971, and unit 16 was activated in November 1971. The scheduling of installation of the remaining four authorized units has not been definitely programmed as yet, and will depend upon their future place in the overall power demand and resource picture.



JOHN DAY DAM - 1970

In the 77-mile reservoir area, 14 public-use areas were planned and have been developed to varying degrees involving over 2,000 acres of suitable shorelands. About 1,000 more acres have been reserved for future development for water-related public use. In addition, the 30,000-acre National Waterfowl Management Area astride the river near Boardman had been turned over to the U.S. Fish and Wildlife Service. In accordance with the project operating agreement with the Portland District, the sites as developed in the lower two-thirds of the reservoir area were turned over to the Portland District for operation. In 1972, when the construction effort for the entire project was essentially complete, the decision was made to have Portland operate all of the reservoir public-use facilities up to McNary Dam. The Walla Walla District designed and constructed all recreation facilities on the south shore of the reservoir area in three phases - underwater, basic grading, and surface work including buildings, etc. This was completed by 1973 at a total cost of $4 million. The District designed all facilities for the north shore public-use sites and turned the plans and specifications over to the Portland District to construct. The Portland District subsequently assumed complete supervision of the John Day project in June 1973.

Two exceptions to the release of the construction effort in various units of the John Day project have been made because of expertise available in the Engineering staff of this District for development of fish hatchery facilities. The Spring Creek Hatchery on the Washington shore in the Bonneville pool and the Bonneville Hatchery at Bonneville Dam are being enlarged to more than double their previous capabilities as mitigation measures. The design effort for this work was done by this District as well as the construction supervision at Spring Creek. The Spring Creek Hatchery, one of the oldest in the Pacific Northwest, which was opened in 1901, has been doubled in size at a cost of $8.7 million. The new system became operational in December 1972. Dedication ceremonies were held for the remodeled hatchery on 22 September 1973. The Bonneville Hatchery enlargment work is still actively underway by the Portland District. However, the design effort by this District was basically finished by the spring of 1975. This essentially completed the Walla Walla District's involvement in the John Day project.

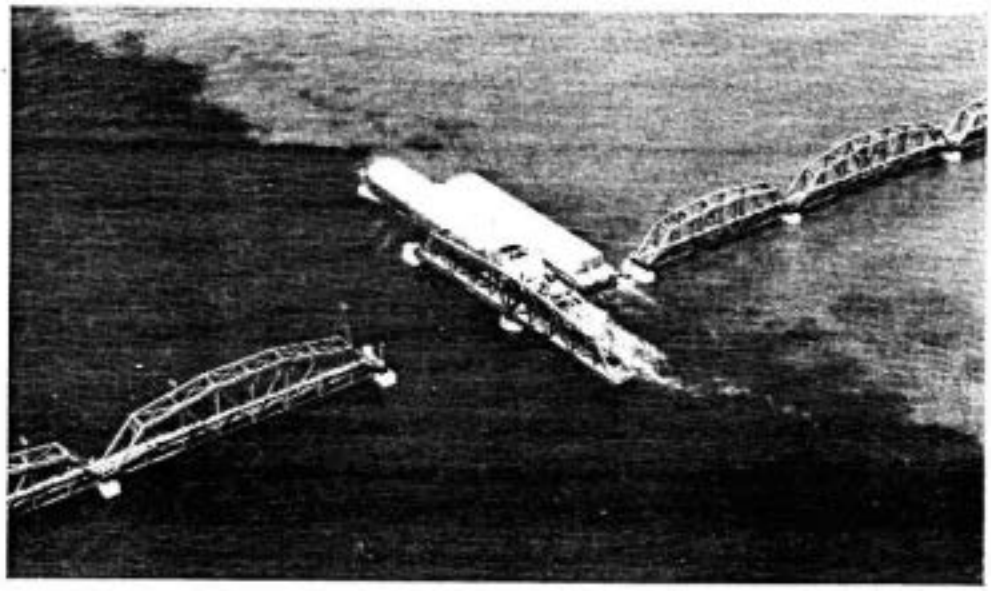
McNARY DAM

The preceding volume of history for the McNary project cites the need for replacement of two railroad bridges in the upper reservoir area: the Union Pacific Railroad bridge below the mouth of Snake River, and the Northern Pacific (Burlington Northern) bridge across the mouth of Snake River. Also recounted in that volume was the decision in connection with relocations in the Lower Monumental reservoir area on Snake River that the Northern Pacific Railroad would in the future operate over the Union Pacific tracks from Riparia to the

mouth of Snake River, where it would revert to its own tracks. This required extensive modifications to the Northern Pacific bridge at the mouth of Snake River.

The bridge was strengthened and a new draw span built by agreement with the railroad under a contract of March 1968. The work was actually accomplished from March 1969 to January 1972. The cost of $6,400,000 was jointly shared by the railroad, the McNary project, and the Lower Monumental project.

The Union Pacific bridge is still in place, with any question of its modifications deferred to the U.S. Coast Guard through authorities granted to them under the "Truman-Hobbs" Act. A decision has been made, with design underway, to replace the present swing span with a vertical lift span similar to the other two railroad bridges over the reservoir. Actual construction is yet to be initiated.



UNION PACIFIC RAILROAD BRIDGE - 1975

A project that enhances the environmental and public use of the project lands has been underway along the south shore of the Columbia River below the dam to the municipal development at Umatilla and the highway bridge. A previously constructed fish spawning channel has been improved, dikes modified, nature trails installed, and a sizable area set aside for wildlife and its observation. Several species of fish have been planted and other wildlife encouraged to inhabit the area, with considerable success.

At the dam, changing of the lower segment of the spillway faces will be undertaken in FY 1976. Bids were opened on 26 June 1975 for installation of the "flip lip" deflectors controlling spillway discharges. (See Part II for further description.)

ICE HARBOR DAM

This project has experienced a major change in that it is the first project in the District to receive additional hydroelectric power units to strengthen the peaking capabilities of the Columbia Basin hydro system. Power units 4, 5, and 6 were authorized for future installation when the project was initiated. The need became evident prior to this decade and funds were made available in FY 1971. Construction of the powerhouse, three turbines, and generators was initiated in August 1971, with completion of all three units early in 1976. More details concerning this increased power capability will be included in Part II of this volume.

The only other material change in the project was in connection with improvements for public use at Charbonneau Park just above the dam on the south shore. Additional recreation facilities, access roads, sanitary facilities, and waterfront improvements were made during 1973.

ICE HARBOR DAM - 1975

LOWER MONUMENTAL DAM

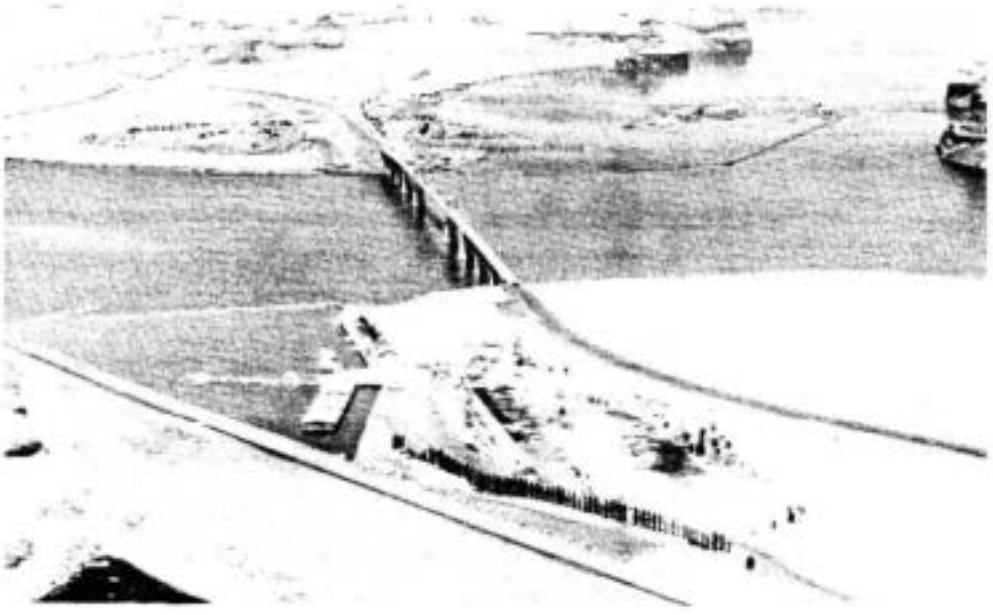
This project has been the location for some innovative research and construction change in spillway shape and design in the interest of conservation of migratory salmonid fingerling moving seaward. Unit 4 of the eight-bay spillway was modified initially in 1972 by contract to provide a "flip lip" at the waterline of the spillway face, thus precluding a deep plunge of the water into the stilling basin. The objective of the aeration of the spillway discharge is to

reduce the buildup of free nitrogen in the water below the project resulting from the compressive effect of the spillway action in the deep stilling basin. Excess nitrogen is deleterious to adult fish as well as the young migratory fish.

The experiment and hydraulic model tests were favorable, showing a marked reduction in nitrogen supersaturation. Accordingly, a second contract was let for revision to five more spillway bays in 1974. The work was completed in August 1974 at a total cost for both contracts of $700,000. Spillway bays 1 and 8 were not revised. This successful modification and testing presages similar changes for other projects.

The rebuilding of the Northern Pacific Railroad (Burlington Northern) bridge at the mouth of Snake River, part of which was the responsibility of the Lower Monumental project, is recounted under the McNary Dam construction work. This work was accomplished during the period 1969 - 1971.

The Lower Monumental reservoir area was the scene of considerable development for six of its recreation and public-use sites along both shores. Extensive development of the sites was accomplished during 1971 under contract, with the addition of landscaping and more visitor facilities in 1974, all at a total cost of about $1 million. One of the units is a 1,200-acre area at the mouth of the Palouse River adjacent to the historic Lyons Ferry. Upon completion of the development in this



MOUTH OF PALOUSE RIVER

Left to Right - Joso Railroad Bridge; Marina; Lyons Ferry Highway Bridge; Lyons Ferry Park at North End of Bridge

area, the Lyons Ferry Park was transferred to the State of Washington for operation, including lands extending upstream along Palouse River to the Palouse Falls State Park. This provides a continuous public-use area along the river of over six miles, including the well-known Marmes Rockshelter project as recounted in the previous volume of history. The Lyons Ferry Park was dedicated with appropriate historic review ceremonies on 20 June 1971.

At the dam, contracts have been awarded for manufacture of turbines, generators, and powerhouse construction together with the installation of power units 4, 5, and 6. These units are scheduled for completion by 1979. (See Part II for further details.)

LITTLE GOOSE DAM

This project experienced its inception as the third operating unit of the lower Snake River system in the spring of 1970. Its construction is described in some detail in the preceding volume of the District History. The contracts for that initial construction ran until the early spring of 1971 before being completed in their entirety.

Work in the reservoir area continued with completion of the work on the relocation of the Camas Prairie Railroad in March 1970, and the high-level Central Ferry highway bridge in July 1970. Construction of public-use facilities at five locations along the reservoir was partially completed when the pool was raised. Additional site developments were undertaken in 1973 and completed in November 1974 at a total cost of $2 million. This included the major park facilities at Central Ferry downstream of the new highway bridge, which has been turned over to the State of Washington as a unit in the State Park system.

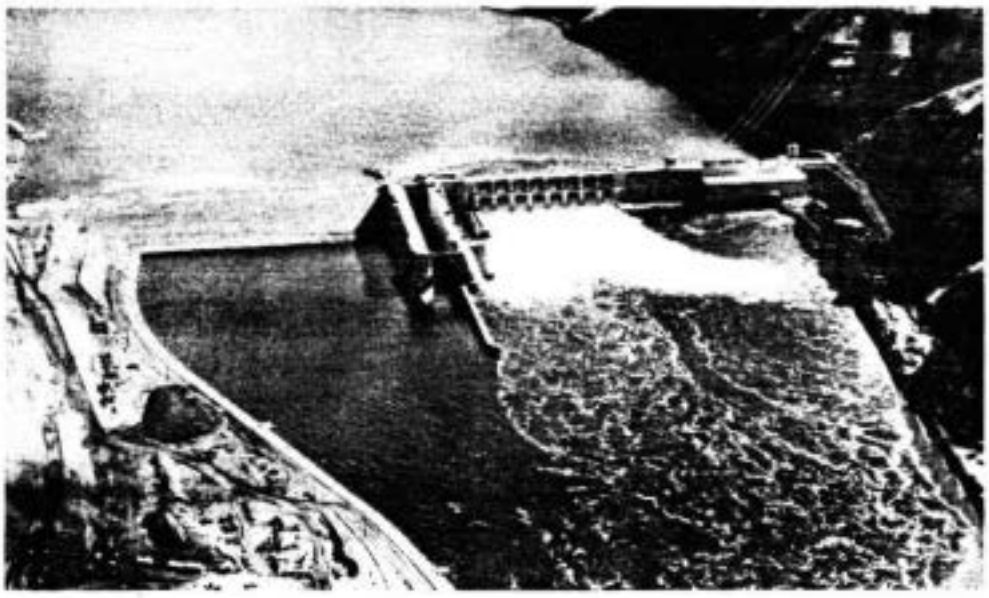
CENTRAL FERRY PARK

As at the Lower Monumental Dam, experimental construction changes in the interest of conservation of downstream salmonid fingerling were undertaken at the powerhouse. Traveling fish screens for the intake bays for all three power units were installed during 1973. These were experimental units, designed to direct the small fish around the turbine units and deposit them through diversion channels into the pool below. The contract for this work, costing $333,000, was awarded in November 1972 and completed in May 1973. Since that time the screens have been modified by research and have proven successful. As a result, the intake bays at the Lower Granite powerhouse will be similarly screened. Transportation of the diverted fingerling to the lower Columbia River area by fishery tank trucks will be discussed in Part II of this volume.

The installation of the additional three hydroelectric power units 4, 5, and 6 for peaking capability of the Snake River system has been scheduled for the Little Goose project. Award of the contract for the turbines was made in July 1974. The contract for generators was let in April 1975. Construction of the additional powerhouse will follow with completion scheduled for 1978. (See Part II for further details.)

LOWER GRANITE DAM

This project has been under very active construction throughout the period of this chapter of the District History. As recounted in the previous volume, the main dam construction contract was awarded in May 1970 with the project placed into operation in February 1975. Construction activities on the many facets of this final unit of the Lower Snake River Project have included: the dam construction itself; railroad relocation; highway relocations, including a new route for Washington Highway 193; an extensive levee system at Lewiston; bridge modifications;



LOWER GRANITE DAM - FEBRUARY 1975

relocation of community facilities; and creation of several public-use and recreation sites. More details on much of this work are recounted in Part II, together with several interesting aspects arising from the realization of the project.

With completion of the Lower Granite Dam in 1975, proper dedication of the lower Snake River navigation system was a must. The Pacific Northwest Waterways Association, joined by several Port authorities, masterminded the three-day program (18-20 June). It was an eventful occasion and the local people appreciated the opportunity to visit the three projects. Details of the dedication are recounted in Chapter 7, Part II of this volume.

As at other projects on the Columbia and Snake Rivers, the Lower Granite Dam and reservoir lies in an area extensively used by the Indian tribes of the region prior to arrival of settlers from the east. The Lower Granite project area was particularly used by the Nez Perce Tribe which now has its headquarters at Lapwai, Idaho, in the Clearwater Basin. Movement of known Indian burials and artifacts has been a project activity parallel to the construction effort. Some particularly clear petroglyphs remain on rather extensive basalt rock panels close to the river on the left bank opposite the mouth of Steptoe Canyon, about 12 miles downstream from Lewiston. There was a strong desire of the Tribe, as well as the National Park Service and State Historical Association, to preserve these markings. Physical movement, as was done for the Indian Memorial at Ice Harbor Dam, was found impractical. Washington State University Laboratory of Anthropology has developed a technique for making "plastic peels" of rock faces. These were made and can be used for casting copies. The copies will be made available for public display at selected locations such as the Tribal headquarters, the Lower Granite Visitors' Center, and the Lewiston Levee Interpretive Center for the project.

INDIAN MARKINGS ON BASALT COLUMNS

DWORSHAK DAM AND RESERVOIR

This project was well underway at the start of this volume of history. First construction work started in April 1963 with work on the dam itself beginning in 1966. By August 1970 the placement of the four-millionth cubic yard of concrete was celebrated, with 2-1/2 million more to go. A measure of the volume of work at the dam is indicated by a June 1970 payment estimate for work accomplishment - $3,600,000 - the largest check ever written by the District. The Lower Granite project payments dwarfed this figure in 1971.

A contract for construction for the first three units of the six-unit powerhouse was awarded in April 1970 to the main dam contractors, who started work immediately. A contract for design and manufacture of three turbines was awarded in 1968 for installation in 1971. Contract for the electric generators for the three power units was awarded in January 1970 with installation in 1972. The remaining three units and the powerhouse structure will not be contracted for until after 1975.

DWORSHAK DAM CONSTRUCTION - NOVEMBER 1971
POOL BEING RAISED - POWERHOUSE UNDER CONSTRUCTION

Construction of the dam had progressed sufficiently that partial filling of the reservoir could be initiated in September 1971. Some flood control was realized in the spring of 1972 with the filling operation. Additional control was realized in the spring of 1973 as construction effort both at the dam and in the reservoir was completed. The reservoir was completely filled on schedule in July 1973. Drafting of the stored water started almost immediately because of the low runoff in the 1973 summer. The water was used to supplement downstream generation capabilities.

In the reservoir area clearing operations and sale of the merchantable timber which had been initiated in 1964 were resumed in May 1970 and continued through 1973. Much of the debris and timber to be disposed of was collected by flotation after the pool was raised in 1973. The two major bridge structures over the reservoir were completed in the same period. The Dent Bridge, 15 miles above the dam, was started in December 1969 and completed in October 1971. The Grandad Bridge in the upper reservoir was started in July 1970 and completed in July 1972. Approach roads serving the upper reservoir area were started in August 1971. They were completed just ahead of the pool raising in October 1972 at a cost of about $2 million.

The previous volume of history described in some detail the major steelhead fish hatchery constructed at the mouth of the North Fork Clearwater River just below the dam. The success of the first unit finished in 1969 was marked, and decision was made to build a second unit to enlarge its capacity. This work was placed under contract in April 1972 and completed in December 1973 at a cost of $3,800,000.

Recreation and public-use areas for the project are somewhat unique because of the remoteness and configuration of the 53-mile-long reservoir area. Two boat launching and recreation areas were built in 1973 in the vicinity of the dam and a third launching and parking area was constructed in 1974 at the Dent Acres site 13 miles above the dam. Additional major development work is underway in 1975 at Dent Acres and Grandad Creek (mile 40). Plans for similar facilities at the mouth of Freeman Creek on the east bank of the reservoir about seven miles above the dam are also being prepared. Access to the reservoir shoreline is limited other than at these points. However, 92 mini overnight camp and picnic sites have been designated along the reservoir shoreline and provided with limited facilities. These sites are accessible

DENT ACRES RECREATION SITE

only by boat from one of the launching areas. Designated public-use areas other than the mini campsites will occupy about 10,000 acres of project lands. The Nez Perce Indian Tribal Council is operating the major public-use and launching area at Big Eddy just upstream of the dam on the eastern shore.

DWORSHAK DAM DEDICATION
NEZ PERCE INDIANS ENTERTAINING

Dedication ceremonies for the dam and reservoir were held on 15 June 1973, at which time the Secretary of the Army, Howard H. Callaway, made the dedicatory address with the assistance of the Governor of Idaho, members of the Nez Perce Indian Tribe, and local dignitaries. Mrs. Henry C. Dworshak, widow of the late Senator, unveiled a bronze plaque honoring the Senator. A gala time was had by about 2,500 people inspecting all aspects of the project that day.

RIRIE DAM

This is a project that received expedited authorization and initial work, as described in the narrative section of the first volume of history (p. 102). The construction start for this $25-million project was made in 1967 with a site preparation contract. Funding limitations precluded further work until a second site preparation contract was let in May 1970, to be completed in August 1971. Funding was again a problem until the major dam construction contract was started

in January 1973, to be completed 17 June 1975. Difficult foundation conditions delayed construction. Because of this, combined with the seasonal nature of construction due to the annual stream regimen and the 5,000-foot altitude, completion will be almost a year late. The dam was topped out in the fall of 1975 with a pool raising now set for the flood period in the spring of 1976. Even though not complete, very substantial flood protection was provided Idaho Falls during the record-breaking spring runoff of 1975. This was done by raising the upstream cofferdam enclosing the construction area to pond and regulate the streamflow. The contentious downstream outfall channel from below the dam to Snake River, found necessary to protect Idaho Falls from reservoir releases as well as downstream flood flows, was put under contract in June 1975 with completion in 1977. Completion contracts will be awarded later for the buildings and grounds and the five recreation sites around the reservoir area. Seventy percent of the project lands around the lake are allocated to wildlife management, including a remote area up Henrys Fork purchased as a mitigation measure for displaced wildfowl and fur-bearing animals. The Ririe project will be turned over to the Bureau of Reclamation for operation because of the irrigation facets of the stored water.

RIRIE DAM CONSTRUCTION - SEPTEMBER 1974
Spillway Channel, Left Foreground; Dam, Downstream Face;
and Outlet Conduits

WILLOW CREEK AND RIRIE DAMSITE
Looking Upstream at Ririe

MILL CREEK PROJECT IN ACTION
Offstream Reservoir at Extreme Left

FLOOD FIGHT ACTION - JACKSON, WYOMING - 1975
Cut-off Dike to Preclude Avulsion

FLOOD CONTROL ACTIVITIES

CONSTRUCTED WORKS

Over the initial 22 years of the District's work, many formal channel and storage flood control projects were realized. Flood actions prompted repeated surveillance, maintenance of three storage units, and some assistance in extraordinary repair work at others. The Chief of Engineers' Annual Reports for the Walla Walla District cite 35 to 50 constructed local protection projects throughout the District, some major works and others of limited scope. They all demand attention for proper maintenance, and because of exceptional flood conditions some years, extraordinary emergency repair work by the District is required, either in anticipation of extreme flood action, during flood fight activities, or after high waters have receded. Routine clearing and snagging of critical reaches of streams, performed during low-water periods, as well as rehabilitation of many Federally constructed works which have been damaged beyond local capabilities to repair, are annual undertakings. Santayana once wrote: "All problems are divided into two classes, soluble questions, which are trivial, and important questions, which are insoluble." To some extent it seems at times that flood problems are of the "insoluble" variety. In the five-year period (1970-1975) $340,000 has been expended at 13 locations throughout the District for "clearing and snagging" of tributary streams. Similarly, rehabilitation and restoration of constructed works at 32 locations have been done at a cost of just over $1 million.

Three reservoir projects, Mill Creek Reservoir at Walla Walla, the Dworshak project on Clearwater River, and Lucky Peak on Boise River above Boise, Idaho, continue to be operated for flood control by the District. Coupled with these Corps storage projects are 17 irrigation reservoirs in the Snake River Basin owned by other agencies which are operated for flood control as needed through cooperative agreements with the Corps and monitored by the Hydrology Section in the District Office.

NEW PROJECTS AND REPAIRS

During this 1970-to-1975 period three additional local protection projects were built.

Camp Wooten - Tucannon River, Washington

This project is in the upper river valley in a heavily forested, highly used recreation area. The work consisted of channel improvements

and levee construction along 1,900 feet of stream, including partial riprap. The cost of the project was $74,000 and was completed in December 1970.

Lyman Creek - Rexburg, Idaho

This work provided a new channel for Lyman Creek through an agricultural area to the Snake River about 9.5 miles south of Rexburg, Idaho. The new alignment is 4,500 feet long with levees and riprap at critical points, including a new bridge at one point. The cost of the project was $252,000, including non-Federal costs, and was completed in February 1971.

Lapwai Creek - Culdesac, Idaho

This work was done at the village of Culdesac on Lapwai Creek about 20 miles east of Lewiston, Idaho. The work provided reshaping of the channel, levees, and riprap at critical points along 3,200 feet of this cantankerous stream. The cost of the project, including non-Federal work, was $182,000, and was completed in August 1972.

Mill Creek Reservoir - Walla Walla, Washington

The Mill Creek offstream flood control reservoir combined with the lined channel through Walla Walla operated in a routine program through the past five years. There were two flood periods in the Mill Creek Basin that required diversions into the storage reservoir. These occurred on 19 January 1971 when up to 550 cfs were diverted during a critical but short flood stage. The other diversions were made on 15 January 1975 and 25 January 1975 when up to 300 cfs- and 900 cfs-flows were diverted to storage to relieve flood stages through and below the city. During the five-year period extraordinary maintenance required remodeling and updating the division works into Yellowhawk and Garrison Creeks, below the reservoir diversion dam in 1972, together with paving of roads to recreation areas that same year.

Lucky Peak Reservoir - Boise, Idaho

The Lucky Peak project on Boise River above Boise, Idaho, experienced some of its wettest seasons of record, and its driest. 1971 and 1974 were two years approaching the highest total runoff of record for the basin. Conversely, 1973 had the least of record. The two high years required extensive evacuation and storage activities to preclude flood stages through Boise and the lower valley. Fortunately during 1973 Lucky Peak was full at the start of the irrigation season, as were the two Bureau of Reclamation reservoirs upstream, so the large irrigated agricultural area of the lower valley did not materially suffer in spite of the record low runoff of that year. (See page 303 of the prior volume of History on the Lucky Peak project.)

Construction activities at the project were limited to improving parking areas for the extensive recreation use of the Lucky Peak reservoir and some major repairs at the outlet works, both to the valves and to the structure due to rather critical cavitation pressures. Work on the outlet works channel was done in 1972 and outlet valves in 1974.

EMERGENCY FLOOD CONTROL INVOLVEMENT

The normal annual precipitation over the Snake River Basin ranges from less than eight inches in portions of the plains of southern Idaho to an estimated maximum of 70 inches in the Bitterroot Mountains. The normal annual precipitation averaged over the entire Basin is estimated to be 20 inches, much in the form of snow. Accordingly, the mountainous streams of the District demand careful annual attention for both potential and flood experiences. The first half of the decade of the 70s was a very active one for both advance repair work in anticipation of flood conditions and actual flood-fight efforts. The autumn and winter precipitation over the District in late 1970 was above normal with above-normal streamflows and snowpack. By early January 1971 snow depths ranged from 130 to 200 percent of normal. Alternate periods of warming and precipitation resulted in flood problems and action from February to June. In March 1971 specially authorized advance flood protective work was undertaken in anticipation of severe problems on particular streams - "Operation Foresight." This work applied almost entirely to streams in Idaho and Wyoming. Eleven streams or locations received attention by strenghtening existing works or steps taken to preclude an avulsion. These 11 emergency works, including one in Washington in the Walla Walla River Basin, cost a total of $403,000.

The following fall and winter of 1971-72 again experienced well above average snowpacks with heavy precipitation in January 1972. By April 1972 most tributary basins had excess snowpacks, ranging up to 150 percent of normal. Again, "Operation Foresight" was instituted in March 1972 to minimize anticipated flood damages. Advance flood protective work was carried on at 18 locations in Wyoming, Idaho, and Oregon on streams within the District at a total cost of $349,500.

Conversely to 1971 and 1972, the precipitation and snow experiences for the 1972-1973 fall and winter season were near the lowest of record. However, temperatures were also extremely low (-30 to -40 degrees). Three critical ice jams resulted in Blackfoot, Pocatello, and Weiser, Idaho, causing about $1 million damage. No advance flood protective work was done that year.

The fall, winter, and spring of 1973 to 1974 experienced two exceptional hydrologic conditions which caused extreme stream runoff conditions. In January 1974 a warming period with heavy rainfall caused snowmelt, ice jams, and flood flows primarily in the Snake River Basin and its tributaries from the Payette River downstream. About $2 million of damages were caused. No advance flood protective work was done in anticipation but flood fights were made in several locations, as will be

recounted later. In June of 1974 a period of heavy rains combined with record high temperatures (105 degrees at Boise) caused rapid snowmelt and excessive flooding about the middle of the month, particularly in the Snake River Basin above Lewiston, Idaho, with record flows in some tributary basins. The resultant flood action could be anticipated to some extent, and advance flood preparation work was undertaken at a cost of $281,000 during the first half of June at six general locations. Actual damages from this flood were over $2-1/2 million, predominantly to roads, bridges, and highways.

The winter and spring of 1975 had some unusual snow cover and runoff conditions in the District that dictated emergency activities other than advance preparation: the Weiser River in March and June; Big Wood River in May; the Big Lost River and Snake River in Wyoming in June; and a major flood in the Wallowa Basin of Oregon in June and July. Late fall and early winter precipitation and temperature conditions were not unusual and little difficulty from floods was anticipated. The 1975 spring floods occurred generally during June. Precipitation for June was about 130%, 70%, and 90% of normal for the upper, middle, and lower Snake River region, with temperatures 5 degrees to 10 degrees above normal.

The April to July runoff volumes for Snake River were above normal as illustrated by the following tabulation:

Station	% Average
Palisades Reservoir Inflow	112
Henrys Fork at St. Anthony	175
Willow Creek - Ririe	115
Big Lost River - Mackay Res.	141
Big Wood River - Magic Res.	142
Boise River at Boise	125

The Wallowa River Basin, a tributary of the Grande Ronde River in eastern Oregon, received major flood damages due to rain and heavy runoff from snowmelt in the mountains. Flooding began 5 July 1975, continuing until 10 July with a peak discharge of about 1300 cfs. Flood damages, estimated at $2,744,000, were caused to agricultural lands, roads, residential, commercial, and community facilities of the two towns, and primarily to the Union Pacific Railroad which sustained about half the damages. Governor Straub declared Wallowa County a flood disaster area.

FLOOD FIGHT WORK

In addition to the regular building of flood protective works and advance construction in anticipation of serious flood conditions, actual flood emergencies arise almost annually along the many turbulent streams of the District. The past five years have been no exception. This flood fight effort, while done under trying conditions,

has prevented extensive damage to the highly developed valley bottom areas throughout the region. These emergency activities are many faceted in that they attempt to stop or divert overbank flows in critical areas, repair and reinforce existing flood protective works which are showing points of weakness, and reduce threats of avulsion where streambanks are being attacked.

The 1970-71 snow and weather conditions mentioned above resulted in an average water content of the snow in the upper Snake River Basin by April 1971 of about 180 percent of normal. This snow condition combined with above normal precipitation produced an extremely high flood potential throughout the Basin. Flood-fight activities were undertaken in many locations, primarily in Wyoming and Idaho, at a cost of $347,700, preventing damages estimated at more than twice that amount.

The 1971-1972 winter season again experienced critical flood potential conditions for the upper Snake area as well as northeastern Oregon. High flows were forecast at as much as 150 percent of normal. Actual flood-fight action was required at 21 locations throughout the District at a cost of $323,000, again primarily in Wyoming and Idaho, with an estimated savings in damages prevented at near 50 percent more than the cost.

The 1972-73 winter and spring season was comparatively free of critical flood action except at localized reaches which were cared for primarily by local effort, including ice jams at three points in Idaho as cited previously. Active flood-fight assistance was undertaken at the Blackfoot and Weiser ice jams by Corps action at a cost of $88,000. Pocatello was able to care for their problems by local effort only. This was a particularly dry summer and fall with many water users looking vainly for higher streamflows.

As noted above, two District flood periods were experienced in the winter and spring of 1974. The January flood had its major impact downstream of the Boise River Basin. These floods, caused by storm rainfall during 13-18 January in land areas below 5,000 feet elevation, prompted the President to declare a major disaster in portions of Oregon, Washington, and Idaho, with funds for rehabilitation made available through the Federal Disaster Assistance Administration. The District took direct charge of some of the repair work and provided supervision for repair of other damages. Flood emergency work was performed in eight tributary basins as well as along Snake River. A total of $355,000 was expended by the District in these efforts with an additional allocation of over $1 million granted for local rehabilitation.

The June flood of 1974 was to considerable extent cared for by the advance flood preparation work described above. However, actual flood-fight work was undertaken in the Clearwater, Big Lost, and upper Snake River areas with an expenditure of $272,000. Damages prevented by the District's flood-fight efforts are estimated at $2 million. The community of Lewiston, Idaho, was saved extensive damages from this flood

Catherine Creek Dam Site - General View Looking Upstream

Zintel Canyon Dam Site - Looking Upstream into Reservoir Area

Existing Blackfoot Dam - Looking Upstream. Dam and Spillway Outlet Works on Right

by two major projects. The Dworshak reservoir, recently completed, provided storage of a portion of the North Fork Clearwater flood flow. In addition, the levee system around Lewiston being constructed for the Lower Granite navigation and power dam on lower Snake River was near enough to completion to afford very effective protection from a flood flow which under natural conditions would have approached the flood of record (1948) which did extensive damage to the urban area.

Fiscal Year 1975 saw a variety of emergency flood control activities. In Jackson Hole, Wyoming, it was realized in October 1974 that some advance strengthening of the existing levee system was necessary and about $100,000 was expended at various locations along the stream at that time. Similarly, in January 1975 repair work was done throughout the Heise-Roberts levee system in eastern Idaho at a cost of about $130,000. March 1975 saw two critical local problems develop in the Weiser River Basin of western Idaho at a cost of $40,000, and flood flows in May 1975 dictated strengthening of existing works in the Big Wood Basin at a cost of $40,000. In late May and June 1975 high runoff in the Wyoming sector of Snake River required a return to that area to combat flood actions by flood-fight methods at four locations from Teton Park south to the lower end of the valley. In addition, some action was also required in the Big Lost and Weiser Basins, all at a cost of about $180,000. During 1975 about $500,000 was expended on various types of local flood control work.

A brief review of the interesting emergency and other-than-programmed flood protective work in the Camas Creek-Mud Lake area of eastern Idaho is recounted in Chapter 4 following. This is an authorized local protection project which has demanded special attention over the past five years.

In summary of the local flood control activities Districtwide during the five-year period (1970-75) other than formal construction undertaking, we find this phase of the District activities an important unit of its responsibilities. These many separate undertakings also affect the economic well being of the many valley populations, resources, and industry in a very direct way.

Following is a tabulation of the District's investment in maintenance, restoration, and flood-fight activities for the five-year period:

1.	Clearing and Snagging	$ 340,000
2.	Rehabilitation of Constructed Works	1,003,000
3.	"Operation Foresight"	945,000
4.	Flood-Fight Activities	1,126,000

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FLOOD CONTROL - AUTHORIZED WORKS

JACKSON, WYOMING

The existing levee system through the Jackson Hole country is a unique structure designed to restrict Snake River and lower Gros Ventre River through this 25-mile-long very scenic valley. As recounted on pages 95, 100, and 142 of the previous volume of history, levees along 15 miles of both banks of the river were built from 1959 to 1964. The river, like some of the cattle and horses of the area, proved obstreperous and difficult to control. In the 10-year period since completion of the authorized project (1965-1975) the county and state have expended about $246,000 in maintenance and repair. The Corps has invested $410,000 in supplemental repairs, as well as considerable "Operation Foresight" funds in protection of critical reaches along the left bank downstream of the authorized work. Protective works of varying degrees of permanency now exist along about 20 miles of Snake River as well as along the lower four miles of the Gros Ventre River.

In 1969 it was agreed that a careful evaluation of the adequacy of existing works should be made. This was for possible reduced maintenance costs as well as proper design for any extensions being considered downstream. Hydraulic design criteria of the late '50s was evidently not adequate, considering the unstable stream conditions caused by islands, moving bed load, width of channel (1,000 feet) and debris. Water surface elevations during flood flows vary as much as five feet from design criteria in local reaches and impinging flows attack the levee directly at critical points in the braided stream.

A Design Deficiency Report for the permanent levee system has been under preparation since 1970 with two interim submittals of partial data. The complete evaluation is now scheduled for Fiscal Year 1976. The study will consider about 10 alternatives from continuing present O&M practices to elimination of Federal spending in Jackson Hole and reversion to a "wild river" status. Under provisions of paragraph 5d of the Wild and Scenic Rivers Act of 1968, the Secretary of the Interior has designated Snake River from Jackson Lake in Wyoming to Palisades Reservoir in Idaho as a "potential wild and scenic river." The more than 5,000 inhabitants in Teton County and property owners of the 100,000 to 150,000 acres in the valley, ten percent of which is in the flood plain, will be consulted on the findings and recommendations.

MUD LAKE AREA AND CAMAS CREEK - EASTERN IDAHO

The efforts of the District to prevent major flood damages in the very interesting geologically peculiar Mud Lake Basin of eastern Idaho deserve review. This saucer-shaped Basin in a relatively new, highly porous, basaltic lava section of the Snake River plain in the Craters of the Moon area has a tributary drainage to the north of about 1,100 square miles. The Basin, except for the developed area south of the Lake, is a sparsely populated, arid region with considerable of the water supply for the Lake coming from ground water.

The Lake existed many years ago as one of many marshy areas, filling during wet seasons and essentially drying up following dry periods. Irrigation development in eastern Idaho changed this routine by seepage of waste water and return flows into the porous, basaltic substratas which surfaced at Mud Lake as springs, making a permanent Lake. This resulted in the local people building 10 miles or more of levees in an attempt to control flooding and direct flood flows back into the lava beds to the south.

The flood problems of the highly developed irrigated area south of Mud Lake have been recognized since the preparation of the 1948 "308 Report," which recommended protective works around the south side of the Lake and up Camas Creek a short way. A Justification Report supporting an authorized project was approved in 1959. A local flood control district operates the levee system and drainage structures.

Emergency flood control activities here have been the order of the day since the District was formed. A particularly critical year was 1969, as cited on page 115 of the previous volume. That spring under "Operation Foresight" a diversion of inflows from Camas Creek was made about 32 miles above the Lake directing the floodwater into the lava beds to the east. In addition, many reaches of the levee were reinforced against overtopping and wave action. A specifically authorized $30,000 levee repair and rehabilitation job was performed late in 1973 along 4,000 feet of an outlet canal leading south from the lake. "Operation Foresight" work has also been undertaken in 1971, 1972, and 1974 which has resulted in placing the levee cross section and its extent into fair condition for protection. The relief canal and pumping plant putting excess water into the desert and lava beds to the south of the Lake have been improved, as has the new diversion works to the north on Camas Creek.

The diversion from Camas Creek has subsequently proven very effective and a three-bay concrete diversion structure was formalized by the local people in 1974. This step has not only afforded good control of flood flows in Camas Creek, but because of the stored water in the lava beds, summer stock water and return flows into Mud Lake and the surrounding area late in the summer have greatly benefited irrigated agriculture.

These emergency flood fights, "Foresight," and special steps over the past 6 to 10 years have resulted in a relatively adequate flood protective system for two communities, 5,000 to 7,000 acres of highly developed agricultural land, and a wildlife refuge area. Their problems have not all been solved; more adequate permanent protective works are needed in some reaches, but much has been accomplished by intermittent emergency steps. A Reconnaissance Report updating the needs of the area was submitted in May 1970 in anticipation of the subsequent preparation of a Definite Project Report which was then scheduled for 1972. That report has now been reprogrammed for late 1975 to firm up the specific remaining needs.

BLACKFOOT RIVER RESERVOIR

Pages 82, 83, 95, and 142 of the previous volume of history cite the background for the authorized modifications to the Bureau of Indian Affairs dam and irrigation reservoir on upper Blackfoot River. The changes to the project were authorized in 1962 with the objective of obtaining better control of floods in the lower valley through programmed storage, including some exclusive flood control space in the top two feet of the reservoir.

To understand the unstable scope of the authorized works necessitates a review of both design studies and public participation over the initial eight years of authorization (1962-1970), as well as the activities of the past five years. This reservoir, built about 65 years ago, has an authorized design pool elevation of 6124.0. Seepage problems developed at the upper end of the reservoir in porous basaltic formations with resultant flooding of the so-called "Fivemile Meadows" to the south in the Bear River drainage. To control this seepage, the China Hat Dam or levee was built on the upper reservoir fringe several years ago near the divide between the two drainages. The Bureau of Indian Affairs has operated the Blackfoot Reservoir at a maximum elevation of 6120.5 which afforded adequate irrigation water for developed lands at that time and made very good use of the average annual runoff of Blackfoot River at that point, but gave limited flood control.

Funds to prepare the necessary engineering design and reservoir land acquisition reports were initially allocated in Fiscal Year 1965. 1967 to 1969 saw several design changes at the dam structure due to modified criteria for spillway and outlet capacities as well as operating procedures for flood control. In addition, there were extensive discussions by wildlife interests on the use of the reservoir capacity for flood control involving greater pool fluctuations in spring and early summer. Many discussions were held with the relatively new homeowners in the upper reaches who would be affected by the flood storage activities. A Design Memorandum was submitted on 18 September 1969 specifying structural changes and real estate requirements for a reservoir to meet the flood control requirements as specified in the 1962 authorizing document.

The 1969 design study provided for increasing markedly the spillway capacity and replacing outlet gates at the dam, raising and sealing of China Hat Dam at the south end of the reservoir to limit seepage into the Bear River drainage, and purchase of seepage easements in the Fivemile Meadows area. Supplemental reports in 1970 and 1971 to that design study proposed purchasing lands including freeboard areas in fee title to elevation 6130. This real estate purchase plan involved 3,100 acres of shorelands. The 1969 General Design Memorandum was approved in June 1970 and advance engineering funds were made available in FY 1971.

The reservoir shorelands near the China Hat Dam at the easterly end of the reservoir are very desirable for summer homes and lie near the industrially active community of Soda Springs, Idaho. During the late '60s and early '70s many sales for shorelands were entered into for homes along the reservoir, with most of them built near the operating pool level of 6120.5 and within the area subject to flooding with the now authorized flood control pool level 6126.

A public meeting was held in Soda Springs on 30 October 1972 as a joint venture by Bureau of Indian Affairs and the District. A draft of an environmental impact statement was prepared and distributed for review in March 1974. Another public meeting was then held at Blackfoot, Idaho, on 1 May 1974. The one strong protest was to flowage expropriation of the summer-home lands. This question had also received Congressional attention by a volume of letters.

Studies continued on possible modifications, physical changes, and potentials for revising the reservoir operation sequences, still satisfying irrigation requirements and flood control with less gross storage. In the fall of 1974 a proposal was made to Bureau of Indian Affairs that runoff and evacuation measures be modified through careful stream forecast procedures; modifications be made to spillway and outlet works; the dam and the China Hat structures be strengthened; the current pool operating level of 6120.5 be retained; and that the Bureau of Indian Affairs be responsible for any wind/wave action on the private property in question. These proposals were satisfactory to the Bureau and a mutual agreement was reached in November 1974. Accordingly, a supplement to the General Design Memorandum of 1970 was completed in April 1975 and was submitted for review. The environmental impact statement will also be revised. Other public meetings will then be scheduled presenting these results. Rebuilding of the dam structure may still be realized during this decade. Considering the age and capabilities of the structure, coupled with the need for added flood protection in the lower valley, this is a very desirable objective.

BOISE FRONT PROJECTS, BOISE, IDAHO

Page 105 of the previous volume describes the early history of the flood problems generated by four small drainage basins flowing through the Boise area to the adjacent river from the steep hillside

to the north. Two detention reservoirs, Cottonwood Creek and Stuart Gulch, were authorized by the Flood Control Act of 1966.

Design studies for the Cottonwood Creek project were submitted in October 1969. This report found need for major changes in the size of the project because of modified hydrologic data and revised flood volumes which increased over 200 percent. These revisions from the original authorization increased the dam height and length with major changes in project costs, including local participation. A Post Authorization Review Report was subsequently submitted in June 1971, with additional supplemental data furnished in June 1972. An environmental impact statement was also furnished in October 1971.

Project benefits for the Cottonwood project also increased so that justification appeared adequate. However, policy decisions concerning the method of evaluating flood control benefits have been undergoing reevaluation in 1974 and 1975 which could affect the project justification. Accordingly, further project development studies are being held in abeyance in mid-1975. There is still good support locally for the project. The Boise area is apprehensive about the potentials for both Cottonwood and the adjacent drainages creating havoc.

The Stuart Gulch flood control project was also subject to reevaluation in 1972 and 1973 with revised design studies completed in October 1973. In addition, an environmental statement was submitted in 1971. As with the Cottonwood project, more extensive hydrologic studies materially increased the size of the project. The height of the dam was raised from 44 feet to 74 feet and the storage capacity from 510 acre-feet to 2,420 acre-feet. Design studies continued until April 1974.

The project justification was still found to be adequate, as with the Cottonwood project, but sponsorship problems developed. The County of Ada was the original sponsor in 1966 since 95 percent of the lands involved were under county supervision. By 1974 the City of Boise had annexed 95 percent of the lands into the City, and the County withdrew its sponsorship. Several official requests were made but the City had not agreed to sponsor the project by 1 April 1974 so the Stuart Gulch reservoir project was declared "inactive." This official designation permits a change in status any time within the next five years.

A comprehensive Boise Urban Study was initiated in mid-1972 to evaluate the urban flood problems, water quality, wastewater management, and flow conditions of Boise River below Lucky Peak Dam. This will evaluate pollution and sewage treatment in line with the 1972 Water Quality Act, supplemental flows at critical times, and will investigate some of the storm drainage and flood problems from the Boise front tributaries as well as in the Caldwell area. The front tributary evaluations, however, will deal primarily with the restricted channels in the developed areas, not the more infrequent but devastating rapidly developing snowmelt and heavy storms emanating from the hillside areas. That report, which will

develop plans for both urban and agricultural wastewater management, is scheduled for completion in late 1976. Ten years of study of the Boise front problems have yet to evolve viable flood preventive measures.

GRANDE RONDE RIVER BASIN, OREGON

Two multiple-use storage reservoirs were authorized for this Basin by the Flood Control Act of 1965. They are briefly described on pages 105-107 in the previous volume. The larger project at the lower Grande Ronde site above La Grande, Oregon, with 160,000 acre-feet of storage has received little attention design-wise in the past five years. Local discussions as well as with state interests indicate that questions on irrigation, the stream fishery, and environmental changes will need early examination when design studies are authorized. No funds have been appropriated to date.

The Catherine Creek storage project has been under study since 1968. This reservoir is also planned for multiple-purposes, including flood control, irrigation, municipal water supply, fish and wildlife, and recreation. The dam is designed for storage of about 61,000 acre-feet of water by a structure 210 feet high and 790 feet long. Construction costs, originally less than $20 million, are currently estimated at over $27 million.

General design studies were submitted in late 1971, a water quality report in June 1972, and the environmental impact report in May 1974. Congress appropriated $400,000 for start of construction in FY 1973. The funds were frozen by Executive Order until July 1973. An additional $1,500,000 construction funds was appropriated for FY 1975. No actual construction has been accomplished, however. The Confederated Indian Tribes of the Umatilla Indian Reservation are opposed to the project for fear of the effect it might have on their tribal off-reservation rights established under an 1855 treaty. Six meetings were held with the Indians over a 14-month period and formal proposals to protect their rights were presented to the Tribes in March 1973 and May 1974. Both proposals were rejected.

Congress received testimony regarding the Indians' objections to the project on 25 June 1974, but still appropriated construction funds for FY 1975. Accordingly, the Tribes were advised on 5 November 1974 that construction would be initiated. The Tribes countered by filing an injunction suit on 19 December 1974 that the project will unconstitutionally involve a "taking" of tribal off-reservation fishery, hunting, and gathering rights. Practically all lands involved are now privately owned, with one small parcel of Forest Service property.

Detailed planning and design for the many facets of the project including benefits for irrigation, recreation, municipal and industrial water supply, and for enhancement of fish and wildlife resources have continued to date, pending the outcome of court action.

HEPPNER-WILLOW CREEK, OREGON

The interesting problem of storm runoff and its control in the Willow Creek Basin above Heppner, Oregon, is described briefly on pages 109-110 in the previous volume. As outlined there, an 11,500-acre-foot storage project at a natural damsite just upstream of the community was authorized in 1965.

Design memorandum studies on various facets of the project were initiated in FY 1972 with a report submitted in July 1973. That report found some major changes were necessary in the use of the storage capacity to accomplish the control necessary. Other potential uses of the project were also found to need adjustment. One of the critical factors was that more research on cloudburst-type storms in this section of the state dictated the holding of storage space available for these storms later in the spring than was originally planned. This made joint use of some space for irrigation impractical because of lack of excess precipitation, generally in late spring and summer.

Coupled with the need for more exclusive flood storage space was the failure of irrigation interests to sign up commitments for stored water to justify the storage costs apportioned to that use. The loss of irrigation storage demands and the change in operation for flood control storage modified the use of the reservoir for recreation and sports fishing and wildlife. In addition, a small portion of storage space was allocated to municipal and industrial water supply. The community determined that because of water quality problems and costs, adequate supplies could be obtained from wells at lower costs than from storage.

The Plan Formulation Report of August 1973 specified these changes in project purpose and utilization, recommending that the authorization be only for flood control, recreation, and fish and wildlife enhancement. The following table illustrates the changes in storage use. The project cost has also been escalated from $6.7 million in 1963 to $13 million in 1973 which was found to be economically justified.

Project Function	Authorized Project A.F.	Modified Project A.F.
Exclusive Flood Control	1,300	9,500
Joint Use Space	7,900	0
Water Quality Control	300	0
Municipal & Industrial Water	100	0
Fish & Wildlife and Recreation	500	600
Sediment	1,400	1,400
Total (Acre-Feet)	11,500	11,500

A more detailed Design Memorandum on the project changes was submitted in December 1973, with other specific studies submitted early in 1974. Irrigation is not precluded entirely. If future demands develop

some joint-use space can be made available through careful operating procedures. Based upon this material, the decision was made that the project needed Congressional reauthorization. Testimony was presented before the Public Works subcommittees during 1974 and a bill was passed by both the House and Senate and sent to the President in December 1974. President Ford vetoed the bill on 18 December 1974 on the grounds that it "raised unresolved issues relative to the general principles and standards governing the evaluation of water resource projects."

In accordance with this action which questions qualitative factors, all work on the project has been halted until directions concerning the questionable facets are formulated. The admonition of the previous volume that "Heppner should hold off having another cloudburst until at least late in the '70s" still appears valid and conservative.

ZINTEL CANYON, KENNEWICK, WASHINGTON

The community of Kennewick on Columbia River below the mouth of the Yakima River has been plagued for many years with sudden snowmelt and rainstorm floods from the small Zintel Canyon south of town. Urban development and some industry have crept into the Basin, increasing the damaging effects of flood action. Studies during the '60s found the only practical solution to control of flood flows was a small detention dam and reservoir area, together with some channel work.

Such a project was authorized by Congress in December 1970. The project provides for a dam in combination with a downstream conduit, some channel work, and partial flood plain zoning regulations. The dam, 2.1 miles south of the urban area at a natural draw, is only for detention purposes and not to hold a permanent pool. Flood flows will be impounded and then gradually released until the reservoir area is dry. The reservoir will hold 2,560 acre-feet of flood waters and the downstream channel will pass 500 cfs flood flows. The project cost was estimated at $2½ million in the General Design Memorandum which was submitted in January 1974. The final Environmental Impact Statement was submitted in August 1974.

During 1974 an alternate to the authorized earth and rock-filled dam structure was proposed as more appropriate for the site. The alternate, an "Optimum Gravity Dam," would provide a portland-cement-enriched solid structure using Columbia River alluvium materials obtained in the area. Such a structure will eliminate the need for a separate spillway structure and will permit any very infrequent extreme flood flows to spill over the crest of the dam. The concept of an "Optimum Gravity Dam" has been used in Europe for a number of years and this project offered a very practical location and conditions for its use here. The design studies for this alternate will be completed in 1975.

Local interests and the authorities of the City of Kennewick and county are anxious that a construction start on the project be realized during FY 1976 and are making overtures to Congress accordingly.

THE ONGOING STUDIES AND DISTRICT INVOLVEMENT

The District's involvement in constructed works, emergency flood control, and flood fight activities is briefly outlined in Chapter 3. Work on authorized control works prior to actual construction is discussed in Chapter 4. These two chapters describe a broad, active involvement in the water resource problems districtwide. The last few pages of Part I of the previous volume (Chapter 9) mention many other problem areas on tributary streams and potentials for some additional water resource development. Studies on these problems and potentials have also been active over the past five years but solutions in most cases have not been put into finite terms.

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Basin studies in these categories, such as the Mud Lake and Big Wood River Basins in eastern Idaho, are still incomplete. The Mud Lake investigation is commented upon in Chapter 3. The Big Wood Basin study has two facets. The main upper Big Wood valley area and communities desire some relief from floods but want no new storage projects or work that would greatly disturb the existing natural and attractive channel through the valley bottom. The Little Wood Basin in the Shoshone to Carey area has good potentials for one or more diversions to the south into the natural porous lava beds, which would give a good measure of flood control and return the water to the Snake River in the Thousand Springs area to the west. The Big and Little Wood Basin Water Resource Study is scheduled for submission in FY 1976.

The patriarch of irrigation storage in eastern Idaho, the American Falls Dam at Pocatello, is described briefly on page 143 of the previous volume. Final plans for rebuilding the project, which is in critical physical condition, are now taking shape, including its financing provisions, with the prime mover, the water-user organizations, involved. The Idaho Power Company will develop the hydroelectric power potentials. The Bureau of Reclamation will continue to operate the rebuilt project, and under currently existing plans flood control will not be a project function. It is anticipated, however, that the storage operations will be coordinated with the two upstream reservoirs as before and some flood control benefits realized.

SNAKE RIVER - ASOTIN DAM

The authorized Asotin Dam, the fifth unit in the lower Snake River development at the head of the Lower Granite project, was described on page 146 of the previous volume. The project potential has had a checkered history over the past 10 years as indicated therein. During the past five years the proposals before the Congress for hydroelectric development of the middle Snake River Basin above the mouth of Salmon River (Hells Canyon area) by private interests have been countered by parallel legislation setting the region aside as wilderness, or a public-use natural reserve. The later natural preservation legislation envelops the entire Snake River reach from Lewiston to the Idaho Power development at Hells Canyon Dam, specifying the deauthorization of the Asotin project as a hydroelectric project. To date the Congress has not acted on either proposal. The Asotin project rests quietly on the "back of the shelf."

PALOUSE RIVER - PULLMAN

The Palouse River north of Snake River in eastern Washington has a reputation for critical flood flows, and a major channel project was completed at Colfax, Washington, in 1965. The City of Pullman, upstream of Colfax, also had a project authorized in 1944 and has been the topic of flood control design studies for well over 10 years. The community has had specific thoughts as to the type of channel development desired and, through the coordinating efforts of the university there, has presented alternative ideas to a formal lined channel such as at Colfax. A restudy of the District's authorized project is proposed combining some control works and flood plain environmental development. A feasible alternate project may be forthcoming in the next year or two that can be acceptable to all concerned. Experience-wise, the Colfax project 15 miles downstream has taken three major floods in the past 10 years with full protection of the community, while Pullman has suffered extensive damages during all three occurrences.

OTHER TRIBUTARIES

The District has other local flood control studies underway on many tributaries to strengthen, extend, or afford protection to localized reaches, many of which have existing works. This is a continuing undertaking and the eccentricities of streamflows will prompt many others in ensuing years. The Annual Reports of the Chief of Engineers will recount such actions.

FLOOD PLAIN MANAGEMENT SERVICES PROGRAM

The involvement of the District in this evaluation program has developed essentially during the last 10 years, moving at a faster pace during the past five years as a result of new legislation on local development, funding, and the flood insurance requirements. Flood plain

information studies are initiated at the request of local governmental bodies, which usually are forthcoming for urban areas. Flood plain information for communities, including counties, can be provided in three basic ways: through flood plain information reports, through special flood hazard information reports for specific areas, or by providing technical services by letter or even more informal means.

Enactment of the Flood Disaster Protection Act of 1973 resulted in a major increase in demand for flood plain information because of its fiscal and insurance requirements. This Act in essence required all communities to come under the National Flood Insurance Program by 1 July 1975 in order to qualify for Federal financial assistance in any area identified as having special flood hazards. To do so, the local political entity must enact adequate land use and control measures for all flood hazard areas within their jurisdiction, thus qualifying them to be eligible for flood insurance. All this resulted in a strong desire by local officials and lending institutions, including Federal agencies, for flood plain information studies and flood hazard surveys.

During the past eight years the District has prepared studies for 30 communities or portions of tributary valleys. Some have resulted in the local governmental bodies adopting restrictive land development measures for the flood-prone areas within their jurisdiction. Two such entities representative of quite different types of land use are the urban areas of highly developed Pullman, Washington, on the Palouse River, as described previously, and Blaine County in the upper Big Wood Basin of central Idaho - a rustic area of wooded valley bottom land and mountainous upland reaches, including the well known Sun Valley ski area at Ketchum.

The program is a fast changing, Federally controlled undertaking for regulation of flood plain development, coupled with provision of financial protection through insurance, rather than resorting to physically controlling the streams' flood propensities. In the decade of the late '60s through 1975, the District has expended over $1 million in assisting local entities to define flood-prone areas and flood characteristics of the many tributaries. The requirements of this program relative to developments in the flood plain affect materially the benefits creditable to structural measures for control of floods. This "nonstructural alternative" approach has reduced the project scope and benefits creditable to physical facilities such as storage and major channel works. The activities and results of the next 5 to 10 years of this program will be needed to compare with the experience of the past 10 years or more of the District's physical measures taken on streams for flood control and related activities. The accomplishments of the flood plain management program can then be objectively evaluated in relation to community economics and overall environmental enhancement.

LOWER BOISE RIVER METROPOLITAN STUDIES

In 1972 the Office, Chief of Engineers initiated five "pilot" studies to analyze the many facets of wastewater treatment from urban areas.

One primary objective of the "pilot" studies was to evaluate the potentials for using land treatment processes to dispose of effluent from urban sewage. From these "pilot" studies, which considered only wastewater, the work branched out into comprehensive urban water resource studies covering all water source concerns.

One such early urban study authorized was for the Boise, Idaho, urban area, initially from Lucky Peak Dam to the Ada County line 25 miles downstream. The Upper Snake River Basin Study, discussed on pages 81-84 of the previous volume, is still an open authority for water resource problem evaluations and has been used accordingly for this comprehensive water resource study.

The investigation covers a wide area of wastewater treatment, both urban and agricultural, such as industrial, sidehill drainage in urban areas, feedlot wastes, sewage plant effluents, and irrigated agriculture return flows to the river. The study considers related questions of regional growth, recreation, municipal water supply, streamflow minimums, Lucky Peak scheduled releases, Barber Dam irrigation diversion actions, and similar water-related factors.

In developing the plan of study it was recognized that the water treatment needs, sediment, and drainage problems in adjacent communities of Nampa and Caldwell and contingent areas of Canyon County were an integral part of the treatment problem so the study was broadened to cover Canyon as well as Ada County, or the Boise River from Lucky Peak Dam to its mouth, a reach of over 50 miles.

The analyses of the several separate parts of the overall study are due to be completed during the summer of 1975. The parts will then be put together to formulate a basinwide plan for the lower Boise River by the spring of 1976. The final report is scheduled for the fall of 1976. The cost of the three-year study through FY 1975 is $700,000, with the final cost estimated at $870,000. This innovative type of study for overall urban water resource evaluation may open vistas for waste management that could correct many current problems.

COLUMBIA RIVER AND TRIBUTARIES STUDY

The North Pacific Division, during FY 1973, initiated some comprehensive reevaluations of existing projects, depletion, and power demands. This District is preparing four studies under this authority:

Lucky Peak Dam Modifications - Boise River

This study includes increased storage, power potentials, and an additional outlet to provide minimum flows downstream when the existing single outlet is closed for inspection and repair. The Twin Springs Dam above Lucky Peak, as described on page 144 of the previous volume, is not being considered. The Boise River system and downstream needs may, however, point to needed additional storage. In addition, the need

downstream to maintain a live stream at all times dictates modifications to the outlet system. The evident loss of energy in the present outlet works prompts the reevaluation of the hydroelectric power potentials at the project. This study will be completed in FY 1976.

McNary Dam Modifications - Columbia River

This first-step study for feasibility involved the potential for a second powerhouse at the project, the practical number of power units, and the general layout for such an expansion. The general plan also included some additional wildlife potentials and the need for beautification of the levee system in the upper reservoir area at the Tri-Cities of Pasco, Kennewick, and Richland, Washington. This feasibility report was initiated in the fall of 1973 and submitted in December 1974 recommending the project expansion. The proposals are described in more detail in Part 2 of this volume.

Lower Snake and Lower Columbia River Irrigation Depletions

The development of irrigated agriculture in these subbasin areas by means of high-lift pumping projects dictated the evaluation of the impact of such development potentials upon the streams. This includes reduced streamflows, possible minimum restrictions, loss of power generation, and demands for pumping power. This very objective water resource evaluation initiated in FY 1975 may lead to some interesting evaluations of irrigation potentials and effects upon the Columbia River system. The study is scheduled for completion in June 1976.

Off-Stream Storage for Energy Generation

A fourth preliminary evaluation was made of the physical potentials for so-called pumped storage hydroelectric power capabilities, for producing peaking power - or energy generation. This was initiated in May 1972 with a report in June 1972 on a single potential for the Palouse River Basin, pumping from the Snake River. In November 1974 a second report was initiated covering seven additional potentials with very preliminary evaluations to define the scope of a possible more comprehensive study. That report was submitted in January 1975. Those findings will be combined with other studies of other reaches of the Columbia River Basin by the North Pacific Division to define the Basin potentials for such future hydroelectric power input. This concept of added hydrogeneration needs is the result of decisions on energy demands and satisfying those needs. This involves conversion from a mainly hydro system at present (85 percent) to a hydrothermal system which will place hydro into a much needed peaking role, while thermal will provide most of the base load generation. The Palouse River (Union Flat Creek) proposal has been approved for more detailed studies.

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THE INLAND EMPIRE DISTRICT
REASSIGNED DISTRICT OFFICERS AND CHANGED RESPONSIBILITY

NEW DISTRICT ENGINEER

Colonel Nelson P. Conover, a native of Mobile, Alabama, was assigned to the District on 8 July 1973. He came to his new tour of duty with a wide range of Corps assignments: a troop unit in Korea; 8th Infantry in Germany; two tours of duty in Vietnam; the ROTC Unit at the University of Dayton; and with the Nuclear Power Division in the Office, Chief of Engineers. Colonel Conover holds a B.S. degree in Civil Engineering and a Master's degree in Nuclear Engineering. He is a graduate of the Command and General Staff College and the Army War College.

Colonel Conover arrived in the District just one month after the dedication of the major Dworshak project but has supervised its completion details and problems as a prime unit in the Columbia and Snake Rivers system. He, however, had the distinct pleasure of being directly involved in the multiple dedication of the Lower Snake River Projects in June 1975 - a major accomplishment of water resource development after 100 years of Federal involvement in that reach of river. Colonel Conover has proven to be a careful administrator and a perceptive and astute director over the many-faceted activities of the District, including its involvement in fish and wildlife problems, environmental considerations, changing flood control concepts, and water management policies. He has found himself involved in a wide variety of specific problems: negotiations with the Umatilla Indian Tribes on an injunction for the Catherine Creek project; changes in District boundaries; lock and generator deficiencies; top personnel changes; land disputes such as at Blackfoot, Idaho, and for cattle access to water at McNary; and completion of two of the largest projects the Corps has built - the Dworshak Dam and the Lower Snake four-dam project. He also enjoys participation in community and regional activities.

Colonel Conover has had two Deputy District Engineer officers as his assistants. Major David R. Spangler reported to the District on 20 August 1973 from a tour of duty in Korea. Major Spangler, a graduate of West Point in 1962, is a registered Professional Engineer with both a B.S. and M.S. in Civil Engineering, the latter from the University of Illinois in 1966. Major Spangler left the District in July 1974 to continue his academic training.

Major Spangler was succeeded in July 1974 by LTC Edward H. George III who came to the District from the Military Science (ROTC)

program at Eastern Kentucky University. He had previously had two tours in Vietnam, one in West Germany, and one in Brazil. LTC George has a B.S. in Mechanical Engineering and a Master's degree in Industrial Technology.

THE DISTRICT'S CHANGED BOUNDARIES

Two changes in the geographical area assigned to the Walla Walla District were made over the past five years:

John Day Dam and Tributary Streams

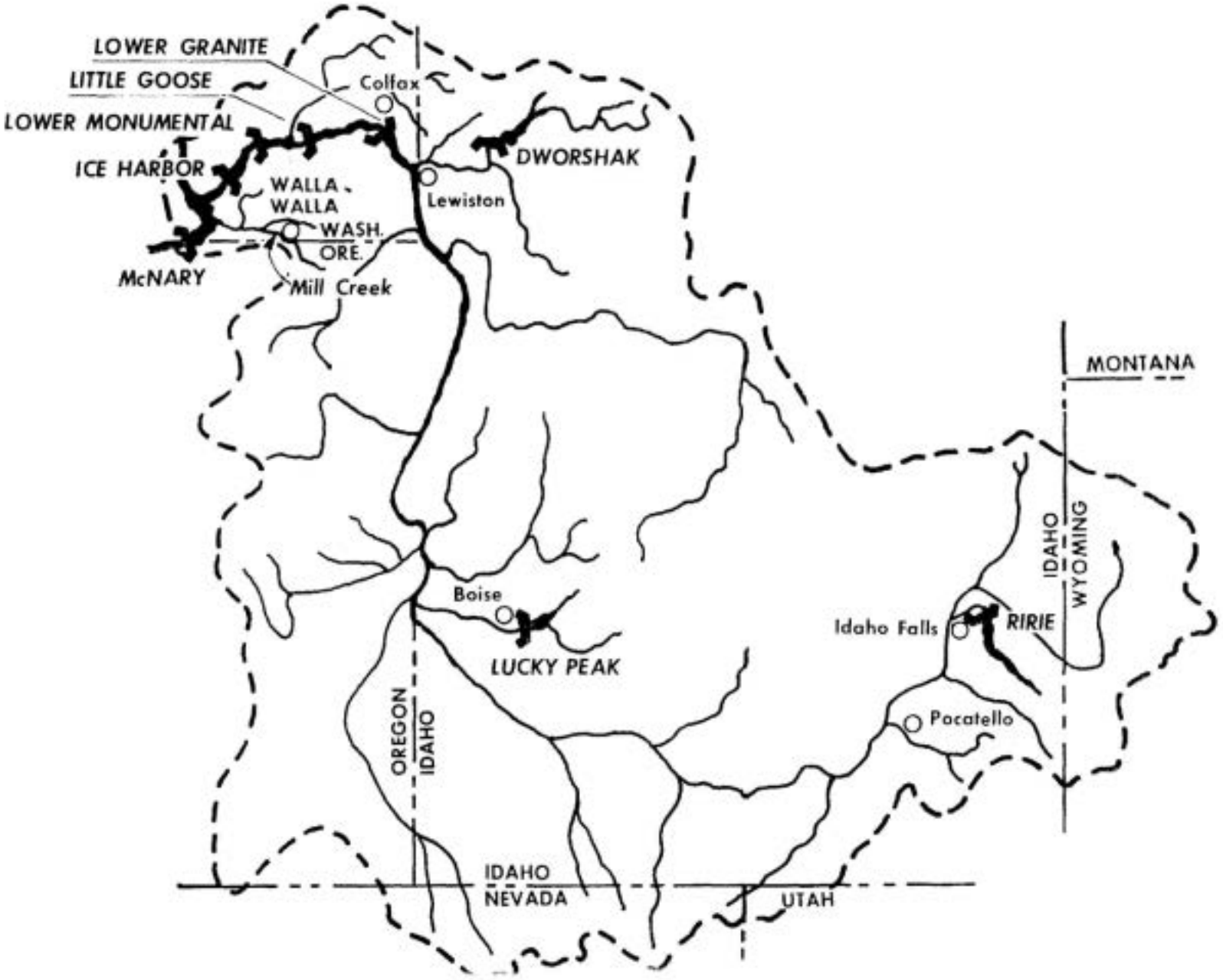
The addition to the District of the John Day and Willow Creek Basins in central Oregon in 1955 is described on pages 54 to 56 of the previous volume. This enlargement of the District enveloped the John Day Dam project on Columbia River, the construction of which is described in some detail in other parts of this volume.

The desirability of integration of the operation of the John Day project with that of The Dalles Dam downstream prompted the decision that the Portland District would operate the two as a unit. Reservoir operation and management of recreation facilities then prompted a redefinition of District boundaries, including tributary basins. Accordingly, the geographical boundary between the Walla Walla and Portland Districts was changed by General Order No. 17 dated 28 June 1972, effective 1 July 1972. That boundary change transferred all river basins entering Lake Umatilla from the south between John Day and McNary Dams from Walla Walla District to Portland District.

The boundary on Columbia River was subsequently more specifically defined as being at the highway bridge at Umatilla, Oregon, just downstream of McNary Dam. This automatically placed the Umatilla River Basin within the Portland District, an area contiguous with the Walla Walla River Basin and within commuting distance to Walla Walla. The Umatilla River has received much attention over the past 25 years for flood control. In follow-up action the Division Engineer on 16 April 1973 directed the District Engineer, Portland District, to assume responsibility for all civil works activities within his District boundaries.

Because of the current involvement of the Walla Walla District in the Heppner, Oregon, and Willow Creek storage project, the Division Engineer on 19 October 1973 transferred responsibility for design and construction of the Willow Creek Lake project from Portland District to Walla Walla District. No change in District boundaries was made, with operation of the completed project possibly to be a joint responsibility between the local entity and the Corps.

Subsequent to this change in area of responsibility there have been emergency flood conditions in the Umatilla River Basin which have demanded attention. The Portland District called upon the Walla Walla

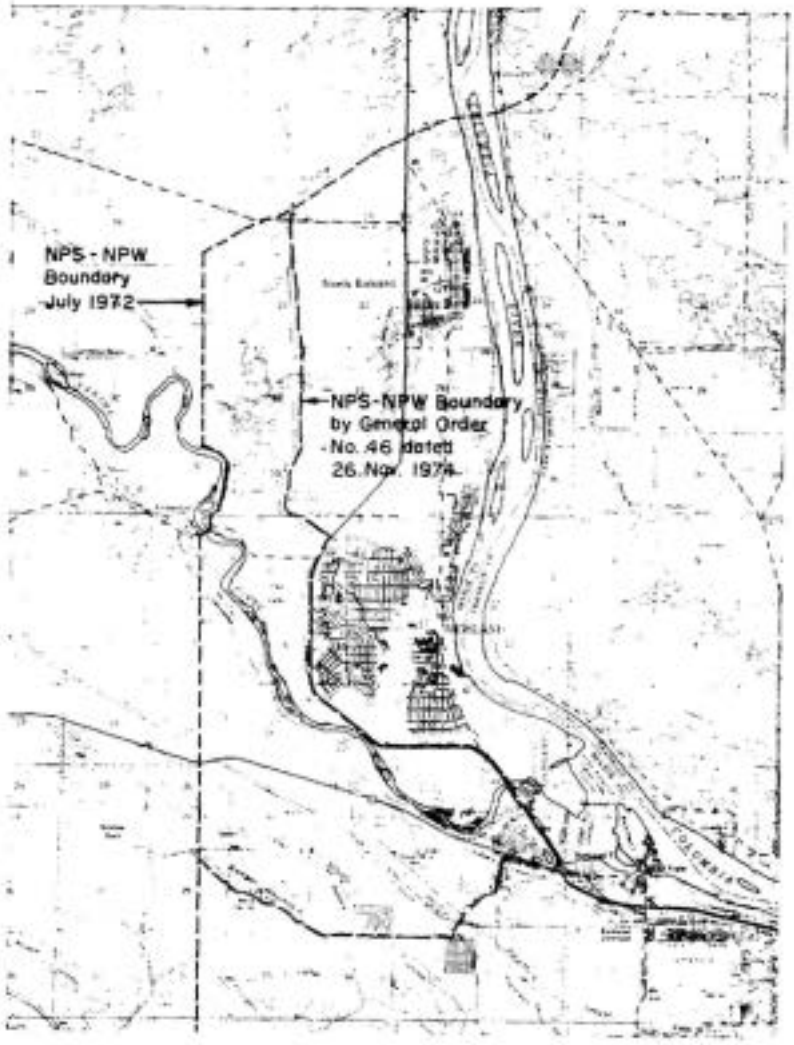

LOWER GRANITE
LITTLE GOOSE
LOWER MONUMENTAL
ICE HARBOR
McNARY
Colfax
WALLA WALLA
WASH.
ORE.
Mill Creek
Lewiston
DWORSHAK
MONTANA
IDAHO
WYOMING
Boise
LUCKY PEAK
Idaho Falls
RIRIE
Pocatello
OREGON
IDAHO
IDAHO
NEVADA
UTAH

District to investigate and assist in controlling the flood action. There have been no similar problems during the past two years in the John Day or Willow Creek Basins.

Yakima River Mouth - McNary Project

The second change in District boundary was to try and define more clearly responsibilities for flood action and flood plain studies on the lower Yakima River from Prosser, Washington, to the mouth at Richland. Because of backwater conditions from McNary Dam in the lower nine miles of Yakima River, the Walla Walla District has had jurisdiction of the problems in that reach, including both flood plain zoning operations at Richland and levee protection at West Richland.

The Division Engineer decided that the Seattle District should exercise supervision over the entire Yakima River watershed. On 26 November 1974, by General Order 46, he directed the following boundary change between the two Districts:



"The Seattle District will comprise that part of the State of Washington embracing the Pacific Coastal drainage basins. . .; the Columbia River and tributaries above river mile 345 (head of McNary pool); and the Yakima River; . . . .

'The Walla Walla District will comprise all Columbia River drainage and tributaries thereto between the head of the McNary pool (river mile 345) and the Umatilla Bridge below McNary Dam, except the Yakima River Basin."

The detailed physical line of demarcation between the two Districts adjacent to the City of Richland was agreed to by the Seattle and Walla Walla District Engineers. The new boundary starts at the lower Yakima River bridge, passing around the outskirts of the city to the airport, then north along the Horn Rapids Ditch 3½ miles to the original boundary.

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THE DISTRICT AND ITS STAFF

CONSTRUCTION DIVISION

The previous volume, in describing the new District formation, indicated it was initially an organization charged with a potential long-range construction program, which it proved to be. Table 1 of that volume illustrates the fact and the corresponding tabulation in this volume extends the trend. The first volume describes the construction activities over the District's initial 22 years of effort, and for some projects the change to operation phases. The past several years of additional construction effort continue to be illustrated by the establishment and demise of Resident Offices for construction supervision. The "rise and fall" of construction Resident Offices for supervision of the work in some ways depicts the flow of the District's activities in realization of major water resource projects and its activities in military construction. A brief review of them in more detail than other phases of the District's program seems to be in order to document more specifically an important component of the District's history and show how "people" become a major facet of it.

As first organized, with the exception of work at McNary Dam, all construction offices and all construction activities of the District were under the direct supervision of the District Operations Division, renamed Construction Division in 1950. Construction of McNary Dam was supervised by the McNary Operations Division (renamed McNary Project Office in 1951), the chief of which reported directly to the District Engineer until 1953 when, as construction was waning, it, too, was placed under the supervision of the Construction Division. In 1957, to increase the external prestige of the heads of field construction offices in conformance with Corps policies, the project (resident) construction offices were placed directly under the supervision of the District Engineer and Construction Division's supervisory role became more that of staff, advisory, and support functions. Through the years Construction Division has continued to supervise numerous small construction projects when establishment of an independent office has not been warranted. Operation and maintenance activities of the newly organized District were principally operation and maintenance of Mill Creek Reservoir, issuance of navigation permits, inspection and repair of local flood control work, emergency-type flood control protection, maintenance of the District offices, and operation of the District motor and equipment pools. To these were added the operation and maintenance of McNary Lock and Dam when that reservoir was filled and as power generation began. In 1958 as Ice Harbor Lock and

Dam operation was approaching reality, a separate Operations Division was formed.

The McNary Dam project office was established by Portland District in 1947 with George J. Schock as Resident Engineer. It was staffed to provide much more detailed supervision of contract work than has since become the modus operandi of the Corps. As an example, all layout surveying and surveys for payment measurements were done by Corps personnel. In 1949 the staff for surveying alone was 45 men. The project office staff at one time totaled over 350 persons. A sizable portion of these managed and serviced the McNary townsite and performed other service activities but over 200 had exclusive duties related to the contractor's activities. Schock was replaced as Resident Engineer in 1948 by LTC William J. Ellison, Jr., who was replaced in 1949 by Samuel G. Neff. After Neff became Chief of Construction Division in 1953 the office was headed in turn by Alton G. Davis (who died in service at McNary) and Richard L. Earnheart, until construction was complete in 1956.

Through most of its life, the McNary Resident Office was staffed to handle most all its construction problems (as differentiated from design problems) without close District Office help. In contrast, the construction of the extensive McNary project railway and highway relocations on both sides of the Columbia and the levees in the Pasco-Kennewick-Richland area was more closely supervised by the District Office Construction Division. Relocation construction of the Union Pacific Railroad and U.S. Highway No. 730 on the south shore downstream from Wallula was supervised by an office opened in the vicinity of Wallula in 1950, with J. Fred Skidmore as Resident Engineer. This office, with a peak employment of about 25, was closed in about two years. Relocation work on the north shore was initiated in 1959 under a Resident Office at Yellepit, with George Schock as Resident Engineer. This office later moved to Hover, and in 1951 to Pasco where it was called the Pasco-Kennewick Resident Office. It supervised the relocation of the Spokane, Portland and Seattle (now the Burlington Northern) Railway and the Union Pacific and Northern Pacific (also Burlington Northern) Railways upstream from Wallula, construction of the levees around the upper portion of the reservoir, raising the Union Pacific and Northern Pacific Railway bridges near Burbank, relocation of several roads and highways, relocation of the town of Wallula, and numerous other construction activities. Maximum employment in this office was about 50 persons. When relocation work was completed and this office was deactivated in 1953, Schock and a considerable portion of his staff transferred to Portland District to undertake relocations for the then-under-construction The Dalles Lock and Dam project. In 1957 Schock and many of the same crew returned to Pasco to a reopened Pasco Resident Office charged with constructing railroad relocations for Ice Harbor Lock and Dam. On the north bank these required a new roadbed and trackage for the Spokane, Portland and Seattle Railway from about five miles downstream from Ice Harbor to Lower Monumental Dam and for

the Union Pacific Railroad on the south bank of the river from about five miles upstream from Ice Harbor to Lower Monumental. The office employment was at 61 persons in 1958. As work on John Day highway and railway relocations got underway in 1958, responsibility for these was added to the functions of this office. Personnel had increased to about 75 in 1961. In 1962 responsibility for relocation work on the south shore of John Day reservoir was reassigned to a newly established John Day Relocation Resident Office, South Shore. The Pasco office was renamed John Day Relocation Resident Office, North Shore, retaining responsibility for relocations on the north shore, principally about 00 miles of the Seattle, Portland and Spokane Railway, adjacent Washington State highways, and the town of Roosevelt. At the beginning of 1965 Schock retired. He was succeeded by James A. Van Sant, second man in the office. Van Sant resigned in 1966, and was succeeded by Robert F. Curtiss. The staff gradually declined to about 14 persons in 1968 when construction had been completed. At the beginning of 1969 remnants of the staff formed a project office of the Construction Division to administer relocation agreements. When it was deactivated in 1969 this office, originated at Yellepit in 1949, had been in continuous existence except for the years 1953-1957, and as such has had the longest history of any construction office of the District.

In 1948 the District had a small field office at Boise, Idaho, which developed into the Lucky Peak Dam Project Office at the damsite with a peak staff of about 25 persons. Leonard G. Estey was the first Project Engineer, succeeded by Walter J. Murphy in 1953 when Estey transferred to the Portland District to duty in the building of The Dalles Dam. When the District was assigned military construction at Mountain Home Air Force Base in 1951, a suboffice was opened at the air base. As the military work increased, so did the importance of this suboffice. In 1952 Benaiah W. Molle was assigned there as Project Engineer and in 1953 it became independent of the Lucky Peak office. The Lucky Peak office was closed in 1955 when that project was completed.

Employment at the Mountain Home Project Office reached a peak of over 40 persons in 1954, then declined to a modest 10 in 1956. In 1958 it was up to 30 and continued at about that level until 1960 when beginning of construction for Titan II ICBM's there resulted in an increase to 85. In 1955 Molle transferred to the District's field office at Great Falls Air Force Base when military construction there was turned over to the District by the Seattle District. He was succeeded at Mountain Home by Walter J. Murphy. In 1959 Murphy was replaced by Thomas J. Mendiola who, in turn, was replaced in 1960 by LTC J. R. Woodruff, Jr., with Molle as his principal assistant. In 1960, after nine years of service, the office passed from the District's control as it became a part of the Corps of Engineers Ballistic Missile Command (CEBMCO).

In 1951 when the District was given responsibility for military construction at Larson Air Force Base near Moses Lake, a project office was activated there. Carlos B. (Gus) Olmstead, who had begun service with the District in the Yellepit residency, was the Project Engineer. This office had as long and as continuous existence as the one at Mountain Home.

Employment was in the 10 to 20 person range most of the time but reached 34 in 1958. Titan II ICBM construction initiated in 1959 resulted in a growth to 89 persons in 1960. In 1953 Olmstead transferred to the District Office and was succeeded by Harold F. Schwarz, who was replaced by Thomas J. Mendiola in 1956. Mendiola continued in charge until he transferred to the Mountain Home office in 1959 replacing Murphy. He in turn was replaced in 1960 by LTC Robert W. Fritz, with Olmstead as his principal assistant. In 1960 this office also passed to the control of CEBMCO.

Other military construction offices initiated or taken over by the District in 1951 were at North Richland for work in the Hanford and Pasco areas, at Fairchild Air Force Base in Spokane, and at Great Falls (Malmstrom) Air Force Base. Construction work (and offices) at Fairchild and Great Falls were turned over to the Seattle District in 1952. The Great Falls office, after return to the Walla Walla District in 1954, continued as part of the District until 1959 when it was again transferred to Seattle District. Walter Murphy was in charge of the office for the 1951-1952 period. Ben Molle was in charge in 1954. He was succeeded in 1955 by Charles L. Morgan who had been at McNary Dam through its construction. Morgan retired in 1959 and was replaced by his assistant, Kenneth C. Jones, who remained until the office was transferred to Seattle District.

Beginning in 1951 the North Richland Project Office (later called the Camp Hanford Project Office) was headed by LTC Clayton A. Rust for a short time. He was succeeded by Joseph F. Skidmore and in 1955 by James D. Van Sant. This office principally supervised construction for troops deployed for anti-aircraft defense of Camp Hanford, and refurbishing of the "Big Pasco" Engineer Depot and Umatilla Ordnance Depot which were relics of World War II. During the Korean conflict it had a top staff of about 15 which fluctuated downward until 1957 when it increased to 20. It was integrated with the Pasco Project Office that year as military activity rapidly declined.

In 1955 when the District began construction of a completely new air base at Glasgow, Montana, a project office was opened at the site of the base with Skidmore as Project Engineer. This office had a substantial staff from the beginning and reached a top employment of about 65 in 1958. In that year Skidmore was succeeded by John E. Butler. At the end of 1959 after major construction was complete, the remaining work and the office were transferred to the Seattle District.

When construction of Ice Harbor Dam was about to begin, Clarence C. Davis was recruited to head the Resident Office at the damsite. Davis was an employee of the Portland District with considerable construction experience and had spent a number of years as an officer in the military side of the Corps. The office was established in 1956 and a year later had a staff of about 60 persons. It stayed at near that strength until mid-1960 when it was up to about 75. In 1959 Oliver A. Lewis retired as Chief of the Construction Division and Davis took

his place. Leonard Estey, second man at Ice Harbor, succeeded Davis. When construction of Lower Monumental Dam began in 1961 as Ice Harbor was nearing completion, supervision of the work (except road and railway relocation work handled by the Pasco Resident Office) was placed on the Ice Harbor staff so as to make the most efficient use of the people and the experience gained at Ice Harbor. In mid-1962 all construction for the Monumental project and most of the staff of the Ice Harbor-Lower Monumental Office were transferred to the Seattle District.

In 1958 the John Day Dam Resident Office was activated at the damsite with Hugh B. Elder as Resident Engineer. He had just completed a number of years in a similar position at The Dalles Dam for the Portland District. The staff which had grown to almost 60 persons in 1960 reached a peak of about 95 in 1965, and then slowly declined to 14 when it was deactivated in 1972. In 1963 Elder retired and Gus Olmstead returned from CEBMCO to take his place. When at the end of 1965 Olmstead replaced Bertram W. Hoare as Chief of Construction Division on his departure for the Corps Mediterranean Division office, Sherman W. Williams became Resident Engineer. Williams, recruited from the Omaha District, had worked many years on the Missouri River and had been second man at John Day for several years. He continued in charge until he retired in 1971, and was succeeded by Douglas S. Sharpe who had also come from Omaha District several years earlier and at the time of his appointment was second man at John Day.

When supervision of the John Day relocation work was first under study it appeared that it would be spread fairly evenly over enough time so that it might be handled by one resident office. Access to work on the north bank of the river was very difficult and the Pasco-Kennewick area offered the best city base from which to work there; also, the best dwelling place for most of the staff. By 1962, because of delays in getting much construction work underway, it was evident that there would be some very substantial peaks in the work and further that the public relations aspect of necessary townsite relocations would make it necessary to establish another major office. Accordingly, the John Day Relocation Resident Office, South Shore, was established near Heppner Junction near the mouth of Willow Creek. Its principal functions were the relocation of about 60 miles of the Union Pacific Railroad and adjacent U.S. Highway 30 (which in the relocation process was being upgraded to be I 80 North), and relocation of the towns of Arlington and Boardman and a number of affected utilities. Ben Molle returned from CEBMCO to head the office until 1965 when he went to Lower Granite to head a new office opened there. Tom Mendiola, also returned from CEBMCO, succeeded him. The office, which had a peak staff of about 45 persons, was recombined with the John Day Relocation Office, North Shore, in 1967. The combined office located in Pasco was headed by Mendiola and was renamed John Day Relocation Resident Office.

In 1963 a Resident Office for Little Goose Lock and Dam was activated at the damsite. Roy M. Cami, an experienced resident engineer from the Tulsa District, headed the new office until he went to Alaska District in 1965 as Chief, Construction Division there. He was replaced

by John R. Soderberg, another experienced resident engineer from the Tulsa District. Soderberg continued in charge until construction at the dam was nearly completed when he retired at the end of 1969. The work at Little Goose was stretched out because of slow money appropriations in the first two years and the staff for that period did not exceed 10 persons. In 1965 it began to increase and by 1967 had reached a peak of about 80 people and then declined to about 20 at the beginning of 1970 when it became a suboffice of the Lower Granite Resident Office. It was closed in 1971.

The Lower Granite Resident Office, activated in 1965 with Molle as Resident Engineer, completed a first cofferdam, a railroad shoofly, some miscellaneous excavation, and a resident office building and then ran out of work at the dam until 1970 because of lack of money appropriations. Retaining the same name, it was moved to a location near Central Ferry Bridge over Snake River and was assigned the relocation construction for the Little Goose project. The staff varied between 20 and 30 persons. In 1970 as the relocation construction was completed, it was moved back to Lower Granite damsite where work was resuming. Later that year Molle became Resident Engineer at Dworshak Dam, and Tom Mendiola succeeded him at Lower Granite. In 1972, with construction of the dam well underway, the responsibilities of the office were expanded to include the railroad, highway, and utility relocation construction and the levee construction for the project. At that time it was renamed the Lower Snake River Resident Office. To handle work in the Lewiston vicinity, and particularly to enhance public relations, a suboffice was established in Lewiston that fall. With the added scope of work, the staff which had reached a peak of about 60 in 1971 expanded to about 100 in 1973. In 1975 Mendiola replaced Hoare on his retirement as Chief, Construction Division, and Bud R. Van Stone, who had been second man at Lower Granite, became Resident Engineer. At mid-1975 the main office had been assigned supervision of powerhouse expansion and installation of an additional three generating units at each Lower Granite, Little Goose, and Lower Monumental with a plan for office relocation to Pomeroy as better for control and communications.

In 1963 construction was initiated for the Dworshak Dam and Reservoir project. Initial road construction, tree clearing, and diversion tunnel construction were supervised by Construction Division until early 1966 when the Dworshak Dam Resident Office was activated with Donald Basgen as Resident Engineer. Basgen was Chief, Construction Division of the Portland District at the time of his appointment and was an experienced resident engineer. The office was assigned responsibility for all construction for the project. The office staff, which had a strength of about 30 in mid-1966, grew to about 105 in early 1969 and continued at about that level through 1970, then gradually declined to about 70 in 1972, and to 14 in 1974 when the office was deactivated at the conclusion of principal construction work. In 1970 Basgen transferred to Portland District to become Chief, Engineering Division. He was succeeded by Ben Molle, transferred from Lower Granite Resident Office. On deactivation of the Dworshak Office, Molle joined Portland

District to head construction supervision for the Bonneville Dam expansion and alterations.

At the beginning of 1973 an Ice Harbor Dam Resident Office was activated to supervise expansion of the powerhouse and installation of the three additional generating units there. The opening of this office coincided with the deactivation of the John Day Dam Resident Office and Doug Sharpe brought much of his remaining staff from that project as he became Resident Engineer at Ice Harbor. The staff which numbered 12 at inception has numbered between 12 and 15 since. Besides its primary mission, the office has supervised miscellaneous construction at McNary Dam in the Pasco-Kennewick area and along the shores of Lake Sacajawea above Ice Harbor Dam.

The field office with one of the most checkered careers is the Southern Idaho Resident Office. It was initially set up in 1966 with Frank A. Anderson as Resident Engineer and was originally located at Pocatello for the Pocatello channel project and the Heise-Roberts extension work above Idaho Falls, fully anticipating that the Ririe and Blackfoot projects would provide continuity for several years. Such was not the case, and the office was discontinued at the end of 1968. In the meantime, Anderson had departed for Alaska District to become Resident Engineer at Snettisham Hydroelectric Project and had been succeeded by Floyd K. Haugen. The office was reestablished at Ririe Dam in 1970, only to be discontinued in 1971 at completion of a contract for building an outlet conduit and miscellaneous items. With the advent of FY 1973 Ririe funds, the office was again reestablished at Ririe Dam in 1973 with Boyd Kramer as Resident Engineer. Since 1973 the staff has varied between 15 and 25 persons.

In the foregoing brief resume of construction offices and forces it is seen that several individuals headed several offices. Many other persons worked in several offices as well, an indication of not only the shift in construction activity but of loyalty to the District even though staying with the District meant frequent moving of families. Only those in charge of the offices have been named, but many who have not been named made equally important contributions. One that has had a particularly large influence on the quality of construction contract administration in the District is Kenneth C. Jones, long Chief of the Contract Administration Branch of Construction Division. It is not by accident that the District has emerged for many years from annual visits of the Engineer Inspector General and repeated reviews by the Army Audit Agency and the General Accounting Office without significant adverse comment on the construction contract administration activities.

OPERATIONS DIVISION

The Operations Division as a unit of the District Office has experienced a quite different trend of growth. It was not established as an independent unit until almost 10 years after the District formation.

Project operations gradually became an important factor and the Division grew with the continuing overall program.

With the implementation of the three lower Snake River projects and the Dworshak Dam over the past eight years, the technical staff of the Operations Division has doubled from 55 in 1967 to 110 in 1974. In addition, they have required 135 to 165 wage board employees, some on a seasonal basis. This change has occurred even though the very sophisticated centralized operation of all projects for hydropower production centered at McNary Dam has materially reduced the staff requirements at individual projects.

DISTRICT STRENGTH

In comparison with the variations in Construction Resident Office and Operations staffing, the overall District manpower requirements have shown a marked decrease over the past eight years. Table 2 of the first volume illustrates the changes in personnel strength for that period. A similar tabulation in this volume, Table 1, depicts both the work placement and employee strength which has gradually reduced from 1,020 employees in 1967 to 750 in 1975.

ITS PEOPLE

> To paraphrase another author of District history, the practical visions of the District Engineers and their civilian staff have as much to do with the success of water resource development as Congress and its appropriations. You must consider men - as well as policies.

Structurewise, the District Office has continued to operate in the '70s generally in the same organizational pattern as during the 60s, with some limited internal shifting of responsibilities. However, as discussed in the introductory paragraphs to Chapter 8 of the first volume, the maturity of its key staff resulting in retirement continued to be felt into Section levels during the five years 1970-1975. An unfortunate accident also took its toll. Following the format of that Chapter for continuity, and in extension of the changes discussed in it, the following transfers in divisional supervision have taken place.

ENGINEERING

Harry L. Drake, one of the District patriarchs as mentioned on page 128 of the previous volume, continued his active involvement in the engineering facets of the several major projects underway until 20 January 1973 when the call of outside interests, including his rose garden, won over the strain and stress of District activities. Harry had 37 years of Federal service, 24 years of which were with this District, including six years as Chief of the Engineering Division. He was awarded the Army's Meritorious Civilian Service Award in recognition of his achievements, administration, and technical ability - a very illustrious career with a number of major water resource projects entering his portfolio during those four decades.

A search was made throughout the Corps for persons interested in assuming his position. After careful evaluation of many applications, Colonel Connell, District Engineer, with the hearty concurrence of his staff, reached down into his own organization and selected Willard E. Sivley, then Chief of Planning Branch, as the new head of the Engineering staff. Sivley, who entered District employment at Lucky Peak Dam in Boise, Idaho, in 1950, moved through the Estimates Section of Design Branch from 1951 to 1960. He then transferred to the Planning Branch where he worked until 1965. At that time he became Assistant Chief of the Engineering Division under Fritz Franzen. He remained in that position until mid-1970

when he took over the Planning Branch from this co-temporary Historian. He assumed the top Engineering Division job on 8 April 1973.

Sivley was succeeded in the Planning Branch by Frank W. Parsons, a Utah native and an 18-year veteran of the District. Much of his time in the District had been spent in Planning Branch as a hydroelectric power specialist and head of one of the internal sections. He assumed his new job as Chief in September of 1973.

During the first half of the '70s, four other top employees of the District's Engineering Division who had come at its inception also decided to retire to pursue their avocations:

Melvin J. Ord, a Hydraulic Engineer and head of the Water Control Section, retired in June 1972 with 38 years of service, 24 of which were with the District. At the time of his retirement, Mel was awarded the Meritorious Civilian Service Medal - one of very few to be granted in the District - by the Chief of Engineers for his very capable career.

Philip B. Ekstrom, a Civil Engineer, came to the District to work, originally, in the Design Branch. He later was deeply involved on engineering design work in the very active military construction program during the decade of the '50s. In 1960 he moved into the Program Development unit of Engineering to supervise funds distribution and budget requirements, a very exacting job. Phil decided to budget his time to other interests in December 1973 after 37 years of service, 25 of which were with this District.

Charles J. (Joe) Monahan, a Civil Engineer and a geology specialist, came at the District's inception and spent his 25 years with it in the Foundations and Materials Branch, the last eight years of that service as Chief of all its geological and soils work. Joe retired in December 1973 with 33 years of Federal service to his credit, also being given the Meritorious Civilian Service Award. Joe can count several major water resource projects erected on solid foundations and built with the best of materials because of his attention.

Farrell A. Spencer, a Civil Engineer as head of the Relocations Section in the Design Branch, has been a colorful character in the organization since its inception. He has a strong sense of duty and humor, as well as a strong conviction on the proper way to execute a project. He decided suddenly to do other things on 16 May 1975 after 41 years of service. Spencer has worked with Boy Scouts for many years and won several accolades for his effort. He will no doubt maintain his interest in youth.

EXECUTIVE OFFICE AND COUNSEL

Page 132 of the first volume reviews briefly the exigencies for the "Front Office" and the incumbent Executive Assistant Van Natta Baldwin. Van, one of the original patriarchs, spent 20 years guiding the critical "affairs of state" for the office. Finally on 26 February 1971, he found the lure of Arizona, the golf course, and Lake Coeur d'Alene too strong and retired. As a measure of Van's capabilities for the Corps, he was also given the Army Meritorious Civilian Service Award for his Federal service, which extended from 1934 to 1971 in the Fort Peck, Bonneville, Portland, and Walla Walla Districts.

Van was succeeded by Orville F. Murray, a man well versed in the District program and able to see the humorous side of its many involvements. Murray, a veteran of the Seabees in the Pacific Theater, was working on McNary Dam construction work when the District was formed in 1948 and moved to the Supply Division office in November 1948. During the ensuing years he had temporary assignments in New England, Alaska, Hawaii, and Japan. He became head of the Supply Division in 1967 and assisted Van Baldwin with some of the tasks of the Executive Office. On 2 March 1971, Orv assumed the full responsibility as Executive Assistant. In March 1974 he was awarded the Army Meritorious Civilian Service Award. A devotee of the Little Theatre movement and the golf course, he was frequently able to put aside the meticulous and demanding details of his office to regain his composure. With 40 years of Government service to his credit in June 1975, Orv decided that was enough and retired on June 13th. His sage comments and wisecracks will be missed around the "Front Office."

Colonel Conover again found a very capable replacement in his own organization, selecting William F. Holmes, the Administrative Officer in the Engineering Division. Holmes, after spending 4½ years in the Army and four years in college, joined the District in 1967 in the Comptroller's Office. He spent six years there before moving to the Engineering Division in the fall of 1973.

Another position in the "Front Office" which is critical for the District Engineer, as well as for the various segments of the District, is that of Office of Counsel. Staffed with attorneys, this office is the watchdog for the legal implications in all of the aspects of the District work from its staff to its contractors.

John J. Oldfield, an attorney with 10 years of experience, came to the District in November 1948, working in the real estate acquisition program then very active on the McNary project. John, looking for broader experience, moved to the central office Legal Branch in 1951 and on 23 June 1957 was promoted to District Counsel. He very capably oversaw the many legal implications of the active military and civil works program of the District until 1964 when the Mediterranean Division of the Corps was searching for a Supervisory Attorney for its Leghorn, Italy, office. The lure was too strong for John and he transferred there on 19 July 1964.

He remained in Italy for three years, returning in August 1967 to this office to resume his old job which he held until 12 June 1972 when he, too, felt the desire to retire and play golf. Frequent special jobs have drawn him back to the office for short periods and afforded him the opportunity to keep his active and inquisitive mind involved in some of the particular legal problems of the District's work.

Oldfield was succeeded by Richard F. Heffel, Attorney, who came to the Real Estate Office in January 1963 and moved to the Office of Counsel in 1965. In April 1967 an opportunity to move to the Office of Counsel in Vicksburg, Mississippi, was available which he took, remaining there until 1972. The challenge of the very active office here prompted Heffel to apply for the position vacated by Oldfield. He was successful and returned to Walla Walla on 27 August 1972 as head of the Office of Counsel. One of the tragedies of the District struck the following February when Rich Heffel, in company with two other District staff members, was killed in a chartered airplane accident. The accident cut short his active career on 12 February 1973. The District Counsel position was then assigned to Robert A. Heins on 15 July 1973. Heins had been an Assistant in the Office of Counsel since August 1966 except for a six-month tour in the Los Angeles District from January to July 1973 as District Counsel.

REAL ESTATE

Page 133 of the first volume has a brief statement on the Real Estate Division and its head, Max K. Tysor. The real estate activities have continued to be a critical facet of the District's water resource development. The past five years have seen an additional 278 tracts handled involving 11,843 acres at a cost of $7,984,951. With the near completion of acquisitions for the Ririe project in eastern Idaho the tempo of purchasing private property will slack off. Disposal of small parcels may continue for a period.

Max Tysor continued to head up all of the real estate activities, as well as be a right hand to the District Engineer, until 12 February 1973. On that day tragedy struck for three of the District staff. Dick Heffel, Max, and one of his very able assistants, Stanley W. Marks, were killed in an unfortunate charter airplane landing crash on the evening of 12 February during adverse weather conditions. The accident was only about two miles from the Walla Walla airport when the pilot attempted a landing as they were returning from a special conference with the Assistant U.S. Attorney in Spokane. The plane pilot was also killed. The accident cut short a full and active career for Max, as well as the other three men. He had 33 years of Federal service, 24 of which were with this District. Stan Marks, as Chief of the Acquisition Branch of Real Estate, had almost 22 years service with the District. The loss of these three men left a large hole in the District's staff. On the anniversary of the Corps' birthday in June 1975, Tysor was posthumously honored as a member of the Gallery of Distinguished Civilian Employees of the District.

The position of Chief, Real Estate Division was assumed on 6 May 1973 by Harold Buerstatte, who had been Tysor's right-hand man. Buerstatte, a native of Walla Walla who has enjoyed being involved in community politics for many years, has had 18 years of Federal Service, all with the District, not including several years of military activity prior to his District work.

CONSTRUCTION

The Construction Division has been an area of major activity throughout the life of the District and, as recounted previously, has had a distinguished series of engineers directing its work. Eight men took turns supervising the Division in its first 20 years, including two periods by Bertram W. Hoare, a Mechanical Engineer, who returned from overseas in 1968 to resume the top position which he had held in 1961-1965. He directed the construction program from 1968 until 31 December 1974 when he decided to retire and construct other things. Bert, a veteran of 42 years of Federal service, has seen service in several fields as recounted on page 131 of the first volume.

Bert's relief from his job was brief since the District Engineer requested that he return to work on a "temporary appointment" as Chief pending the selection of his successor. As with all top jobs, this is an involved process and required considerable time. On 14 April 1975 Colonel Conover announced the selection of the person to assume the position on 5 May 1975.

Thomas J. Mendiola, a very versatile and capable Civil Engineer from Idaho, received the nod as successor. Tom, a recipient of extensive basic training for the job through six construction projects in the District, has proved himself a capable administrator. He gained the first 10 years of his experience during the 1950s in the military construction program of the Corps at Mountain Home, Idaho, and Moses Lake, Washington. With the completion of that work, Tom moved into the extensive highway and railroad relocation work for the John Day project in 1962. He then took over the Lower Granite and Lower Snake River Resident Office in 1968 and supervised the completion of the complicated Lower Granite project. The transition into the top swivel-chair job in the Construction Division will be an interesting experience for him.

The field people supervising the extensive construction activities of the District have been recounted to a limited extent in Chapter 7. To review, the field has been the source of supervising engineers who have moved into the District Office, such as Samuel G. Neff from McNary, C. B. Olmstead from John Day, Clarence C. Davis from Ice Harbor, Bertram W. Hoare from McNary, John E. Butler from the military construction program who opted for retirement on 18 April 1975, and now Thomas J. Mendiola from the Lower Snake projects.

DISTRICT STAFF

The citation of certain persons for special comment who have been top supervisors, primarily in the "action" programs of the District, should not overshadow the multitude of staff members in all categories who have worked diligently, retired, passed on, or gone to other jobs.

A District that has had a work placement program aggregating over $2 billion in a 27-year period has had a dedicated and professionally competent staff involved in its activities at all levels. Kudos have been given to a large number of these persons, recognizing not only the ones who have retired but those working.

WATER RESOURCE DEVELOPMENT

The incremental realization of flood control, navigation, and power multipurpose projects in the Columbia River Basin has been the creator of some major changes in the Inland Empire's regional development as well as its problems. Changes in stream regimen have augured well for Northwest citizens through the irrigation development of the Columbia Basin project and the removal of the threat of flood ravages such as occurred during the 1894 and 1948 floods. In many ways the projects have enhanced the environment and ecology of the region by land-use development, creation of a multitude of recreation opportunities, better transportation, and making available a large block of economically favorable hydroelectric power with attendant economic development involving many facets.

HYDROELECTRIC POWER

The concept of economic development of hydroelectric power for other than base or firm load has seen a major change over the past 30 years since the initiation of design effort for the McNary project. Project justification studies then were basically founded upon the capability of producing high load factor power (70 - 80% of the time) as firm generation. With the California intertie, the growth of fluctuating power loads, nuclear and fossil fuel potentials, and changing concepts of the position of hydro generation in the total power demand picture, added hydroelectric power generation capabilities became critical. As described in Part II of this Volume, project peaking capabilities have been accelerated by advancing the schedule for installation of units at John Day, completing the lower Snake River projects during this decade, and initiation of serious studies for additional units at the McNary project.

NAVIGATION

The opening of the lower Snake River for commercial navigation to Lewiston, Idaho, became a reality in May 1975, one hundred years after Congress began making appropriations to improve the lower Snake River for such use. Navigation of the lower Columbia River and lower Snake has made major changes in this section of the Inland Empire, and its influence will be felt into the wheat producing states of the northern midwest. See Table 2 for total traffic trends. Commercial navigation requires terminals, processing plants, and related surface transportation which in turn influence local environment, land-use practices, and economic development. Recreational small boat traffic has similar demands. These needs and

conflicting demands for land use are surfacing, both with private lands under local planning boards, and use of Federally owned shore lands.

PUBLIC USE

The position of recreation opportunities in the life of Inland Empire citizens - and visitors - has received increased attention over the past five to ten years with resultant careful planning and development of many water-related public-use recreation sites in this local region of the Inland Empire. The John Day, McNary, Lower Snake and Dworshak projects have seen extensive activities in recreation development by this District in the past decade. Over 70 sites along the 280 miles of these reservoirs have been developed to some extent for public use at a total cost of about $31 million, much of it within the past five years. Land-use evaluations have demanded careful attention for this development, with competitive needs ranging from wildlife, commercial installations, private desires, and municipal facilities. The Federal involvement in public use facilities, access, scope of development, and operational facets has changed materially over this same past decade which has influenced project development planning.

IRRIGATION

As an indication of the trends in placing lands under irrigation in the District, following are records of permits issued during each year for irrigation pumped diversions from the river for the lower Snake, essentially for the Ice Harbor project area. Potentials for irrigation diversions are limited above the Lower Monumental Dam because of high pump lifts required to the desirable lands.

Date	Land Served	Date	Land Served
1950 to 1966	9,500 Acres	1970	6,000 Acres
1967	7,900 "	1972	7,900 "
1968	7,000 "	1973	6,000 "
1969	9,100 "	1974	3,200 "

Irrigation development is continuing not only for this reach of Snake River near its mouth, but on downstream along the McNary reservoir and below. Data obtained from the Washington State Department of Ecology indicates that in excess of 75,000 acres of land have been placed under irrigation from Lake Wallula. Since the creation of the John Day reservoir in 1968, marked development of sprinkler irrigation is underway in the Umatilla-Boardman reach on the Oregon shore. Development from private wells is also moving at a rapid pace in this area of the Inland Empire as well as in southern Idaho.

FISHERY RESOURCES

The anadromous fishery resources of the entire Columbia River Basin have received careful attention during the development of water

resource projects over the past 25-30 years. This has involved extensive research for both fingerling and adults on guidance, safe passage routes, optimum attraction conditions, proper fish ladder flows, passage through turbines, spillway design for fish movement, and proper conditions for passage during construction.

ATMOSPHERIC GAS SUPERSATURATION

One fishery resource problem which escaped specific attention until about the time the John Day project was put into operation is supersaturation of streamflows below dams with free nitrogen gas. Water released over each of the dam spillways carries large quantities of air into the stilling basin below. As the water and air mixture plunges deeper the gases contained in the air are forced into solution by dynamic and hydrostatic pressures, thereby creating supersaturated water. The nitrogen element of such atmospheric gases in the water readily attains a concentration level which is lethal to fish by blocking their blood vessels and causing blisters of gas in the fins and roof of the mouth.

In free-flowing rivers with some turbulence the dissolved gases are more rapidly released and thus not a continuing problem. With the long successive impoundments as created with the advent of the lower Snake River projects and John Day, the turbulence of streamflow needed for speedy release of dissolved gases was no longer present. As a result of the overall construction of the water resource projects in the Columbia Basin, almost all of the Columbia River below the Canadian border, and many miles of the lower Snake River are now seasonally supersaturated. Yet shortly after dams stop spilling, the river returns to the normal level of saturation. Unfortunately the periods of high streamflow are basically the periods of major movement of anadromous fish, both for adults moving upstream and fingerling passing downstream to the sea.

The first attempt at eliminating some of this supersaturation was with the construction of multi-orifice gates or slotted bulkheads to permit passage of excess flows through the skeleton power bays at the lower Snake dams (three at each dam), thus releasing water by means of submerged discharge rather than flowing over the spillway with the resulting plunge and air entrainment. The "holey gates", which were first installed at the Little Goose project in 1971 on an experimental basis, were very successful in reducing the nitrogen supersaturated conditions below dams and units were purchased for Ice Harbor and Lower Monumental Dams. However, again unfortunately, experience found that many of the sea-going migrant fingerling were injured passing through the orifices, so these gates are now used only during high flow periods, if at all, before and after the juvenile "out" migration. The installation of additional power units will eliminate their use. Other means of reducing the supersaturation being needed, a comprehensive evaluation of alternate potentials was made.

One means is the optimum utilization of upstream storage and downstream generation facilities. By metering out water discharges from

upriver storage projects to minimize spill at downstream dams, at the same time making maximum use of generating facilities by exchange of power generation, spill can be reduced. These steps have provided some relief to salmon migration in the past four or five years.

A concerted effort is currently underway (1975) to reduce supersaturation at each dam through revising the shape of the spillway lower face as it discharges into the stilling basin. Careful experimentation was done at Lower Monumental Dam in 1972 and 1973 by physically changing No. 4 spillway bay through the installation of a concrete deflector just below the water level of the downstream pool. Usually flows plunge to the bottom of the stilling basin with the entrained air. The deflector was designed to direct the spilling water horizontally into the downstream pool, thus eliminating the plunge. Tests of this "flip lip" deflector in 1973 showed markedly reduced gas supersaturation with no evident damage to either juvenile fish or adults seeking the ladder entrances.

As the result of this successful experimental redesign, decision was made to modify five more spillway bays at the Lower Monumental Dam (six of the eight spillway bays) which was done in 1974. The work involved removal of about 40 cubic yards of the existing concrete from each bay and constructing a deflector of steel fibrous reinforced concrete. The spillway sections at the Lower Granite Dam were modified before removal of the cofferdam and placing the project in operation in 1975. Similar revision of spillway bays at Little Goose is scheduled for FY 1976, Ice Harbor during FY 1977, and McNary during FYs 1976 and 1977. Installation at the three projects below McNary - John Day, The Dalles, and Bonneville - are all scheduled for completion within the next three to four years. Current cost estimates (1975) place the cost for this modification program at roughly $11 million.

The need for additional hydroelectric power is commented upon above. The accelerated completion of installation of the additional units for the four lower Snake River dams will materially reduce the amount of river flow passing over the spillways, thus reducing the nitrogen supersaturation. The additional units for Ice Harbor are expected to be complete in 1975. The purchase of added units for the other three dams was placed under contract in 1974 for completion in 1978 and 1979.

The composite of these actions will make a major change in the streamflow pattern for the lower Snake River. Bolstering this action program on Snake River is the current study for additional generation at McNary Dam which would very effectively reduce the spilling schedule at that project.

COLLECTION AND TRANSPORTATION OF JUVENILES

Since 1970 the National Marine Fisheries Service has undertaken Corps-financed experimentation and program of collecting and transporting

downstream migrants from an upstream dam to a point below Bonneville Dam to eliminate losses of juveniles from turbines, nitrogen supersaturation, pollution, and delay at a large number of dams. Giant traveling fish screens were inserted in the turbine intakes at Little Goose Dam, diverting the young downstream migrant salmon into bypass conduits to a collection area. They are then transferred to specially constructed tank trucks, transported 400 miles downstream and placed back in the Columbia River in the tidewater area near Portland, Oregon. Final evaluation of the efficiency of this scheme to remove the hazards of damage from free movement through that reach of six impoundments must await the experience of the return of adults during the next several years. Results through 1975 have been encouraging enough to continue the experiment full scale with collection of fingerling at both Lower Granite and Little Goose Dams. Over one million fingerling have been moved in this manner with a substantial increase evident in the survival of steelhead but less favorable results for chinook salmon. As of 1975 the program is still essentially a rather sophisticated research study. Its current objective is to collect and mark 50,000 fingerling each year with a control group continuing on downstream through the river system. The marked returning adults are then identified at Little Goose Dam to evaluate comparative results. The current aim of the transportation program is to move at least 50 percent of the outbound young fish in this manner to reduce mortality.

LOWER SNAKE RIVER FISH AND WILDLIFE MITIGATION STUDIES

The authorizing act of 1945 for the four lower Snake River projects made no provision for mitigation measures compensating for possible adverse effects upon either fishery resources or wildlife. By the mid-1960s it was evident the construction program was well underway, and compensating steps should be taken for the impact of the projects upon these natural resources. Coordination with the U.S. Fish and Wildlife Service in 1966 established the need for an agreed-to physical plan of mitigation steps to be taken for the four dams, including costs, which could then be submitted to Congress for authorization. These steps prior to 1970 are discussed briefly on pages 259 and 260 of the previous volume.

An initial draft of a "Fish and Wildlife Impact Report for Lower Snake River Projects" was prepared by the U.S. Fish and Wildlife Service in 1970 and 1971. Agreement was not reached upon many aspects of the report and extensive revision was recommended. Participation in the review and revisions was limited by some state agencies because of the lawsuit initiated in 1970 against the Lower Granite project, as described in the above reference to the previous volume of history. A summary of action to date on that injunction request follows this review of the Impact Report.

The official "Lower Snake River Mitigation Report" was received by the District on 2 November 1972. Subsequent discussions between principals clarified positions and furnished additional justification material. The District then prepared its own draft "Mitigation Report," which was submitted on 13 April 1973 to all directly interested agencies for review and comment. This report contained recommendations for fish and wildlife

compensation for potential losses caused by construction of the four dams. The compensation measures were estimated to have an initial cost of about $46 million and to require about $3 million annually for operation. These measures include salmon, steelhead, and trout hatcheries; game bird stocking; wildlife habitat development; and the acquisition in appropriate estates of 26,500 acres of land for fish hatcheries, habitat development, and fisherman and hunter access.

Several hearings were subsequently held on the proposal with a number of comments by those directly affected, particularly landowners, and reviews were received on the draft material. In addition, an Environmental Impact Statement on the "Lower Snake Fish and Wildlife Compensation Plan" was prepared. Revised drafts of the Compensation Plan and the Environmental Statement were submitted 5 March 1975 for review by all agencies directly involved and final drafts of the Plan and Statement were submitted to the Division Engineer and Office, Chief of Engineers in June 1975. Subsequent action with respect to an acceptable final report for submittal to Congress for consideration of authorization will then be programmed.

LOWER GRANITE DAM INJUNCTION COURT ACTIONS

On 11 March 1970 the Northwest Steelheaders Association petitioned the U.S. District Court in Spokane, Washington, for an injunction to halt the construction of the Lower Granite Dam. It has subsequently been joined by a considerable number of area sportsmen's organizations and the Washington State Departments of Game and of Fish. The plaintiffs sought to enjoin construction on the basis of the Fifth and Ninth Amendments to the Constitution and Sections 101 and 103 of the National Environmental Policy Act of 1969. They allege in their complaint that Lower Granite Dam was improperly authorized in that the defendants (1) held no hearings regarding the authorizations; (2) failed to report certain objections; (3) misrepresented costs and benefits involved; (4) underestimated costs involved and overestimated benefits; (5) failed to take proper account of environmental effects of that construction; and (6) were generally negligent, deceitful, and presumptuous in dealing with the projects. An amended complaint seeking to also enjoin any new or additional construction on Ice Harbor, Lower Monumental, and Little Goose Dams and relocation of the Camas Prairie Railroad and dikes at Lewiston and Clarkston was also filed. The final Environmental Impact Statement under the National Environmental Policy Act was filed for Lower Granite just before arguments were heard by the Court. The Government, through the office of the U.S. Attorney at Spokane filed a counter "Motion to Dismiss" against the steelheader groups and the individual parties.

These motions were heard by U.S. District Judge William H. Goodwin at Spokane on 12 November 1971. At the conclusion of the hearings the Judge, on 14 December 1971, filed a Memorandum of Opinion concluding that the Court lacked jurisdiction and the action of the Plaintiffs was dismissed. The Plaintiffs subsequently appealed that decision to the 9th Circuit Court of Appeals at San Francisco.

On 21 September 1973 the U.S. Court of Appeals for the 9th Circuit reversed the steelheaders' case, returning it to the U.S. District Court. On 20 May 1974 a pre-trial conference was held before Judge Goodwin at Yakima, Washington. There had been no action of record for about a year subsequent to that conference and as a result the U.S. Attorney filed a motion to dismiss the action for want of prosecution. The hearing on the motion was held on 19 May 1975 at Yakima. The Judge had not made a decision on dismissal as of June 1975.

ENVIRONMENTAL IMPACT STUDIES AND STATEMENTS

Across the nation the year 1970 became the year of "environment." The Environmental Policy Act of 1969 became law on 1 January 1970. Environmental quality is obviously difficult to define. The phrase is meant to convey that state of delicate socioeconomic-ecological balance that is subject to abuse by many impacts, particularly in urban areas. Control of such abuses coupled with conservation of resources is evidently important in achieving good environmental quality.

Water resource activities deal with a wide range of natural and cultural environmental effects. As a result, practically all project proposals or undertakings now require an environmental impact statement. Five specific topics must be covered in each report: the proposed impacts, the adverse effects, the alternatives, long range implications, and irreversible commitments. Over the four-year period 1971 through 1974, approximately 40 environmental impact statements were prepared, either in draft or final form, covering about 20 different projects or problems. These reports cover several categories of potential problems from limnological, vegetation, aesthetics, and direct impact on physical properties. One report submitted in draft form in 1972 on the authorized Catherine Creek project in the Grande Ronde River Basin has required two years of meetings and correspondence. One response to the draft report posed 252 questions regarding the project. The final report on the Catherine Creek storage project was issued in 1974. The initial environmental impact statement for the Lower Granite project was issued in 1971. It contained 150 pages. After much public attention it was revised in draft form in February 1975. The final report was printed and issued in May 1975. One other of generous size is the Draft Environmental Impact Statement for the McNary project which was completed in March 1974. It contains extensive physical, ecological, biological, and hydrological information as well as detailed operational data. The report consists of over 240 pages. Review has been extensive by many interests and agencies. The final report was issued in June 1975.

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THE WORK REMAINING

The 1975-76 workload of the District and some of its water resource problems left to be solved are recounted briefly throughout the summary of activities in Chapters 2 to 5. While major projects and related work placement have come to fruition, many smaller projects and local problems are still in the inventory of unfinished objectives.

Answers are still to be forthcoming on the Boise metropolitan studies for the lower Boise River, as well as for the potential for modifying the Lucky Peak project for better storage utilization and hydroelectric power potentials. Further study of stream basins for potential stream control and water resource mangement such as for the Silvies River Basin in central Oregon and the Big Wood Basin in Idaho are also in the inventory of unfinished work. Hydrologic and hydraulic studies are continuing at a rapid pace for flood plain information and flood insurance reports. This emphasis reinforces nonstructural solutions such as flood plain regulations and flood insurance as viable alternatives. Six reports are scheduled for the ensuing year.

The need for additional generating capacity and potentials for a second powerhouse at McNary Dam have been established. Authorization has been recommended and the potential exists for some advance engineering funds to initiate more detailed design studies. The Catherine Creek Dam in the Grande Ronde Basin, in the initial construction phases is experiencing growing pains which may be solved by agreement with the Indian tribes so that it can move ahead. Plans for multiple-use and single-purpose storage projects authorized for tributary streams in the Snake River Basin such as the Blackfoot Reservoir project, the Boise Front detention dams, Catherine Creek and Grande Ronde reservoirs, and the interesting Mud Lake Basin of eastern Idaho are seeking proper solutions for better control and more adequate use of the water resource potentials for the people of the basins. These objectives also apply to the Zintel Canyon project at Kennewick and particularly the Willow Creek Dam at Heppner, Oregon, where disaster struck once. These projects appear to be farther in the future.

The ongoing construction program for the seven dams from McNary to the Dworshak project in the Clearwater River Basin of Idaho, as well as the Ririe project at Idaho Falls, Idaho, is moving ahead with an anticipated budget of about $80 million for Fiscal Year 1976. Additionally, the operational phases of those projects as well as other completed works are a major facet of the District workload with an anticipated budget approaching $15 million. The later three years of the 1970s could see considerable

construction activity for fish hatcheries related to the lower Snake River mitigation efforts. (See Chapter 9.) The report for authorization, being actively evaluated at the Washington, D.C., level, may see approval by the Congress and funding in 1976. The realization of additional anadromous fish propagation could eliminate some of the uncertainties in the adequacies of the Columbia River fishery as now being experienced.

Control of flooding for localized areas remains an unresolved question simply because of the geographic and topographic conditions and development that has taken place. Flood plain studies will define the problems. Solutions for people and concentrated land use in areas such as Jackson Hole, Mud Lake, Henrys Fork, Blackfoot and Portneuf Rivers, the Wood River area, the Boise, Payette, and Weiser Basins, the Clearwater communities, the Palouse Basin, and eastern Oregon tributary areas all augur for continued local effort in better use and control of the spring runoff - and late fall deficiencies.

As the District continues to review how to reach the goal of adequate water resource control for its many streams it must, of necessity, become involved in the basic conflict between those changing the environment and those who want the status quo. Then comes a critical flood and people, crops, physical development, and the economy of the area are directly affected. The balance between protection of people and development and the proper waterway for a stream is a critical one. More than likely the day of perfection will never come. A great deal of our good agricultural and urban lands is still unprotected and will remain so unless considerable change is made in the "economic justification" analyses for channel and storage work, using that phrase in its broadest sense. James A. Michener, in his recent work "Centennial" (Page 105) in commenting on the future town of Centennial in the Platte River country, said the town "would stand at the spot where man could look eastward and catch the full power of the prairie or westward to see the Rockies. The history of the town would be a record of the way it responded to the impossible task of conciliating the demands of the mountains with the requirements of the prairie." How true this last sentence is to the many communities situated in the Snake and Columbia River valleys of the District, which look at their conflicting demands for free-flowing streams emanating from the mountains above them and the requirements of their economic and social life.

PART II

THE PROJECTS


WASHINGTON
OREGON
COLUMBIA R.
SNAKE RIVER
SPOKANE
YAKIMA
PENDLETON
LA GRANDE
BAKER
BOISE
ROCK ISLAND DAM
WANAPUM DAM
PRIEST RAPIDS DAM
LOWER MONUMENTAL DAM
LITTLE GOOSE DAM
LOWER GRANITE DAM
JOHN DAY DAM
McNARY DAM
HELLS CANYON DAM
OXBOW DAM
BROWNLEE DAM
Harney Lake
Lowell Lake
NPP-NPW Boundary by General Order No. 17 dated 28 June 1972.
NPP-NPW Boundary July 1970

PREFACE

For this "supplemental" volume of history on projects underway and completed during the first half of the decade of the '70s, the preamble prepared for the initial volume (p. 151) is still a good introduction. People are increasingly being served by the projects.

The Battelle Memorial Institute in 1967 prepared an economic study titled "The Pacific Northwest - Economic Growth in a Quality Environment." An addendum study was prepared in March 1975. The report predicts a population growth rate for the area of 12 percent during the 1970s, with continued interest in agriculture and nonindustrial employment. "The development in irrigated lands and consequent food processing are supporting economic levels in the Pacific Northwest far beyond earlier expectations." Industry, however, will also play an important role in the overall development.

The report points out that with this growth in population will come demands on the region's environment and resources; demands for more adequate recreational facilities; better planning for proper integration of residential, commercial, industrial, and recreational developments; economic development of natural resources by wise management; and a reliable and adequate source of energy which is basic to the region's needs. The report states that "Maintenance of the region's quality environment cannot be accomplished without an assured energy base." All this augurs for actions to insure environmental protection in the light of good economic sense - to realize "Economic Growth in a Quality Environment."

The projects discussed in some detail in this part, as well as the channel works on many of the tributary streams, have been conceived and built within the framework of maintaining and enhancing the region's economic growth, still protecting and improving where possible our quality environment for the people of the Northwest.

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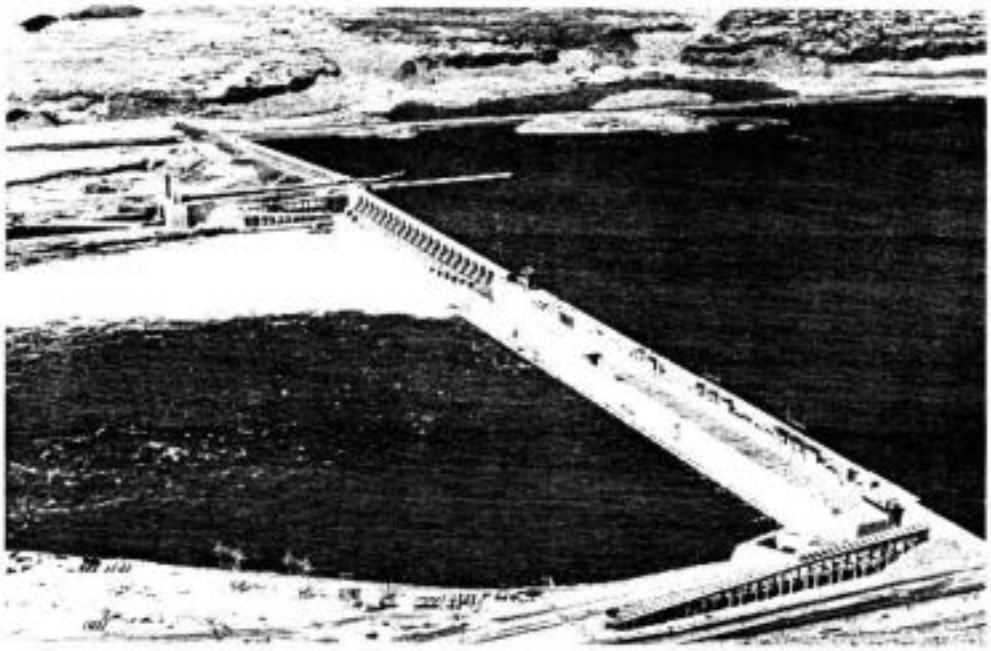
JOHN DAY PROJECT

THE DAM

The John Day Lock and Dam with its 77-mile reservoir area is a major unit in the Columbia River system of navigation, hydroelectric power, flood control, and public-use projects, with an increasingly important irrigation facet. As recounted in the prior volume of the District history, the Walla Walla District initiated work on the project by critical site selection investigations in 1955. The work progressed steadily from that time to 1973 under 110 construction contracts, 43 "agreement" contracts for utility relocations, and numerous supply contracts; 18 years of design and construction effort on a $500 million project that established several records for accomplishment--the highest single-lift navigation lock in the free world; one of the largest hydroelectric power projects in the world; innovations in dam construction; and railroad and highway relocation work; and a prime contractor (a joint venture sponsored by Vinnell Corporation) for the largest portion of



JOHN DAY DAM
Looking Northeast from Oregon Shore

the dam construction with two concurrent contracts having a total value of $100 million. An interesting management facet of these two contracts was that they were administered over an eight-year period with no critical disputes. There were of necessity many changes during the construction effort which were settled amicably without litigation or major contentions--a reflection on the integrity and relations of the contractor and his staff with proper administrative effort by the project management to meet obligations of both sides. Similar kudos apply to the work of Vinnell Corporation on two other dam construction projects on Snake River with an equal total value and administrative record.

Thus the Portland District was furnished a major water resource project to operate, which was planned, designed, and constructed by the Walla Walla District over an 18-year period through the concentrated efforts of a highly professional staff and management, coupled with competent construction involvement of a large number of contractors. Responsibility for all facets of the John Day project was turned over to the Portland District on 30 June 1973 in accordance with directives of the Division Engineer. (See Chapter 2 and Chapter 6 of Part 1.)

COMPLETION OF THE PROJECT

Pages 153 to 184 of the previous volume of history outline in some detail the construction effort for the dam up to 1970 and the many facets of its reservoir relocation requirements, including communities, railroads, and highways. Considerable work was left to be completed after FY 1970 and extended to 1973. Sixty individual consultants and architect-engineer firms were employed in the process of design. Approximately 168 construction and supply contracts were awarded, of which 40 contracts exceeded $1 million in total earnings, 9 of these performing services exceeding $5 million.

Relocation work along the 77-mile-long reservoir was essentially complete in 1969, as were the extensive changes to the communities of Arlington and Boardman. The structural work at the dam, including the powerhouse, was also essentially complete by late 1969, and the Vinnell Corporation had initiated dismantling of its shops and equipment. This left primarily the interior work of continued unit installation in the powerhouse. Generator units 1 through 12 had been placed into power production by the end of FY 1970.

POWER UNITS

The installation of turbines and generators continued on a careful schedule, with unit 13 being placed on the line 3 November 1970 and unit 14 on 17 December 1970. Contracts for turbines and generators for units 15 and 16 were not let until September 1965 and July 1969 for completion in the fall of 1971. Unit 15 was actually placed on the line 30 September 1971 and unit 16 on 1 November 1971. This completed the construction schedule for the power units currently programmed. Units 17 to 20 will be scheduled for installation in the future.

RELOCATIONS

The accomplishment of the extensive railroad and highway relocation work along the reservoir length, as well as the embayment fill at Arlington, has proven that previous experience with construction at McNary and lower Snake River projects, with resultant changes in design, is a good teacher. The 130 miles of relocation work adjacent to the new reservoir at a cost of about $160 million have been essentially free of movement problems, critical subsidence, and wave damage. Remedial work was necessary on one short section of the SP&S roadbed near Alderdale because a pre-existing landslide over which the roadbed passed became active. It was also necessary to reslope about 1,000 feet of a high rock cut along Highway I-80 and a short section of a rock cut on the UPRR to eliminate rockfall hazards.

At the urging of the District, the SP&S had agreed to accept continuous welded rail for its relocation. The UPRR would not. It was gratifying to note the substantial smaller costs of extraordinary maintenance on the SP&S new track as compared with the UPRR, a direct result of the welded rail.

The unique relocation and resettlement undertaking at Arlington, Oregon (p. 167-169 of previous volume of history) was basically successful except for a problem at the entrance to the embayment with its multipurpose harbor front. The area includes small boat moorages, a ferry landing, recreation areas, and municipal facilities. Wave action from strong westerly winds made the area untenable at times and dictated remedial works. Earlier pile jetties and some fill had proven inadequate. In August 1970 construction was initiated on a major rockfill breakwater structure armored with riprap, as well as extension of the outfall line of the sewage disposal plant. The work was completed in December 1970 at a cost of $685,000.

Railroad relocation agreements with the UPRR and SP&S provided for a five-year deferred construction period after the reservoir was first filled prior to release for all reconstruction obligations. These contracts provided for extraordinary maintenance items after completion of construction and extended until mid-1973. Similar contracts, which ran until January 1972, were in force on relocated highways. While substantial payments were made for deferred construction and extraordinary maintenance until roadbeds and cut slopes became seasoned, the cost of several remedial actions to correct inadequate planning or mistakes was infinitesimal in comparison with the scope of the relocations.

FISH HATCHERIES - SPRING CREEK AND BONNEVILLE

The obligation of the project for mitigation of changes to the fishery resource is outlined on pages 175-178 of the initial history publication. Work on enlargement of the Spring Creek Hatchery on the Washington shore opposite Hood River, Oregon, was initiated in

January 1971. The construction work continued until December 1972, costing about $8.5 million including correction of some deficiencies. The decision was made when design was initiated to include an automatic fish feeding system as had been done at the Dworshak Hatchery, and a contract for the system was awarded in June 1972. It was essentially completed by the end of 1973 at a cost of $500,000 and put in operation. Final completion was in May 1974.

SPRING CREEK HATCHERY
Washington Shore looking Upstream

The Spring Creek Hatchery situated on the shores of the Bonneville reservoir utilizes the water supply from five nearby springs. The hatchery is a unit of the U.S. Fish and Wildlife Service and has been in existence since 1901. It is designed to handle the propagation of the fall run of chinook and coho salmon. The enlargement was designed to double the previous capacity. The "computerized" hatchery now has the capacity to incubate 38.5 million chinook salmon eggs and about 1 million coho salmon eggs. The actual rearing capacity of the hatchery facilities is about 17 million fingerling. The spring water supply with a temperature of 46 degrees is heated to 53 degrees for better rearing conditions. Ninety percent of the water in the system is purified and recirculated for optimum utilization. Temperature in the tanks containing fish to be released is gradually reduced to river temperatures before discharging the fish into the Columbia for their trip to the ocean.

The hatchery was appropriately dedicated on 22 September 1973 under the sponsorship of the White Salmon-Bingen Jaycees. The dedication address was given by the Honorable Nathaniel P. Reed, Assistant Secretary of Interior for Fish and Wildlife and Parks. Colonel Arthur R. Marshall, Deputy Division Engineer, North Pacific Division, Corps of Engineers, officiated for the Corps.

Operation and maintenance of the hatchery remains with the U.S. Fish and Wildlife Service. Funds for this supervision will be advanced to the Service by the Corps of Engineers from its fiscal year appropriations. This exchange of funds, which covers only one-half of the regular operation and maintenance total expense, includes any future proposed capital improvements and necessary property acquisitions. To properly measure the efficacy of the hatchery and its capabilities in mitigating the anticipated damage to the fishery by the John Day and The Dalles dams, evaluation studies will be made annually for ten years from 1973 through 1982.

The Bonneville Hatchery is owned and operated by the State of Oregon. It is located on the south shore of Columbia River immediately downstream of Bonneville Dam. As with the Spring Creek Hatchery, enlargement of the Bonneville Facilities was agreed to as a mitigation measure, with half of the increased capacity to be installed at Spring Creek and half at Bonneville.

By agreement with the Portland District early in 1971, actual construction at the hatchery would be by that District. All design, as well as plans and specifications for the work, was to be prepared by the Walla Walla District. The work has moved ahead on this division of responsibility with all that portion of the cost chargeable as mitigation of effects of the John Day project financed by appropriations to the Walla Walla District through FY 1973 for the project. When the John Day project was officially turned over to Portland on 1 July 1973, funding of this District's work on the hatchery projects was then by allocation of funds from the Portland District.

Preconstruction design and plans for the Bonneville Hatchery continued all through Fiscal Years 1971 and 1972. Actual construction was initiated in the fall of 1972, with the main contract awarded in August 1973. The work is still underway and will continue until the spring of 1976. This District's involvement in the engineering aspects of the work will continue until well after the hatchery is put into operation and all facilities are operating satisfactorily. The total estimated cost of the modifications to the Bonneville Hatchery is about $9 million.

The capacity of the existing facilities will be increased by one-third to one-half. The completed hatchery will have the design capability of producing 14,800,000 fingerling ready to be released for their trip to the ocean.

The operation and maintenance of the completed works will be by the Oregon Fish Commission, with the costs shared by the John Day project in proportion to the expanded facilities as related to the original hatchery, modified to some extent by shared responsibility of the Bonneville Dam project.

The Walla Walla District's expertise and engineering capabilities in this very specialized field of fish hatcheries has contributed materially to these mitigation efforts aimed at maintaining the anadromous fish runs of the Columbia River system. One measure of the capabilities of the District staff in this area is illustrated by an award to Morris C. Croker, Chief of Mechanical Design. A research and development study was initiated in 1970 on the Dworshak Hatchery to modify the water reconditioning and waste treatment systems for more efficient culture, to increase fish production, and to develop more effective wastewater treatment before hatchery waters are returned to the river. The two-year research program with several units involved resulted in a redesign of the second-phase work at Dworshak Hatchery and changes in design for the Bonneville project. The research effort resulted in a first cost savings of $1,400,000 in construction costs, together with an annual O&M savings of $25,000. The very intricate and mechanized system evolving from the study was awarded a Presidential Management Improvement Certificate in April 1973. Croker and his wife, Dorothy, were sent to the Pentagon in Washington, D.C., on 7 August 1973 to receive the Certificate and kudos from OCE.

RECREATION FACILITIES

Six sites were selected along the south shore of the John Day reservoir for concentrated recreation development, and preliminary work had been accomplished on underwater work prior to creation of the pool. A contract was awarded in February 1972 for completion of the sites. The work involved water wells; toilets; sewer and water systems; paved roads and parking; landscaping; picnic facilities, including fireplaces; launching ramps and docks; and breakwaters, all at selected locations. The recreation developments were at Arlington, Irrigon, Boardman, LePage, Wenahla, and Quesnel. The contract was completed in June 1973 and the completed work turned over to the Portland District for operation at that time. Three other sites along the south shore received very limited development, primarily for access to the reservoir. These were at Phillipi Canyon, Blalock Station, and Jones Canyon. The total cost of the south shore work was about 2.5 million.

Design for the development of the five recreation sites along the north shore of the reservoir was undertaken by the District for later construction by the Portland District. About $2 million of facilities were planned during 1972 and 1973 with the plans and specifications turned over to Portland for execution as funds became available.

BOARDMAN PARK - OREGON
Looking Downstream

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MCNARY DAM

THE DAM

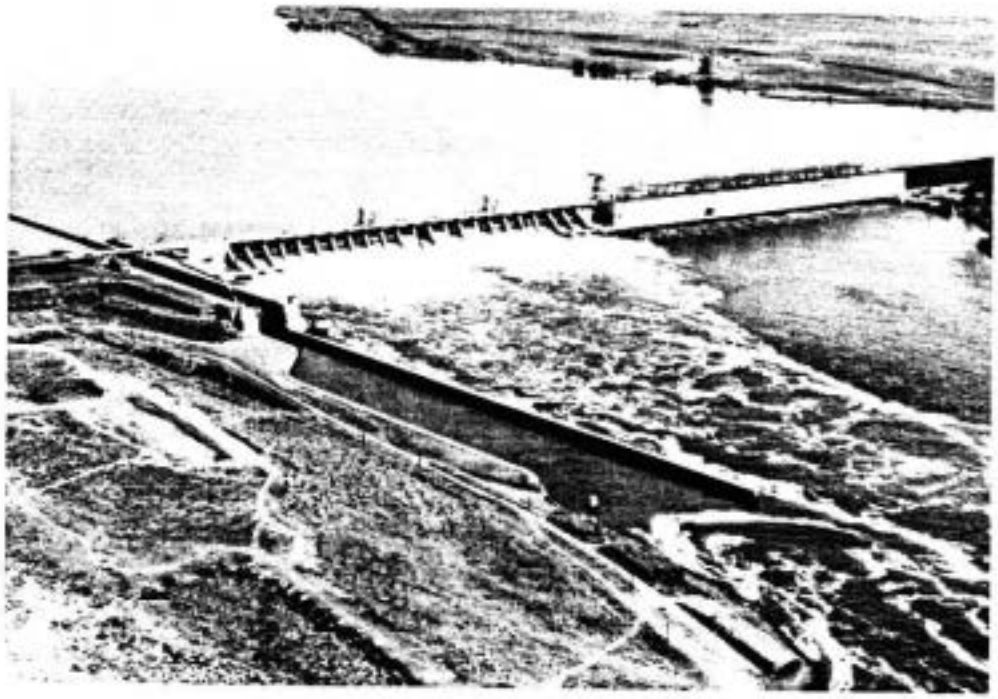
The fourth major unit in the Columbia River system (Rock Island, Bonneville, Grand Coulee, McNary) and the patriarch for this District has served well through its initial 20 years of service. Man's needs change, however, and new ideas are being explored for increasing the effectiveness of the McNary project, particularly in light of the extensive water resource development that has taken place in the Columbia River system during those 20 years.

Development in the reservoir area related to navigation and public use has not been of major consequence over the past five-year period. Port facilities have been improved but not materially expanded. Developmental planning is being seriously considered in the North Richland-Hanford reach of the upper reservoir but no specifics have been agreed upon. Commitments are being made for a major aluminum plant at Umatilla, Oregon, within the existing Umatilla Port development on the south shore of the reservoir just above the dam. When in operation this could mean considerable tonnage of bauxite moving through the locks and possible movement on the waterway of finished materials.

BRIDGES

Two railroad bridges near the mouth of Snake River had been declared hazards to navigation and the U.S. Coast Guard directed that they be modified. The Northern Pacific Railroad (NPRR) bridge across the mouth of the Snake River required modifications, not only because of having limited navigation clearances but the requirement for strengthening because of relocation agreements executed in connection with the Lower Monumental Dam project (page 234, first volume history). The railroad awarded the first contract for bridge modification in March 1968. The work consisted of new, heavier fixed spans for the approaches to the navigation channel and replacement of the old swing span over the channel with a vertical lift type span. This modification increased the neat horizontal clearance for navigation from 155 feet to 378 feet. The vertical clearance of the new lift span is 60 feet. The work of modifying the bridge was completed in December 1971 at a cost of over $6-3/4 million as the Government's share.

The Union Pacific Railroad bridge across the Columbia River at Burbank is similar to the NP bridge in that it has a swing span with



MCNARY DAM
Washington Shore Looking Southeast

UPRR BRIDGE
NPRR Bridge at Mouth of Snake River in Background

limited clearance. After extensive negotiations between the Department of Transportation of the U.S. Coast Guard and the railroad concerning the finding that the bridge is an obstruction to navigation, "enforcement action" has been taken. Design of a vertical lift span to be placed immediately adjacent to the south end of the existing swing span is underway by the railroad. The present navigation channel through the existing swing span is only 113 feet. The new lift span will have a navigation clear width of about 375 feet. No firm data has as yet evolved for the initiation of construction for the modifications.

STRUCTURAL CHANGES

At the dam three major modifications have been undertaken during this five-year period. The counting stations for the two fish ladders have been modified to eliminate the old horizontal white board over which the fish pass for identification. To replace the old viewing arrangements from above water surface, vertical wiers now direct the migrating fish past a viewing window in the side of the conduit, thus permitting better passage and identification. At the north shore ladder, a visitors' viewing room was also constructed around the counting station for better public access. The work on the ladders was accomplished from November 1972 to May 1974 at a combined cost of just over $500,000.

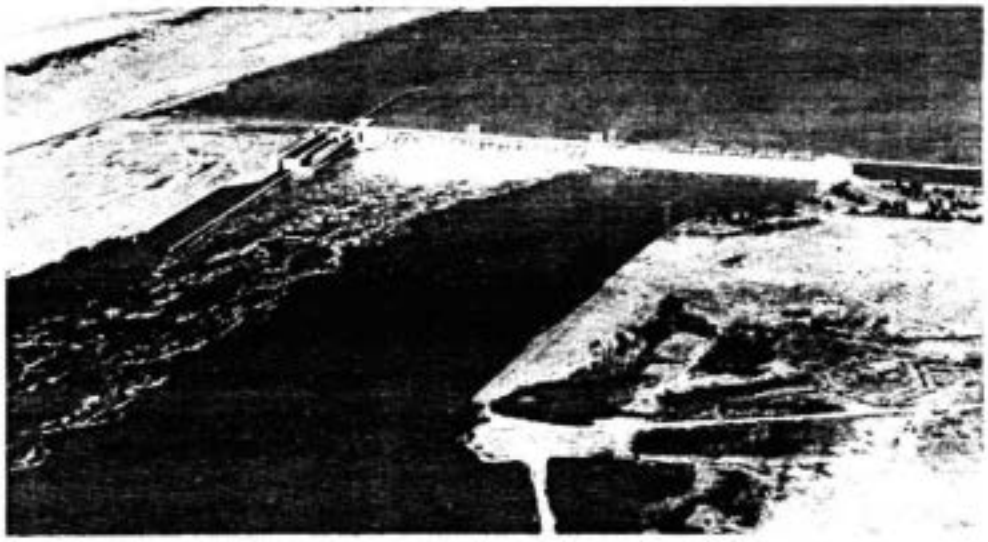
A modification to the navigation lock involved structurally strengthening the concrete monoliths of the concrete wall supporting the downstream lock gates. Research on the original design and construction of the reinforced concrete units dictated the installation of steel post-tensioning units for adequate structural strength. This work was accomplished from June 1973 to February 1974 at a cost of about $400,000.

The third necessary change involved the more complicated operational pattern for the dam's spillway gates. As previously equipped, 5 gates of the 22 total were remotely controlled at the powerhouse. The remainder required the use of a spillway crane to open, close, or adjust. The 5 gates automatically controlled were adequate to pass normal excess flow over and above the streamflow demands of the power units. The resultant spillage pattern in the stilling basin endangered the downstream migrant anadromous fish. To obtain the desired, more nearly uniform spillage pattern, crowned at the center, a more uniform flow across the entire spillway was needed. In addition, the installation of the "flip lip" deflectors at the McNary Dam will be made during FY 1976, bids for which were opened 26 June 1975. The proper use of these deflectors for the reduction of nitrogen supersaturation requires considerable regulation of the position of the spillway gates. Implementation of these changed operational requirements dictated installation of individual electrically operated gate hoist units, remotely controlled. Contracts for these units were awarded in July 1974, with completion scheduled for January 1976. The cost of these gate modifications will be approximately $2.5 million. (See Chapter 9, Part I concerning "Fishery Resources" and the problems of atmospheric gas supersaturation with respect to "flip lip" development.)

PROJECT LAND USE

During this past 5-8 years the project staff at McNary has recognized the need for additional public use of project lands at the damsite. They also over the years have realized the potentials for extensive unused project property along the Oregon shore between the developed area immediately below the dam and the Umatilla bridge. During the 1950s fish were observed spawning in a drainage channel downstream of the south abutment, used primarily to evacuate controlled seepage from the abutment. Taking advantage of this drainage channel, a temporary fish spawning channel with controlled water level conditions was constructed in 1957 to experiment with salmonoid propagation. The channel was operated by research agencies until 1967, then abandoned.

The low lying areas of land and ponds adjacent and downstream of the spawning channel proved to be enticing to wildlife. During the 1950s and 1960s an excellent population of pheasant, quail, songbirds, heron, and small animals developed. In addition, the area proved to be a major mosquito breeding site, making much of the project-developed recreation areas untenable in the afternoons and evenings.



MCNARY DAM WILDLIFE AREA

Starting in 1970 a determined effort was made to eliminate the objectionable factors and at the same time develop the area for its aesthetic, wildlife, and public-use potentials. By 1972 the area was open to the public. Thus was created the 425-acre McNary Wildlife Park which basically expanded the then existing public-use areas at the dam. Controlled ponds were created; a multiple-use area of fishing and wildlife was developed; the water areas were stocked with trout, bass, and channel catfish; several thousand trees and shrubs were

planted; and about four miles of natural trails were created throughout the wildlife park. Local groups assisted in the creation of the facilities, and use inventories indicate wide public acceptance, particularly by older citizens. Development continues, including careful mosquito control. Its use is expanding rapidly. The estimated attendance in 1973 was 67,500 and in 1974, 115,000 persons.

In addition to this specialized wildlife park at the damsite, the McNary project has an unusual number of contact points and developed recreation areas for public use ranging from simple visitation sites to swimming, fishing, and picnicking -- even professional hydroplane racing at Columbia Park between Kennewick and Richland. There are 28 such areas available for the public at which some attendance records are kept. Considering the limited population of the immediate tributary area, many tourists must visit the project, as well as the local population making frequent and repeated visits. Following is a record of total attendance over the past six years.

1969	1,483,633
1970	2,207,201
1971	2,404,447
1972	2,403,282
1973	2,596,314
1974	3,580,829

Half of these were credited to the extensive facilities at Columbia Park, with Sacajawea Park, Hood Park, Hat Rock Park, McNary Beach, the damsite, and the above-discussed wildlife park receiving the major numbers. Recognizing the need for adequate maintenance and improvement of the project's public use facilities, a pending report for modifications to the McNary project, including a second powerhouse, recommends improved visitor facilities, levee access and beautification in the Pasco-Kennewick-Richland area, fish and wildlife subimpoundments along the reservoir, and preservation of existing environmental resources.

NAVIGATION TRAFFIC

Tables 3, 4, 5, and 6 illustrate the traffic through the locks of the individual projects. Shipments through the McNary project, which has been in service for 20 years, illustrate the economic trends for commodities such as grains and petroleum products which are volatile in the world markets. The tables also indicate the importance of the McNary reservoir as a terminus for distribution and collection of commodities from and to the Inland Empire area. No petroleum products have moved into the lower Snake system as yet, evidently awaiting the Lewiston terminal. The movement of small grains showed marked increases in use of navigation facilities as soon as the Lower Monumental and Little Goose projects were available, with some of these shipments originating east of the Rockies by truck. Two sources of water movement for barley and rye to the coast for export appear to be the Central Ferry area of the Little Goose reservoir, with a major addition to that movement at the terminals in the McNary reservoir.

PROPOSED PROJECT MODIFICATIONS

The present hydroelectric generating capacity for the McNary project was conceived under quite different demand characteristics than currently in use for other plants such as John Day and the lower Snake River projects. The present electrical power system in the Columbia Basin is primarily hydropower. However, future demands cannot be satisfied by existing or potential hydro projects, so increased energy demands will be supplied by thermal sources. The conversion from a mainly hydro system to a hydrothermal system will place hydro into a much needed "peaking" role, while thermal will provide most of the base load generation.

The provision for increased hydro capacities was made in most of the existing plants; however, no authority exists at present to increase the McNary capacity to place it in hydraulic balance with the plants upstream and downstream. The project now has 14 generating units at 70,000-kw nameplate rating each, or a total capacity of 980,000 kw.

Initial proposals for an in-depth study for expanding the project were made in mid-1971. Decisions were made a year later to give priority to the proposal with request for funds to be made available in FY 1974. Under provisions of the current review authority of Columbia River and Tributaries Basin Study ("308 Report") the study was initiated in the fall of 1973. As an initial step, a draft of an Environmental Impact Statement on the present project was issued in March 1974. The report on the "Feasibility of Installing Additional Hydroelectric Generating Capacity at McNary Dam" was issued in December 1974. This report also included other needed changes throughout the project area, partially justified by the anticipated increase in frequency of reservoir fluctuations due to peaking power demands. These fluctuations, however, would be within the currently designated five-foot operating range, but would create more frequent fluctuations throughout the week on a daily basis. The selected plan as contained in the report of December 1974, which is currently under review in Washington (mid-1975) prior to submittal to Congress for possible authorization, proposes:

a. A 10-unit second powerhouse structure immediately south (Oregon shore) of the existing powerhouse. The units would each have a generating capacity of 105,000 kilowatts and a hydraulic capacity of 25,000 cfs for each turbine.

b. Relocating and improving visitor facilities located near and downstream of the powerplant (but not materially affecting the new McNary Wildlife Park discussed above).

c. Levee access and beautification for improved public use and aesthetic values through the extensively leveed areas of Pasco, Kennewick, and Richland. This would include planting of trees, shrubs, and dryland grasses and provide rest areas and hard-surfaced pathways.

MCNARY DAM
South Shore Embankment, Fish Ladder,
and Public-Use Area

d. Protection and improvements of existing recreation facilities and fish and wildlife habitat through construction of impoundments for shallow water areas by diking so water surface levels for those shoreline areas could be kept reasonably constant to maintain the existing fish and wildlife uses.

The currently estimated capital cost for the entire modification project is $318 million.

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ICE HARBOR DAM

THE DAM

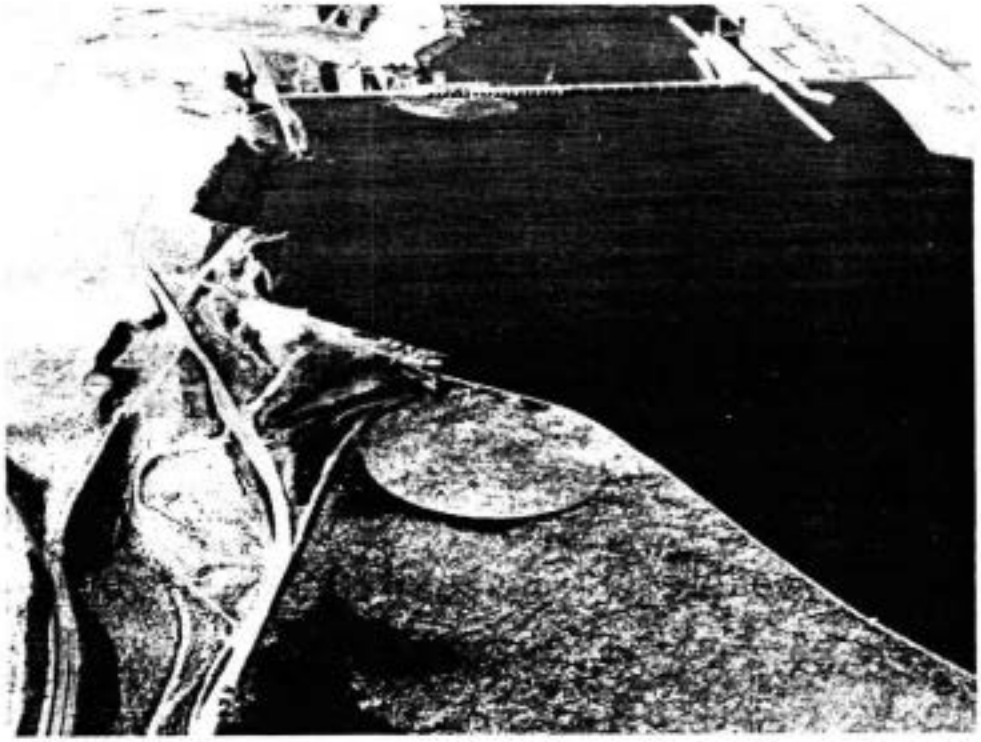
The Ice Harbor project, as the first unit in the lower Snake River composite undertaking, has had an interesting developmental history from its authorization in 1945 through its next 30 years of realization and operation. The concept of resource development of our rivers for optimum use changed rapidly in the 1940s and 1950s. In making the decision to install only four dams in the lower Snake River system the Engineers committed themselves to the design and construction of four navigation locks 50 percent higher than any then (1947) existing anywhere in the world. Pages 215-222 of the previous volume of history describe the development steps and changes in design of the dam up to its dedication in 1962.

To illustrate one changing concept for water resource development, the four lower Snake River dams were approved in the late 1940s for installation of three hydroelectric power units of 65,000-kw capacity each initially, with space provision made for two additional units for future installation, a total installed capacity of 325,000 kw. At start of construction in 1956 the size of the power units had been increased to 90,000 kw and during construction a space for a sixth unit was authorized. This made a total generating design capability of 540,000 kw. (By the

ICE HARBOR DAM
Looking Northeast

time the Lower Monumental project was underway this design concept had changed to six units of 135,000 kw, or a total of 810,000 kw.) As will be described later, the installation of the additional three units at Ice Harbor has been completed with each of the three units capable of producing 116,800 kw, providing the project with a total capacity of 620,400 kw.

Since the time of dedication the project has done yeoman service with its opening of the lower section of Snake River for navigation, hydroelectric power production, and service to the region with good recreation facilities and boating on 30 miles of a very scenic lake. It has even provided the local Tri-Cities area and surrounding communities with an excellent source of firewood. Snake River carries an inordinate amount of trash consisting of floating logs, sticks, boards, and other material. A decision was made during the late 1960s to install a trash boom above the dam and remove all floating material coming down Snake River, piling it on an appropriate spot on the south shore. The public has been permitted to come in under controlled

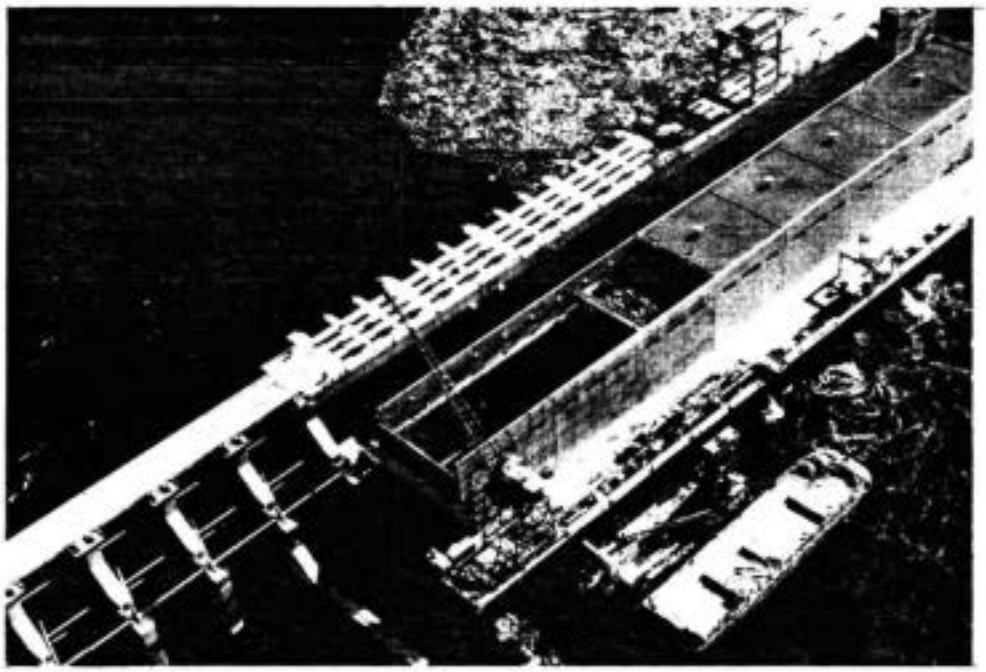


ICE HARBOR DAM AND TRASH BOOM
With Logs and Trash

conditions, cut up the usable debris, and haul it away for personal use. It has been proven to be a very good public relations factor and of considerable assistance to many needy families. The picture illustrates the scope of the undertaking. The log boom has also been the means of retrieving saw logs lost by Potlatch Corporation at Lewiston during flood conditions on the Clearwater River.

ADDITIONAL POWER UNITS

As indicated above, additional power units were provided for in the original construction. About the time of completion and dedication of the project the additional three units were anticipated to be needed about 1980. Due to a much faster load growth in the Pacific Northwest, the anticipated future need arrived early. Funds, plans, and construction schedules were set for start of work by 1971 and a contract for three 174,000-hp hydraulic turbines was awarded in August 1971. Other contracts followed in short order for generators, other necessary parts, expansion of the powerhouse, and installation of the units. Units 4 and 5 are now



ICE HARBOR POWERHOUSE
Units 4 - 6 Under Construction

anticipated to be ready for commercial generation by September 1975 and Unit 6 by November. The anticipated cost of the three-unit addition to the project is $37 million.

RECREATION AND PUBLIC USE

The Ice Harbor project with its scenic reservoir area has been a popular recreation area for the Tri-Cities, Connell, and Walla Walla region. Its ten points of access to the river canyon have seen extensive use, five of them with particular emphasis. Attendance tabulations for 1969-1974 illustrate this use.

1969	-	197,000	1972	-	181,000
1970	-	199,000	1973	-	171,000
1971	-	195,000	1974	-	238,000

Charbonneau, Fishhook, and Levey Landing parks have received extensive development over the past four years with boating facilities, paved parking, access roads, comfort stations, etc., being added at a cost of close to $1 million. Charbonneau Park on the south shore just above the dam received a major portion of the development during this period which is reflected in its attendance records, expanding from 5,000 per year in 1970-1973 to over 30,000 in 1974. Public interest in Ice Harbor Dam itself, with its interesting Indian Memorial Park at the south abutment, has held strong over the past five years with attendance ranging from 60,000 to 73,000 each year.

STRUCTURAL CHANGES

The Ice Harbor Dam has taken its place in the Columbia River water resource program with little modification since its completion in 1962. Operation and maintenance problems have been essentially routine, except for an interesting metallurgical problem with the turbine blades for unit 2. When the unit was shut down in 1974 for overhaul, which is scheduled every three years, it was found that the trailing edge of one turbine blade was broken off and a second blade cracked. The piece broken off was about one third of the blade, the outer end, broken straight across. The blades are roughly six feet long from the hub to tip.

First thoughts were to replace the two blades, but because installation of units 4, 5, and 6 was then utilizing the assembly bay erection space, it was decided to weld the cracked blade and splice on a replacement for the piece that was missing. Bonneville Dam had a spare blade of approximately the same dimensions and shape, so the outer end of it was used to replace the lost blade tip. The repairs were apparently successful; the unit has been in continuous service since the repair. Prior to discovering the blade loss there had been some problems in controlling the load on this unit but with no severe vibrations and roughness in operation that would have been anticipated with the unbalanced turbine. Operating conditions have been satisfactory since the repair. Checking of the repairs will be made as soon as the unit can be taken from service, possibly late in 1975.

The north shore fish ladder was scheduled for changes to its fish counting facilities, changing the old horizontal white board over which the fish pass for identification to the vertical wier with a viewing window as had been installed at McNary Dam. This reconstruction was accomplished during the winter of 1974-1975, including a viewing room for the public, at a cost of about $200,000. Similar changes to the counting facilities and public viewing area of the south shore fish ladder are scheduled for the 1975-1976 winter season.

NAVIGATION TRAFFIC

Tables 3, 4, and 5 document the navigation traffic through the Ice Harbor lock which from a commodity standpoint is essentially downbound small grains. With the advent of navigation to Lewiston, Idaho, in June 1975 these statistics should show material increase. Table 3 tabulates the total lockages for each year by type of vessel. Comparison of the passages at Ice Harbor for private vessels in relation to both McNary and Lower Monumental indicates the popularity of the lower 40 miles of Snake River for recreation boating. The sale and servicing of small boats for recreation use in the region bears out this localized use and the need for adequate launching and mooring facilities.

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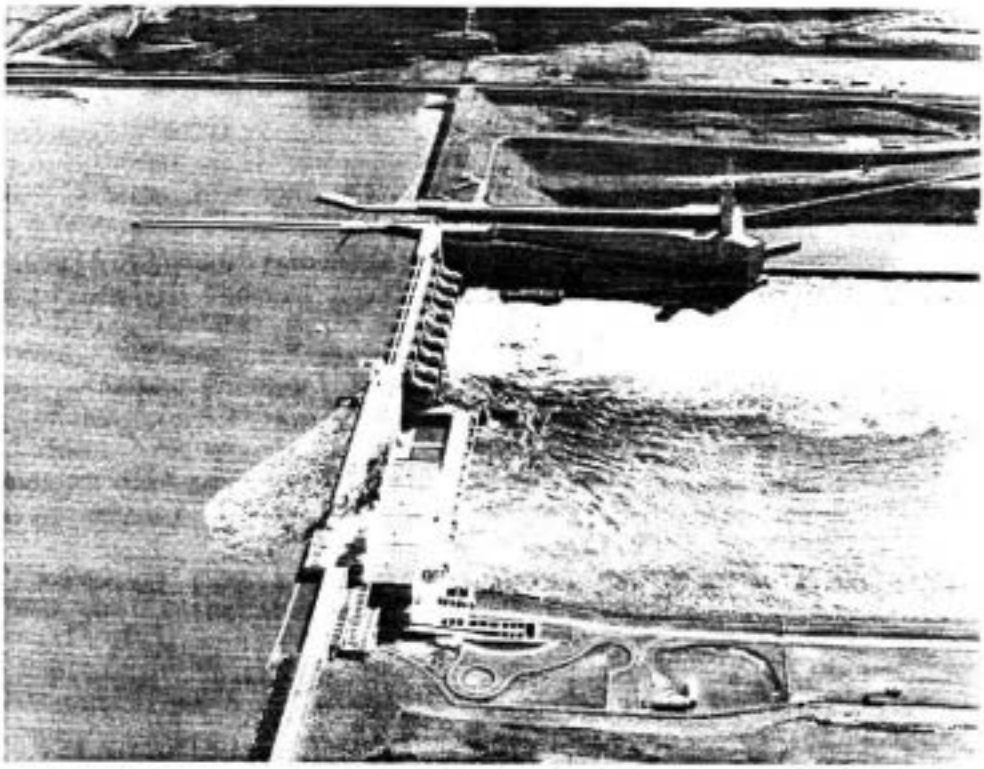
LOWER MONUMENTAL DAM

THE DAM

Supervision of the construction of this project during the 1960s was by the Seattle District, as recounted in the previous volume of history, pages 231 to 239. The pool was raised behind the dam in February 1969 and the three generators placed on the line during the ensuing year. The navigation lock was placed into operation in April 1969, thus extending the lower Snake River slack-water navigation to the Little Goose damsite 27 miles upstream, or halfway to Lewiston. The project was essentially completed by mid-1970 and supervision transferred back to the Walla Walla District for operation.



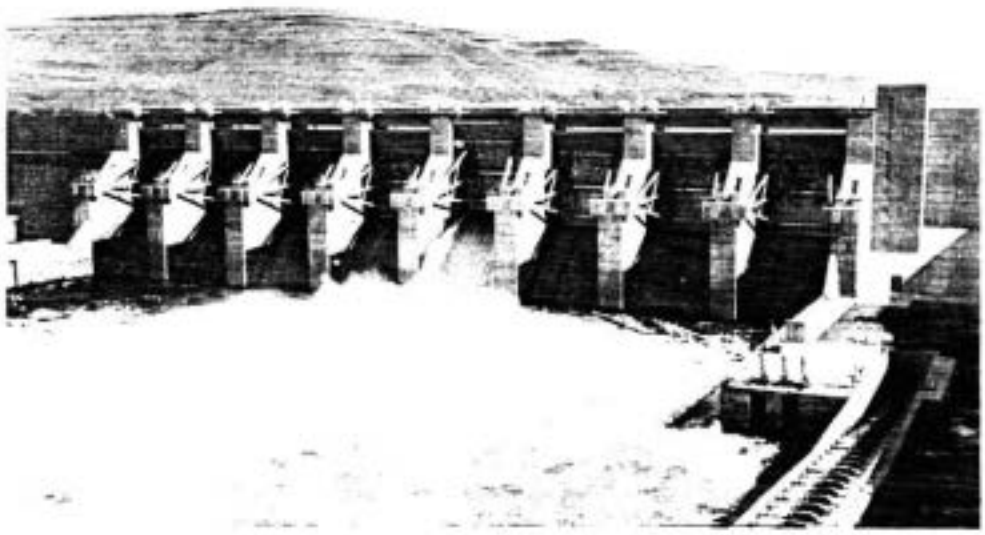
LOWER MONUMENTAL DAM
Looking South - 1970

An area of possible structural weakness was found in the upstream wall of the powerhouse erection bay by careful reanalysis of stresses. Accordingly, the decision was made to prestress the area by insertion of tension members in the concrete. A contract was let in July 1971, and the work completed in March 1972 at a cost of approximately $200,000. Except for this one modification the project has been operated essentially as designed and constructed during the ensuing five years with no major problems, patiently awaiting dedication ceremonies until June 1975. That event will be recounted later in Chapter 7.

SPILLWAY MODIFICATIONS - FISH

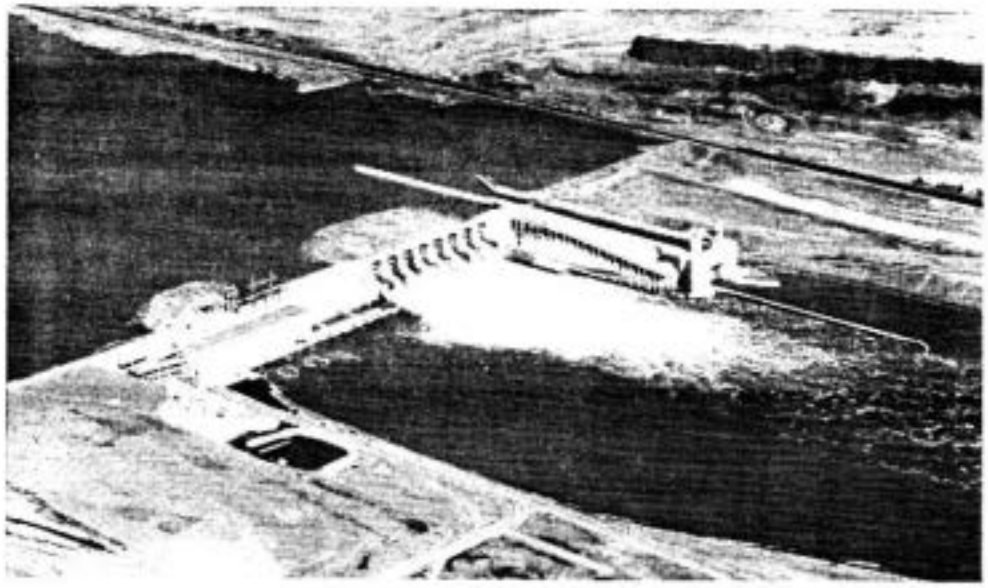
Chapter 9 of Part I discusses the problems of nitrogen gas supersaturation affecting fish migration. The Lower Monumental Dam was selected for a research study on modification of spillway flows, attempting to devise a proper spillway design which could be used at all projects to eliminate the problem. After some preliminary research on methods for modification and materials, spillway bay 4 was selected for the experiment. The plan was to modify the shape of the lower face of the spillway to eliminate the plunging flow into the stilling basin, thus dissipating the energy in the falling water in a different way than with the original design. To accomplish this, a concrete deflector was built across the face of the spillway bay just below tailwater elevation. This deflector, with a transitional curved surface to meet the face of the upper spillway, deflects the falling water to an approximately horizontal stream, dissipating its energy by diffusion with the surface water below the dam. This eliminates the excessive air absorption that comes from pressure in the deep stilling basin and the resultant supersaturation of the downstream water with nitrogen gas.

A contract was let in September 1972 for the modification of bay 4, which was completed in February 1973 before the spring high water flows. The work was accomplished behind a specially designed buoyant steel bulkhead, which was floated into position and then anchored securely to the piers adjoining the spillway face. Deep incisions were then made into the spillway face with mechanical equipment for anchorage of the concrete for the modified spillway structure. The new concrete was then placed, with several different surfacing materials being added to find the one most effective in reducing erosion of the concrete surface. When put in service, tests showed that fibrous steel concrete made the best wearing surface. Subsequent tests for the amount of free nitrogen in the water below that bay in comparison to the standard bays was so much less that the experiment was judged a success and the decision made to modify six of the eight spillway bays of the project. A second contract was awarded in November 1973 to modify all but the end bays of the spillway. The work was completed in August 1974. The same buoyant bulkhead, with minor changes, was used. The concrete



LOWER MONUMENTAL DAM
Flip Lip Test - Bay 4

excavated for anchorage purposes was removed by means of controlled explosive charges. The cost of the original experiment was about $400,000 and the modification to the remainder of the spillway about $1 million, making a total of about $1,400,000.



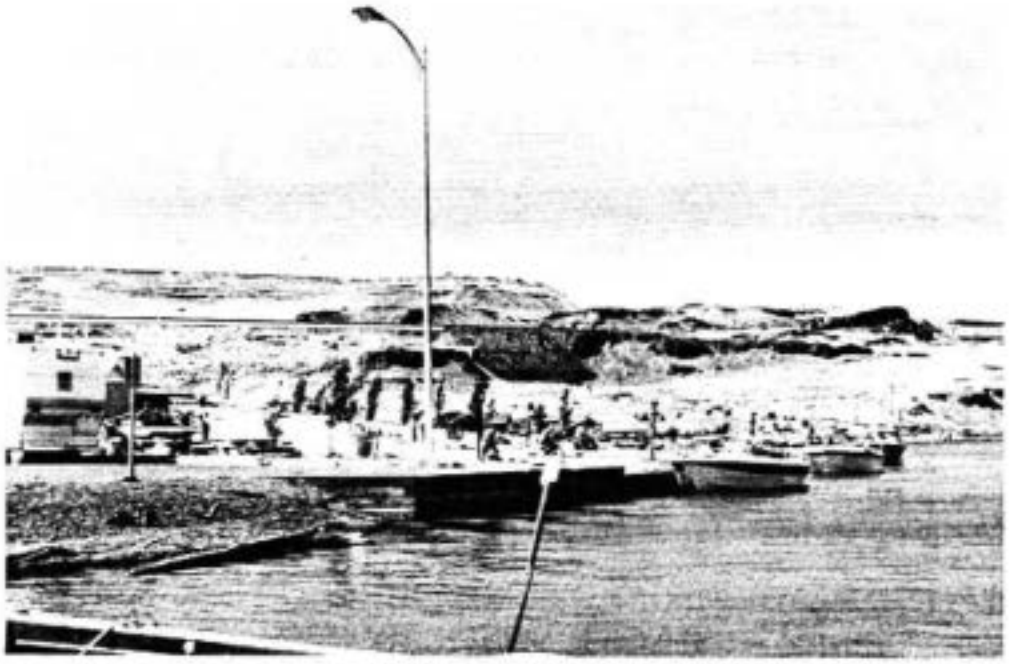
LOWER MONUMENTAL DAM
Flip Lip Test - All Bays - 1974

FISH LADDER MODIFICATIONS

As at other projects, changes were dictated in the method of counting fish and for better identification. Changes were made to the south shore fish ladder by contract in the winter of 1972-1973 to eliminate the original horizontal white counting board and small counting station. A vertical counting station with viewing window was installed for better identification and fish passage at a cost of approximately $150,000.

PUBLIC USE FACILITIES

Access to the Snake River canyon in the Lower Monumental reservoir area is somewhat limited except at the mouth of the Palouse River (Lyons Ferry area), which is a highly developed public-use reach with a large state park and a major marina. Five other access points have been developed for essentially day-use activities, including facilities at the dam. Two major changes in the project facilities for the public have taken place in the past five-year period. Facilities at the dam received extensive improvements at the north shore and south shore abutments in landscaping and conveniences for the visiting public. The work was accomplished from February to December 1974 at a cost of roughly $500,000.



LYONS FERRY STATE PARK

The second project was at the Lyons Ferry Marina site (see pages 236 to 239 of the initial volume of history). It is a concentrated area of use for pleasure boats and moorage. Experience at the marina and in the embayment revealed that wind and wave action as well as passing barge traffic caused excessive disturbance in the moorage area with damage resulting. Remedial action was construction of a floating breakwater across the entrance to control wave action. The work was started in September 1974 and completed in April 1975 at a cost of approximately $500,000.

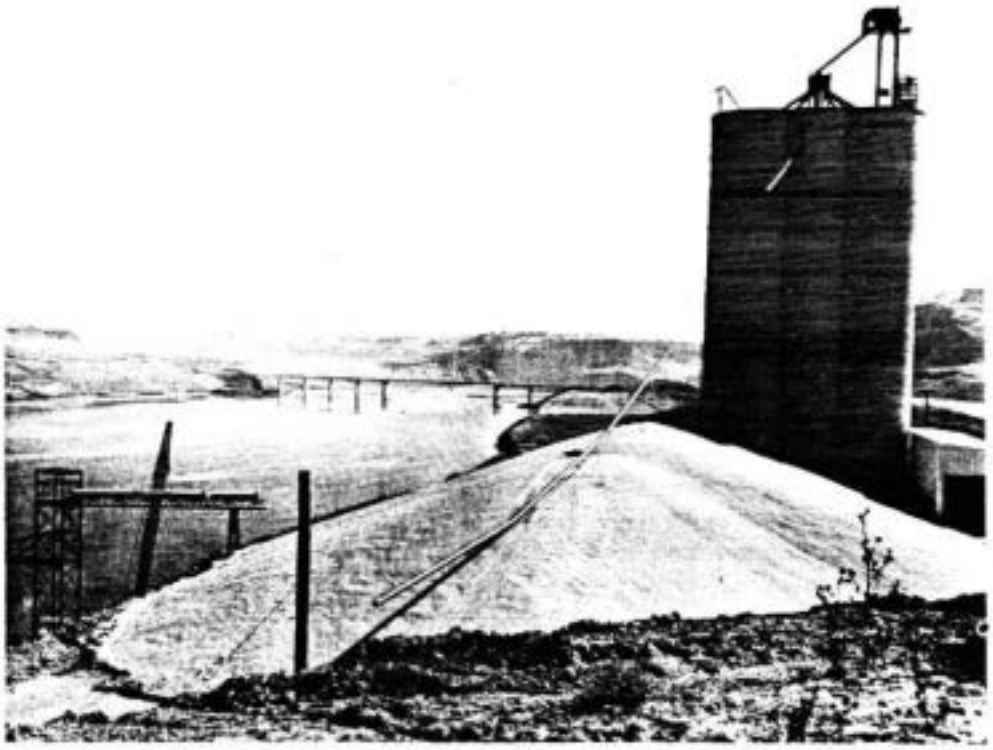
The Lyons Ferry State Park is a major recreation area on the reservoir. Its geological interest, archaeological value, the Indian burial grounds, and scenic attractions are some of its drawing cards. (See pages 236 to 239 of the previous volume of history.) The 1,200-acre park was developed by the District, with initial work providing a day-use area, boat dock and sheltered mooring area, as well as a 50-unit overnight camping area. The park also contains the Marmes Rockshelter site. The park area was turned over to the State as a part of the Washington State parks system. An impressive dedication ceremony was held on 20 June 1971, with speeches noting the historical significance of the site and including acceptance by the State.

RELOCATIONS

Railroad relocation agreements with the UPRR provided for a five-year deferred construction and extraordinary maintenance period after the reservoir was first filled. Prior to its expiration in February 1974 the railroad was reimbursed a substantial but reasonable sum for its extraordinary costs. One small contract was let for deferred construction in erecting a barricade to prevent rocks falling from one short section of rock cut facing the tracks. The barricade utilized concrete stoplogs which had seen service they had been designed for during the construction of the dam. The contract also provided some minor bank protection repairs.

NAVIGATION TRAFFIC

Tables 3, 4, and 5 indicate the commercial traffic in the Lower Monumental reservoir area and passage statistics at the lock. The Port of Columbia County, with terminal facilities below the mouth of Tucannon River, has the only extensive development which is utilized for movement of small grains from the surrounding tributary area. Most of the commercial traffic on the reservoir so far, as illustrated by Tables 3 and 4, is through movement from the Little Goose project. Traffic through the Lower Monumental lock consists of a fair percentage of private pleasure craft moving up and down the river in other than just local pleasure ventures such as around the Lyons Ferry area (Table 3).



PORT OF COLUMBIA COUNTY
Wheat Storage Awaiting Shipment

ADDITIONAL POWER UNITS

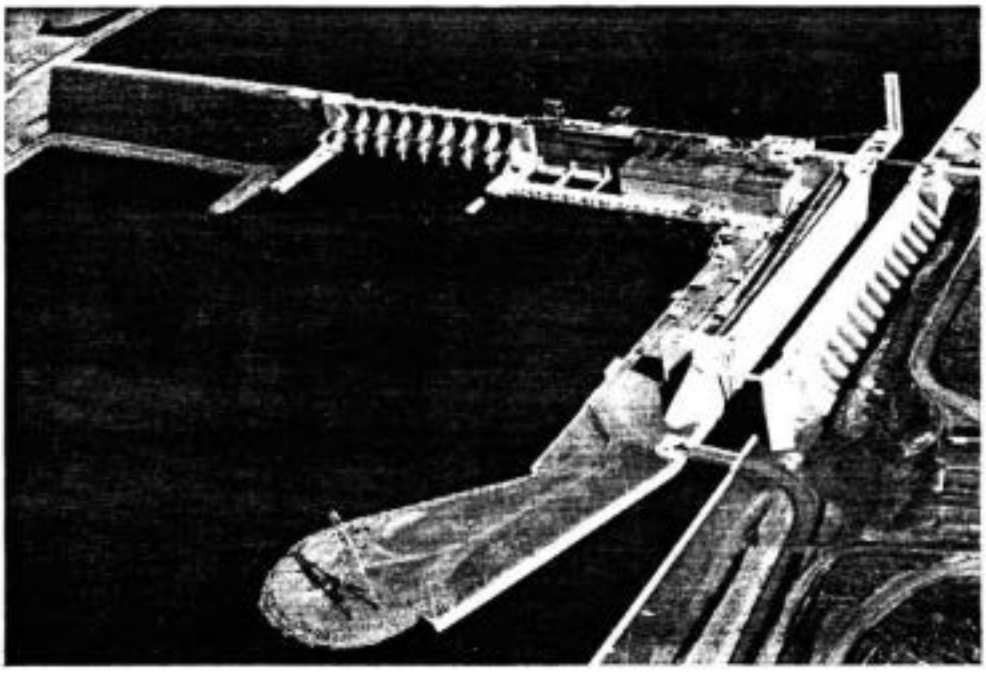
In accordance with a coordinated hydroelectric load forecast and installation schedule for the four lower Snake River dams, the additional units for the Lower Monumental Dam were put under contract in 1974 and 1975. The three turbines were contracted for in July 1974 with delivery in late 1977. Contract was awarded for the three generators in April 1975 with delivery and completion of installation in the spring of 1979. The contract for powerhouse expansion and equipment installation, together with several other equipment purchase contracts, has similar schedules, being awarded in June 1975 with completion set for 1979. The designed generating capacity for the additional units will be identical with the initial three units at 135,000 kva each.

LITTLE GOOSE DAM

THE DAM

This project, as described in some detail in the first history volume, pages 241 to 249, reflects to a considerable extent the developmental or scoping studies for Ice Harbor and Lower Monumental dams. As a result, it is very similar in capabilities and physical aspects to the Lower Monumental project. It was constructed almost concurrently with that project. The initial construction work was in 1963 with the project put into service in the spring of 1970. It has performed in a very satisfactory manner during the ensuing five years.

As at Lower Monumental dam, strengthening the upstream wall of the powerhouse erection bay was determined to be necessary and was accomplished by means of insertion of tension members in the concrete. This work was initiated in July 1974 and completed in March 1975 at an overall cost of approximately $350,000.



LITTLE GOOSE DAM

The Lower Monumental pool was raised in 1969 and Little Goose pool in 1970. That year's span saw 66 miles of the Snake River navigation system placed into service, one-half of the overall project, which had a fair impact upon the economy of the surrounding or tributary area. Two grain terminals were constructed in the Central Ferry area of the Little Goose pool and the first year of the reservoir saw over 125,000 tons of grain move downstream. (See Table 4.) With the raising of the Lower Granite reservoir in 1975 to Lewiston, Idaho, the competition between the two terminal areas will be interesting to observe, particularly in relation to downstream movement of small grains.

PUBLIC-USE AREAS

Six sites are being developed initially to provide facilities for the public. The development includes picnic and camping facilities, water supply, sanitary facilities, seeding and planting, access roads, parking areas, boat launching ramps, boat basins, and other items. Approximately 750 acres of project lands have been zoned for these sites. Two major contracts for the development of recreation sites were entered into over the past five years. The first was for the creation of the Boyer recreation area, a major park along the north shore just below the Lower Granite Dam. This 43-acre area just upstream of Almota Creek very effectively serves the Pullman, Colfax, and Moscow region to the north. Operated by the Port of Whitman County, it provides overnight camping facilities for trailers, tenters and group camping, with picnicking, swimming and boating provisions. A very adequate marina area is also operated by the Port. Work on this area was initiated in September 1971 and completed in May 1972 at an overall cost of $1,200,000. Some additions were made to the area in 1974.

The second large contract was initiated in April 1973 for recreation facilities and public-use areas at four locations on the project, the principal one being in the Central Ferry area where the main north-south highway crosses Snake River. This site consists of 185 acres of land and water within the park boundary, with areas allocated for a large overnight trailer, tenting, and group campground, day-use parking, picnicking, swimming, and boating. The Central Ferry area has been leased to the State of Washington as a State park. Access is directly from State Highway 127 with a short access road. The park was dedicated on 14 July 1974. The cost of development at this park is estimated at about $2 million. The entire contract which provided for other recreation work at the dam and four other sites, including one in the Ice Harbor pool, was completed in November 1974. The estimated cost of all work is $2.8 million.

CENTRAL FERRY STATE PARK

NITROGEN SUPERSATURATION AND FISH PROBLEMS

The Little Goose project was selected as the location for certain experimental work looking toward reduction of excess nitrogen which is proving deleterious to the movement of anadromous fishes in the river. (See pages 63-64.) A concerted effort was first made through careful coordination of the operating procedures for the Snake and Columbia River systems to reduce as far as practical the individual projects having to spill excess water over their spillways in order to reduce atmospheric gas supersaturation, principally nitrogen.

Initially, intake diffuser gates were constructed to be placed in the unused powerhouse bays for units 4, 5, and 6 of the project in order to pass as much excess water as possible through these skeleton units rather than over the spillway. These "Holey Gates" with apertures through which water and downbound fingerling can pass were built for all nine of the intake gate openings for the three units. Screens were placed over the lower discharge openings of the draft tubes to prevent adult fish bound upstream from entering. The contract for assembly of the gates and screens was awarded in September 1971 and completed in February 1972 in time for the spring flood period. The cost was about $570,000.

The "Holey Gates" accomplished their mission by markedly reducing the nitrogen supersaturation, and units were purchased for Ice Harbor and Lower Monumental dams. Unfortunately, later tests proved that many of the juvenile fish migrating to the sea were injured passing through the holes in the gates. The gates were retired from use after

the experience of two seasons, and in the meantime efforts had turned to the "Flip Lip" spillway modifications.

As recounted on pages 64 and 65, efforts to improve fish migration also turned to methods of capture and either passage around each dam or trucking to the lower Columbia River and releasing them in tidewater. At the Little Goose project traveling fish screens were installed in each of the intake openings for the three power units now in operation. These traveling screens diverted the down-bound juvenile fish into a bypass system around the power units. They were then either released into the river below the project or placed into special tank trucks for movement to tidewater.

The traveling screens and appurtenant necessary facilities in the intake openings were placed under contract in November 1972 and completed in June 1973 at an estimated cost of $675,000. The trucking of fish to relieve them of the hazards of migration has since indicated success and the process is being expanded. In 1973 over 1,750,000 fingerlings were collected by the screens in this manner, of which about 425,000 were transported downstream by truck. The remainder were returned to the river in the Little Goose tailrace.

ADDITIONAL POWER UNITS

As with the Ice Harbor and Lower Monumental projects, additional power units to fill out the skeleton bays 4, 5, and 6 have been definitely scheduled and contracted for. The turbines for the three units were placed under contract in July 1974 with scheduled delivery during 1976 and 1977. Similarly, the generator units were contracted for in April 1975 for delivery in 1977. The contract for the powerhouse extension and equipment installation for the three units was awarded on 19 June 1975. All three units are scheduled to go into service from February to May 1978, which will complete the entire project as envisioned 20 years previously.

LOWER GRANITE DAM

THE DAM

This project, since its original conception 30 years ago, has seen several modifications in scope and capabilities, as described in Chapter 6, Part II of the previous volume of history. In the dam's physical characteristics it now follows closely the Lower Monumental and Little Goose projects, and it has been constructed in a very similar manner. The orientation of the several parts duplicates the Ice Harbor layout except that the earthfill dam between the lock and the north bank is considerably longer. The general discussion, location, and site characteristics are described on pages 251-258 of the first volume of history, as noted above, so will not be recounted here. The project construction was definitely underway in 1970 and proceeded with few delays to completion and dedication in 1975.

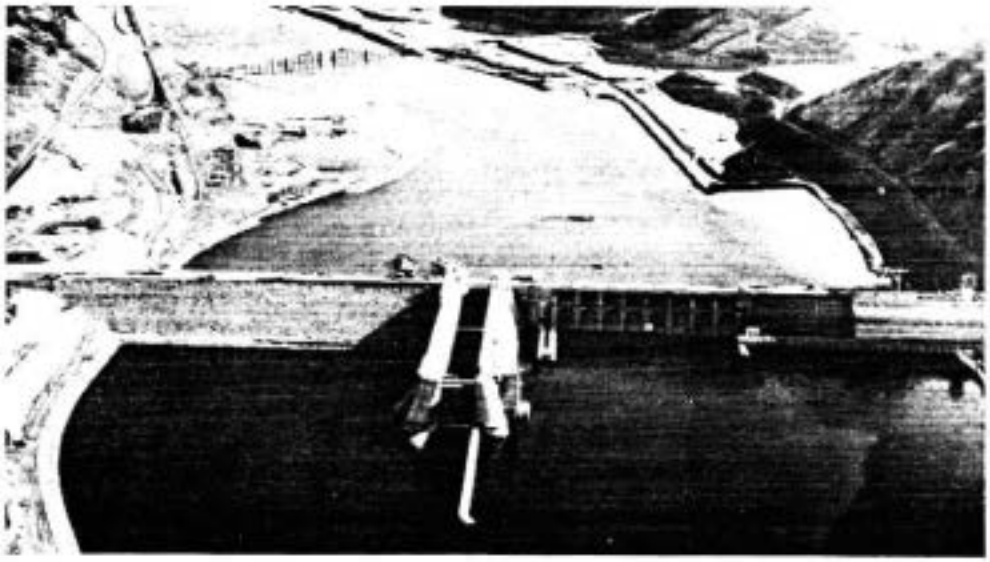
CONSTRUCTION

Since the first-step cofferdam had been constructed in 1965-67 and a south-side access road to the site joining existing roads from Pomeroy, Washington, had been finished in 1967, the site was essentially ready for the construction effort when funds were made available. The contract for construction of the lock, dam, powerhouse, and installation of equipment was awarded on 13 May 1970, to a joint venture of four major construction firms for $105+ million. The Guy F. Atkinson Company, which had done most of the construction at McNary Dam and had a hand in building the other Snake River dams, was the sponsor. Access to the construction area on the south shore is difficult due to the terrain. In addition, rail access is available only on the north shore. To aid in the delivery of materials and to reduce labor costs by improving vehicle access, the contractor built a pile-bent construction bridge for vehicle traffic across Snake River about one-half mile above the site. In order to maintain navigation past the area, a central span with 74-foot-wide clear width and 47-foot-high opening was built into it. The bridge was completed by November 1970 and remained in service until early in 1975.

Rock excavation for the structure had been essentially completed by the spring of 1971 and concrete placement started in February of that year. The millionth cubic yard of concrete was placed in February 1972 and by the spring of 1973 practically all mass concrete had been poured. The years 1973 and 1974 saw installation of spillway gates, navigation

lock equipment, and generator and turbine units 1, 2, and 3, as well as completion of the powerhouse structure.

The cofferdam, including the steel cell units north of the navigation lock structure, were removed during the fall and early winter of 1973-1974. The cofferdams for the north shore embankment were initiated after the spring high water and were in place by August 1974. As the cofferdam was closed, the stream was diverted through the skeleton bays of the powerhouse. Work then started on the second phase of dam construction, the building of the 1,530-foot-long north shore embankment to complete the dam structure. This earth and rockfill section proceeded rapidly and was essentially complete by December 1974. Several minor items remained in the river to be removed before pool raising in February 1975.



LOWER GRANITE DAM
Before Raising Pool - November 1974

Immediately upon raising the pool, the work at the dam concentrated upon testing and placing the three power units "on the line." Unit 1 was completed and serving Bonneville Power System by mid-April 1975; unit 2 placed on the line by mid-May; and the third unit synchronized with the BPA system on 24 June 1975, thus placing all three units in service without undue problems within a two-month period. Work continues under another contract for the expansion of the powerhouse and the installation of the additional future three power units at Granite.

Concurrently with construction work at the dam, work was underway on the relocation and development work in the 39-mile-long reservoir area, particularly in the Lewiston, Idaho, area which

required an extensive levee system. The Lower Granite damsite, access roads, railroad and highway relocations, pool area, levee locations, and public-use areas required the purchase of about 10,000 acres at a cost of $20 million for both lands and damages.

The upstream portion of the area to be occupied by the reservoir, particularly from Steptoe Canyon to Lewiston (10 miles), was historically an important area for the Nez Perce Indians and many burials had been made along the banks of the river. The Nez Perce requested the relocation of burials, either known or discovered in the course of construction, which would be inundated. The Corps, in cooperation with the University of Idaho and the Nez Perce Tribal Committee, removed the ancestral remains from approximately 275 graves for reinterment in common graves at the Nez Perce Historical Park at Spaulding, Idaho. Artifacts recovered in the disinterment are the property of the Tribe and will be placed in the tribal museum.

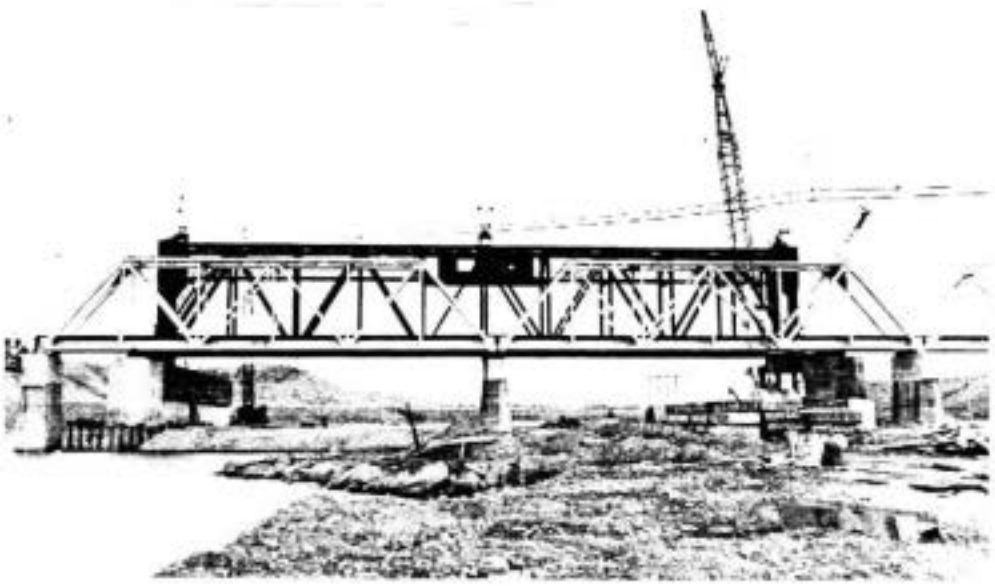
Because of its remoteness from suitable housing, the damsite was judged in need of a small housing area at the project for employees needed in emergency situations. A very suitable riverside area about three miles below the dam on the south shore, directly across the river from the Almota recreation area, was selected. A water supply, utilities, roads, lawn, and landscaping were provided by contract early in 1975 for four new houses, five trailer pads, and refurbishing a ranch house on the site, all of which will be ready for occupancy in the fall of 1975.

RELOCATIONS

Roads and Railroad.

The work of providing a clear reservoir area of 8,900 acres for the Lower Granite project was a major undertaking. Relocation of the many affected urban facilities in the Lewiston-Clarkston area required careful planning and many negotiations. Highway and rail relocations involved moving 37.5 miles of Camas Prairie Railroad including modifications to their bridge over the lower Clearwater. There were 20.4 miles of state highway changes and 24 miles of county roads to replace. The Camas Prairie Railroad had been raised to its new alignment at the damsite and on upstream about three miles to Wawawai Canyon prior to renewal of dam construction in 1970. The work to complete the railroad changes was initiated in the fall of 1972 and completed in the summer of 1974 under four separate contracts for successive reaches along the river.

In order for the modified Camas Prairie Railroad to reach its terminal in Lewiston, the railroad bridge at the mouth of the Clearwater River required raising and changes for the navigation span. This work was placed under contract in April 1973. The bridge was raised to accommodate the new pool level for the project, abutments modified, and the old spans 3 and 4 removed completely, to be replaced by a 240-foot clear span vertical lift unit for navigation traffic to port facilities in the



CAMAS PRAIRIE RAILROAD BRIDGE - LEWISTON
Old Spans for Removal and New Lift Span

lower Clearwater River. The bridge was ready for operation in December 1974 after an expenditure of about $5 million.

Prior to initiation of the Lower Granite project, Whitman County provided a gravel access road along the north shore of Snake River from the stateline down to Wawawai Canyon. Due to the configuration of the river canyon with a full project pool, and the need to place both on a fill much of the distance, the relocated County Road 900 could best be built adjacent to the railroad throughout this reach. With this arrangement, common fills could be used. Accordingly, the railroad relocation contracts provided for simultaneous construction of the railroad bed and the county road, a gravel road with a 28-foot width. Upstream from Steptoe Canyon, in anticipation of the roadbed's future use as a State Highway, the county road design was modified to the wider and more exacting State Highway standards.

This new State Route 193 extends from Steptoe Canyon to Wilma (8 miles) where Washington State installed piers and approach facilities across Snake River for a future 15th Street highway bridge, as part of a north-south route from Clarkston, Washington, north to Pullman. This reach of road has been built to a width of 42 feet in accordance with current standards, even though the highway cannot be used as such until extensive work is done up Steptoe Canyon and construction of the bridge structure is programmed.

RAILROAD AND HIGHWAY RELOCATION

Another major highway relocation project involved U.S. Highway 12 on the south shore from Clarkston west to Alpowa Creek. This required the raising without significant change in alignment for the section of the highway skirting the golf course and downstream adjacent to the cliff west of Clarkston, together with realignment to higher ground from there upstream to Alpowa Creek. This eight-mile reach of a major highway was designed and constructed under an agreement contract with the Washington State Highway Department at a cost of about $7 million. The work was started early in 1973 and completed during the summer of 1975.

Clarkston Golf Course.

A problem with considerable local interest involved the flowage needs at the Clarkston Country Club golf course, a 90-acre, 18-hole course which forms a very attractive and scenic entrance to the City of Clarkston on U.S. Highway 12. The flowage needs involving about 38 acres had three alternatives for solution: (a) Construction of a levee and pumping station for protection; (b) acquisition of the affected area, taking it out of use; or (c) modification of the area by fill, relandscaping and replacing of tees, fairways, etc. Design studies and extensive negotiations eliminated the first two alternatives, with only modifications as the practical solution. This involved placing over 400,000 cubic yards of fill late in 1973, relandscaping and replacing fairways and greens, by June 1974, and careful nurturing of the area for the following year with resumption of play in the summer or fall of 1975. The work was accomplished by the Clarkston Golf Club.

Washington Water Power Dam.

A problem in the basic planning for the Lower Granite project, particularly with respect to the pool level, was the proper treatment for the Washington Water Power Company (WWP) Dam at mile 4.5 on Clearwater River. This hydroelectric project was nearing the end of its 50-year license from the Federal Power Commission (FPC); had limited generating capacity; and the desired 738-foot pool level for the Lower Granite project would critically reduce that capacity because the effective head at the powerhouse would be decreased by about 12 feet or one-third of its head. A coincident problem was finding the most practical solution to protect the major lumber and paper mill of the Potlatch Corporation (formerly Potlatch Forests, Inc. (PFI)), a mile downstream from the dam. An earth dam which ran downstream from the dam to the powerhouse impounded a large pond used by PFI for storing logs and from which water was drawn for the powerplant. This water then passed down a tailrace through the middle of the PFI plant to re-enter the river downstream.

Levees were required to protect the extensive PFI plant. Two alternatives were available with respect to the WWP powerplant; either extend the levee system up the long WWP tailrace through the PFI plant to permit the powerplant to continue to operate under a reduced head, or cross the tailrace at its mouth with the levee, thus stopping all power production at the plant. The second solution would cost about $2½ million less for levee construction than the first. After considerable preliminary negotiation between PFI, WWP, and the District, during which all three parties were amenable to alternate solutions, OCE granted authority to negotiate a three-way settlement for ceasing operations of the powerplant and removal of the dam.

Under the agreement reached, PFI was to pay WWP $1.2 million and gain ownership of the earthen dam impounding the log pond and some adjacent lands needed for construction of a new secondary sewage treatment aeration lagoon. The Corps paid WWP $1.5 million to obtain levee right-of-way and right to block the tailrace. The Corps also agreed to remove the spillway from the river at an estimated cost of $1 million. WWP thus received $2.7 million in exchange for all properties involved and to cease generation. This tripartite agreement was completed in the summer of 1972. A contract for removal of the spillway section was awarded in November 1972 and essentially completed the following spring before fish migration. As a result of the agreement, PFI was able to reclaim the old 275-acre area occupied by the log pond above its plant. Due to the reduced river level, the log pond was dried up to provide land space for secondary treatment aeration lagoons for their industrial waste and for log storage.

REMOVAL WASHINGTON WATER POWER DAM

LEVEE CONSTRUCTION

The early considerations for a levee system for the Lewiston-Clarkston area are described briefly on pages 254 to 258 of the prior volume of history. Because of 1948 flood conditions the original concept of low levees for the Lower Granite Dam was changed to an independent flood control project with a greater degree of protection which was authorized in 1950. As the Lower Granite reservoir studies developed with a pool level of 738 instead of 715, the levees again became a part of that project in 1959. Land utilization, changing municipal needs, the changed concept between flood control needs and those of a navigation project with harbor facilities, recreation boating, and land-use development subsequently dictated major reconsideration of levee locations and features.

Development studies for the Lower Granite reservoir area became firm in 1963 and 1964, and the basic levee system took a definite location and shape with simple functional design. The final levee location in the Lewiston area evolved from a series of alternate plans, with various factions of the community exerting opinions on relative needs. The original alignment for flood control in the 1950s generally followed the shoreline along the north shore of Clearwater River and several sections of these works were built for flood control to north Lewiston during the late '50s. On the south shore of the Clearwater the flood control plan generally followed the city waterfront and the railroad embankment from the PFI plant to the mouth and up Snake River to the interstate bridge area.

When navigation became a project purpose again in 1959 little change was made in alignment along the north shore. However, Holbrook Island, a 50-acre gravel island owned by PFI, in the middle of the Clearwater River between Memorial or 16th St. Bridge and the Camas Prairie bridge at the mouth was judged to be prime land for Port facilities and the levee alignment was shifted to the north edge of the island, leaving essentially a free-flowing navigation channel between the north and south levees. Holbrook Island then became an integral part of the City of Lewiston as industrial land.

Studies for public use and needs for a marina for Lewiston in 1966 resulted in an alternate plan for use of Holbrook Island, by providing a major boat basin between the island and mainland, with its entrance just above the railroad bridge. A levee was then required against the city side of the marina with Holbrook Island built up for parking and public use. The Port of Lewiston and municipal interests made alternate studies for three years on the optimum method of development for this critical 1,000 by 6,000 feet of river frontage land and water area. During the discussions the need for a vehicular bypass to relieve traffic in the business district was also proposed, to be located along the south bank outside the railroad, thus moving any levee alignment riverward to accommodate it. Navigation requirements, drainage systems,

CLEARWATER RIVER - MEMORIAL (16TH STREET)
Bridge Downstream - Levee and By-Pass Road Along Lewiston Waterfront
Holbrook Island Excavation Center of Picture
North Bank Levee in Place

SNAKE RIVER - LEWISTON WATERFRONT LEVEE
Interstate Bridge and Mouth of Clearwater River in Background
Clarkston Washington - Left Bank

changes in the railroad, needs for the bypass, and a shortage of levee materials all had an influence on the final decisions. Finally, a determination was made in 1969 that Holbrook Island was not the proper location for a marina. This permitted a final alignment decision in 1972 well shoreward of the original north bank of Holbrook Island. The left bank levee for Clearwater River and the right bank of Snake River above the mouth now extend essentially from the old Washington Water Power Dam at river mile 4.6 downstream to the mouth, thence south along Snake River about 7,000 feet to protect the developed river frontage in that reach.

It was seen that to control seepage a positive cutoff would be necessary under the levees through the generally deep gravel formations to an impervious foundation. As designed and constructed, water passage through the pervious gravel underlying the levee is limited in most areas by excavating a trench to the impervious material and backfilling with an impervious material. Sides of the trench were supported with Bentonite slurry until the backfilling was complete. For trenches up to 40 feet in depth the backfill was earthfill materials and the manner of construction was similar to that for the Tri-City area of the McNary project. Other reaches were protected from seepage by placing a carefully blended blanket of impervious earthen materials on the channel bank outside the levee. Because of deep sections of pervious material in two locations, extending as deep as 70 feet below water surface, an alternate cutoff procedure was needed. After considerable research, decisions were to use a tremie concrete positive wall similar to a design used at Kinzua Dam in Pennsylvania. One reach of levee requiring this type of cutoff wall was in the north Lewiston levee upstream of the Memorial Bridge. The 700-foot-long concrete wall, approximately 65 feet high and 24 inches thick was constructed to the bedrock or conglomerate material by careful excavation of a trench using the Bentonite slurry, then backfilling the trench as the work progressed with a tremie concrete instead of the selected earthen materials as in other reaches. The initial step in the excavation was drilling holes to the selected foundation, setting steel beams vertically in the holes, and filling the holes with lean concrete. The beams set every 12 to 20 feet served as guides for excavation equipment forming the trench between. After excavation for a section was complete through the gravels and into the impervious material below, the slot was filled with concrete. The beams were left embedded in the concrete wall.

A second section of concrete wall was required on the south bank in the Lewiston levee at the mouth of Clearwater River just below the Camas Prairie Railroad bridge. In this location approximately 1,300 feet of concrete cutoff wall about 70 feet high and nominally 24 inches thick was constructed in the same way as described above. The concrete cutoff walls were constructed under a contract awarded ahead of other levee work. The entire levee system for Lewiston, except for the concrete cutoff and other related facilities adjacent to the levee system, was placed under contract in May 1973 and completed just prior to pool raising in February 1975 at a cost of about $20 million.

LEVEE ESTHETIC CONSIDERATIONS

Since before the start of project construction residents of the Lewiston area have repeatedly requested that levee design include measures for improving the appearance and esthetic quality of the finished levee system. One of the first suggestions was that the top of the levee be developed as a rather elaborate mall, with extensive landscaping, lighting, overlooks, dining terraces, and features for sightseeing, walking for pleasure, passive recreation, and other forms of enjoyment. The desire was that this all be tied closely and obviously to a revitalized downtown area of the City in ways assuring pleasant experiences for the people. The more practical concepts of this general theme have continued throughout the years of project planning.

The need for and existence of levees was even contested in 1970 by local interests. The opposition was pronounced enough that advisory ballots were taken in both Lewiston and Clarkston in the fall of 1971. The balloting was indecisive, but all the local expressions of antipathy lent to strong support to the concept of improving the esthetic quality of the levee system.

To summarize, in the original planning documents the Lewiston levees were proposed strictly as functional and entirely utilitarian elements of the Lower Granite project, with their sole purpose being the protection of the city from flooding. The public pressures described above, however, combined with important changes in Corps policies in response to public sentiment on a national scale, brought about changes in the design criteria and functional objectives of the levee system. Those changes recognize esthetic quality as a valid function of design and have been reflected in the overall design of the levee system. To implement this concept, an architectural consultant was engaged in August 1971. Plans evolved until the fall of 1972 when many facets were agreed upon. These and the basic grading requirements were incorporated in the levee and the two-lane highway bypass. A contract for the system was awarded in 1973.

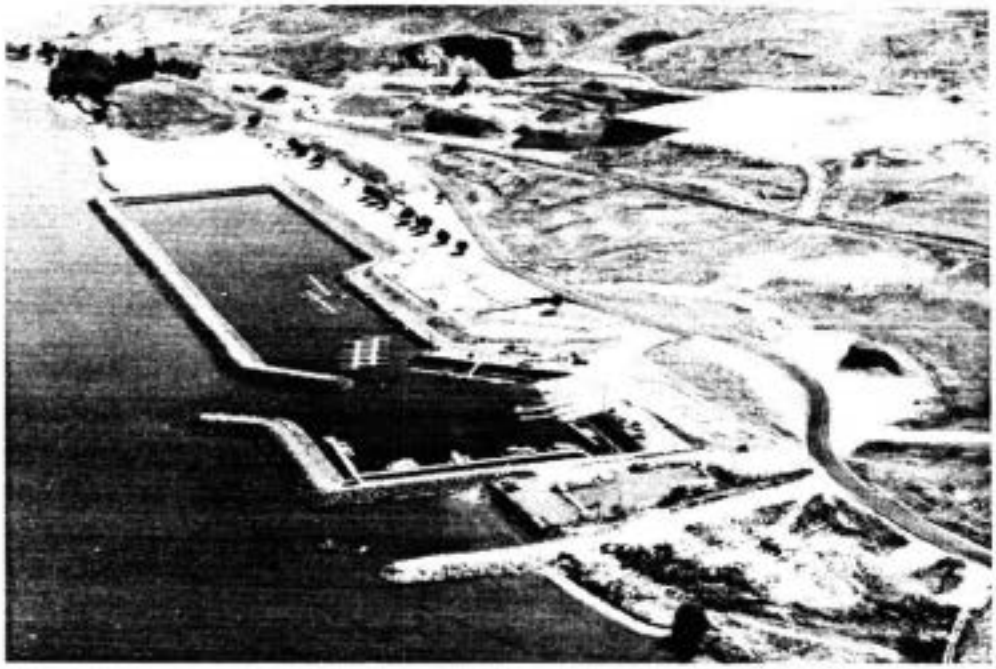
The several facets of the levee and waterfront beautification include moving the levee riverward in reaches to permit flattening of back slopes and better alignment; enveloping the interior drainage features which are extensive; creating small islands; plant containers in the levee slopes to control root growth; viewpoint or mini park areas; walkways; service and bicycle roads; small boat handling docks; shelters and interpretive displays; and benches and sunshades. These will all be with minimum lighting, and appropriate structures will be on treated timber supports. These esthetic features are under design and now that the basic levee and road grading contracts are complete will be contracted for late in 1975. Access to the levee system will be from several points: at the upper end on Snake River at 18th Street; near Interstate Bridge

to the mouth of Clearwater River and on up to the Camas Prairie Railroad bridge; at Ninth Street in the business district; and at the Memorial Bridge up Clearwater River where the levee, highway bypass, and the bridge meet.

LOWER GRANITE RESERVOIR - LEWISTON WATERFRONT
Interstate Bridge Right Foreground - Memorial Bridge Left Background

PUBLIC USE AND RECREATION PROVISIONS

The Lower Granite project with its extensive reservoir area in an urban community affords interesting development potentials for use by the public. As described in relation to the levee system, plans have evolved for many public access points, local land-use areas, and facilities for the recreation-bound general public to be essentially developed by project funds. Three large areas have been set aside and partially developed to date as major recreation sites: the Hells Gate State recreation area on Snake River upstream of Lewiston (89 acres) to be administered by the State of Idaho; Chief Timothy State Park downstream of Clarkston, Washington, on U.S. Highway 12 (143 acres) to be administered by the State of Washington; and Swallows Park and Marina, a long, narrow river frontage along Snake River upstream of Clarkston, Washington (64 acres) with joint responsibilities by Asotin County and the Corps.



HELLS GATE STATE PARK - MARINA CONSTRUCTION - SNAKE RIVER
Right Bank Looking Downstream

In the Lewiston area, other than the Hells Gate State Park, four separate park and recreation developments are in various stages of development with about 80 acres of usable area, primarily related to lands adjacent to the levee system, both along Snake River and lower Clearwater River. These will be principally day-use facilities, with launching ramps, play areas, observation points, shelters,

sanitary and water facilities, and picnic units. A compact interesting park area of 13 acres at the mouth of Asotin Creek at the upper limits of the reservoir area will be administered by the Town of Asotin, Washington.

From the dam upstream to the mouth of Alpowa Creek and Chief Timothy State Park, a distance of about 33 miles, six small areas, primarily along the north shore of Snake River adjacent to County Road 900, will be developed as access points with launching sites and day-use facilities. As of mid-1975 five contracts totaling about $3½ million have been underway on five of the reservoir area recreation sites for grading, sanitary facilities, and underwater work. In addition, extensive work has been accomplished as an integral part of the levee construction work in the Lewiston area. Design effort is well along on several units for early accomplishments. The people of the region as well as the many tourists visiting the area should enjoy the scenic and recreation facilities in this urban area.

CONTRACTORS - LOWER SNAKE RIVER DAMS

In excess of 630 construction and supply contracts have been awarded to date for the Lower Snake River Project. More than 90 of these contracts exceeded $1 million in total earnings. The main contract to Lower Granite Contractors, a joint venture between Guy F. Atkinson Company, Dravo Corporation, The Arundel Corporation, and L. E. Dixson Company, has exceeded $110 million.

THE LOWER SNAKE RIVER PROJECT DEDICATION

When the Lower Monumental and Little Goose projects were nearing completion in 1969 and indications were that the Lower Granite Dam construction would be underway within a year or so, decisions were made that dedication ceremonies of the three dams would be a united effort celebrating the advent of slackwater to Lewiston, Idaho, as the culmination of almost 100 years of navigation development effort on the lower Snake River. The construction effort at the dam over the past five years, accentuated by the extensive levee work, railroad relocation work, changes at the Washington Water Power dam, and general waterfront activities in the Lewiston area all emphasized the creation of a major waterway harbor and terminal for commercial and recreation craft. These five years of activity pointed toward appropriate ceremonies to mark the creation of "Idaho's year-round seaport, the farthest inland port on the west coast," 464 miles from the Pacific Ocean.

Ideas for an appropriate multiple ceremony began to formulate in 1974. The Pacific Northwest Waterways Association acted as the catalyst, ably assisted by the several Port authorities along the waterway from Portland to Lewiston. The McNary Dam was dedicated by President Eisenhower. Ice Harbor and John Day projects were dedicated by Vice Presidents Johnson and Humphrey, respectively. The remaining three lower Snake River projects were considered of equal importance and efforts were made to have the President or Vice President do the honors for them. While still Vice President, Gerald Ford had agreed to do so, but when he changed office he excused himself.

With the three dams each to be honored, an appropriate vehicle to move between them as an integral part of the waterway was sought. The Port of Portland has one remaining steam-powered sternwheeler, the "Portland," in use for harbor work. This double-decked vessel was selected to be the central figure, moving up the river on an appropriate schedule carrying the dignitaries between projects and on to Lewiston. Lewiston was founded in 1861 to serve passengers and cargo of sternwheelers because they were unable to go farther up the Clearwater River to the Idaho goldfields, making the city the head of what was at best an occasional seaway. The last sternwheeler to serve Lewiston left in 1940 because of navigation difficulties and rail completion. The return of commercial navigation was signaled by the trip of the "Portland" in June 1975.

STEAMER "PORTLAND" PASSING MONUMENTAL ROCK
Snake River

The dedication procession to the three projects was tied to the movement of the Sternwheeler "Portland" which had moved from Portland to Pasco, Washington, prior to 17 June 1975. On that day it sailed from Pasco to the Lower Monumental project and tied up for the night, ready for the initial ceremony on the morning of 18 June at 9:30 AM. Charter buses carried the dedicatory party from Pasco to the dam to board the vessel prior to the ceremony. The "Portland" was tied in the lock near the upper lock gate with the audience on the south lock wall and dam abutment area. The speakers occupied the upper deck of the vessel. Small craft were free to move through the lock to the upper pool area prior to the ceremony.

The dedication at Lower Monumental was completed soon after 10:00 AM and the "Portland" steamed upstream with the dignitaries aboard to arrive at the Little Goose Dam about 2:45 PM. The dedication of that project also took place above the navigation lock at 3:00 PM on 18 June with the audience along the upper lock wall just above the upper gate and the speakers on the upper deck of the "Portland." Upon completion of the dedication at about 4:00 PM, the dedicatory party left the sternwheeler and returned to Walla Walla and Pasco by bus. The "Portland" steamed on upstream to the Central Ferry area where it remained overnight.

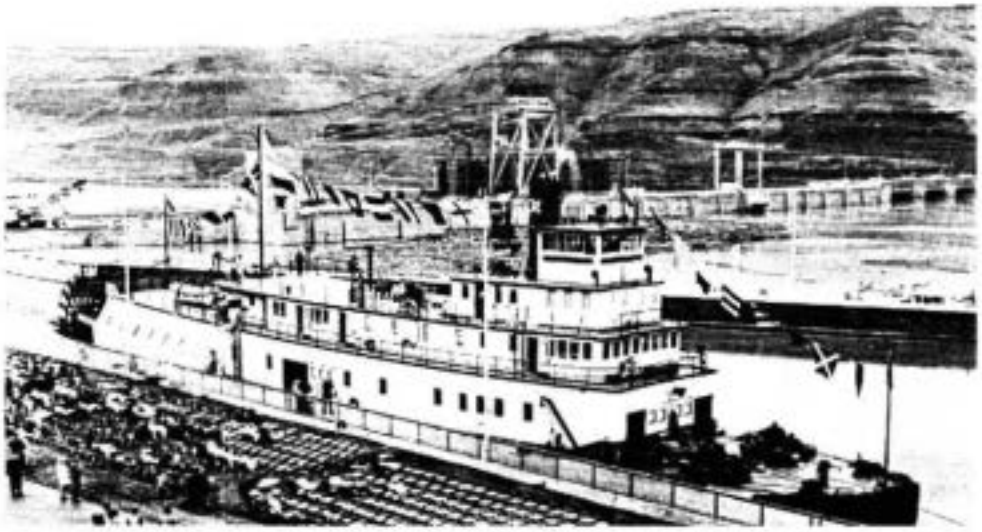
On 19 June 1975 the "Portland" moved to the Lower Granite Dam early in the morning, ready to receive the dedicatory officials by 9:30 AM with the official dedication set for 10:00 AM. Here, the

LOWER
MONUMENTAL
DAM

DEDICATION
18 June 1975

LITTLE
GOOSE
DAM

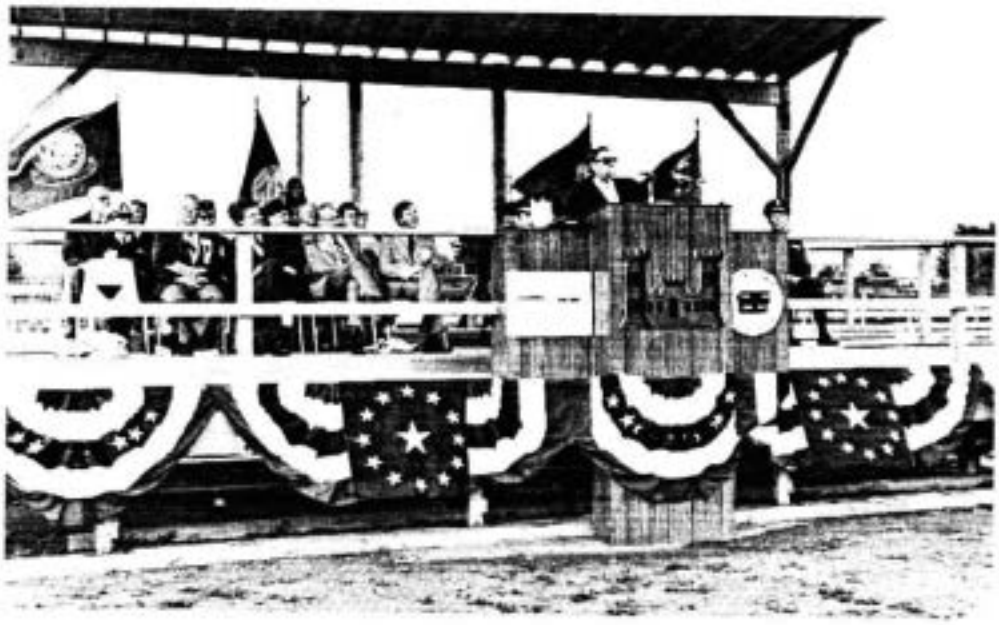
DEDICATION
18 June 1975



LOWER
GRANITE
DAM

DEDICATION
19 June 1975
(Looking upstream
at Lock wall
and Spillway)

ceremony was in the lock near the lower gate with the audience on the south lock wall. The dedicatory officials remained aboard at completion of the activities to sail on upstream to the Port of Clarkston where they left the vessel for the evening.



DEDICATION CEREMONY AT LEWISTON ROUND UP GROUNDS - 20 JUNE 1975
"Today's Northwest Passage"
Senator Warren G. Magnuson, Speaker

The culmination of the Lower Snake River Project dedication took place on 20 June 1975 at 10:00 AM at the Lewiston, Idaho, Round Up Grounds at north Lewiston, just inside the levee system. The dedicatory party had reboarded the "Portland" at the Port of Clarkston to steam upstream into the lower Clearwater River above the Camas Prairie Railroad Bridge, docking adjacent to the grounds. The party then moved to the Round Up Grounds for the "Today's Northwest Passage" ceremony which was completed at 11:00 AM. Special events on the waterway took place in the afternoon, including invitational tours on board the "Portland" from the Port of Clarkston.

The dedicatory party for each dam dedication varied since three states and several public officials were involved in the project. The Lower Monumental Dam dedicatory address was to have been by Honorable Thomas S. Foley, Congressman of the 5th District in eastern Washington. Due to Congressional obligations he was unable to come and was represented by his wife, Heather. Brigadier General Kenneth McIntyre, Deputy Chief of Civil Works, OCE, representing both Congressman Foley and the Corps, made the principal address to about 600 persons. He stated that opening of the river system "could well be the catalyst

to further development of the Snake River Valley," with rail and barge traffic becoming complementary, not necessarily competitive.

At the Little Goose project the Honorable Robert Straub, Governor of the State of Oregon, made the dedication speech before an audience of about 500 persons. The Governor said "There is every reason to believe I'm sharing the podium with the spirits of men whose vision, bravery, and persistence were vital factors in unlocking the Inland Empire's rich bounty." In this vein he mentioned Herbert G. West and Marshall Dana as visionaries who "recognized the unlimited potential of the waterway."

The dedication at Lower Granite Dam the next morning was made by Honorable Cecil Andrus, Governor of the State of Idaho, talking to an audience of about 800 people. The Governor said the entire project will improve the economics of Idaho and the intermountain states, tie the area to the markets of the world, provide a more productive life for their residents, and further strengthen the bonds between Washington, Oregon, Idaho, and Montana. Governor Andrus reminded the audience of some of the environmental and natural resource problems related to the project, saying, "But we shouldn't wring our hands. These problems are solvable."

At Lewiston, with an audience of about 1,500 people, the speakers for the theme "Today's Northwest Passage" were to be Senator Warren G. Magnuson of Washington, Senator Frank Church of Idaho, and Senator James McClure of Idaho. The latter was unable to attend due to commitments in the Senate. Senator Church in his speech made the following comments concerning the waterway and Lewiston:

> "But there is much more to it than the modest changes in a single city. It is not simply a river that has been widened. The horizons of Idaho, eastern Washington and western Montana are a little wider as well....
>
> "A seaport, in this particular location, is the fulfillment of an extraordinary dream a century in the making. But the larger dreams take a little longer.... it is almost as difficult to comprehend the vision that was required, over so long a period, to bring the Pacific to Lewiston....
>
> "And that is what we witness today--virtually an arm of the westward ocean penetrating 464 miles into the continent. Economically, this part of Idaho is now a coastal state, and that is a circumstance that will give Lewiston, Clarkston, and neighboring communities the best of both worlds....We must not forget the true parents of this project, those pioneers who populated the beaches of the confluence in the 1860s and almost immediately began to spin visions of a year-round inland seaport. A century ago, they had the dream....

"What they began, we now finish. A community that started from the deck of a wooden riverboat now welcomes home its descendants, the steel tugboats and the burdened barges of today."

Senator Magnuson, a long-time ardent supporter of the development of the Columbia River Basin for its water resource potentials commented "The nay-sayers said it couldn't be done, shouldn't be done, and wouldn't be done - but over 35 years ago we planned for the future. We can tell the nay-sayers we have succeeded where they said we would fail." Praising the "great team effort" on the part of both Government and private interests, the Senator said the benefits of the system of dams would be felt in four major areas--electricity, irrigation, navigation, and recreation.

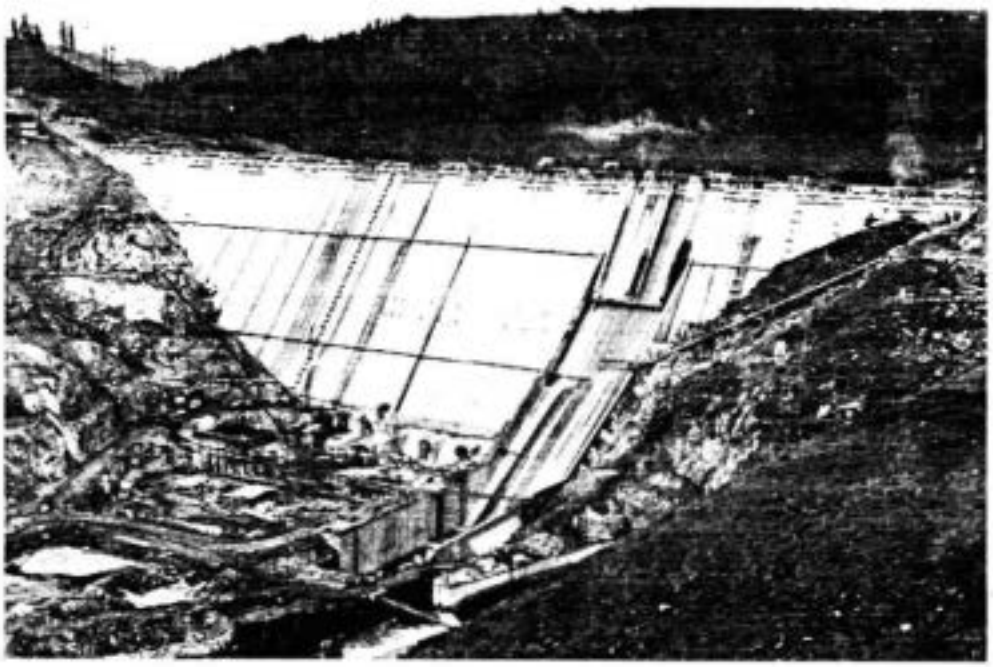
The weather at all four ceremonies was not too cooperative and the distance between projects and urban areas made attendance somewhat restrictive. However, the well coordinated plans moved the entire affair along in good shape; the "Portland" appearance was a landmark for river navigation in this reach of Snake River, and recreational boating complemented the occasion. "A good time was had by all" and a major water resource project was placed into operation for the Pacific Northwest, even if a complete "Northwest Passage" in its original concept was not realized.

DWORSHAK DAM

THE DAM

Mid-1970 saw activities at the Dworshak project under full swing, aimed at having the reservoir available for partial filling during the 1971-1972 winter and spring season. Details of the construction process, reservoir features, and fish and wildlife factors are related in the previous volume of history, pages 263 to 293.

With four million cubic yards of concrete in the dam structure in August 1970, the height had reached 444 feet of its ultimate 717 feet. Work adjacent to the foundation area of the powerhouse at the toe of the right abutment had been completed so work on the powerhouse could proceed. A contract was let for its construction in April 1970 to the Dworshak Dam Constructors for about $18 million, with the Dravo Corporation the sponsor of this joint venture. Contracts for turbines and generators and appurtenant equipment had been awarded in 1968 to 1970 in order to meet installation schedules.



DWORSHAK CONSTRUCTION
February 1971

Progress on the dam proper was critical in 1971 and 1972. Commitments had been made that power generation would commence by the end of 1972, which made it necessary to close the diversion tunnel during low water in 1971 and initiate filling of the reservoir. Progress on the dam was behind the original schedule because of foundation difficulties. At the beginning of 1971 there remained 1½ million cubic yards of concrete to top out above the spillway, which was essential by the spring of 1973 if filling was started in 1971.

After consideration of the status of the work and the contractor's capabilities, it was decided to close the tunnel and the contractor was so directed in July 1971. Actual closure of the tunnel was completed on 27 September when a large slide gate was lowered into position at the upper end of the tunnel. This gate had a gated orifice which permitted a minimal flow to continue through the tunnel to the lower river for fish. On 8 November the water behind the dam had reached the temporary low-level outlet at elevation 1165 feet, so the water passage through the diversion tunnel was stopped. The contractor then had 100 days to place a 75-foot-long concrete plug in the diversion tunnel. It was completed 17 February 1972 and the downstream end of the tunnel was then backfilled with random materials.

By 30 December 1971 concrete placement had totaled over 6 million cubic yards with a dam height of 624, or to elevation 1520 feet. At that point there was 100 feet of dam yet to be built. The pool level at that time was 1227. The following winter of 1971-1972 experienced a record, or near record, snowfall which resulted in filling the reservoir up to the level of construction in a single runoff year rather than the planned two years.

Inflow into the reservoir was high during the spring of 1972 and this storage of flow was beneficial for flood control downstream. The reservoir rose rapidly, reaching the three regulating outlets installed at elevation 1350 early in March. Upon placing these permanent outlets in service, the three temporary outlets below were closed and the temporary outlet tunnels grouted shut. There was some concern during the spring that the construction work on the dam monoliths might be overtopped. While the maximum height of the dam construction had reached 675 feet by the end of May 1972, one monolith, No. 19, was being left low at a height of 619 feet (elevation 1515) to provide an emergency spillway for flood waters, if needed. On 31 May 1972 the pool level had reached 1475 and continued to rise, but under control, so low monolith construction was brought up to a level with the higher monoliths. This permitted a pool elevation of 1540, just below spillway crest by the end of June, at which elevation it was held for the 1972 season. The creation of the reservoir thus was a success but with a few tense moments. The new lake for the region attracted some recreation that summer in spite of floating debris from clearing operations.

CONSTRUCTION PROGRESS
February 1973
Powerhouse at Toe of Dam

By the end of January 1973 all monoliths in the dam had been topped out and construction effort then was essentially the appurtenances on top of the dam, including the roadway, bridge over the spillway, and walkways. By June 1973 concrete placement had been essentially completed with 6,600,000 cubic yards in place. The pool level was then raised to regular operating level of 1600 and the project was in operation. It was planned to hold the pool full for 120 days to permit assessment of potential slides in recreation areas, and allow the reservoir clearing contractor to collect debris and merchantable timber. Due to a very dry year in 1973 and demand for supplemental flows at downstream power projects, drafting of the pool started only two days after filling. Thus, the project in its second year again provided much needed downstream benefits.

POWERHOUSE CONSTRUCTION

The powerhouse, sitting at the toe of the right abutment and including the discharge draft tubes for all six ultimate units, is an independent structure from the dam. A contract for its construction was awarded in April 1970 at a cost of about $19 million. Completion was scheduled for the spring of 1973, including installation of the first three power units. Decisions concerning the ultimate power installation are covered briefly on page 266 of the first volume of history. Installed capacity as authorized is for four units at 220,000 kw and two at 90,000 kw. Intake draft tubes for all six units are a part of the dam structure. The initial installation was two 90,000 kw units and one 220,000 kw unit.

Fluctuations of water level in the Clearwater River resulting from peaking operations of these units are about as great as are acceptable to fishermen and fishery interests presently. Hence, a reregulating structure in Clearwater River below the North Fork will be needed before additional units can be used. This is a very unpopular subject in this region at the present time.

Construction of the powerhouse proceeded rapidly, including placement of the embedded parts for the three turbine units. By March 1973 installation of turbine and generator units was essentially complete and the initial mechanical run of units 2 and 3 was made. Unit 1 was farther advanced and actually had power on the line at this time. By May 1973 units 2 and 3 had power on the line. During this same period other features of the powerhouse were completed including interior and exterior architectural features with ample room for visitors and the elevator to the top of the dam, which will be the means of access by the public.

POWERHOUSE JULY 1974
Future Unit Space Center of Picture
Spillway at Left

As soon as the three power units were placed on the line in 1973 problems arose with generator thrust bearing oil leaks, inadequate cooling systems, and winding failures. By mid-year 1973 the difficulties were such that all three units were judged to require major modifications. Units 1 and 2 were capable of carrying only

70 percent of their load. Unit 3, after experiencing winding failures, was repaired so that it could be operated at full load until replacement of the stator windings could be made. Several months were needed by Allis-Chalmers, the contractor, to correct the design deficiencies. Unit 3 was repaired and entered into commercial production in December 1974. Upon completion of unit 3, unit 1 was taken out of service for basic changes in the generator cooling system, which were completed about 1 June 1975. Unit 2 was then rebuilt and returned to service by mid-September 1975. The project required 52 construction contracts, 14 relocation contracts and 39 material supply contracts, or a total of 105. As of the closure of this history period, the Dworshak project is essentially in full operation for its intended uses, except for some additional recreation development and commercial facilities in the reservoir area. The public use of the reservoir for many types of recreation is proving to be a major factor.

RESERVOIR BRIDGE CONSTRUCTION

Construction in the reservoir area was also active during this same period with work on road relocations, reservoir clearing, and the Dent Bridge. Award of a contract for the Grandad Bridge in the upper reservoir area was made on 17 July 1970. The Dent Bridge, crossing the reservoir about 15 miles above the dam, was officially opened to the public on 29 October 1971. This bridge made possible much better communication between the County Seat at Orofino and the populated portion of the county west of the North Fork. The bridge is a pleasing structure across a narrow reach of the reservoir, and also the largest suspension bridge in the state, the center span being 1,050 feet between piers.

DENT BRIDGE
(River Mile - 17)

GRANDAD BRIDGE
(River Mile - 40)

The completion of several miles of the approach roads to both bridges opened up access to recreation areas on both sides of the reservoir. In 1973 the two bridges received accolades for design. The Dent Bridge was submitted to the AISC bridge competition by the Contractor and received an Award of Merit for design. The Grandad Bridge was entered in a Corps design contest and also won an Award of Merit for engineering.

OTHER PROJECT FACETS

As mentioned above, the largest structure of its kind in the U.S. has much public-use appeal. A major unit in caring for the public is a visitor building which is located on top of the dam at the right abutment. A large area at the abutment has been developed for parking, visitor circulation, and some displays. The building, which received careful architectural planning, includes a large foyer, information desk, food and drink facilities, appropriate furniture, and displays. In the center of the foyer is a topographic relief map of the lower 15 miles of the project mounted on a 10-foot-diameter pedestal. The second floor of the building has a 66-seat theater with multi-projector audiovisual equipment.

The galleries in the dam provide tourist access to the elevators and access to the powerhouse, which is arranged to be an important part of visitor reception. Public access across the top of the dam is available on weekends. In addition, there is a four-lane boat launching ramp with adequate parking at the "Bruces Eddy" public-use area in the embayment at the left abutment.

DWORSHAK VISITORS CENTER
At Right Abutment of Dam

Because of the extremely isolated character of the 50-mile-long reservoir and difficult access problems, decision was made to develop a quite different type of public-use facilities. Public use of the reservoir area is essentially by power boats, so they are considered the means of transportation. Two major boat launching areas are near the dam - the Big Eddy area on the right bank two miles upstream, and the Bruces Eddy ramps at the left abutment. Ramps have also been built at

BIG EDDY LAUNCHING AREA

Dent and Grandad Creek, serviced by the two bridges. The ramp at Big Eddy can be used at any stage of the reservoir from maximum pool down 150 feet to minimum pool. The other ramps can be used only from maximum pool down to water level 50 feet lower.

With power boats the means of transportation to public-use areas, the decision was made to develop a large number of small individual camp units. As a result, 92 mini-sites all along both banks of the reservoir were developed initially. Each location has graded tent sites, chemical toilets, picnic tables, and fireplaces, the number depending upon the area available. Trails and a fire prevention buffer area are included. These isolated, attractive campsites have proven popular and received very good use during 1974 and early 1975.

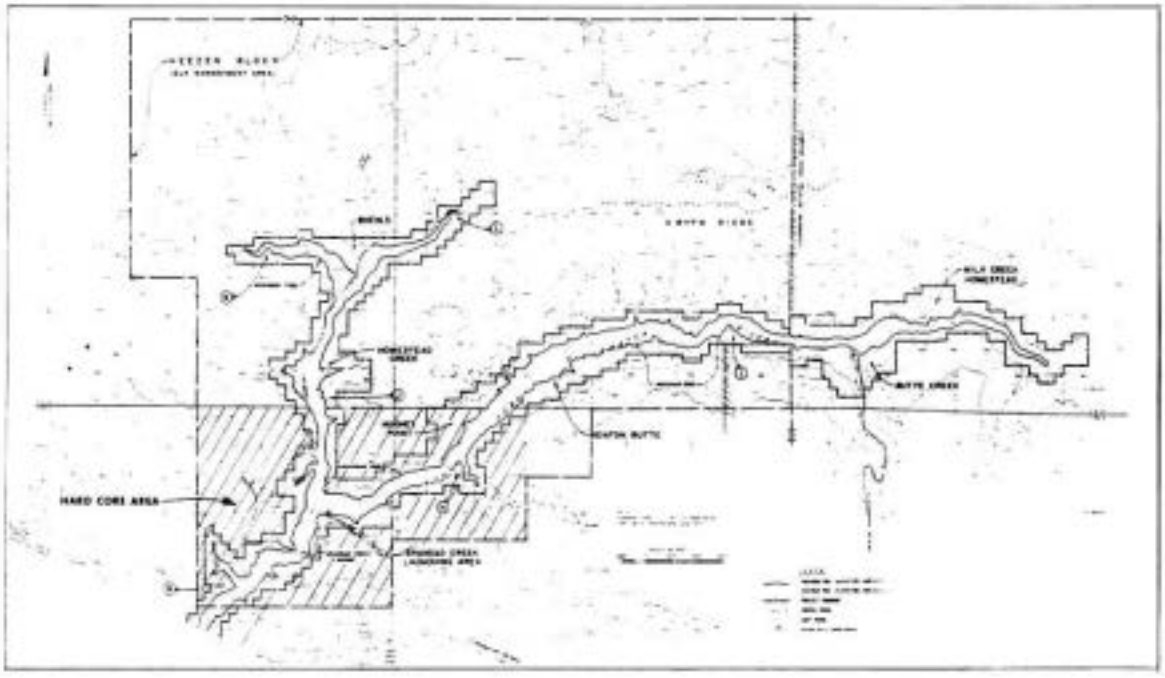
"MINI CAMP" AT MARY'S BAY - 1975

Development of two large public-use areas with highway access is underway for the Freeman Creek embayment about seven miles above the dam on the right bank and the Dent area about 15 miles upstream of the dam on the right bank. These two sites will be developed with the full complement of facilities for a major park area. Some work is underway at this time at the Dent site (June 1975) but completion dates have not been set. The State of Idaho may have an interest in one or both of the sites.

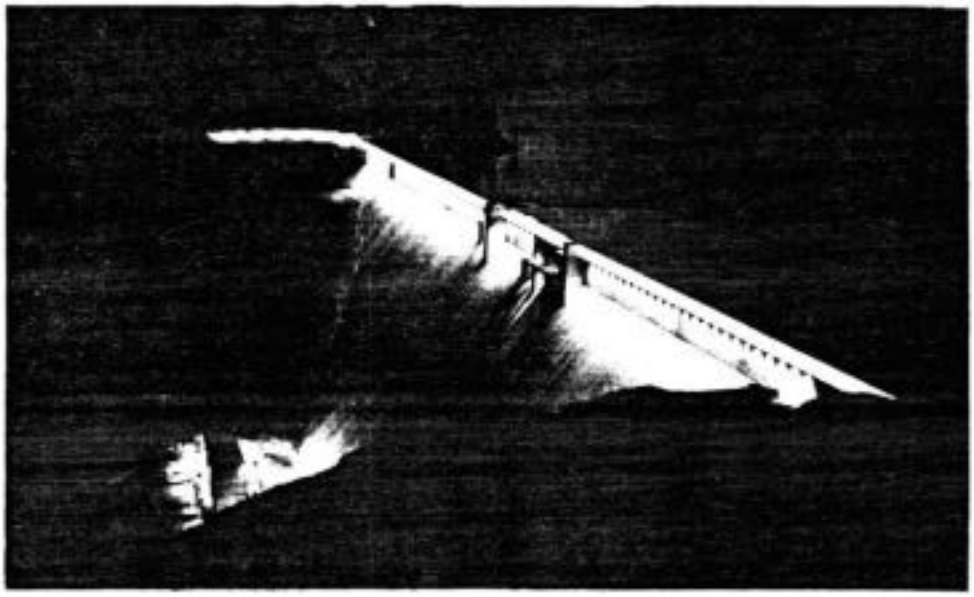
Pages 285 to 288 of the original volume of history describe the extensive big-game management negotiations and operating agreements for the "hard core" area in the upper reservoir. Supplemental negotiations with the U.S. Fish and Wildlife Service and the Idaho Department

of Game have resulted in agreement to enlarge the area by a land exchange covering about 4,500 acres of additional land along "Smith Ridge" east of the original area. The additional area is presently owned by the U.S. Bureau of Land Management.

In addition to the "hard core" area, about 3,200 acres of project lands scattered along the reservoir in small parcels have been designated as wildlife areas. Some 800 acres of these parcels have been cleared for big-game use and further work is scheduled on additional small units. In the "hard core" area initial logging development work is underway in 1975 to clear cut about half of these lands. It is now programmed (1975) to turn over the two large elk browse lands ("hard core" and Smith Ridge) to the U.S. Fish and Wildlife Service for operation and O&M funding in 1978.



With the advent of the reservoir and near completion of the power units, the Dworshak Project Office was established for project operation on 5 May 1972. The Resident Office for construction supervision was closed on 1 July 1974, at the same time establishing an Inspection Office under the Construction Division of the District to handle the remaining construction activities for the project.



DAM AND RESERVOIR
July 1974

"THE TYSOR"

Difficulties of access to the reservoir area for patrol, maintenance work, and development dictate the use of floating plant, including a tug or "tender," with a barge and equipment. A contract was awarded in 1973 for a 36-foot-long tender to serve the project, a versatile craft with a speed of 9 knots and a displacement of 36,000 pounds. The craft was delivered in the fall of 1973 and promptly christened the "Tysor" in honor of Max K. Tysor, Chief of the Real Estate Division for the District from 1958 until his death on 12 February 1973 in the very unfortunate airplane accident recounted earlier. (See resume' of Tysor's activities with the District, Part I, of this volume, page 58.) Tysor was instrumental in transacting much of the land acquisition for the Dworshak project and settlement of difficult disputes over making some of the parcels available for project use. His widow christened the tender on 10 October 1973 in the traditional manner.

STEELHEAD FISH HATCHERY MODIFICATIONS

The previous volume of history recounts in some detail on pages 281 to 285 the establishment of the steelhead hatchery at the mouth of the North Fork Clearwater River and its implementation in August 1969. At that time the hatchery, with a planned ultimate capacity of handling 6,000 adults, had been built to process an estimated 3,000 adults and their eggs. Actually the hatchery has handled 10,000 returning adults and for egg taking could handle 12,000. The 6,000 adults, however, provide an adequate number of eggs for raising at the hatchery. Any eggs taken over that amount must be distributed elsewhere to other hatcheries. A female steelhead produces up to 6,000 eggs.

The initial hatchery was composed of 84 rearing ponds for juvenile fish, each 17' x 70'; 64 rearing tanks for small fish, 128 incubator trays, and 9 adult holding ponds. The hatchery had computerized feeding equipment as well as water reconditioning and reuse facilities for 25 of the rearing ponds supplied with recirculated environmentally controlled water temperature. Growth rates for fish in the ponds with the controlled environment system of temperature and biologically controlled water quality have far exceeded estimates assumed in designing the hatchery.

Evaluation of the original hatchery capabilities indicated that required mitigation could not be provided, even though very good results had evolved from the initial returns. Increased hatchery capabilities were provided through recirculating and environmentally controlled water facilities for all of the 84 existing ponds versus the 25 ponds originally on the system. Water quality must be monitored continuously for the millions of small fry being raised in the confined area to preclude disease and stimulate growth. Temperature of the incoming water is also critical for those two factors. This plan, through improved management of rearing, would allow release of the fish in one year instead of two.

This modification involved not only fish facilities, including automated feeding, but the laboratory building, mechanical building, generator building, and the entire water purification and reuse facilities. Solid waste from the fish is a constant major consideration in the hatchery rearing tanks and water circulation system. Filter beds are required and the hatchery produces about 500,000 pounds of solid waste a year. It is disposed of for agricultural use after passing through a digesting plant. Eight contracts were entered into from May 1970 to May 1974 for the various phases of enlargement at a total cost of about $6 million. Limited fishery runs in the fall of 1974 and spring of 1975 provided only the minimum number of returning adults needed for egg production.

DWORSHAK FISH HATCHERY

DWORSHAK DEDICATION - 15 JUNE 1973

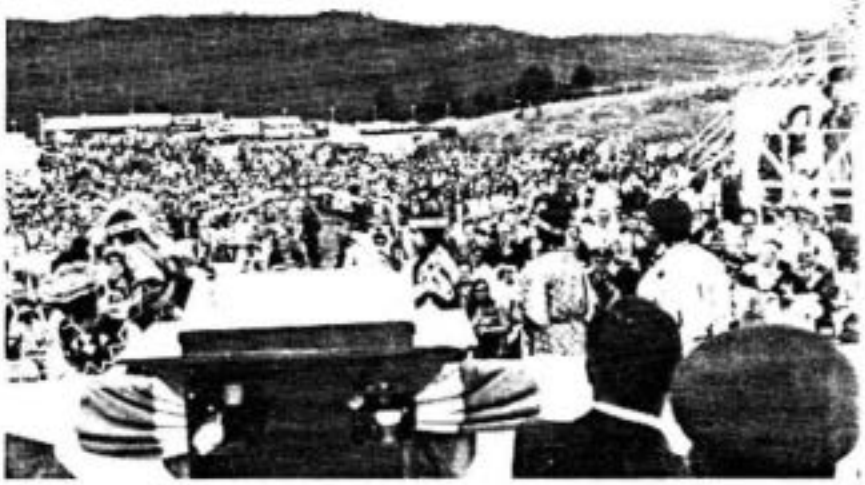
The highest, straight-axis concrete gravity dam in the Western Hemisphere, and the largest concrete dam ever built by the Corps, called for proper recognition of its completion by a formal dedication with appropriate celebration for a major public project 20 years in the making. The fall of 1972 saw initial steps to plan for the occasion which was set for mid-1973.

The Pacific Northwest Waterways Association masterminded the production, assisted by governmental and other units of the region, including Clearwater County and City of Orofino with its long-time Mayor, Bert Curtis, one of the original prime movers behind the Dworshak project.

The weather was right; good provision had been made for bus transportation from Ahsahka at the mouth of North Fork to the large visitors' viewpoint overlooking the dam; and a 90-minute varied and interesting ceremony was presented. The visitors' building at the right abutment was well equipped with displays and a construction movie, and the powerhouse and dam structure were open for detailed inspection. An estimated 2,500 to 3,000 people attended the 9:30 AM to 2:30 PM organized programs.

DWORSHAK DAM
DEDICATION

Audience
at
Visitors' Center



NEZ PERCE
INDIANS
ENTERTAIN

DEDICATION
ADDRESS
by Honorable
Howard H. Callaway.
Mrs. Henry C. Dworshak
in Front Row

In addition to the speakers at the formal ceremonies in the morning, two highlights included a very colorful series of interpretive dances by members of the Nez Perce Indian Tribe, this region being an integral part of their heritage. The other highlight was a presentation by the Pacific Northwest Waterways Association of a bronze memorial honoring the late Henry C. Dworshak of Idaho, for whom the dam was named. His widow unveiled the bas-relief sculpture plaque which is now mounted at the visitors' overlook area for the dam. A number of the Dworshak family members were in attendance. Senator Dworshak of Burley, Idaho, had a strong belief in and supported the concept of storage on and control of the flows of the North Fork Clearwater River at the "Bruces Eddy" site, one that had been studied for many years.

Dedicatory addresses were given by three dignitaries: the Honorable Cecil B. Andrus, Governor of Idaho, who is a native of the Clearwater Basin; Major General Andrew P. Rollins, Deputy Chief of Engineers, U.S. Army; and the Honorable Howard H. Callaway, Secretary of the Army. Governor Andrus cited the project as a tribute to community tenacity and man's ability to design and implement. He cited the project as a multiple-use facility for electricity, flood control, and recreation for the Pacific Northwest that will help the residents of Idaho and neighboring states all the way to Portland and on to the coast. He called it a very needed project, but probably the last such project in the Clearwater Basin.

General Rollins stated people demand a guaranteed supply of water and power, preservation of fish and wildlife, and entertainment areas, and all of them must blend into the surrounding environment. "People need clean water, protection from flooding, and power. That's what Dworshak Dam is about."

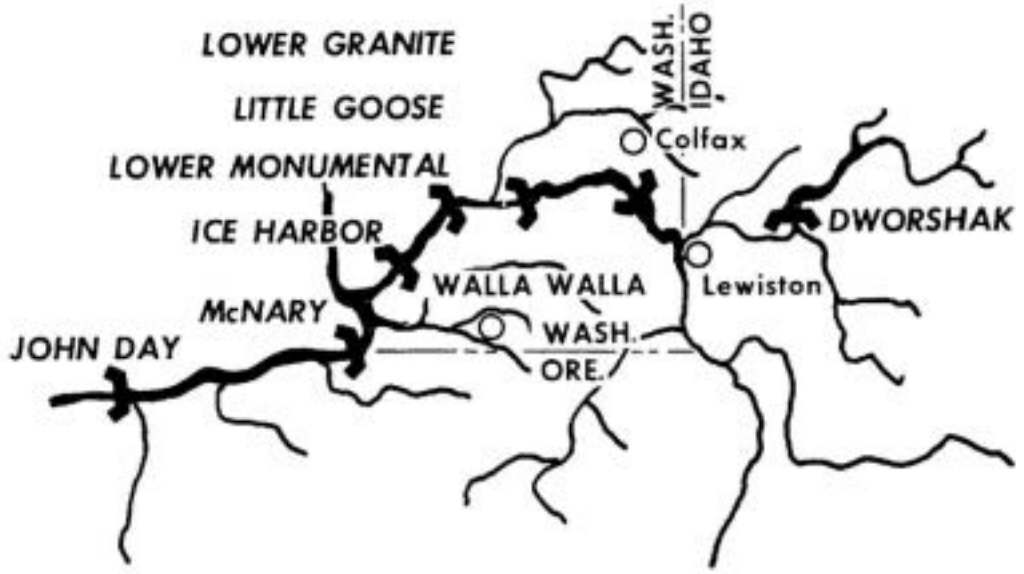
Secretary Callaway, who made the symbolic dedicatory statements, stated the dam will be a source of clean electricity at a time when there is a shortage. It has already been proved a source of flood control. "Literally millions will come here to see this beauty, and who can tell how it will influence the lives of millions of people through the generations?" He complimented the Corps, stating that it can handle any project--small combat bridges to great dams, and anything in between. He went on to discuss the extensive work of the Army in the world today, including its multiple use and versatility. It was a successful dedication of a major project and implementation of one of the Northwest's major water resource projects.

REMOTE CONTROL SYSTEM FOR LOWER SNAKE AND DWORSHAK DAMS

Before leaving the complex of 6 major hydroelectric projects extending from McNary Dam in Oregon, 215 miles east to the Dworshak project in Idaho, a brief summary of the highly sophisticated automated

operation for 5 of these projects should be described. These 5 projects, with an ultimate total generating capacity of 4 million kilowatts from 27 units, are all located on the lower Snake River with the exception of Dworshak Dam which is located in the Clearwater River Basin with an intimate tie to the lower Snake operation. All must operate as a coordinated unit in order to conserve streamflow and insure optimum use of available flows, not only for power but for navigation, irrigation, adequate flows for fish, and suitable recreation conditions.

With the advent of the Ice Harbor project in the mid-60s and additional projects upstream in the late 60s and early 70s, it was seen that a considerable savings in personnel could be realized and available flows could be better utilized if the generating capabilities and control of those projects on the lower Snake River and its tributaries were to be integrated. A concept was formulated by the Walla Walla District staff to tie all of these projects together by a remote control system centrally located at McNary Dam. Control of all generating units and spillway gates would have to be included. Additional savings in personnel and speed of operation could also be realized by using a digital computer for routine operations. Federal microwave circuits administered by the Bonneville Power Administration would be used to effect the project communication integration. Information to be conveyed over the microwave would include forebay and tailwater levels, and spillway, navigation, and fish facility discharges necessary to properly program unit generation and water-use optimization. Other operational aids, such as alarms, event recording, telephone and radio voice communications, and teletype, would also be transmitted over the microwave. The system would be fail-safe and would be designed to allow computer or manual control from McNary Dam, or control could be switched to a given project for local control of that project.



The concept was developed into a working system by the Hydroelectric Design Branch of the North Pacific Division in Portland, Oregon, in collaboration with the District and implemented at the Ice Harbor project, where it proved to be successful. It has since been expanded to pick up the other lower Snake projects, as well as the Dworshak project. Refinements to the system, such as satellite data collection computer systems and television monitoring of event recordings, have evolved since the system at the Ice Harbor project was first put into service.

Power demands and availability from the entire Columbia River hydroelectric system are determined by the Bonneville Power Administration. This information, when combined with water availability data from the Corps' North Pacific Division Reservoir Control Center computer data bank, allows BPA to establish an overall operating demand schedule for each 24-hour period. This schedule is then transmitted to the McNary central computer, now called the System Optimizing Controller (SOC). SOC then divides the load according to unit availability and capability at the several powerhouses and operates the five-dam complex on an optimum basis to make full use of the available water energy.

This sophisticated system of control of 4 million kilowatts of generation has effected major savings in operating personnel, necessitating only one operator at each of the Snake River projects during evening and night shifts and on weekends. This operator not only monitors the power unit operation but operates the navigation lock and fish facilities. He is "wired for sound," in that wherever he is on the project he has radio or telephone communications with McNary and towboats in the vicinity as well as audible indications of any problems that occur on the project. The system has proven very successful.

RIRIE DAM

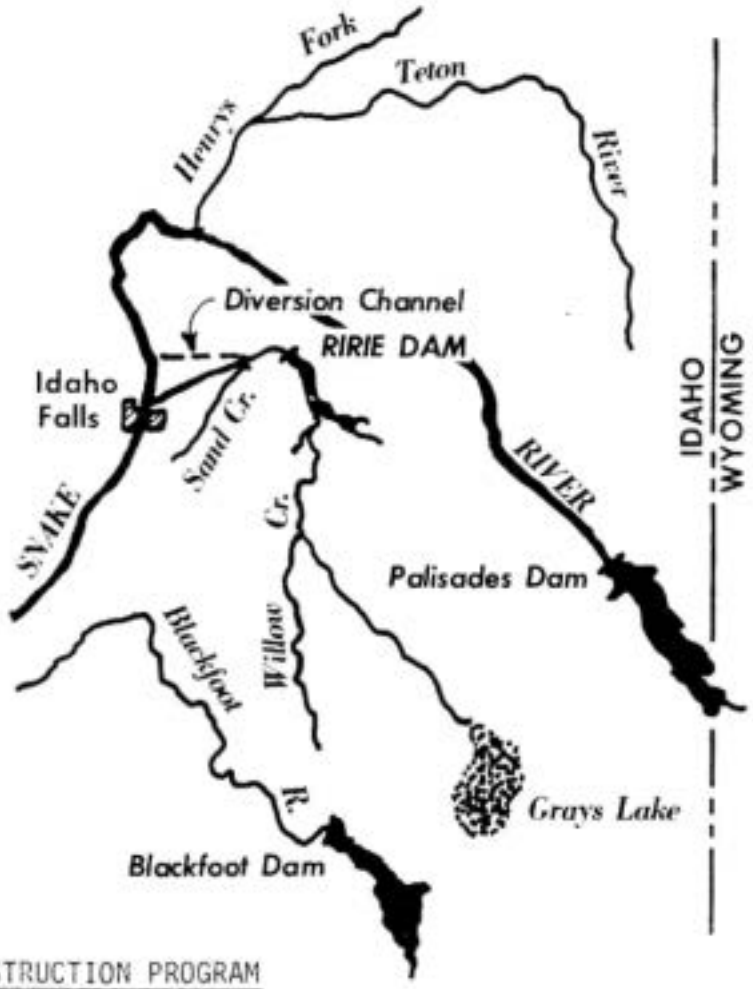
THE DAM

The Idaho Falls area in eastern Idaho and the Sand Creek Basin east of that community have long sought protection from critical spring flooding originating in the Willow Creek Basin. In addition, the area has been in need of a supplemental water supply to firm up irrigation requirements for its fertile soils. Pages 81-84 of the first volume of history describe briefly the Upper Snake River Basin Study which resulted in the project's authorization in 1962. Page 102 of that volume also recounts briefly some of the project's early history.

The Ririe project consists of a dam on Willow Creek at stream mile 23.7, about 15 miles northeast of Idaho Falls, together with a floodway channel extending from the Willow Creek and Sand Creek division structure 8 miles below the dam, due west to Snake River, a distance of 7.8 miles. Controlled releases from the dam plus uncontrollable flood input below the dam dictated the need for the 900-cfs floodway channel.

The dam near the mouth of the Willow Creek canyon is a rockfill dam about 185 feet high above the streambed and 840 feet long at the crest. The reservoir has a gross storage capacity of 100,000 acre-feet, 90,000 acre-feet of which is active for flood control, irrigation, and recreation. The spillway consists of a lined concrete channel in the right abutment with a capacity of 40,000 cfs and a crest elevation of 5093, controlled by two gates. The outlet works for project operation consist of a concrete conduit 1,190 feet long leading from an intake tower upstream to a stilling basin downstream at the toe of the left abutment. It has an outlet capacity of 1,900 cfs.

Construction work to date has completed the outlet works and spillway. The embankment across the canyon is at elevation 5032. The finished elevation will be 5128, which should be reached by mid-November 1975. The overall job completion is about 78 percent (July 1975). Due to the extensive use of the stored water for irrigation, the project will be turned over to the Bureau of Reclamation when complete for operation, with storage and streamflow regulation for flood control specified by the Corps.



CONSTRUCTION PROGRAM

The first construction work at Ririe damsite was a left abutment stripping contract which was awarded in June 1967 and completed in November of that year. Appropriations were difficult to obtain until FY 1970 when a second contract for the first steps in dam construction was awarded in May 1970 for a stream diversion channel and the permanent outlet conduit. Also included were additional foundation investigations and additional left abutment excavation. The contract was completed in August 1971 at a cost of $2.2 million. This work disclosed some changes necessary in preparing the foundation for the dam. These were incorporated into the subsequent construction contract.

Funds were not available in FY 1972, so work at the project was closed down except that a large exploratory adit was excavated in the right abutment bluff. FY 1973 funding permitted renewing active work and a dam completion contract was awarded in December 1972 at a cost of $10,600,000. Subsequent modifications have substantially increased that amount. The work on the dam structure has been subject to several changes in design, primarily because of the complex foundation conditions found for the core of the dam as the area was uncovered and because the rock from the spillway excavation would not make specified quality rockfill without excessive processing.

The changes were needed to insure positive control of seepage, timely construction of the dam, and reasonable usage of available materials. They have resulted in a delay of one year in completion of the structure. At the present time these change orders total about $6.5 million. Work started in 1973, but because of the delays from added foundation work the foundation preparation for the core area was not ready for construction of the dam structure until August 1974. Added foundation work included resloping the left abutment rock in the core trench below the valley floor level for stability and to improve the core contact; constructing a concrete fillet to improve the core contact at the toe of the right abutment; building a sheet pile wall to support the toe of the left abutment where a sand-filled fault existed; and capping the sand strata with a substantial concrete backfill.

At the time of award the schedule provided that the project would be available for control of possible flooding by November 1974. The current estimate (July 1975) is that the dam will be completed adequately to control flooding by November 1975.

RIRIE DAM CONSTRUCTION - 1975
Spillway Channel at Right Abutment
Outlet Works at Left Abutment

1975 was a potentially critical year for flooding. Emergency work was done at the dam to insure minimum damage to the imcomplete structure. With the snowpack conditions, floods could also have caused

extensive damage downstream in the Idaho Falls area. A favorable runoff pattern averted major problems and careful preventive measures taken at the dam resulted in little physical damage. It is anticipated that the project will be available for storage of any flood flows in the spring of 1976, but the downstream outlet channel will not be available until the following year.

The necessary operating buildings and facilities, including shops, utilities, office, public service facilities, hydrologic stations, etc., are scheduled for construction starts within the next two years. Public-use and recreation facilities in the 12-mile-long reservoir area are also programmed for funding in FY 1977.

OUTLET CHANNEL

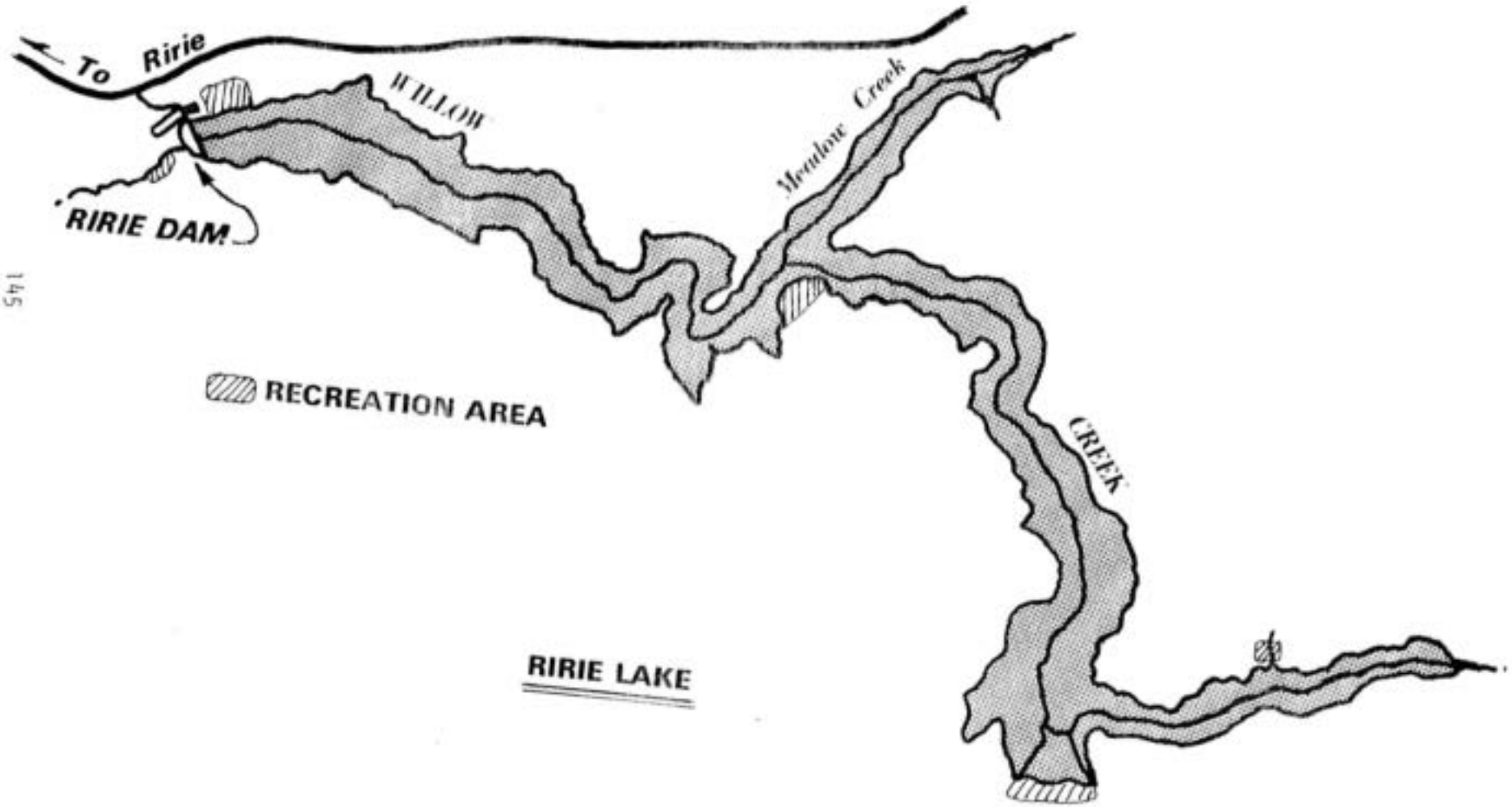
The downstream or outlet channel is an important segment of the complete project for flood control since, in addition to necessary storage releases, it supplements the present capacities of both Sand Creek and Willow Creek by a total of about 90 percent to carry all flood flows. The channel passes through 8 miles of highly developed agricultural lands laced with a railroad, 12 roads, 7 irrigation canals, a gas line, and 21 drainage ditches. Purchase of rights-of-way parcels has been underway over the past five years, involving extensive negotiations. Seventy-five tracts covering 165 acres of land were involved. The acquisition is complete at a total cost of about $177,000.

Construction of the downstream channel was placed under contract in June 1975 at a contract cost of $5.2 million, not including the utilities involved in the crossings, which are estimated at $275,000. The channel construction work will require two years to complete.

RESERVOIR LAND USE

The reservoir area for the Ririe project is in a relatively inaccessible canyon reach of the stream. The 12-mile-long reservoir has an area of about 1,560 acres. The reservoir will fluctuate about 100 feet in elevation, depending upon evacuation for flood potentials and irrigation demands. Real estate negotiations for the reservoir lands, including those at the damsite, resulted in purchasing 5,516 acres within 24 tracts at a total cost of $415,000. Of these lands about 4,500 acres have been acquired around the reservoir. Approximately one-third of these have been allocated to recreation use and two-thirds to wildlife use. In addition, reservoir project lands were purchased in a separate area on the Henrys Fork six miles west of Rexburg for compensation for fur-bearing and wildfowl nesting areas lost. These lands involve the 560-acre Carter Slough wildlife area.

Initial recreation use at Ririe reservoir is expected to be relatively heavy because of its proximity to the Idaho Falls area. Early annual attendance is estimated at about 125,000 annual visitor-days.


To Ririe
WILLOW
Meadow Creek
RIRIE DAM
RECREATION AREA
CREEK
RIRIE LAKE

Accordingly, initial developments are scheduled at three sites on the reservoir and one site just downstream of the dam. In addition, visitor and interpretive facilities are scheduled for building in conjunction with the project headquarters at the right abutment of the dam and its large adjacent recreation area.

Juniper Park at the damsite, with a total area of about 80 acres, will be a point of extensive contact in connection with the project viewpoint. It has an interesting and scarce stand of juniper trees which will be preserved. It will have a boat launching ramp to the reservoir for both recreation and operational use. Sanitary facilities, picnic units, sun shelters, and camp units are included as well as adequate parking and foot trails. The entire area will be fenced to exclude grazing livestock. The entrance to the park area will be at the operating headquarters building, which will also house a visitor information center.

The Creekside Park, an area of about 50 acres on the left bank below the dam, will include picnic units, parking, and foot trails. A pond downstream of the dam will provide fishing, partly as a mitigation measure.

The Benchland Park area is on the west side of the reservoir above Meadow Creek six miles above the dam. The area will have about 120 acres of land for docks, picnic units, sun shelters, pit toilets, and nature trails. It is an isolated area accessible by boat only.

The 338-acre Blacktail Park site, the largest in size, is the most desirable site for outdoor recreation. It is located on the left bank of the reservoir about 10 miles above the dam. It will have a boat launching ramp and the only developed swimming area, although of limited use because of reservoir drawdown. Access to the park will be by county road from Idaho Falls, only about 15 miles. The park will be fenced against livestock, equipped with parking areas, picnic units with sun shelters, vault toilets, and water supply from a nearby spring, all in addition to the boat launching ramp and dock, and the swimming area. Camping units may be put in later, depending upon demand.

A total of $1,444,000 is proposed for initial recreation development. Future development is estimated at another $1 million, making a total cost of about $2½ million for initial and future recreation development.

UNFINISHED BUSINESS

The final pages of Part II of the previous volume of District history lists most of its critical areas for flood control. With the completion of the Lower Snake River Navigation Project to Lewiston, the Columbia-Snake River system is complete for that phase of the District's work. Maintenance of the waterway for river commerce will be an important facet of the future workload, as will be the optimum production of hydroelectric power. Flood control and the studies for optimum use of the bottomlands of the Snake River Basin's multitude of tributary streams remain a challenge. Part I of this volume reviews briefly the several studies underway.

Six structures for flood control and other water uses have been authorized by the Congress (but not built as yet) for better utilization of the resources and protection of specific areas against floods. Their status for construction varies widely, with a potential for one or two being consummated during the later half of this decade. Chapter 4 of Part I of this volume reviews in some detail the current status of these specific works.

a. Blackfoot River Reservoir in eastern Idaho.

b. The "Boise Front" projects at Boise, Idaho.

c. Grande Ronde River Basin in eastern Oregon, including both the Catherine Creek Dam and Lower Grande Ronde Dam.

d. Willow Creek Dam at Heppner, Oregon.

e. Zintel Canyon Dam at Kennewick, Washington.

These projects, together with mitigation steps for the lower Snake River projects (See Chapter 9, Part 1), plus the potential for a second powerhouse at the McNary Dam project, remain as the nucleus of the District's construction activities for the next few years.

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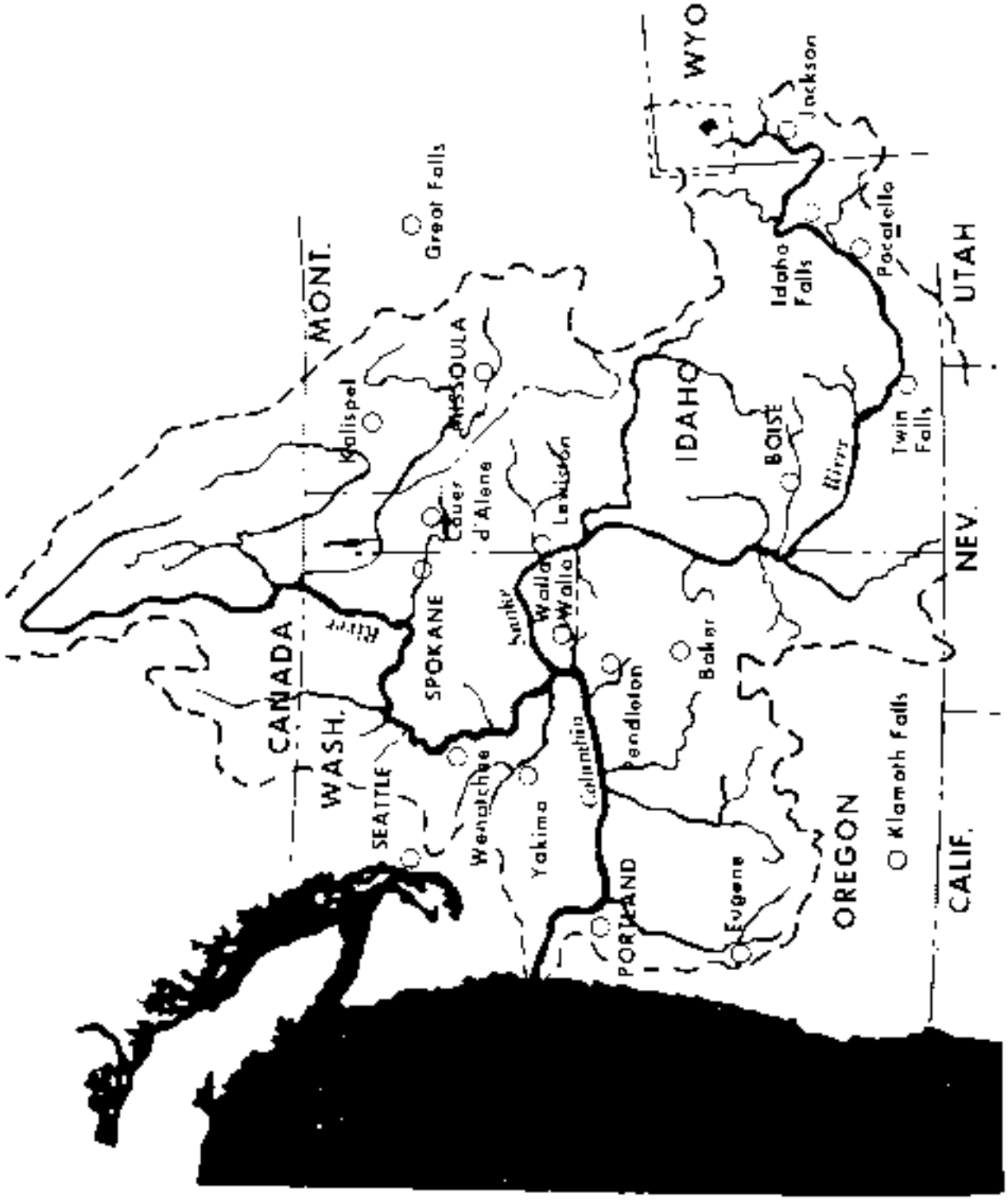
PART III

WALLA WALLA DISTRICT

PART III

WALLA WALLA DISTRICT

THE COLUMBIA RIVER BASIN



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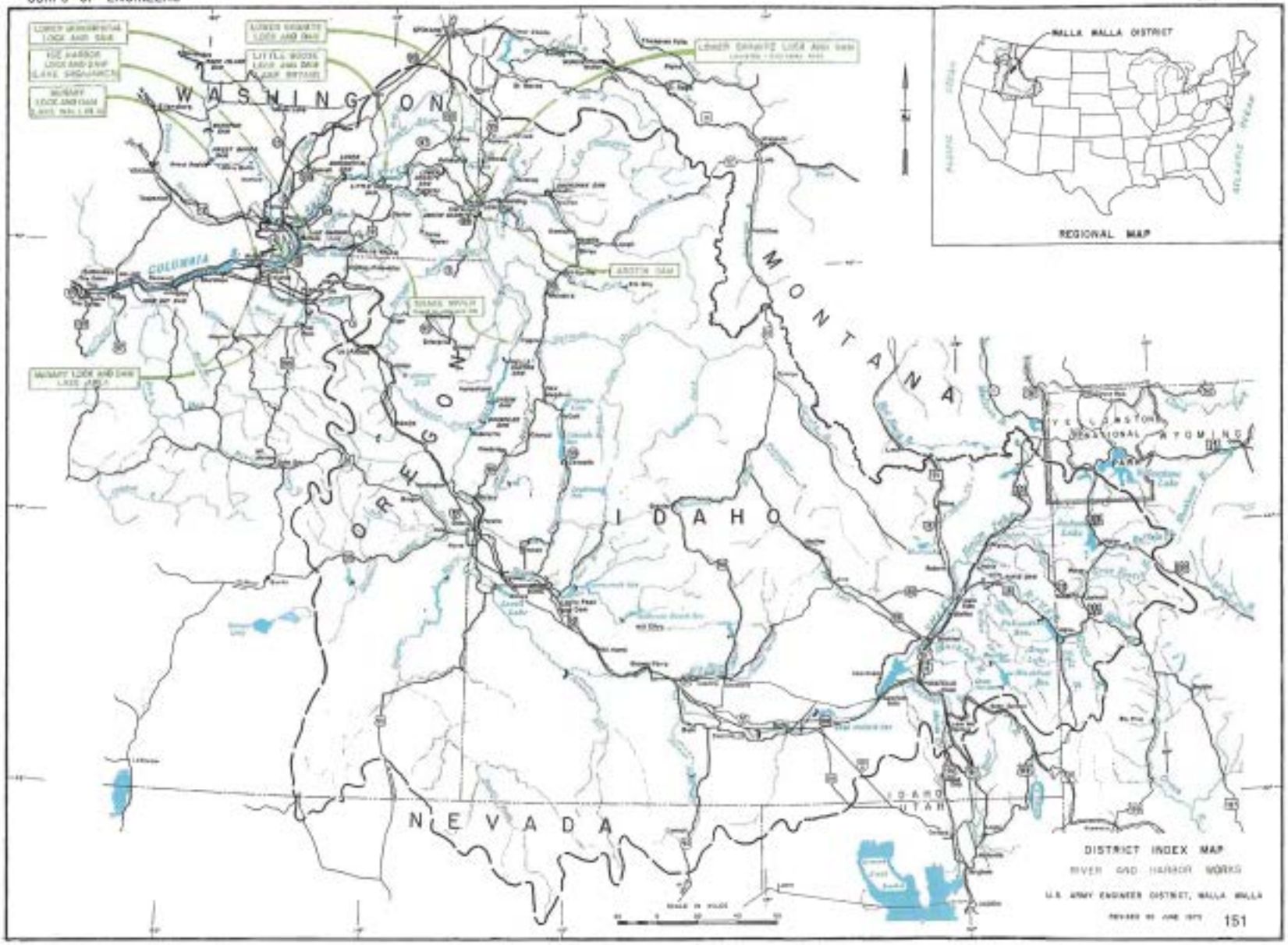
WALLA WALLA DISTRICT
REGIONAL MAP
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
UTAH
COLUMBIA
DISTRICT INDEX MAP
RIVER AND HARBOR WORKS
U.S. ARMY ENGINEER DISTRICT, WALLA WALLA

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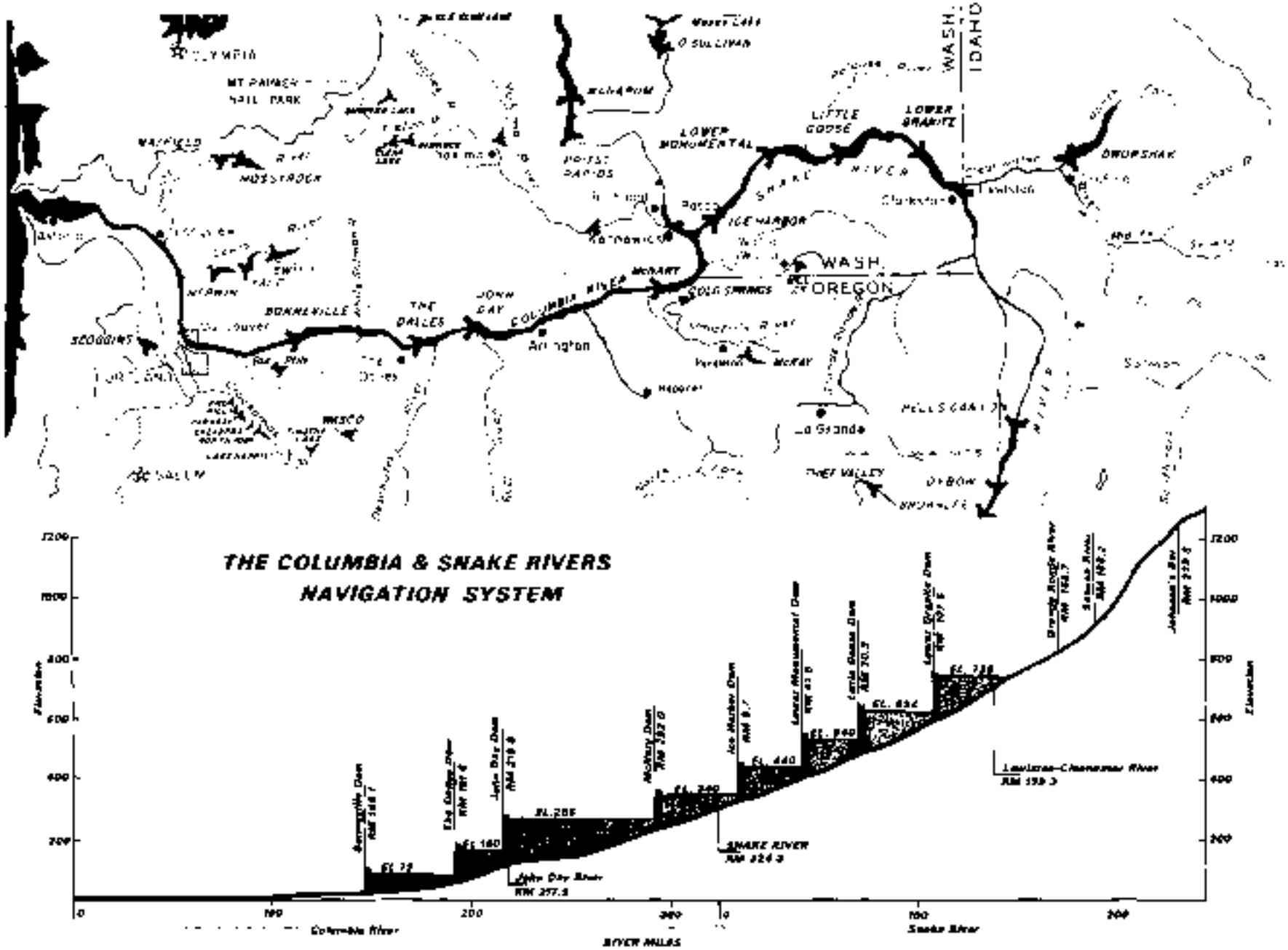
THE COLUMBIA & SNAKE RIVERS
NAVIGATION SYSTEM
WASH.
IDAHO
OREGON
LOWER MONUMENTAL
LITTLE GOOSE
LOWER GRANITE
ICE HARBOR
MCNARY
JOHN DAY
THE DALLES
BONNEVILLE
DWORSHAK
Arlington
Elevation
RIVER MILES
Columbia River
Snake River
Lewiston-Clearwater River
SNAKE RIVER
RM 324.3
Lower Granite Dam
Little Goose Dam
Lower Monumental Dam
Ice Harbor Dam
McNary Dam
John Day Dam
Dalles Dam
Bonneville Dam
Dworshak Dam
Clearwater River
Salmon River
Grande Ronde River
Johnson's Bar
EL. 738
EL. 670
EL. 540
EL. 440
EL. 340
EL. 265
EL. 160
EL. 72

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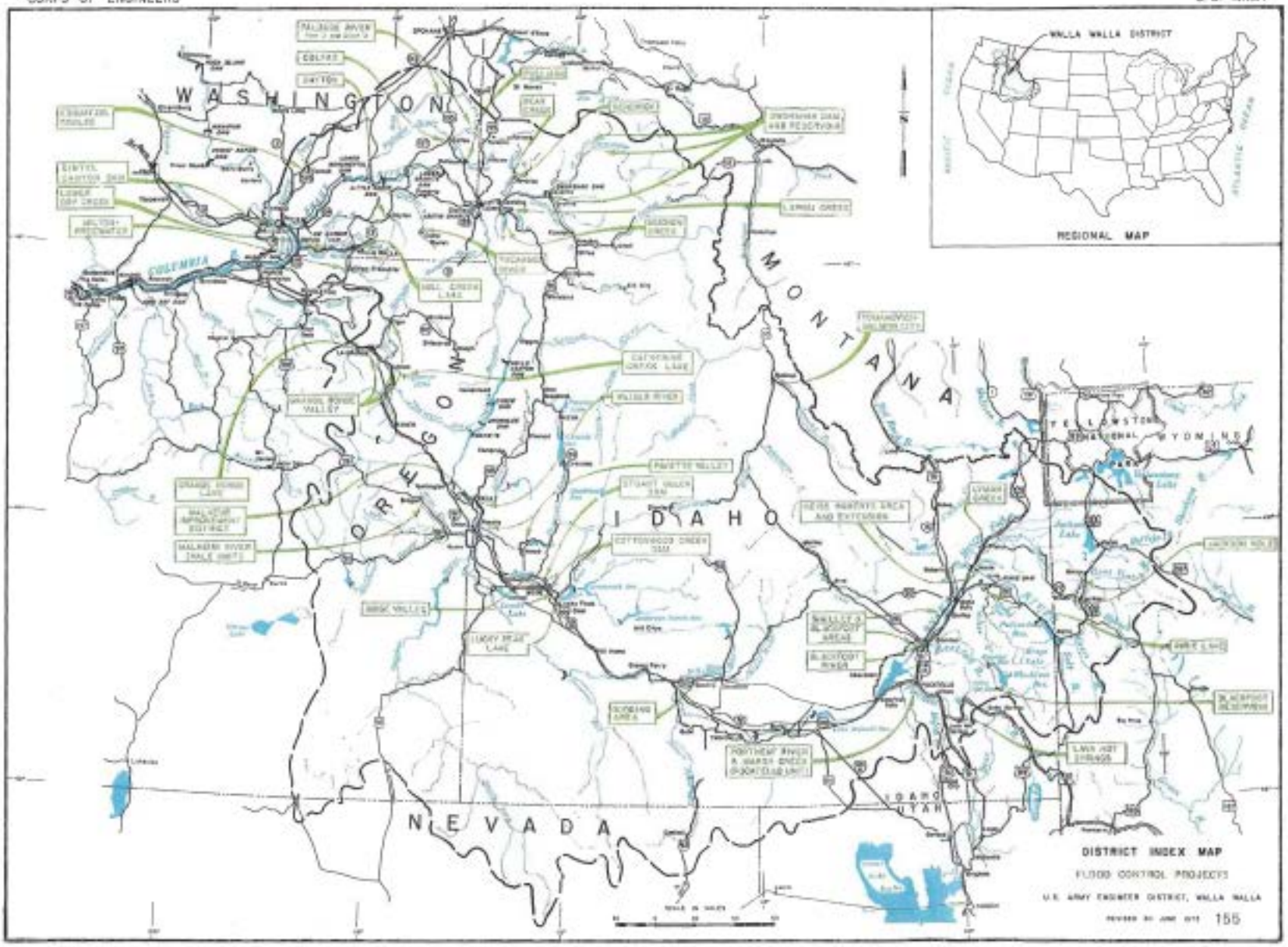
WALLA WALLA DISTRICT
REGIONAL MAP
WASHINGTON
OREGON
IDAHO
MONTANA
NEVADA
WYOMING
UTAH
COLUMBIA
DISTRICT INDEX MAP
FLOOD CONTROL PROJECTS
U.S. ARMY ENGINEER DISTRICT, WALLA WALLA
155

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U. S. ARMY ENGINEER DISTRICT, WALLA WALLA

TABLE I

Work Placement by Fiscal Year

Civil Works

FISCAL YEAR	TOTAL
1968	$112,105,511
1969	91,372,607
1970	87,361,361
1971	110,430,642
1972	131,820,133
1973	106,092,305
1974	100,289,667
1975	82,954,155

TABLE 2

AVERAGE PERSONNEL STRENGTH

FISCAL YEAR	DISTRICT OFFICE	FIELD	TOTAL
1968	565	415	980
1969	560	405	965
1970	510	440	950
1971	458	376	834
1972	437	373	810
1973	434	376	810
1974	409	361	770
1975	397	363	760

LOCK TRAFFIC

DAM (see footnote)	1968	1969	1970	1971	1972	1973	1974	1975 (6 months only)
McNary								
Commercial	2,898	3,220	4,005	3,705	5,235	5,539	4,345	1,957
Private	366	296	258	333	355	484	368	183
Total Lockages	1,075	980	1,218	1,301	1,790	2,016	1,547	668
Ice Harbor								
Commercial	472	767	1,116	1,372	1,579	2,119	1,991	892
Private	984	1,158	1,315	1,357	1,577	1,786	1,263	595
Total Lockages	763	1,014	1,222	1,360	2,029	1,915	1,595	711
Lower Monumental								
Commercial		60	312	747	1,675	1,429	1,308	553
Private		252	368	284	522	521	315	228
Total Lockages	0	199	317	528	1,011	920	716	333
Little Goose								
Commercial			266	643	1,448	1,199	1,117	485
Private			295	384	680	732	625	317
Total Lockages	0	0	320	516	975	984	883	350
Lower Granite								
Commercial								15
Private								172
Total Lockages	0	0	0	0	0	0	0	38

Note: Commercial includes both Towboats and Barges.
Private is individual pleasure and private use craft.
Total lockages indicates times locks operated. (1973 and 1974 were water short years and lockages scheduled for time of passage.

TABLE 4

TOTAL COMMERCE, TONS, THROUGH LOCKS (1)

Calendar Year	McNary	Ice Harbor	Lower Monumental	Little Goose	Lower Granite
1967	1,796	292	0	0	0
1968	1,278	170	0	0	0
1969	1,784	239	7	0	0
1970	2,149	409	135	128	0
1971	2,220	612	389	355	0
1972	3,684	1,354	1,058	894	0
1973	3,646	1,205	926	804	0
1974	3,014	1,073	875	832	0
1975*	1,530	516	412	366	90

(Thousands of Tons)

* 6 months only.

(1) Traffic at McNary Lock consisted of about 1/4 to 1/3 up bound petroleum products. Downbound traffic was essentially all grains with very small percentage petroleum products from the pipeline. Lower Snake River projects essentially all down-bound grain products.

TABLE 5 - (1)

SMALL GRAINS - DOWNBOUND ON WATERWAY

Wheat - Tons

Year	McNary	Ice Harbor	Lower Monumental	Little Goose
1968	797,407	166,583	0	0
1969	1,073,329	230,581	0	0
1970	1,531,561	397,286	127,105	122,055
1971	1,347,621	563,607	345,795	318,998
1972	2,483,957	1,307,108	1,011,736	860,880
1973	2,115,967	1,176,991	898,710	807,566
1974	1,907,135	992,683	795,757	683,902

Barley, Rye & Oats - Tons

1969	15,011	0	0	0
1970	29,792	5,186	5,186	5,186
1971	159,023	38,496	33,091	33,091
1972	58,056	41,904	43,264	28,227
1973	86,905	28,656	27,906	24,306
1974	93,131	63,490	66,190	63,480

(1) From Project Records, not published annual reports.

TABLE 5

TABLE 6

MCNARY DAM NAVIGATION LOCK

STATISTICS FOR

PETROLEUM PRODUCTS (1)

YEAR	UPSTREAM - TONS	DOWNSTREAM - TONS
1969	363,255	172,343
1970	328,468	20,665
1971	548,366	8,505
1972	909,537	9,250
1973	1,217,398	3,217
1974	785,656	16,343

(1) "Petroleum Products" includes gasoline, diesel oil, stove oil, jet fuel, bunker C, etc. Statistics from project records, not published reports.

(2) As of close of 1974 none of the petroleum products move into the Lower Snake River navigation system. All originates or terminates in the McNary reservoir area. (Downstream tonnage is essentially from the Standard Oil Terminal of the Salt Lake pipeline.)

DISTRICT OFFICERS

COL William Whipple	Oct 48 - Aug 50	LTC Vincent "Tex" Frisby
		LTC W. P. Leber
COL W. H. Mills	Aug 50 - Mar 53	LTC R. N. Anderson
		COL A. H. Miller
COL F. S. Tandy	Apr 53 - Jul 54	COL A. H. Miller
COL Alex H. Miller	Aug 54 - Aug 55	LTC Edward C. Bruce
COL Myron E. Page, Jr.	Sep 55 - Aug 58	LTC Edward C. Bruce
		LTC William F. Hart
COL Paul H. Symbol	Aug 58 - Mar 61	LTC Walter J. Hutchin
		LTC Laurence L. Heimerl
COL James H. Beddow	Jun 61 - Jun 64	LTC Laurence L. Heimerl
		LTC E. J. Williams, Jr.
COL Frank D. McElwee	Aug 64 - Jul 67	LTC E. J. Williams, Jr.
		MAJ Homer J. Johnstone, Jr.
		MAJ Robert L. Lane
		MAJ Ronald A. Walton
COL Robert J. Giesen	Aug 67 - Aug 70	MAJ Ronald A. Walton
		MAJ Harold L. Matthias
COL Richard M. Connell	Sep 70 - Jun 73	MAJ Harold L. Matthias
		MAJ Carlos W. Hickman
COL Nelson P. Conover	Jul 73 -	MAJ David R. Spangler
		LTC Edward H. George III

COL ROBERT J. GIESEN

COL Robert J. Giesen
August 1967 - August 1970

A Wisconsinite who was commissioned in the Army in 1942 upon graduation from the University of Wisconsin with a degree in Engineering. He served at Fort Benning, Georgia, and with the 84th Infantry Division in Europe. His military duty also included service at Fort Ord, California, and Camp Century, Camp Tuto, Greenland. In 1962 COL Giesen received an M.S. Degree in Business Administration from Syracuse University. COL Giesen served two years with the Baltimore District, (1953-55) supervising military construction. He then went to Keflavik, Iceland, with the Corps as Chief of Construction. From 1958 to 1961 he was Assistant Director of Civil Works in O.C.E., Washington, D.C. Before coming to Walla Walla he was at the Army Materiel Command, St. Louis, Missouri, as Project Manager developing atomic-powered electric power generating units for Southeast Asia. He reported for duty in Walla Walla District on 1 August 1967 and remained for three years. He retired from active duty on 31 September 1970 to take up private practice in the Puget Sound area of Washington.

COL RICHARD M. CONNELL

COL Richard M. Connell
September 1970 - June 1973

COL Connell, a Pennsylvanian from Erie, attended the U.S. Military Academy, West Point, graduating in 1949. Following graduation he was assigned to the European Command (NTC) for 37 months. He then returned to Massachusetts Institute of Technology for more academic training, where he received his Master's degree in Civil Engineering in 1955. He had further overseas duty, serving 12 months in Labrador in 1956-57; thirty-five months in England from 1960 to '63; and 12 months in Vietnam during 1966-67. In 1959-60 COL Connell attended the U.S. Command and General Staff College at Fort Leavenworth, Kansas. After his foreign service he attended both U.S. Army War College, Carlisle Barracks, Pennsylvania in 1967-68 and the Army Management School at Fort Belvoir, Virginia in 1968. COL Connell served as District Engineer during the period 1 September 1970 through 21 June 1973. He was then assigned to the Continental Army, Ft. Monroe, Virginia. (In the fall of 1974 he was promoted to Brigadier General and assigned as Division Engineer, South Pacific Division, San Francisco, California.)

COL NELSON P. CONOVER

COL Nelson P. Conover
July 1973 -

Colonel Conover, a native of Mobile, Alabama, received his B.S. degree in Civil Engineering from Auburn University and entered the service in 1953. He was assigned to the ROTC unit at University of Dayton, Dayton, Ohio, in 1956 and subsequently entered Massachusetts Institute of Technology in 1958 for an advance degree (M.S.) in Nuclear Engineering (1960). He was then assigned to Ft. Belvoir, Virginia, and with the Nuclear Power Division, OCE. Colonel Conover served two tours in Vietnam, in 1966 and 1970, first with the 1st Brigade, 101st Airborne Division, and later with the 588th Engineer Battalion (combat). He also had a tour of duty in Korea with the 1343d Engineer Battalion, as well as with the 8th Infantry Division in Germany. He was a graduate of the Command and General Staff College in 1968 and came to Walla Walla District in July 1973 after graduating from the Army War College at Carlisle Barracks, Pennsylvania.

HEADS OF PRINCIPAL DIVISIONS

Engineering Division

James E. Reeves	1948-1951
Edwin C. Franzen	1951-1965
Fred W. Sneddon	1965-1966
Harry L. Drake	1967-1973
Willard E. Sivley	1973-

Real Estate Division

Merle E. Lietzke	1948-1953
Max K. Tysor	1953-1973
Harold Buerstatte	1973-

Executive Assistant

Russell D. Whelan	1948-1951
VanNatta Baldwin	1951-1970
Orville F. Murray	1970-1975
William F. Holmes	1975-

Supply Division

VanNatta Baldwin	1948-1951
Edward G. Wainwright	1951-1966
Orville F. Murray	1966-1970
Nicholas R. Gall	1970-

Operations Division (Est. 1958)

Richard L. Earnheart	1958-1965
Duane M. Downing	1965-

Construction Division (Oper. 1948-1950)

Leo M. Buhr	1948-1951
William B. Watson	1951-1953
Samuel G. Neff	1953-1954
Oliver A. Lewis	1954-1959
Clarence C. Davis	1959-1961
Bertram W. Hoare	1961-1965
C. B. Olmstead	1965-1967
John E. Butler	1967-1968
Bertram W. Hoare	1968-1974
Thomas J. Mendiola	1975

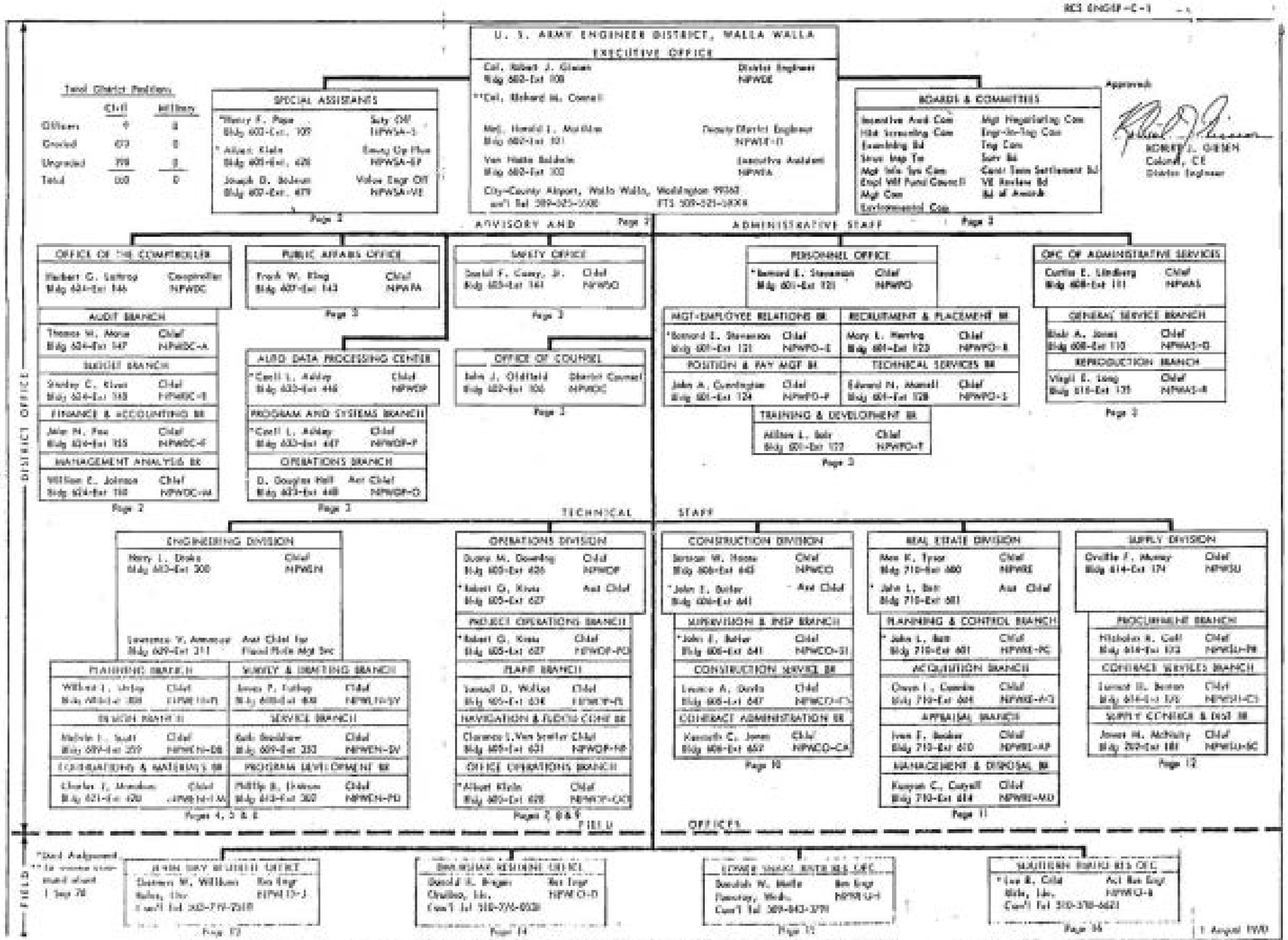
Personnel Office

William E. Sanderson	1948-1959
Theodore R. Bacon	1959-1963
Bernard E. Stevenson	1963-1971
Peter P. Ternes	1972-1973
John A. Cunnington	1973-

Fiscal Officer - Comptroller

Francis C. Casey	1948-1953
August P. Niemi	1953-1969
Herbert G. Lathrop	1969-1971
Stanley C. Klees	1971-

NOTE: See Organization Charts following for full staff composition.


RCS ENGEP-C-1
U. S. ARMY ENGINEER DISTRICT, WALLA WALLA
EXECUTIVE OFFICE
District Engineer
Deputy District Engineer
Executive Assistant
City-County Airport, Walla Walla, Washington
Approved:
Colonel, CE
District Engineer
Total District Positions
Civil
Military
Officers
Graded
Ungraded
Total
SPECIAL ASSISTANTS
BOARDS & COMMITTEES
ADVISORY AND
ADMINISTRATIVE STAFF
OFFICE OF THE COMPTROLLER
AUDIT BRANCH
BUDGET BRANCH
FINANCE & ACCOUNTING BR
MANAGEMENT ANALYSIS BR
PUBLIC AFFAIRS OFFICE
AUTO DATA PROCESSING CENTER
PROGRAM AND SYSTEMS BRANCH
OPERATIONS BRANCH
SAFETY OFFICE
OFFICE OF COUNSEL
District Counsel
PERSONNEL OFFICE
MGT-EMPLOYEE RELATIONS BR
RECRUITMENT & PLACEMENT BR
POSITION & PAY MGT BR
TECHNICAL SERVICES BR
TRAINING & DEVELOPMENT BR
OFC OF ADMINISTRATIVE SERVICES
GENERAL SERVICE BRANCH
REPRODUCTION BRANCH
TECHNICAL
STAFF
ENGINEERING DIVISION
PLANNING BRANCH
SURVEY & DRAFTING BRANCH
SERVICE BRANCH
PROGRAM DEVELOPMENT BR
OPERATIONS DIVISION
PROJECT OPERATIONS BRANCH
PLANT BRANCH
NAVIGATION & FLOOD CONT BR
OFFICE OPERATIONS BRANCH
CONSTRUCTION DIVISION
SUPERVISION & INSP BRANCH
CONSTRUCTION SERVICE BR
CONTRACT ADMINISTRATION BR
REAL ESTATE DIVISION
PLANNING & CONTROL BRANCH
ACQUISITION BRANCH
APPRAISAL BRANCH
MANAGEMENT & DISPOSAL BR
SUPPLY DIVISION
PROCUREMENT BRANCH
CONTRACT SERVICES BRANCH
FIELD
OFFICES
DISTRICT OFFICE
*Dual Assignment
1 August