GRAND COULEE DAM

COLUMBIA RIVER

STATE OF WASHINGTON

STEAMBOAT ROCK In the Grand Coulee
One of the Geological Wonders of the Region

GRAND COULEE DAM

AND COLUMBIA BASIN IRRIGATION PROJECT

A Federal Project of the Public Works Administration ✦ Located on the Columbia River in the State of Washington

Under Construction by the U. S. Bureau of Reclamation

Honorable Harold L. Ickes, Secretary of the Interior and Public Works Administrator

●

ORGANIZATION OF THE U. S. BUREAU OF RECLAMATION IN CHARGE OF CONSTRUCTION

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Elwood Mead, Commissioner

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THE COLUMBIA BASIN COMMISSION OF THE STATE OF WASHINGTON

Headquarters: Spokane, Washington
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J. E. McGovern, Spokane — W. G. Ronald, Ellensburg
Rufus Woods, Wenatchee — Ervin E. King, Seattle
Secretary: James O'Sullivan, Spokane

GENERAL CONTRACTOR

MASON-WALSH-ATKINSON-KIER COMPANY

Comprised of the Silas Mason Company, Inc., of New York
The Walsh Construction Company of Davenport, Iowa
The Atkinson-Kier Company of California

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An air view of the mammoth Grand Coulee Dam project showing in the foreground the world's first all-electric city, Mason City, on the left bank of the Columbia River. On the right bank is the government engineers' town, and in the center of the picture can be seen the outline of the cofferdam which encircles the area where the west abutment of the giant Grand Coulee Dam will rest.

Winding up the hill is the snake-like structure of the world's largest belt conveyor, while high on the hill are the picturesque towns of the "new frontier".

THE GRAND COULEE DAM, to contain 11,200,000 cubic yards of concrete when completed, will be the first structure built by man to exceed in size the Grand Pyramid. In fact it will treble in size the mammoth Egyptian edifice which for centuries has been one of the wonders of the world. Ranking third will be Boulder Dam on the Colorado.

The Grand Coulee project is a major step in the federal government's comprehensive program for the development of the natural resources of the Nation.

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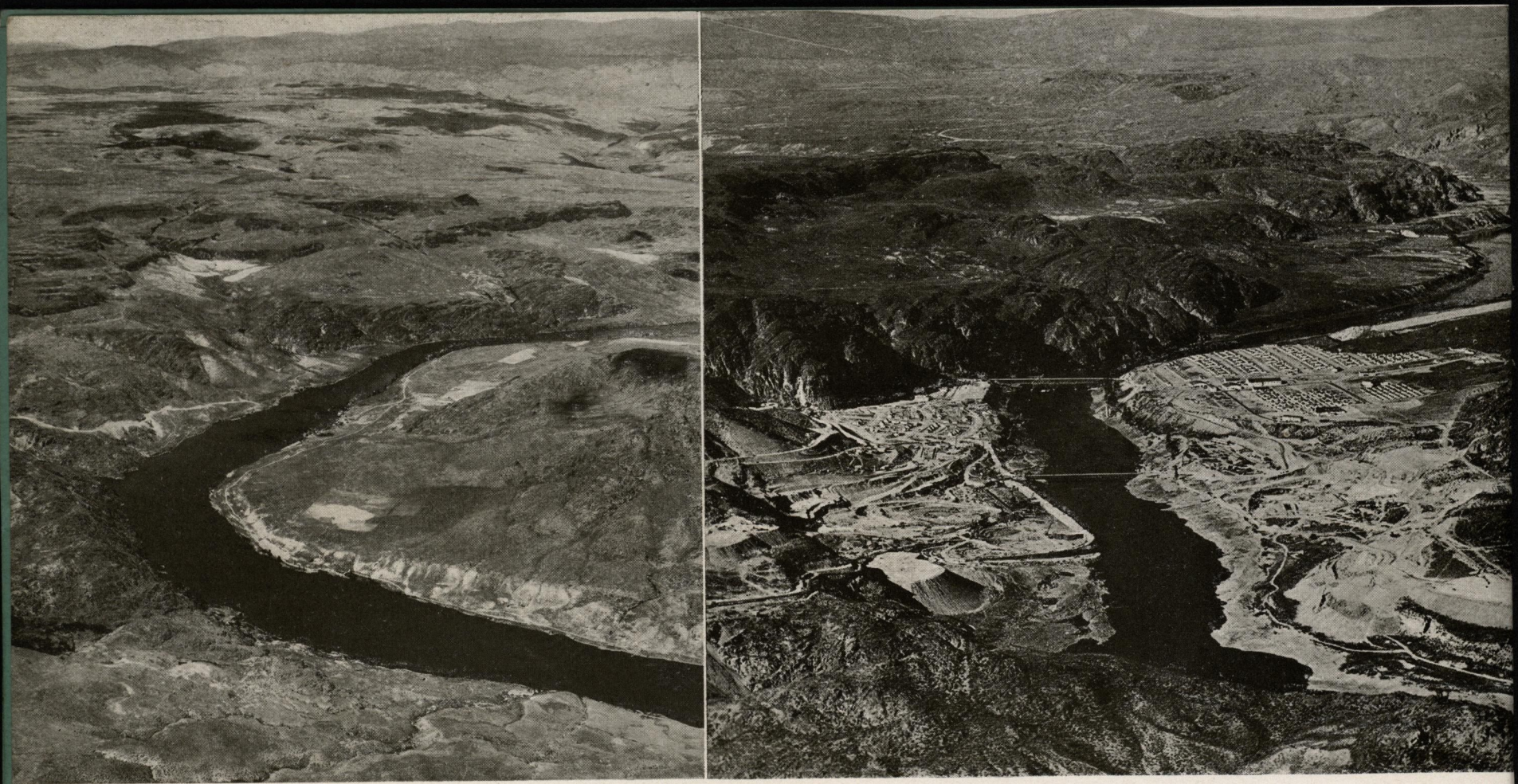

It is the key development on the Columbia River, which river holds the greatest hydro-electric possibilities of any river in the United States.

The development will be a combination, power, irrigation, flood control, storage and navigation enterprise, for linked closely with the Grand Coulee dam is the plan for lifting the waters of the great river of the west to a height where they can be pumped over 1,200,000 arid but highly fertile acres of the Columbia Basin project.

LEFT—The gorge of the mighty Columbia River—the site of the Grand Coulee Dam as it looked in 1933—before work on the United States' largest construction project. This was then an isolated and weird desert area.

RIGHT—A 1935 view of the territory shown in the preceding picture, with Mason City, the all-electric town; the government engineers' town; and excavation work for the foundations of the great dam.

LEFT—The spectacular excavation for the government highway and railroad. This has come to be known as the "slide area" because of slipping of the topsoil on a layer of wet underground clay. Drainage wells have solved the problem.

RIGHT—Some of the hills at the damsite are volcanic ash, sand, and clay, but part are solid granite. The "burr-r" of powerful drills and the shock of blasting echo in the gorge where for centuries there was silence.

THE DAM itself is located in central Washington, 92 miles west of the city of Spokane, at the head of a striking geological phenomenon—the Grand Coulee of the Columbia. The Columbia Basin acres are contained in that portion of central Washington encircled by what is known as the Big Bend of the Columbia.

The cost of the Dam will be $179,000,000. It will measure 500 feet above bed rock, with a length of 4,300 feet at the crest. It will have a power capacity of 2,550,000 installed horsepower and require from six to eight years to build. The

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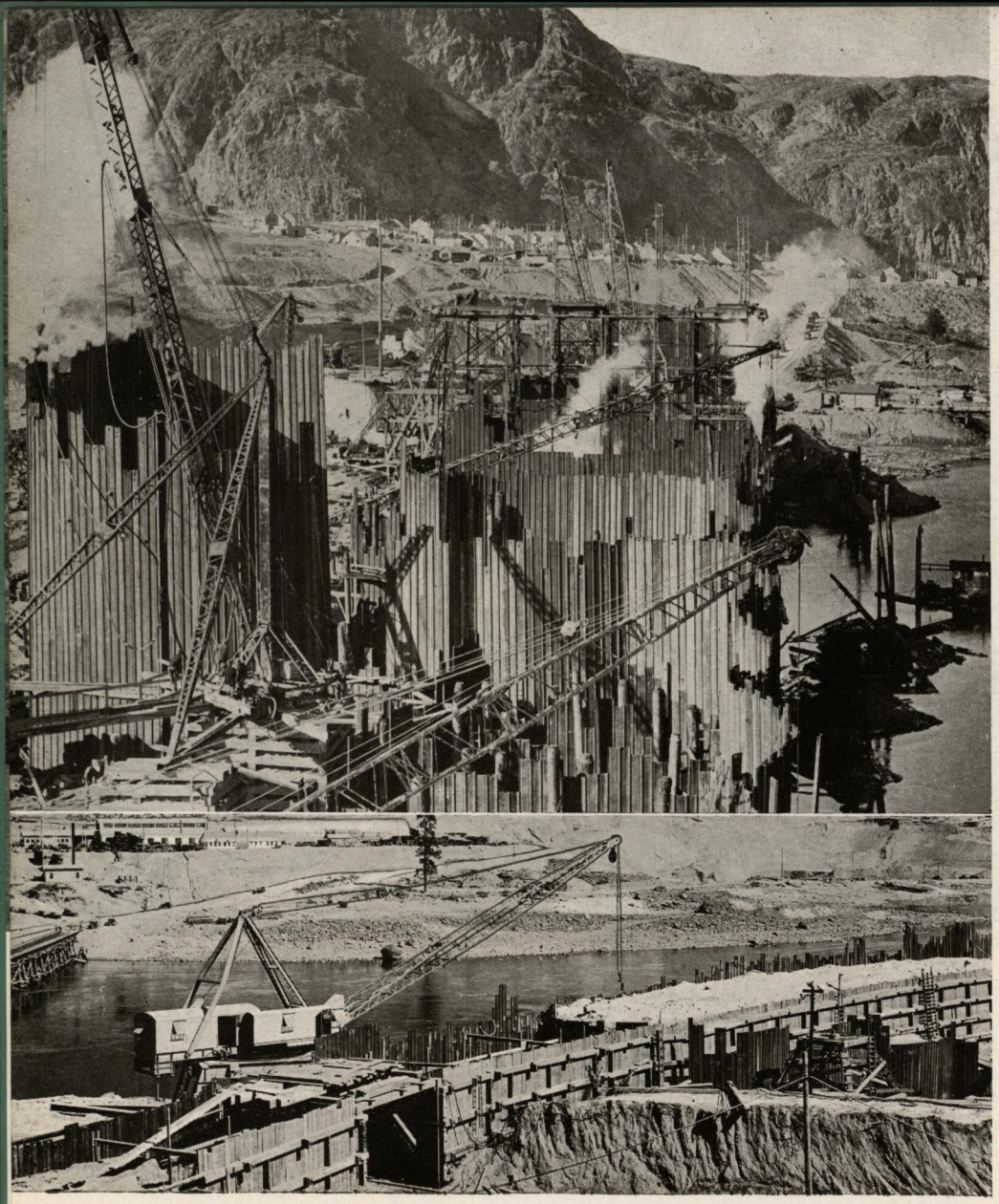


ABOVE — The cellular cofferdam under construction. Great lengths of interlocking sheet steel piling were driven many feet into the earth as a first step in turning aside the river that excavation for the power house and west abutment of the dam might proceed.

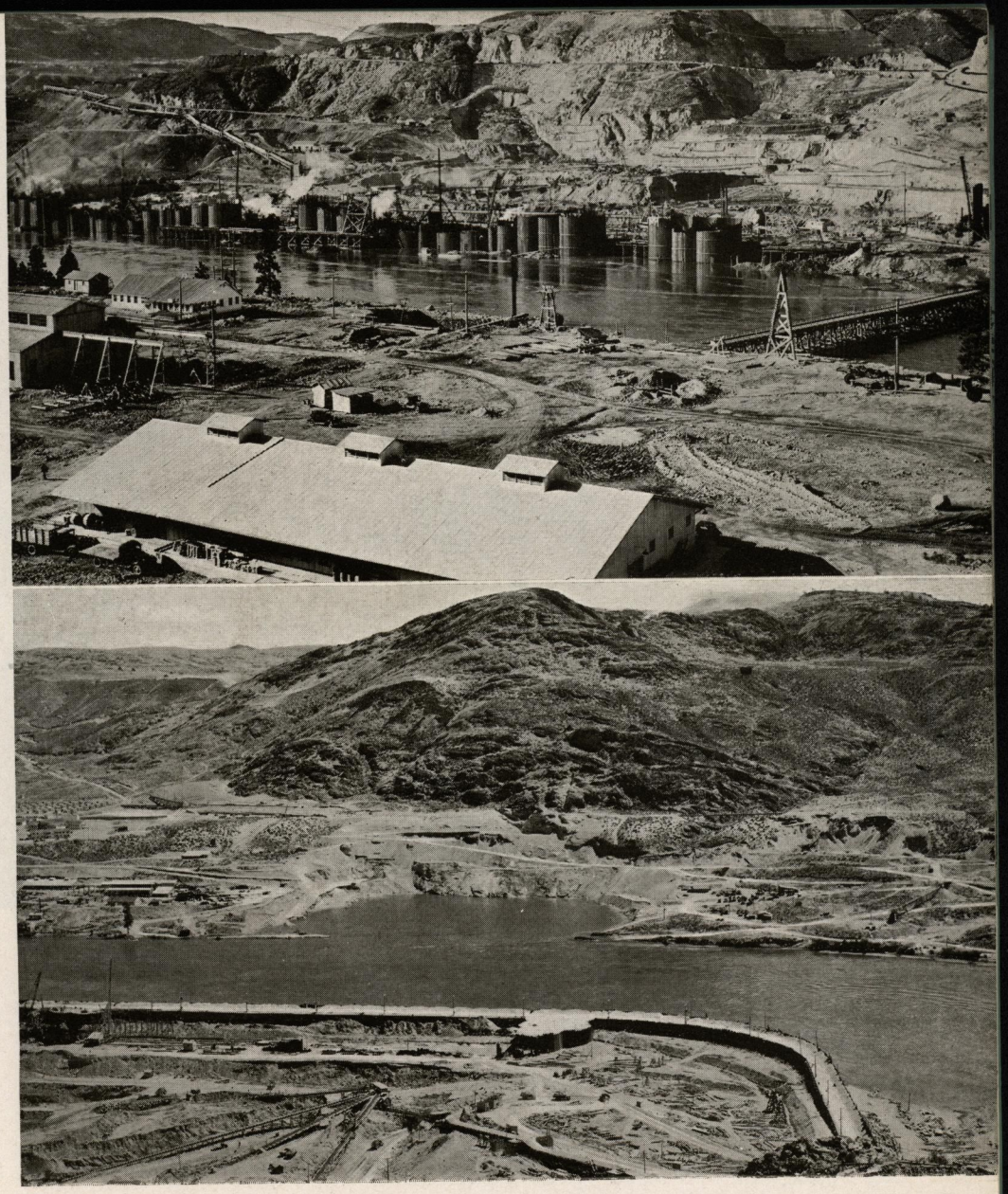
BELOW—A scene from behind the cofferdam showing how the steel piling is re-enforced with earth banks, which in turn are braced with a timber structure.

spillway in the center of the dam will be 1,650 feet long and 325 feet high. Water flowing over it will present one of the world's most remarkable water spectacles.

The estimated cost of the combined dam and Columbia Basin Reclamation project is $393,000,000, but the total estimated investment that will be required is $260,000,000, since power revenues will be credited. The entire project will be self-liquidating through power revenues and payments by settlers.

ABOVE—A view of the west bank cellular cofferdam when almost complete, taken from the Mason City side of the Columbia. In the left background, is the structure of the giant belt conveyor.

BELOW—A view taken almost in direct line where the Grand Coulee Dam will stretch from Hill to Hill across the Columbia River. The east abutment will rest in the pool formed in an excavated area.



Land on the project will be available to settlers at reasonable prices.

United States Army Engineers estimated that completion of the Columbia Basin project will add 1,403,000 to the population of the Pacific Northwest. Based upon the present per capita wealth of this region, the increased taxable wealth will amount to $3,000,000,000.

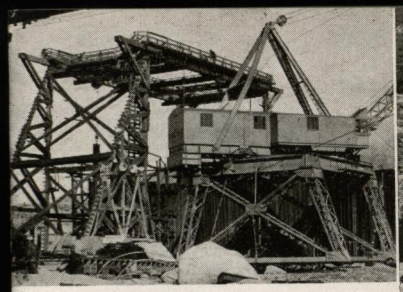
(Continued next page)

ABOVE — One of the four underground feeders of the belt conveyor system. This huge machine is buried under a big grid upon which excavated material is dumped.

LEFT — Thousands of cubic yards of dirt and rocks per day move steadily up the belt conveyor from the area behind the cofferdam to be deposited in Rattlesnake Canyon, more than a mile away.

THERE is nothing more magnificent than the gorge which this structure will dam. It descends thousands of feet from the sheer granite and basalt cliffs, while hills brown with their overcovering of sage and bunch grass, roll interminably into the far distance.

From the damsite the Grand Coulee stretches away, a chasm fifty miles long and several miles wide, with walls of rock towering in places a thousand feet. It was the prehistoric bed of the Columbia River. Even before this, great floods of lava covered the territory. Slowly the lava cooled.



ABOVE — A traveling gantry, used in driving the steel sheet piling to form the cells of the cofferdam — an interesting operation to witness.

RIGHT—The timber encased tunnel through which a belt conveyor will carry material for making concrete two miles from the government-owned pit below the dam, to the mixing plants at the damsite.

As the centuries passed plant life appeared. But another hot flood came.

Again it cooled and life returned. This for seven successive periods—between each of which hundreds of thousands of years elapsed. These lava flows are clearly defined on the Coulee walls. The rock is dark and porous, streaked with greens and reds.

After the last lava flow, an ice sheet, said by scientists to have been four thousand feet thick, descended from the North. It carried huge quantities of boulders and gravel and blocked the bed of the river, forcing this mammoth stream to cut the Grand Coulee for its valley.

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ABOVE—Steamboat Rock in the upper Grand Coulee of the Columbia. This huge formation was an island centuries ago in the giant river that rushed through the beautiful canyon that is now the coulee. This part of the Grand Coulee is planned as a storage reservoir in the Columbia Basin Irrigation project.

BELOW—The Dry Falls of the Columbia. In the lower Grand Coulee, this is now a place of weird shadows, of streaked greens and browns, where once a cataract with the power of forty Niagaras thundered from the cliff.

Across the river is the government engineers' town which will remain as the home of the men who maintain and operate the dam and power plant when it is complete. Here fields of sage brush and sand have given way already to paved streets and yards of green.

These new cities and the building of them are dwarfed by the tremendous activity at the mammoth dam. Giant bulldozers, electric shovels, towering stiff-legged derricks, thundering trucks and the insistent sound of drilling contribute to the awe and amazement which grip the spectator.

Higher on the hills are the pioneer towns that have sprung into being since construction began.

These seem like the old west revived. They are indeed the homes of men and women who are hoping for great things as were the men and women of the early west.

These picturesque settlements extend some distance into the coulee canyon, the great gorge that will be the storage reservoir for the raised waters of the Columbia.

THE DAM will also create the largest artificial lake in the world backing up the waters of the Columbia 151 miles and extending to the Canadian border. This body of water will contain over 5,000,000 acre-feet of useful storage. The release of this storage in the winter, when the river is running low, will in-

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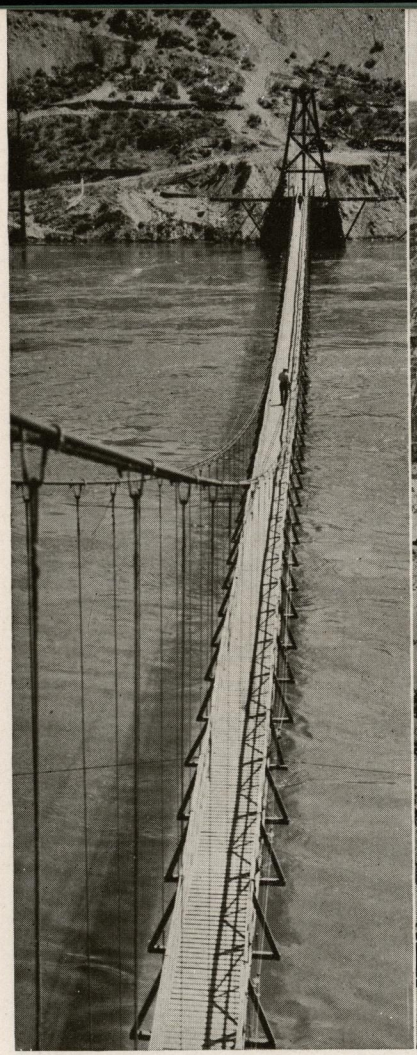
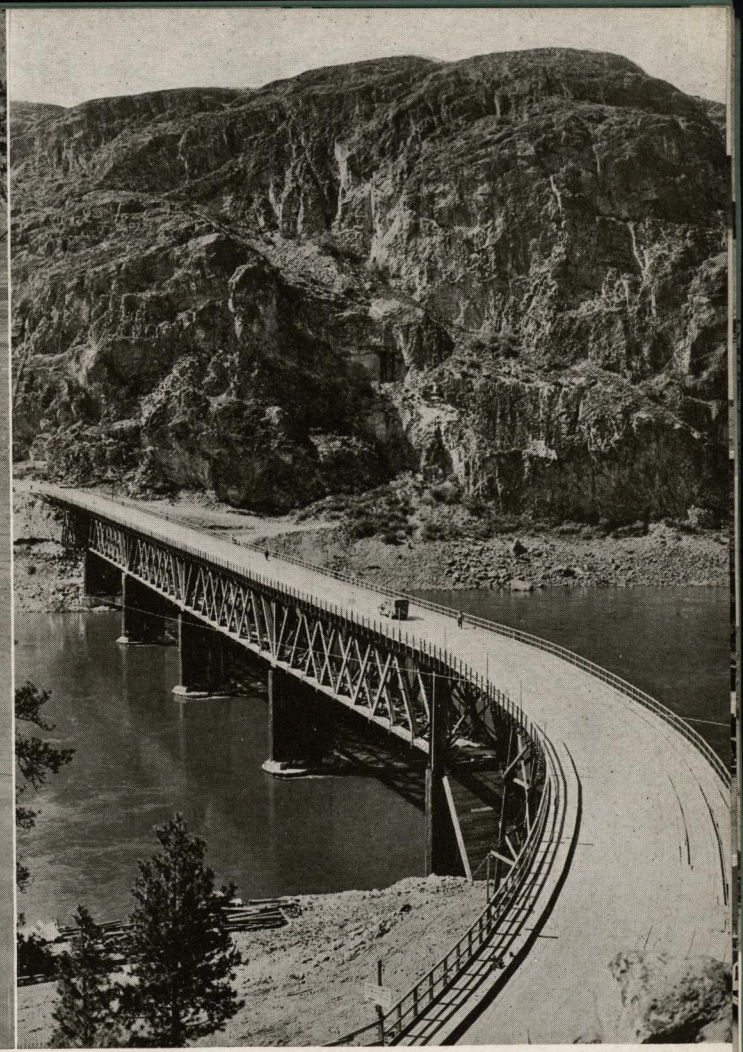




LEFT—A "catwalk" suspended above the rushing flood of the Columbia. This bridge furnishes passage to officials and workmen of the contractor, the MWAK Company; and to the government engineers—affording access to construction operations on both sides of the river.

RIGHT—The combination highway and railway bridge built by the Mason-Walsh-Atkinson-Kier Company, contractors for the Grand Coulee Dam, used as a highway bridge until a permanent bridge under construction by the government is completed.

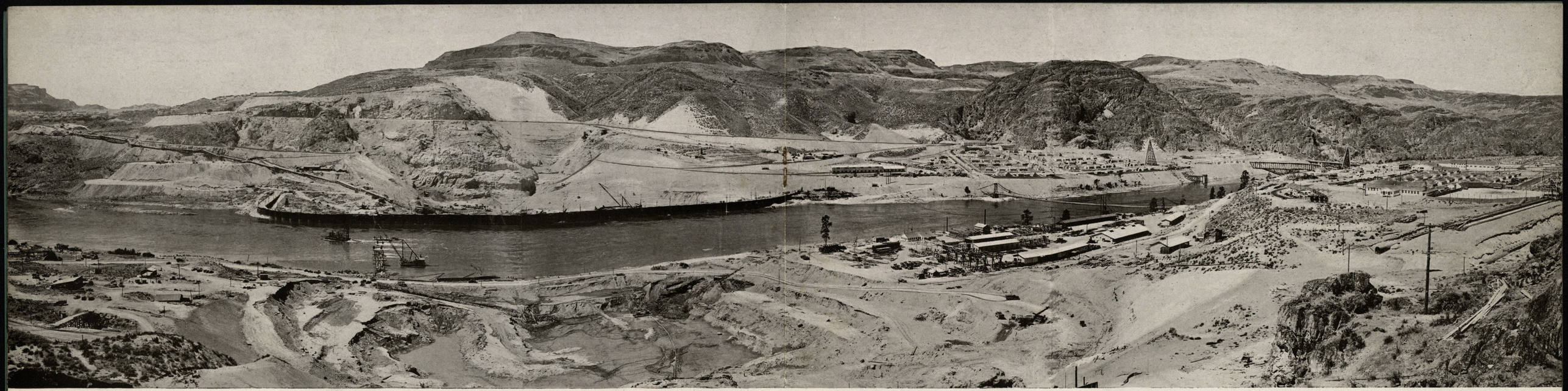
ABOVE—Looking down the main street of the government engineers, town—the United States Bureau of Reclamation's administration building in the foreground—across the Columbia River to Mason City, the contractors' town.

BELOW—A mystic, fairyland scene at night—the cofferdam area with its blazing flood lights, and the two new cities.

crease the prime, commercial power of the river below the dam site as far downstream as the Snake River 100%, and below the Snake 50%. This storage will materially increase the depth of the low water flow of the river, thereby greatly aiding navigation. The regulation of the river will also aid in flood control.

The Grand Coulee Dam will be the largest power development possible in North America.

Five hundred feet above bed rock and 4,300 feet long, or nearly four times the length of Boulder Dam, it will develop three times the power of Muscle Shoals, 50 per cent more power than Boulder Dam and will equal the total installed capacity of Niagara.



A panoramic view of the most gigantic engineering enterprise ever undertaken by man—GRAND COULEE DAM on the majestic Columbia River in the State of Washington.

The narrow snake-like structure in the upper left is the world's largest belt conveyor system which is moving excavated material more than a mile up-hill into Rattlesnake Canyon.

Across stream at the water's edge is the 3,000-foot Cofferdam built to divert the flow of the river while excavation for the west footings are underway and concrete poured for the foundations and power house.

Another cofferdam will be constructed on the opposite side of the river.

When the concrete foundations for the dam are laid behind these two cofferdams, the course of the Columbia will again be diverted to permit construction of foundations for the center section of the dam. Half-way up the canyon wall are seen the railroad and highway grades; the railway continuing through a tunnel in the rocky promontory and crossing the river down stream over a trestle constructed by the Mason-Walsh-Atkinson-Kier Company, the contracting organization; the highway descends at a steeper gradient to the government warehouse.

At the extreme right is Mason City, the contractors' town, housing more than 2,500 workmen and their families.

Both Mason City and Coulee Dam, the engineers' town, are modern in their appointments, with splendid facilities to provide for the comfort of the inhabitants.

IN 1933 President Roosevelt caused the PWA to allocate $63,000,000 to start the dam.

Authority to proceed with the work was given on September 25, 1934. Excavation was begun on October 4, 1934, the excavated material being carried one mile from the damsite on the largest belt conveyor in the world, to be deposited in Rattlesnake Canyon.

The terms largest, greatest, etc., must be repeated over and over in describing the Grand Coulee project, and even these are inadequate.

(Continued opposite page)

The huge cofferdam built to allow for the excavation for the power-house and west abutment, is itself as large as Muscle Shoals and is the largest cellular steel cofferdam ever constructed.

Mason City, the contractors' camp, is the world's first all-electric city. The homes of the 2,500 who will live here while the project is underway are lighted, heated, and cooled electrically. There is not a chimney—not even for Santa Claus.

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1. The mess hall and kitchens of the MWAK company, capable of seating 1,300 at meals. The kitchen is a marvel of modern efficiency. 2. A kitchen in one of the smaller homes in the world's first all-electric city—Mason City, the contractors' town. 3. The children of the government engineers will attend classes in this attractive school building beneath a towering granite cliff. 4. The dormitory at Mason City for the stenographers and women clerks of the contracting firm. 5. For the leisure hours of their workmen, among other things, the MWAK company has built a huge recreation hall. 6. A group of cottages in the all-electric Mason City. Note the absence of the chimney from every roof.

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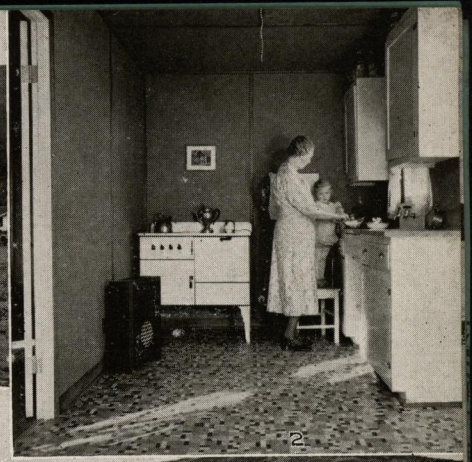
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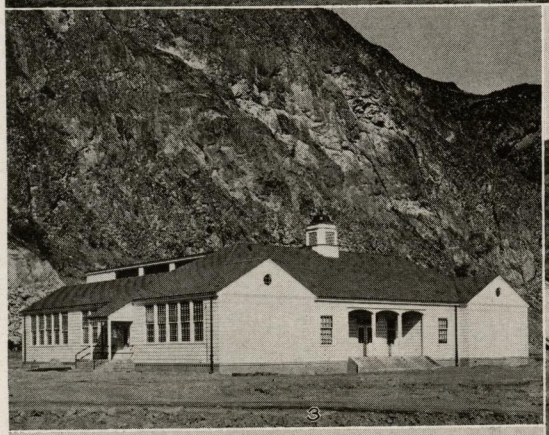
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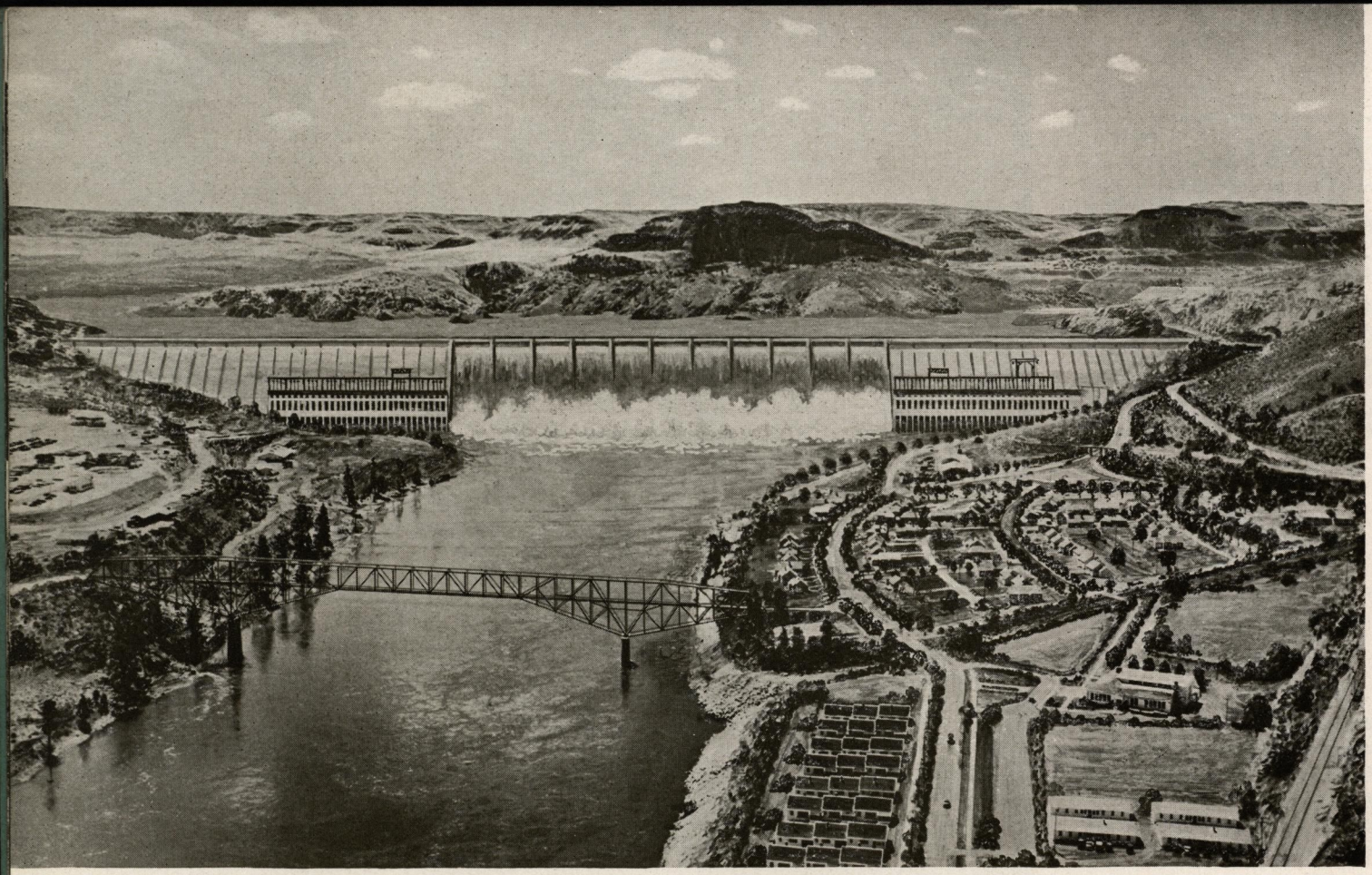
The water impounded will be raised 280 feet from the reservoir by a pumping installation of twenty units, the largest yet devised. Approximately 500 tons of water will be lifted every second—enough to supply, in but a few days, a large city with water for a year.

FOR many centuries the mighty forces of nature were busy carving the Grand Coulee of the Columbia. They made it a land of great rocks and weird shadows, a place fascinating and mysterious.

Now man with his knowledge of science and engineering is at work to create new wonders, to harness the waters and to build an empire.



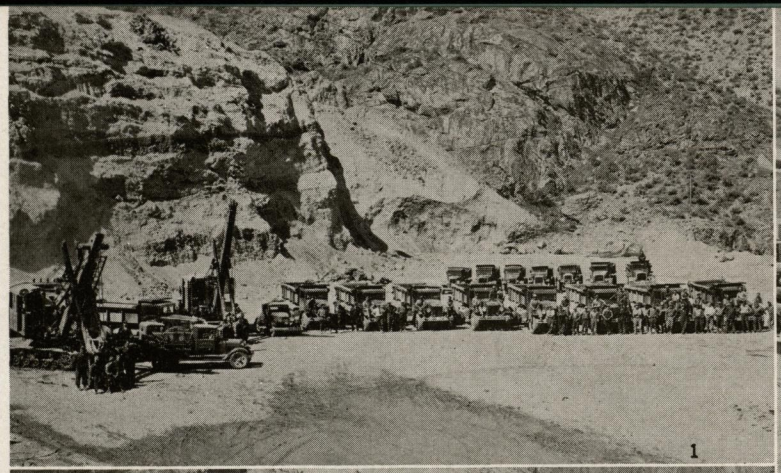
This composite picture, made from photographs and drawings by K. S. Brown, official photographer, and R. T. Sinex, engineer, of the U. S. Bureau of Reclamation, shows how the Dam will look when finished.

The Administration City is shown in the right foreground, with trees, shrubs and roadways, as it will appear when the project is in actual operation supplying electrical energy to a wide area and power to irrigate 1,200,000 fertile acres in the great Basin of the Columbia.

In the top center is seen the completed Dam and power houses, drawn to scale, with the lower end of the longest artificial lake in the world behind the huge wall of concrete.

GRAND COULEE AND BOULDER DAMS COMPARED

	Grand Coulee Dam	Boulder Dam
Height (feet)	500	730
Length of crest (feet)	4,300	1,180
Width at base (feet)	500	650
Width at top (feet)	30	45
Excavation (cubic yards)	15,000,000	7,000,000
Mass concrete in Dam (cubic yards)	11,200,000	3,200,000
Total rated capacity (h. p.)	2,646,000	1,835,000
Firm power developed (KWH)	8,000,000,000	4,330,000,000
Secondary power developed (KWH) (both per year)	4,170,000,000	1,550,000,000
Length of reservoir (miles)	151	115
Average width (miles)	0.8	2
Average annual run-off (acre-feet)	79,000,000	15,700,000
Maximum flow of river (second-feet)	725,000	300,000
Minimum flow of river (second-feet)	17,000	2,300
Spillway capacity (second-feet)	1,500,000	400,000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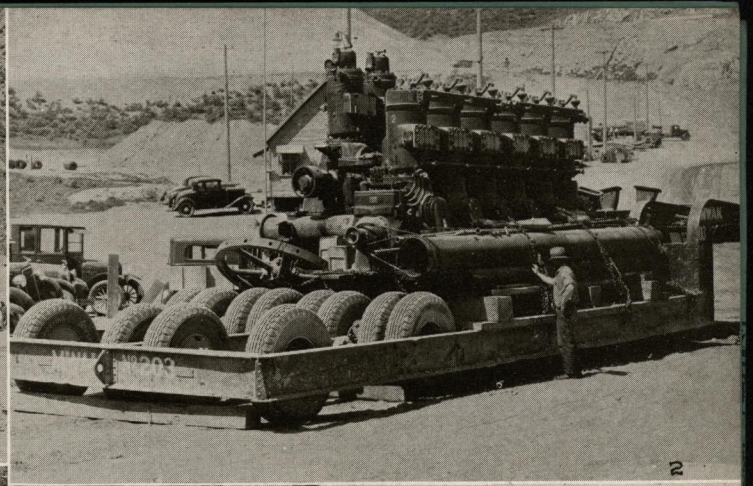
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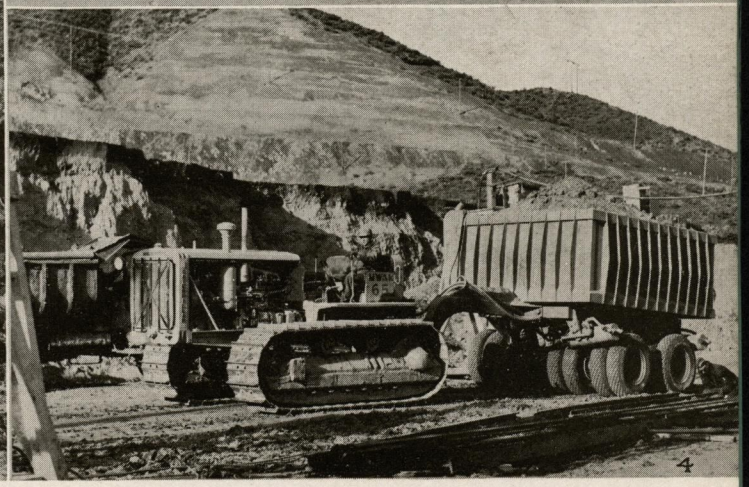
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Latest types of machinery and large scale equipment, in keeping with the magnitude of the operations, are employed at the Grand Coulee Dam.

1. One of the many fleets of trucks faced with the job of moving 16,000,000 cubic yards of dirt.

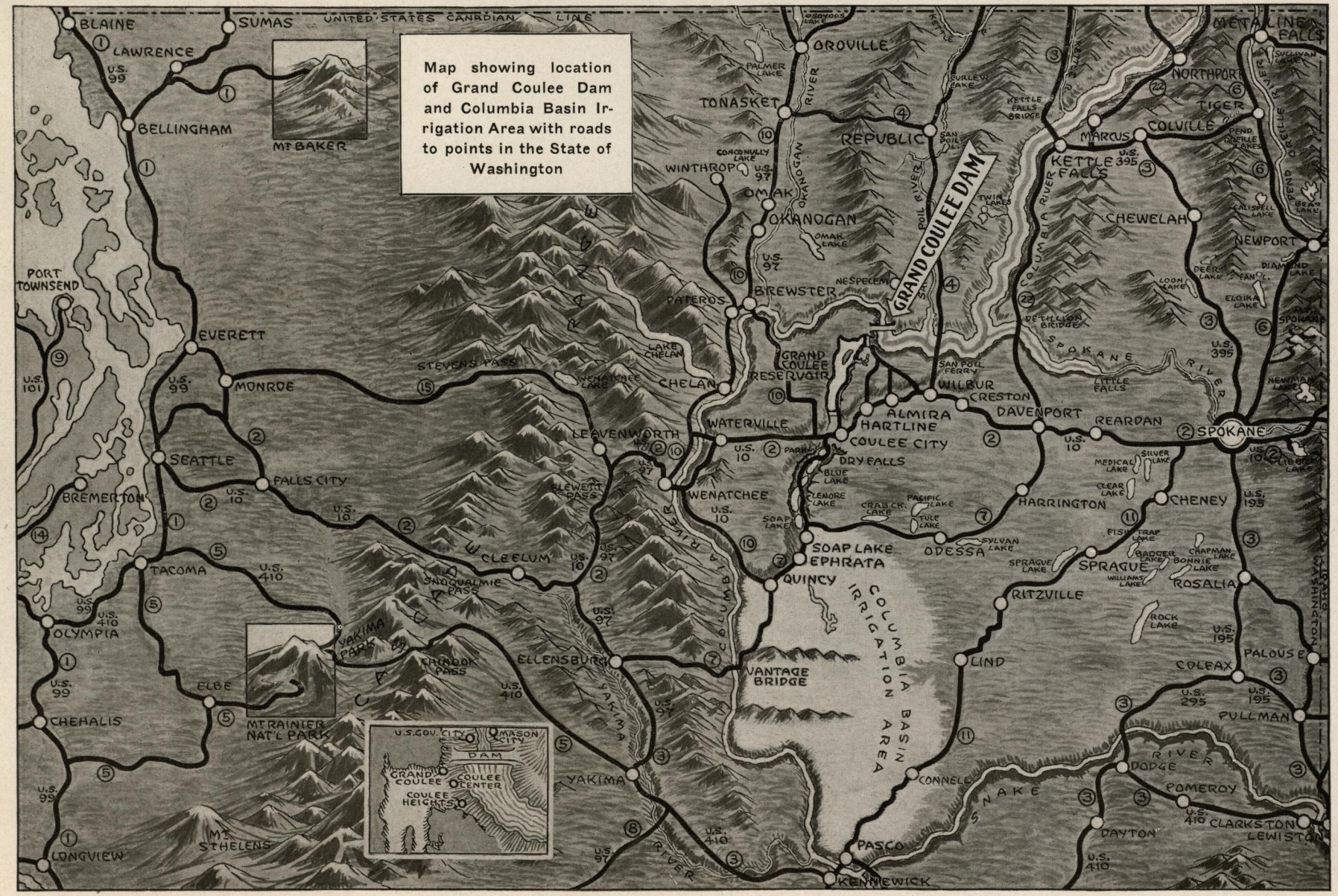
2. Largest trailer ever built—used to convey machinery from railroad to damsite.

3. One of the world's largest electric shovels eating away a mountain side.

4. Huge tractors haul a constant procession of rumbling side - dumping "buggies".

HIGHWAY MILEAGES FROM GRAND COULEE DAM TO: (Most Direct Route)

Spokane (via Wilbur) 92	Davenport 56	Coulee City 31	Soap Lake 55
Lewiston 198	Pasco 169	Harrington 70	Ephrata 62
Colfax 149	Seattle 266	Hartline 28	Quincy 80
Newport 140	Tacoma 280	Nespelem 20	Ritzville 86
Colville 174	Olympia 303	Rosalia 125	Ellensburg 133
Metaline Falls 203	Odessa 59	Tonasket (via Nespelem) .. 95	Yakima 270
Republic 88	Cheney 98	Okanogan (via Nespelem) 73	Everett 233
Oroville 112	Pullman 166	Brewster 94	Bellingham 297
Almira 22	Dayton 167	Waterville 72	Chehalis 338
Wilbur 26	Chelan 85	Wenatchee 102	Omak 90



SEE PRECEDING PAGE FOR DISTANCES FROM DAM TO POINTS IN WASHINGTON

(Statements and estimates on this page are made by the Columbia Basin Commission, State of Washington, which assumes full responsibility therefor.)

Ample Power Market

The Grand Coulee Project will not only serve as a cheap source of power for the present population of Oregon, Washington, Idaho and Montana but will also serve a new population of 1,400,000 brought into the Northwest through the development of the Columbia Basin irrigation enterprise.

Grand Coulee power also will make possible the utilization of extensive mineral resources in the Pacific Northwest that are awaiting cheap power for their processing. Eight hundred thousand Grand Coulee secondary horsepower will be used in pumping for irrigation projects in the Northwest, 660,000 h.p. being used in pumping into the Grand Coulee Reservoir for irrigation of 1,200,000 acres of the Columbia Basin.

With power markets of the Pacific Northwest doubling every eight and a half years, the Commission estimates the power market in the Northwest alone will absorb all of the Grand Coulee power within 15 years after completion of the dam.

Even if the normal rate of growth of the power market were cut in half by the year 1960 there would still be during this period, according to U. S. Army and Reclamation Engineers, a need for new power that will be double the capacity of the Grand Coulee development. It is further anticipated that the electrical utilities of the Pacific Northwest, instead of building new plants, will take care of their increased demand by securing power in the future from the Grand Coulee and Bonneville Dams because it can be secured cheaper than they can produce it themselves.

Temporary power surplus has virtually disappeared. In Washington, during 1934, more electrical power was used than in the peak year of 1929; while almost as much power was used in Oregon and Idaho as in this peak year. During the first six months of 1935 more electrical power was used in the United States than in any previous six months of our history.

Ample Agricultural Market in the Future

The project cannot compete in the present or near-future agricultural markets, as it will be seven years before Columbia Basin lands can be irrigated and thirty or forty years before all the lands are reclaimed.

Increased population resulting from the project development will consume a large part of the agricultural products produced in the Columbia Basin.

The project will be needed to supply the 11 far-western states, having less than 12 inches of precipitation annually and a very limited water supply, with their staple feed and food supplies—such as rye, oats, barley, corn, pork, etc., that they are now importing in large quantities.

Agricultural lands of the U. S. are rapidly diminishing in productivity through drought, soil erosion and depletion.

Project lands, when irrigated, will be twice as productive as the average farm land in the United States. The cost of the land and waters rights including annual maintenance will compare favorably with the cost on successful federal projects.

How Project Benefits the Pacific Northwest

1. Increases its population by 50%.
2. Creates a large home market for surplus agricultural products such as wheat, mutton, wool, fruits, that now must compete in eastern markets, thereby saving large sums in freight rates.
3. Stabilizes agricultural production.
4. Creates an extensive home market for industrial products.
5. Lays the foundation for further development of water, power, agricultural and mineral resources.

How Project Benefits the United States

1. Creates an annual market for 200,000 carloads of agricultural and industrial products, valued at $100,000,000, that will be produced in the United States and shipped into the State of Washington.
2. Creates new opportunities on rich productive soils for American farmers who are now trying to eke out a living on marginal lands.
3. Insures the United States against the impairment of its agricultural resources resulting from devastating droughts, erosion, and soil depletion.
4. Creates a new frontier for the citizens and especially the young people of the Nation.
5. Fortifies and strengthens the military resources of the Nation in the event of an attack by a foreign power on the Pacific slope.
6. Returns the United States $10,000,000 annually in increased income taxes collected in the Pacific Northwest.
7. Returns the United States, after the project is fully paid for by the Pacific Northwest, $15,000,000 annually in net revenues from power sales.

Photographs by K. S. Brown, U. S. B. R.

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