REPORT

Of Altitude Surveys

of

Spencer, Bridge and Diamond Sites

On the Colorado River

By FRANK P. TROTT

AUTHORIZED BY GEO. W. P. HUNT

GOVERNOR OF ARIZONA

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February 5, 1925.

To the PRESIDENT OF THE SENATE,
Seventh Arizona Legislature.

Dear Sir:

Some weeks ago a committee of gentlemen interested in the development of the Colorado River visited my office and called attention to a wide variation in the statements attributed to various representatives of the Federal Government in giving the location of various dam sites on the Colorado River.

It was pointed out that in the opinion of these gentlemen it was vital to the interest of Arizona to determine the correct altitude at Spencer, Bridge and Diamond Canyon.

I authorized a surveying party under the leadership of Honorable Frank P. Trott, former United States Surveyor General for Arizona, to determine the facts as to the altitude of these points, and such additional data as might be of interest to the State.

Mr. Trott and his associates have completed their work and have filed with me a report, copies of which are herewith submitted for the information of the Legislature.

They have also compiled a map showing the various dam sites and proposed irrigation projects which have been under discussion. I am sending sufficient blue prints of this map for the use of the members of the Legislature.

Respectfully,

GEO. W. P. HUNT,
Governor.

Phoenix, Arizona,
February 4, 1925.

Hon. George W. P. Hunt,
Governor of Arizona.

Dear Sir:

The Colorado River party created for the purpose of making "some surveys in connection with possible development of the Colorado River for feasible irrigation of land in Arizona" herewith respectfully submits the following report:

REPORT

To carry out what we considered to be the most important purpose for which this party was created, we decided to ascertain and definitely determine the correct elevation of the low water surface of the Colorado River above sea level at the Bridge Canyon and Spencer Canyon dam-sites and locate what in our judgment would be the highest possible canal line elevation feasible for irrigation by the building of a dam at either of these sites up to the maximum estimated height.

There is a difference in elevation at the Spencer Canyon damsite of about 155 feet between the survey of the Arizona Engineering Commission (Report of 1922-23) and the elevations given by Col. C. H. Birdseye, Chief U. S. Topographic Engineer, in his survey of the water surfaces on October 11, 1923. The Arizona Engineering Commission gives an elevation of 1260 feet above sea level, and Col. Birdseye gives an elevation of 1117 feet at the head of the rapids, a short distance above, and an elevation of 1102 feet below the rapids where this damsite is located. The rapids are about 1000 feet in length.

The nearest available U. S. B. M. to the Spencer Canyon Damsites is at Peach Springs Railroad Station, the elevation of which is given as being 4787.802 in Bulletin 573, Yavapai mountains quadrangle.

From this U. S. B. M. on January 1, 1925, we commenced running a double line of levels along the road leading from Peach Springs to the rim of Meriwhitica Canyon, a distance of 37 miles; thence down the trail in this canyon a distance by trail of about eight miles to its intersection with Spencer Canyon, a distance of about six miles to its intersection with the Colorado River. On January 22 we reached the Colorado and found the water surfaces of the Colorado River by our level lines to be 1098 feet.

The Colorado River was on that date at a very low stage, several feet below the average low stage. So there can be only a slight difference, if any, between these level lines and the establishing of low water surface for a dam at the Spencer Canyon damsite.

Colonel William Kelly, Chief Engineer of the Federal Power Commission, in a report made by him, has given the elevation there as being 1105 feet above sea level, and for the purpose of this report we have accepted this elevation for the starting point for canal construction, and fixing the beginning of the Canal Grade from a 900-foot dam at an elevation of 1980 feet.

From this elevation of 1980 feet, Mr. E. L. Stam, associated

engineer with G. W. Sturtevant in the location of the Highline Canal, has traced upon the map which is submitted herewith what he considers to be the contour lines of this canal. He estimates the distance from the dam to Yucca to be approximately 180 miles.

At this damsite, a low water surface elevation of 1260 and a dam elevation of 620 feet with a grade elevation of 1868, the Arizona Engineering Commission has shown on the map filed with its report, a tunnel line of 92 miles, the Williams River Reservoir, the Bouse tunnel and other features which are copied upon the map filed with this report.

This elevation of 1260 feet, being 155 feet higher than the true low water surface, their dam would have to be raised to a height of 775 feet or the grade line lowered from 1868 feet to 1717 feet, and the 92 miles tunnel grade reduced from 4 feet per mile to 2.32 feet per mile in order to accomplish the results shown on this map of the Arizona Engineering Commission, at the Williams River Dam, the Bouse Tunnel and points below.

About one thousand feet above the mouth of Spencer Canyon on the west bank on a solid granite rock ,we established a bench mark of 1145 feet, and in this canyon, about one mile above the mouth of Meriwhitica Canyon, we established on the west bank of the canyon a bench mark of 1806.35 feet on a solid granite rock.

The tunnel line of 66 miles leading from Spencer Canyon at a point about five miles above its mouth and the heavy canal and tunnel lines shown on the map running northwest and southeast from a point near Yucca between the elevations of 1970 and 1640 feet (traced from the contour map made at the State University) were placed on the map by us. The grade of tunnel we fixed at 2.7 feet per mile.

A branch line can be run from Yucca northwest for a distance of about 40 miles with any desired fall in feet per mile. The Highline Canal at Yucca from the line located on the map by Mr. Stam is practically the same elevation as used by us, viz., 1800 feet; the two lines there join and become the same line from that point to the end of our line, about 15 miles north of Phoenix. Ten miles (along the river) above Spencer Canyon is a damsite called Bridge Canyon Damsite, which is considered to be one of the best on the river. Colonel Kelley gives low water elevation on this site as 1207 feet, and a probable limit of height of dam at 800 feet. If a dam of this height is built there it would have an elevation of 2007 feet and from this dam a tunnel for a canal could be run to Spencer Canyon at a distance of about five miles, and the grade line of this canal would there become the same as the grade for a canal from the Spencer Canyon Dam.

In the preparation of the map, which is made a part of this report, we have endeavored to gather and show all the reliable data available. But the most important point known to us is the correct elevation at low water in Colorado River at the mouth of Spencer Canyon, and in order to divert the water from this point a dam 900 feet in height would be necessary to establish a grade line for a canal with a grade elevation of 1980 feet.

We did not run our levels up to Bridge Canyon Damsite, but we believe the elevation of 1207 feet, given by Colonel Kelley, is practically correct, and a dam 800 feet in height at that damsite

would be necessary in order to divert the water through our grade line from Spencer Canyon Dam.

Our map shows the point of diversion of the Parker Gila Valley project, the canal line and the pumping and power plants down to a point below the end of the light house rock tunnel, but is not long enough to include the full area of land possible for irrigation from the project, or the land possible for irrigation from a canal built from either Spencer or Bridge Canyon Dams.

We suggest that the map of the Arizona Engineering Commission be studied in connection with ours.

A highway or railroad can be constructed from some point on the Santa Fe Railroad between Peach Springs and Hackberry to either Spencer Canyon Damsite or Bridge Canyon site, a distance of about 30 miles, with a grade not to exceed 3½ per cent for railroad or 6 per cent for highway; for about 10 miles of this distance would be through an open country easy of construction; the balance of the distance would be heavy canyon construction in solid rock and steep side hill.

From either the Spencer or Bridge Canyon Dams a canal more feasible might be located than those shown on the map.

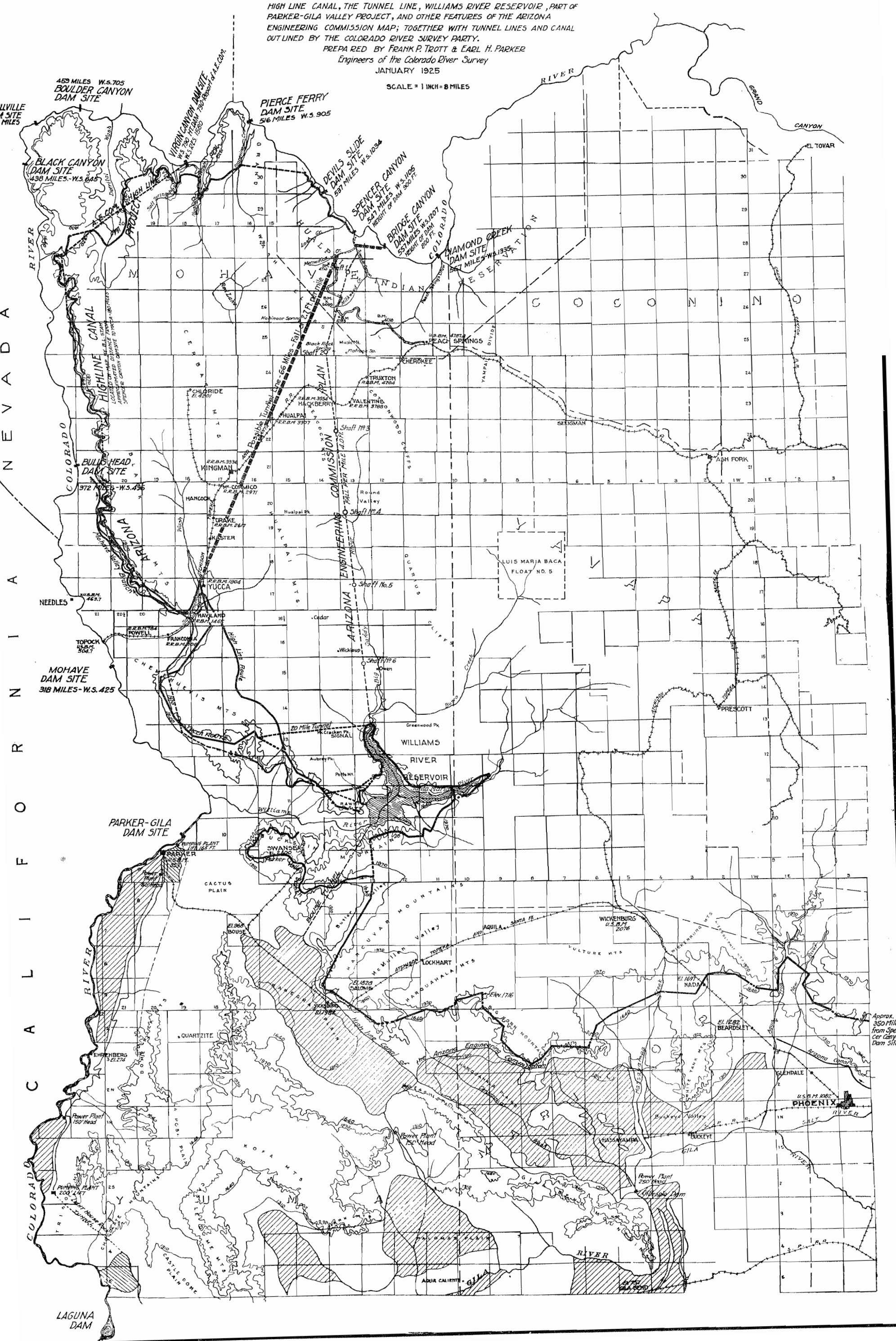
As we have no definite knowledge of the character of rock or soil on the line of any of these proposed locations, we cannot make an estimate of cost of excavation or tunnel work. We also have no definite knowledge of the area of land that lies under any of these lines feasible for irrigation; consequently, we do not recommend the construction of either. However, we are firmly of the opinion that the Bridge Canyon Damsite is the highest site available for irrigation in Arizona, and should the Boulder Canyon Dam be built to an elevation above 600 feet, it would flood this site and all intervening sites and might forever reduce the limit of productive lands in Arizona to a possible area of about eight hundred thousand acres, and having this belief, with the information obtained on this survey and from other reliable sources, we feel it to be our duty to recommend that further investigations for a canal to be diverted from Spencer or Bridge Canyon be made, for if a canal can be feasibly constructed from either dam it will add two or more million acres of productive land to Arizona.

Yours very truly,

FRANK P. TROTT,
EARL H. PARKER,
Engineers of the Colorado River Survey.

MAP
SHOWING
VARIOUS COLORADO RIVER DAM SITES
BETWEEN
DIAMOND CREEK AND YUMA

DISTANCES FROM MOUTH OF COLORADO RIVER AND LOW WATER SURFACE ELEVATIONS ARE SHOWN AT EACH DAM SITE. THE APPROXIMATED LOCATION OF THE HIGH LINE CANAL, THE TUNNEL LINE, WILLIAMS RIVER RESERVOIR, PART OF PARKER-GILA VALLEY PROJECT, AND OTHER FEATURES OF THE ARIZONA ENGINEERING COMMISSION MAP; TOGETHER WITH TUNNEL LINES AND CANAL OUTLINED BY THE COLORADO RIVER SURVEY PARTY.

PREPARED BY FRANK P. TROTT & EARL H. PARKER
Engineers of the Colorado River Survey
JANUARY 1925

SCALE = 1 INCH = 8 MILES