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Notes on the possibilities of domestic water supplies in the area to be irrigated from the Heart Mountain Canal.

Ground water conditions in the area of the Heart Mountain Division of the Shoshone Irrigation Project, Wyoming.

By W. G. Pierce, 1904

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Mr. Charles F. Brannon,
Regional Director,
Farm Security Administration,
Denver, Colorado.

Dear Mr. Brannon:

In further reply to your letter of March 12 (RLO-RP-MLE) requesting such data as the Geological Survey could supply bearing on the development of domestic water supplies in the Heart Mountain Division of the Shoshone Irrigation Project, Wyoming:

A brief report on the ground water conditions in the area of the Heart Mountain Division of the Shoshone project is enclosed for use in connection with your official work on the project. It has been compiled from [illegible] information that is not available for general distribution.

The geologic map accompanying the report shows the distribution of the [illegible] formations; the [illegible] water-bearing formations [illegible] shown by geologic [illegible] and a small sketch map. The [illegible] characteristics of different rock units in the area are briefly summarized in the text.

Mr. Frank C. Foley is in charge of ground water investigations in Wyoming for the Geological Survey. He is located in the office of the [illegible] Water Conservation Commission, Cheyenne. Possibly [illegible] to confer with Mr. Foley regarding the development [illegible] project.

Very truly yours,

W. C. Mendenhall

Director.

G-4/13/42
AAB-PFZ

Enclosure 3706650.
cc: Mrs. Foley (copies of map & rept. included)

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Notes on the possibilities of domestic water supplies in the area to be irrigated from the Heart Mountain Canal

For the purpose of describing their water-bearing properties, the rocks of the area to be irrigated from the Heart Mountain Canal may be divided into two groups — (1) the surficial rocks, which include alluvium, slope wash, and terrace gravel, and (2) "bedrock formations", which include the Wasatch, Fort Union, and all of the underlying and older formations.

Of the surficial rocks, the terrace gravels will probably be the best for yielding water. These gravels are situated on two main benches which are indicated on the map as the Cody and Powell terraces. The Cody terrace is 100 to 150 feet above Shoshone River and in places contains a bench slightly below the main terrace. The Powell terrace is 250 to 300 feet above the river. All of the gravels are unconsolidated and very porous, so that where they are saturated with water they will yield water in wells that penetrate to their base. Where areas [illegible] gravel beds are irrigated under irrigation they will become [illegible] saturated, particularly near the base, so that wells which penetrate to the base of the gravel and are not located too near the edge of the gravel deposit will probably obtain some supplies of water. The water level in wells supplied from the downward percolation of irrigation water will fluctuate widely, becoming much lower in the period when there is no irrigation. The water in such wells is apt to be mineralized, but should become less so as

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time goes on due to circulation of the ground water and consequent flushing out of the soluble minerals in the aquifer. Wells which obtain water from the gravels will be shallow, that is, up to about 75 feet deep.

The material indicated on the accompanying map as slope wash consists predominantly of poorly rounded limestone fragments in a clay and silt matrix. Although the numerous limestone fragments make this material appear quite porous, the movement of ground water through it is probably retarded by the clay and silt matrix. It is commonly 5 to 10 feet thick, but thicknesses of over 20 feet have been observed. In places, such as between Ragmoor and Iron Creek, it may overlie and overlap the Powell terrace gravel. Although it is not indicated on the map, the Cody terrace also is overlain by a thin covering of soil and slope wash. The thickness of this mantle increases from a few feet along the riverward side of the terrace to 20 or 30 feet on the side most distant from the river.

[illegible] has kindly furnished the following data on their well which was dug in 1906 and is on the Cody terrace, in the southwestern part of Tract 85, in sec. 12, T. 53 N., R. 101 W.:

		Feet
Slope wash	Soil and slope wash	0 to 28
Cody terrace gravel	Gravel, small size.	28 " 50
	Gravel, hard, cemented.	50 " 52
	Gravel, small size; water at base . . .	52 " 75
Wasatch formation	Shale with sandstone bed at top (drilled)	75 "100

The water is hard, but otherwise is of good quality. Up to 100 head of stock are said to have been watered here through the winter and the supply through the summer is sufficient for a large dairy herd and garden irrigation. About 1929 the curbing gave way and the well was deepened by drilling from the original depth of 75 feet down to the present depth of 100 feet.

About three years ago, a well was drilled at the CCC Camp which adjoins the Potter ranch on the south. This well was also located on the Cody terrace. In that well soil and slope wash are reported to a depth of 40 feet underlain by gravel. It was drilled to a depth of [illegible] but no water was obtained.

Favorable places for drilling to obtain water from the terrace gravels are where there are intermittent streams that debouch upon the terraces but have not cut a channel down through the gravel to the Shoshone River. Examples of favorable areas of this type are in sec. 1, T. 53 N., R. 101 W., sec. 36, T. 54 N., R. 101 W., and secs. 7 and 8, T. 54 N., R. 100 W.

The [illegible] in most of that part of the Heart Mountain Canal [illegible] lying in T. 53 N., Rs. 101 and 102 W., dip steeply to the northeast. (See cross-section B-B'.) Some of these formations contain hundreds of feet of shale which will not be water-bearing. Consequently, any wells that are to be drilled in these beds should be carefully located with reference to the geology. Two thick shale units in which drilling might be extended for hundreds of feet without encounter-

ing a water-bearing stratum are the Cody shale and the Mowry and Thermopolis shale. The uppermost part of the Cody shale contains some fine-grained, thin-bedded sandstone but the lower 1,500 feet or more of the formation is shale and for the most part will not be water bearing.

Except for the upper 50 feet, the Mowry shale usually will not yield water, and neither will the underlying Thermopolis shale except for the Muddy sand, which is 15 to 35 feet thick and occurs about 200 feet above the base of the formation.

The very limited information now available suggests that for the area northwest of Cody the lower part of the Frontier formation and uppermost part of the Mowry shale may be a favorable water-bearing horizon. Because of the fairly steep dip of the strata, however, the depth to this horizon increases rapidly toward the northeast. On an accompanying small-scale map, areas are indicated where the base of the Frontier is not over 500 feet below the surface, and also where its depth is between 500 and 1,000 feet. Water at this horizon may be mineralized, particularly on the Shoshone anticline where it is associated with oil. [illegible] the State Fish Hatchery, only 7 miles northwest of the [illegible], very pure water issues from springs just below the base of the Frontier formation.

The Sundance, Morrison, and Cloverly formations, which crop out west of Cody, and the Mesaverde, Meeteetse, Lance, and Fort Union formations, which crop out northeast of the Shoshone anticline, all contain several sandstone beds which are sufficiently porous to yield

water, but they all have a steep northeastward dip which carries them to great depths within a short distance laterally.

The area underlain by the Wasatch formation, or the upper part of the Fort Union formation which is similar to it, includes most of T. 54 N., Rs. 100 and 101 W., and T. 55 N., Rs. 100 and 101 W. In marked contrast to the underlying beds the Wasatch is nearly horizontal. It contains a number of lenticular sandstones, some of which may yield water, but their presence can be determined only by drilling. The water is likely to be mineralized.

Dutcher spring, about 2½ miles southwest of Ralston, is reported to have come into existence after the construction of the Garland Canal. It is probably fed by water from the canal.