

GEOLOGIC NOTES ON THE BEAVER-POLE CREEK AND SMITH CREEK DAMSITES
NATRONA COUNTY, WYOMING

General Statement

On April 25, 1962, the writer, upon request of Mr. John T. Goodier, Assistant Director of Water Development, Wyoming Natural Resource Board, made a brief geological examination of two proposed damsites-- one located at the confluence of Beaver and Pole Creeks and the other on Smith Creek. The writer was accompanied by Mr. Goodier during the examination.

General Geology

Rocks cropping out in the general area are the Mowry shale (lowermost beds), Frontier formation, and the overlying Niobrara formation. All are considered to be Late Cretaceous in age. In the general vicinity of both damsites these formations strike north-northwest and dip about eight to ten degrees east-northeast.

Both reservoir and damsite will be located in the Frontier formation which is composed of about 1,170 feet of brown sandstone and black shale. The Wall Creek sandstone member of the Frontier formation, which lies at the top of the Frontier, forms hogback ridges and long dip slopes. The Wall Creek sandstone forms the abutments at both damsites.

Name: - Beaver-Pole Creek site.

Approximate location: - SW $\frac{1}{4}$ sec. 26, T.32 N., R.78 W.

The proposed damsite is located just downstream from the confluence of Beaver and Pole Creeks. At this location both creeks occupy a small valley approximately 250 feet wide (north-northwest-south-southeast direction). Both abutments are approximately 50 feet high (above creek level).

The Wall Creek sandstone crops out at both abutments. This unit strikes N.20° W., and dips 10° NE. (downstream). Approximately 35 to 50 feet of yellowish-gray (fresh surface) fine-to medium-grained cross-bedded moderately hard and fairly well cemented sandstone is exposed here. Bedding planes vary in thickness from a fraction of an inch to as much as six inches. Major joints strike N.80° W. (rudely parallel to the creek) and dip 75° S. Minor joints strike N.10° W. and dip 85° W.

Many cavities are exposed along the outcrop at both abutments. These cavities average about one foot long, six inches wide, and six inches deep. Some, however, are as large as six to eight feet long -- up to one and one-half feet wide -- and up to several feet deep. The cavities are localized along and parallel to the thinner bedding planes and also occur at the intersection of joints with bedding planes.

The depth to bedrock in the valley floor is unknown; however, the small north-flowing tributary to Pole Creek (just west of the Wall Creek sandstone escarpment) was observed flowing on bedrock.

Name: - Smith Creek site.

Approximate location: - NE $\frac{1}{4}$ sec. 35, T.32 N., R.78W.

The proposed damsite is located just downstream from the confluence of Smith and Deer Creeks. At this location both creeks occupy a small valley approximately 200 feet wide (northwest-southeast direction). Both abutments are approximately 70 feet high (above creek level).

The Wall Creek sandstone, which strikes N. 45° W., and dips 8° to 10° NE. (downstream), crops out at both abutments. Here the Wall Creek sandstone is similar to and has the same characteristics as at the Beaver-Pole Creek site; however, these are much more deleterious to the construction of a dam. Many of the bedding planes and the N. 75° E. -striking vertical joints are open, with as much as one inch separation between individual bedding plane or joint surfaces. In addition, many cavities are present, and these are larger and more numerous than at the Beaver-Pole Creek site. Although the Wall Creek sandstone at the abutment location weathers into a bold outcrop, the field examination reveals that it actually is not very resistant to erosion by wind and water.

The depth to bedrock in the valley floor is unknown, but is probably at least ten feet.

Conclusion and Recommendations

Both reservoir basins are entirely within the shales of the Frontier formation. This is considered relatively impermeable despite the downstream dip of these beds.

The construction of a dam at the Smith Creek location is not recommended because of the geological factors mentioned earlier in this report. These observations indicate a good possibility of excessive leakage around and adjacent to the abutments.

The Beaver-Pole Creek site is more favorable from a geological standpoint; however, such factors as joints paralleling drainage, downstream dip of beds, cavities, and the permeability of the sandstone present zones of potential leakage. In view of this, it is desirable to carry out further exploration to determine the feasibility of this project, particularly if the Beaver-Pole Creek site is to be considered further.

The writer recommends at least two diamond drill holes at each abutment drilled to a minimum depth of 100 feet. Core recovery should be as complete as possible, and these cores should be studied with respect to unfavorable aspects, particularly permeability. All holes should be pressure tested for leakage. This may be done by constructing a pressure device consisting of a length of perforated pipe equipped with a rubber packer

at each end. The pipe is secured in the hole by pumping water into the packers. Water is then forced, under a pressure of about 50 pounds per square inch, into the interval between the packers by means of a pump. The hole may be tested in five or ten-foot intervals, or the whole length by removing the plug from the bottom of the pipe. The amount of water pumped into the foundation is measured by reading a water meter placed in the system. These readings should be taken every thirty seconds and recorded carefully.

If the above investigation reveals no excessive seepage, then the writer would recommend that construction of the project proceed.

/s/ William H. Wilson
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Geological Survey of Wyoming
Dated: May 31, 1962

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