REPORT ON THE GEOLOGY OF THE NORTH PINEY CREEK DAM AND RESERVOIR SITE, SUBLETTE COUNTY, WYOMING

January 4, 1932

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On Thursday November 5, 1931, accompanied by Mr. Frank B. Taylor, State Oil & Gas Inspector, I made a survey of the area on North Piney Creek Sublette County, comprising parts of Sections 23 and 24 of Township 31, Range 115, where a dam for impounding irrigation water is proposed to be constructed.

This dam site is located at the mouth of a basin on North Piney Creek on Section 24-31-115 and the topography of the area forms a gorge from the dam site to the point where North Piney Creek flows out of the mountainous area and enters the plains area of the Green River Valley. The mountainous area in this locality is formed by the Wyoming mountain range, and the Darby Fault on the east side of this mountain range caused the placement of the present geology of the area.

The Darby Fault is one of the largest fault planes in the west. In some places it has a throw of 20,000 feet vertically and an overthrust of some 26 miles. The overthrust is from the west to the east. As the pressure of this great overthrust passed over the area now included in the valley of the North Fork of Piney Creek, the strata carried by the fault plane were pressed toward the east with such force that they were moved out and over the top of the strata in situ and assumed a convex form near the end of the overthrust due to their overriding the underlying strata and sliding over same. Accordingly, this action forms a reversal of the

usual system met with upon entering a mountain range by way of one of the streams, and in the North Piney Creek valley, the older strata are first encountered and then the younger as one proceeds westward.

GEOLOGY

The plains valley of the Green River in this area is composed of the Tertiary strata with the Almy formation appearing prominent along the terraces of North Piney Creek. The valley of North Piney Creek, as well as the basin where the proposed dam is to be built, is Quarternary or Recent gravels and alluvials.

On entering the area of the foothills of the Wyoming Range on North Piney Creek, the first formation encountered is probably the Twin Creek which is represented by hard grey limestones that were pushed into a vertical position by the last throes of the forces that projected the overthrust of the Darby Fault. Traveling westward, the Beckwith formation then appears and up the valley, the Bear River, Aspen and Frontier formations may be recognized.

The dam site itself is probably located upon Bear River strata and may be located at the contact of the Beckwith and Bear River formations. In the best exposed sections, the Bear River formation unconformably overlies the Beckwith formation from which it is lithologically distinct and may for the most part be readily separated, although in some places the lower sandstone and calcitic limestone near its base resemble the Beckwith and make it difficult to draw the contact line. Even though these strata may have been shattered to some extent in their movement across

the area of the overthrust, their natural comentation and solidity make for a rather good foundation for a dam.

The area of the basin where this dam is to impound its waters was originally covered by the strata forced by the eastward movement of the Darby Fault. A great deposit of shattered Frontier sandstone and shales was pushed up against the mountain on the north side of the dam site. The stream finally worked a channel through this mass, probably helped therein by a secondary fault plane that enabled the stream to find its way to the plains and into the Green River. Before doing this, however, it appears that this Frontier debris created a natural dam at the narrows located immediately below the site of the proposed dam and, because of the shattered nature of this mass of Frontier formation, the great lake which thereafter formed eventually made this mass of shattered formation quite soft and spongy so that as the lake overflowed the stream eroded out the channel along the fault plane and carried the debris down onto the plains. As the lake receded, the soft mass of formation against the north mountain sloughed back into the valley. This is quite apparent at the present time as is indicated by the various terraces caused by this sloughing of shattered formation into the valley of the creek. Probably at a later period another upheaval in the Cambrian formation to the west caused a great mass of Cambrian shale to move eastward. This shale became disintegrated and shattered and was eventually redeposited in a hill on the south bank of the valley where the dam is to be built.

It is proposed by the engineers, employed by the irrigation district to design and supervise the construction of the dam, that this hill of Cambrian

shale shall be used as principal material in forming the earthen portion of the structure that is to impound the water in this basin. The proposed dam will have a maximum height of sixty feet with a fifty foot head of water and a ten foot freeboard, twenty foot crown, 3:1 slope on the water face, 2:1 slope on the down stream side and is to have an 18" rock rip-rap on the water face. The foundation of the dam is to be further protected by a core wall of puddled material taken from the Cambrian shale hill which will protect the structure and prevent seepage through the shattered Frontier debris on which the north wing of the dam will be located. This puddle trench and core is to be built to solid rock which occurs in the deepest part of the valley at a depth of from forty-seven to forty-nine feet at the dam site.

In going over the dam site, I consider that the Cambrian shale will make an ideal material for the dam as proposed, but the shattered Frontier debris on the north bank may permit an excessive seepage of water since it is already shown that in past ages this Frontier material actually sloughed back into the valley after it had become well soaked with water. If the seepage is found to occur, a revetment of material taken from the Cambrian shale hill may have to be placed on that portion of the north bank through which the sepage occurs. This work need not, however, be done immediately and may never be required because no leakage through the material may be experienced because of the relatively long distance through which the water will have to percolate under the comparatively small head of water occurring at this location, and the shattered material may retain the water as it is intended to do without the necessity of placing this revetment.

The Frontier material occurring on the north side of the creek at the dam site should not be used in the construction of the dam inasmuch as it is quite evident that this material will be subject to sloughing movements when wet, as has already been shown in the sloughed terraces which occurred in the past on the side of the mountain almost to its top.

In my opinion, the major fault which exists in the valley is located far south of the dam site and will not be an element of weakness nor a source of danger to the structure. Even though a minor fault be discovered in the bedrock during the excavation of the puddle trench, I am of the opinion that this also will not be found to be an element of weakness which might contribute to the destruction of the dam. From all apparent surface indications, I believe the dam as proposed to be constructed will be safe with a minimum leakage of water from the reservoir.

Respectfully submitted,

JGM:B

(Signed) John G. Marzel,

State Geologist