

January 7, 1960

Mr Charles Kennedy  
U. S. Fish and Wildlife Service  
209 Grand Avenue  
Laramie, Wyoming

Dear Mr. Kennedy:

Mr. William H. Wilson, Assistant State Geologist, and myself, in your company, recently made an examination of the Hutton Lake Waterfowl Refuge in respect to the possibility of the development of ground water supplies adequate to irrigate a small tract of land on the refuge.

Attached hereto is a geological sketch map made by plotting the geology as observed in the field on an air photo which covers the subject area. It can be noted that the Cloverly formation trends northwestward between Hutton Lake and the small lake to the west of it. This formation, composed mainly of sandstone, is inclined in a northeast direction at an angle of  $60^\circ$  from the horizontal. Just southwest of Creighton Lake the Cloverly sandstones bend around and from that point, trend in a southerly direction and are inclined to the west at an angle of about  $15^\circ$ . This structure constitutes an asymmetric anticline whose crest has been eroded so that the sandstones crop out on either flank. The anticline plunges to the northwest, so that younger and younger beds lie along its axis to the southeast.

Ground water possibilities seem to be of two sorts. The first would be a shallow well, less than 200 feet deep, which would probably furnish a fair supply of water on the pump. The second possibility lies in a deep well, perhaps 1,000 feet deep, which would probably yield a much larger supply of water. At this time, major attention was given to the possibility of drilling a shallow well.

The Cloverly formation, as seen at the outcrop adjacent to Hutton Lake and as the formation is defined in this report, has at its top a soft porous sandstone which approximates or exceeds 50 feet in thickness (Muddy sandstone). Next below is a 30-foot dark shale (Thermopolis shale), and the lower part of the unit is principally sandstones which aggregate nearly 100 feet in thickness. The lower part of this basal sandstone is well exposed and is porous sandstone and conglomerate. These beds are not so well exposed on the west flank of the anticline but form a north-south ridge, marked Cloverly sandstone on the map, west of Hutton Lake.

The outcrop of the sandstones on the west flank of the anticline is crossed by the drainage of Sand Creek, which would allow the entry of surface waters into the sandstones. It is believed that a shallow well, drilled to a depth of 175 to 200 feet, immediately west of the Cloverly ridge, at or near the point indicated as a proposed well location, should yield enough water from the Cloverly sandstones to irrigate 10 or more acres of the relatively flat land west of the ridge. It is believed, also, that

this water would be of suitable quality to serve for irrigation of crops.

A deep well in this area should be drilled to the Casper sandstone, which probably lies at a depth of about 1,000 feet at the point marked "Deep test location" on the map. A well drilled to this formation would likely yield a good supply of water. It should be pointed out that it would not be economical to drill a deep well at the point selected for the shallow well, since the depth to the Casper sandstone at the shallow well location would be considerably greater than at the deep well location, perhaps as much as 500 feet.

In summary, it would appear best to first drill a shallow well, and if this venture were successful, to drill a deeper well later. There is no way of forecasting how much water could be developed at the shallow-well site, and such drilling would necessarily have to be classed as explorational and as the first step in determining the possibility of developing ground water supplies in the refuge.

Yours truly,  
ORIGINAL SIGNED  
HORACE D. THOMAS

Horace D. Thomas  
State Geologist

HDT:dc  
Enclosure

