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January 2010

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Potential Well Construction at the Cut Bank Ranger Station

Water for the Cut Bank ranger station is supplied by diversion of surface water from an unnamed creek that flows into the main valley of the North Fork of Cut Bank Creek a short distance west of the ranger station. The diversion is about 900 feet up the creek from the ranger station. This report investigates the potential for replacing the surface water diversion with a well.

Hydrogeology

The bedrock underlying the ranger station and surrounding area is Cretaceous shale. It has very low permeability and is unlikely to yield water to a well. Drilling into the shale would be a waste of money.

Pleistocene glaciation widened and smoothed the valley, giving it the typical u-shape of a glaciated valley. The glaciers left behind sediments which are thickest near the middle of the valley. In the time since the last retreat of the glaciers, streams have reworked the glacial sediments in the bottom of the valley. This reworking causes some sorting of sand and gravel and flushes much of the fine-grained silt and clay downstream. These processes result in a permeable sand and gravel aquifer underlying the valley.

Additionally, tributary streams drop much of their sand and gravel sediment load as they enter the main valley. The tributary streams are steep and flow at high velocity coming down their valleys. When these tributaries enter the main valley, the gradient lessens, flow velocity decreases, and the sand and gravel sediments are deposited, forming a delta or fan at the mouth of the tributary canyons.

The thickest deposits of coarse-grained sediments are likely to be found along the midline of the main valley and/or at the intersection of tributaries and the main valley. Well drilling is more likely to be successful in these environments.

Previous studies

Don Coffin, of the USGS, investigated the Cut Bank area in 1968 and recommended construction of a test well about 200 feet southwest of the ranger station. A well at that location would penetrate the sediments deposited in the alluvial fan at the mouth of the tributary stream and the underlying glacial sediments in the main valley.

The sedimentary geology at the campground is similar to the ranger station, except that the campground is farther from the mouth of the tributary canyon so the alluvial fan sediments are probably not as thick. However, the campground is closer to the center of the main valley where

glacial deposits and sediments deposited by the North Fork of Cut Bank Creek should be thickest.

A well was constructed at the campground in 1975. The well is 90 feet deep and was completed in sand and gravel sediments from 50-90 feet. There was no indication that the well reached the underlying shale bedrock. It was thought that the well could easily produce 50 gpm.

In 1978, Arnold Boettcher of the USGS conducted another site investigation and recommended that a well should be drilled west of the ranger station (between the ranger station and the creek).

In 1981, a test well was drilled 200 feet east of the ranger station. The well was drilled through glacial sediments from 0-37 feet and then shale bedrock from 37-240 feet. The well did not produce water and it was filled and abandoned. If the well was indeed located 200 feet east of the ranger station, then it was near the margin of the main valley and not aligned with the tributary valley. It comes as no surprise that a well at that location didn't produce water.

[It is somewhat difficult to comprehend that the well was constructed east of the ranger station after two geologists made recommendations to locate the well west of the ranger station. But unless there's someone at the park who would remember the drilling of the test well, we'll need to assume that it was located east of the ranger station. However, it's entirely understandable that someone could have subsequently interchanged east and west in a dyslexic moment and that the well actually was drilled west of the ranger station.]

Recommendations

If a well is desired to provide water for the ranger station, it could be located between the building and the creek; toward the road to take advantage of presumably thicker sediment deposits. The location might need to be changed depending on the location of the septic leachfield. If the leachfield is on the east side of the house, the proposed location is good. If the leachfield is on the west side of the house, then maybe the well site should be moved farther west; to the west side of the creek.

Montana requires additional testing of public supply wells if they are within 200 feet of a stream and the screened interval is less than 50 feet deep to determine if water from the well is "under the direct influence of surface water." If the well is used only to supply water to the ranger station, then it isn't a public water supply and is not subject to those regulations. In that case we wouldn't need to be as concerned about proximity to the creek. However, we would still need to construct the well to minimize the potential for interaction with surface water in the creek and maybe some extra testing would be warranted to determine that the water supply is safe.

Depending on how the house is plumbed and how the water will be used, another alternative might be to continue to use water diverted from the creek for toilet flushing and haul water from the campground well for drinking and cooking.

If a new well is constructed, drilling should stop when the black shale is encountered. There's no point in drilling into the impermeable bedrock. Depth to the black shale bedrock will probably be less than 100 feet.

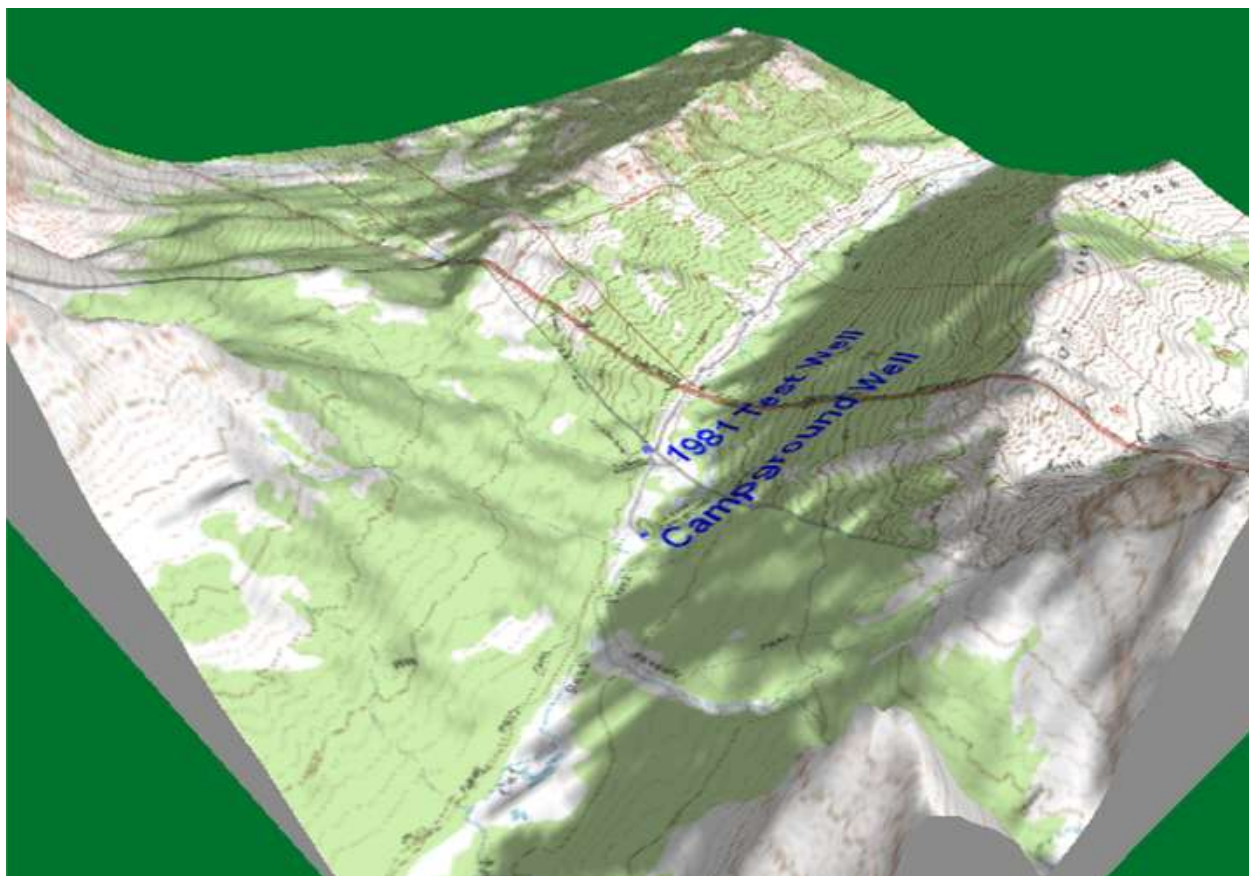


Figure 1. Three-dimensional view in the area of the Cut Bank ranger station and campground showing the U-shaped valley. View is northeasterly.



Figure 2. Proposed well location.

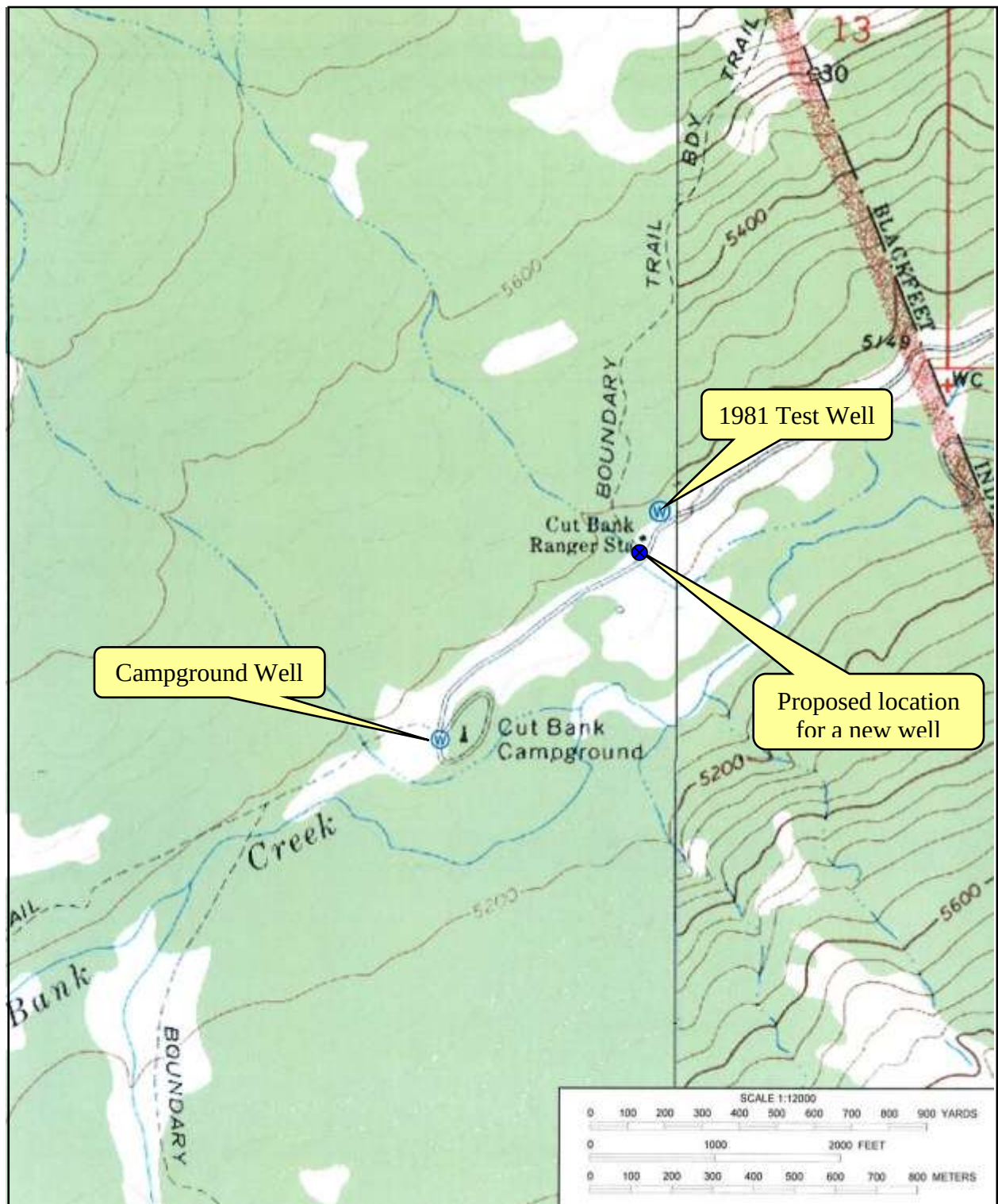


Figure 3. Well locations at Cut Bank