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Potential locations for a new water-supply well for the Fish Creek Campground

The existing water-supply well at the Fish Creek Campground was constructed in 1979. The well is located about 35 feet west of Fish Creek and 150 feet north of Lake MacDonald (Figure 1). The well is 95 feet deep and has well screen in the interval from 80-95 feet below surface. The well is completed in a gravel layer at that depth.



Figure 1. Location of existing well at Fish Creek Campground.

Because of the proximity to the creek and shallow depth to water, the well failed the Preliminary Assessment for determination of Groundwater Under the Direct Influence of Surface Water (GWUDISW) by Montana DEQ. Additional testing will be required to evaluate the connectivity

of water pumped from the well with surface water in the nearby creek. The park is further concerned about the proximity of the well to the creek and the potential for streambank erosion to allow the creek to move even closer to the well. Therefore, the park would like to investigate the potential for constructing a new well at a location where it will not be classified as GWUDISW.

Hydrogeology

A portion of the geologic map of the park showing the area surrounding the Fish Creek Campground is shown in Figure 2. The pink areas northwest and southeast of the campground are bedrock outcrops. The bedrock formations are part of the Belt Supergroup; a sequence of sedimentary rocks that have undergone slight metamorphosis. The rocks were originally sandstone, shale, and limestone. After undergoing some metamorphism, they are now quartzite, argillite, and marble. The water-potential of bedrock formations in this area is largely unknown. There are few wells, if any, that obtain water from bedrock. Most development, and thus most wells, is located in the river valleys where shallow wells obtain an abundant supply of water from the alluvial sediments.

Roubideau Springs is the source of water for NPS facilities at Headquarters and the Apgar area. The spring is associated with a fault zone in the bedrock formations. The fault zone acts as the collection system for groundwater in the bedrock. The quantity and consistency of flow at Roubideau Spring is evidence that groundwater is probably available in the bedrock formations; a bedrock well might be a feasible solution.

Most of the area on the west side of Lake MacDonald is covered by glacial till. It is shown on the geologic map as a yellow-shaded area with blue dots. Till is the unsorted sediments left after the melting of the glacial ice sheets. These sediments were dispersed throughout the glacial ice. As the ice melted, the sand, gravel, silt, clay, and boulders settled down to cover the land as a blanket. Because this material was not reworked or sorted by running water, it remains as a mix of sediments ranging from clay to boulders. The inclusion of clay and silt reduces the permeability of the till, making it a poor source of groundwater for wells. Whether the till in this area contains a lot or a little clay and silt in this area is unknown. The thickness of glacial till and its suitability as an aquifer in the vicinity of the campground is unknown. The Montana Groundwater Information Center has records for two wells among the cabins at the southwest shore of Lake MacDonald. These wells are about a mile southwest of the Fish Creek Campground and close to the lake. Both wells are 50-60 feet deep and produce 40-50 gpm from sand and gravel layers. These wells may be representative of conditions that will be encountered when drilling into glacial till, or they may be more representative of sediments that have been deposited by running water associated with Lake MacDonald or MacDonald Creek.

There is a small area at the mouth of Fish Creek, where it enters Lake MacDonald, that is mapped as an alluvial fan (solid yellow color). This is the delta of Fish Creek. The sediments in this area have been deposited by running water. Most of the clay and silt portion of the sediment load was probably transported further out into the Lake before settling out. Only the coarse fraction of the sediment load, the sand and gravel, was deposited in the delta; creating a very

permeable aquifer of limited extent. The current well at Fish Creek Campground is completed in this aquifer.

Potential sites for a new well

There are three prime objectives in selecting a site for a new well.

1. Likely to obtain a sufficient amount of good-quality water.
2. Avoid locations where a well is likely to be classified as GWUDISW.
3. Resolve the issues of chlorine contact time for the water system.

The current water system pumps water from the well and adds chlorine for disinfection. The water then continues to the distribution system in the campground and to the storage tank about a half mile northwest of the campground. The main water line transporting water to the storage tank also distributes water to the campground. During high-use periods, water flows to points-of-use within the campground within a short time of leaving the chlorinator building. The chlorine contact time may be inadequate for disinfection. The problem could be corrected by installing a separate feed line from the well to the storage tank and a return line from the storage tank to the distribution system. That would require at least a half mile of new water main between the well and storage tank. The second alternative to resolving this issue is to construct a well near the storage tank and move the water treatment to that area.

The current well location is the optimal site for construction of a well if we are only concerned with obtaining a large supply of water. The proximity of the current well to the creek and lake make it susceptible to contamination from surface-water sources. An alternative location could be selected that provides the minimum 250-foot setback from surface water sources to lessen the potential for classification of the well as GWUDISW. A well site could be selected that is closer than the 250-foot setback, but it would probably require additional testing to determine whether the resulting well was GWUDISW.

A test well could be constructed near the water storage tank. The well would initially penetrate glacial till deposits. The thickness and water-yielding potential of these sediments are unknown as no wells have been drilled in this area. The underlying bedrock might yield water, or it might be essentially impermeable. We won't know until we construct a test well. If a well could be successfully developed near the water storage tank, chlorination could be moved to this area along with a separate feed line to the storage tank. That would resolve the issue of chlorine contact time. A well near the storage tank would almost certainly penetrate through the glacial till and into the underlying bedrock as it's unlikely that the till will be more than a few tens of feet thick.

Recommendations

1. Construct a test well near the water storage tank. If it produces a sufficient amount of good-quality water, complete it as a production well and move the chlorination to that area.

2. Identify potential well site(s) at the Fish Creek Campground that are more than 250 feet from both Fish Creek and Lake MacDonald. Identify potential well sites that are in the area between 100-250 feet from Fish Creek and Lake MacDonald.
3. Do not construct a new well within 100 feet of the creek or lake.

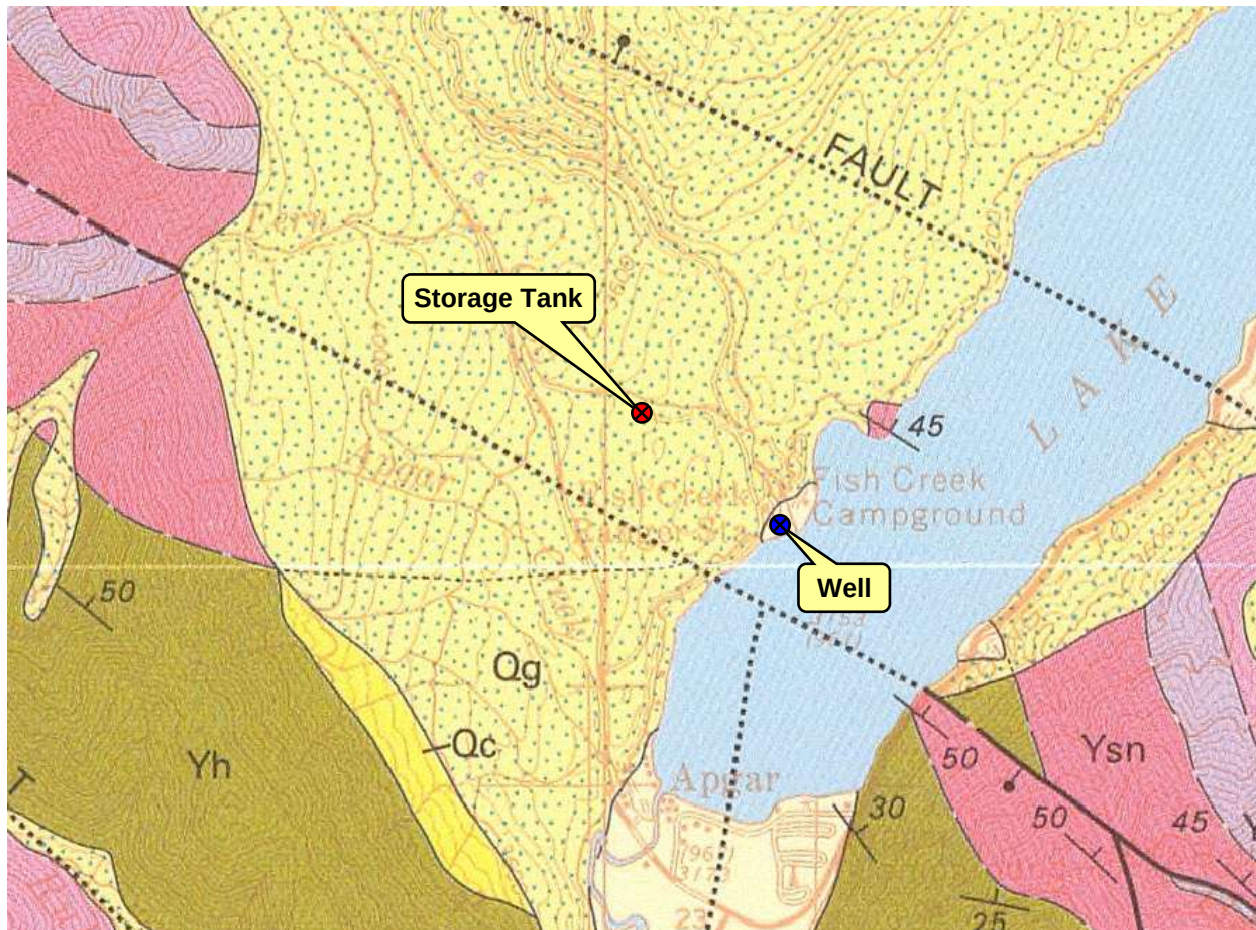


Figure 2. Geologic Map of the Fish Creek Campground Area, from Whipple (1992).

References

- Carrara, P.E., 1990, Surficial geologic map of Glacier National Park, Montana: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1508-D, scale 1:100000.
- Whipple, J.W., 1992, Geologic map of Glacier National Park, Montana: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1508-F, scale 1:100000.