

Hydrogeologic Assessment of the water-supply well at Hawk Creek Campground Lake Roosevelt National Recreation Area

Hawk Creek Campground is at the head of the bay formed in the drowned part of Hawk Creek valley at the southeast side of the sharp bend in Roosevelt Lake. The campground is in the valley just below the waterfall where Hawk Creek drops to lake level. Hawk Creek is 8½ miles south of Ft. Spokane and 23 miles east of Wilbur, WA (Figure 1).

The campground has 21 sites and is open all year long, but the water system is only available seasonally from June to September. The campground does not have flush toilets. The only source of water is from the hand pump on the well. Water from the well is piped through an iodine treatment system into an underground tank to provide some contact time. Water from the tank is piped back to the discharge spout of the hand pump (Figure 2).



Figure 1. Location of Hawk Creek Campground.

There is an unsigned well completion report in the park files, dated April 1981, for what is apparently the current well. The name of the well drilling company is missing from the report. It is 59 feet deep. The well construction report states that the well was constructed with 6-inch casing to 51 feet. A 6-inch Johnson well screen (0.020" slots) was installed by telescoping with a

2-foot top piece and a 2-foot tailpiece. The well screen is set from 52-57 feet below ground surface. The well was drilled to a total depth of 70 feet, but encountered finer-grained sediments below 61 feet and no water. This well does not appear in the Dept. of Ecology well log database for the surveyed location (T27N-R36E, Section 30). Correspondence from DOH indicated the well has an ID tag of AFA205, but a search of the DOE database for that tag # shows no results.



Figure 2. Hand-pumped well at Hawk Creek campground. Iodine treatment chamber is in a cinder block vault to the right of the well. Normal full-pool shoreline is on the far side of the paved road, 145 feet from the well.

Water use at the campground is estimated to be no more than a couple hundred gallons per day. For example, if usage is 20 gallons per day per campsite, then the total usage would be 420 gallons per day. Pumping from the well is not great enough to induce rapid flow of water from the reservoir to the well. However, park staff have noted in the past that the water level in the well varies with the water level in the reservoir. Thus, it is obvious that groundwater pumped from the well is recharged by lateral infiltration from the reservoir.

The drillers log for the well shows:

brown clayey sand.....	0-13 feet	
w/ gravel water at 15 ft	3-`5 feet	
coarse sand water	25-35 feet	
finer more clayey	35-40 feet	
harder clayey sand, no water.....	40-52 feet	
softer brown sand, water	52-56 feet	(screened interval)
more clayey	56-61 feet	
finer sand, water.....	61-63 feet	
harder clayey sand, no water.....	63-70 feet	

Geology

The campground is in a deep narrow valley cut into basalt. Fine sand and silt overlies basalt bedrock at the campground (Figures 3, 4, and 5). The areal extent of the alluvial sediments at Hawk Creek campground is so small that it is not shown at the scale of the geologic map. Likewise, the depth of the sediments is only a few tens of feet. Basalt of the Columbia River basalt group underlies the alluvial sediments. It is unlikely that there is any groundwater contribution to the shallow alluvial sediments from the surrounding upland areas. Thus the only source of groundwater for the alluvium is lateral infiltration for the reservoir.



Figure 3. GoogleEarth view of the Hawk Creek campground, looking northeast

A schematic geologic cross section through the area is shown in Figure 4. The underlying bedrock in the area is basalt, which likely does not contribute groundwater to the well. The alluvial sand and gravel sediments are only a few tens of feet thick, as evidenced by test drilling in the area in 1967. The areal extent of the alluvial sediments underlying the campground is not great, being about 250 feet by 600 feet. There is no practicable alternative source of water for the campground and no realistic alternative location for a well. Constructing a new well farther from the lake would likely result in the well intersecting an insufficient thickness of saturated alluvium to provide an adequate water supply.

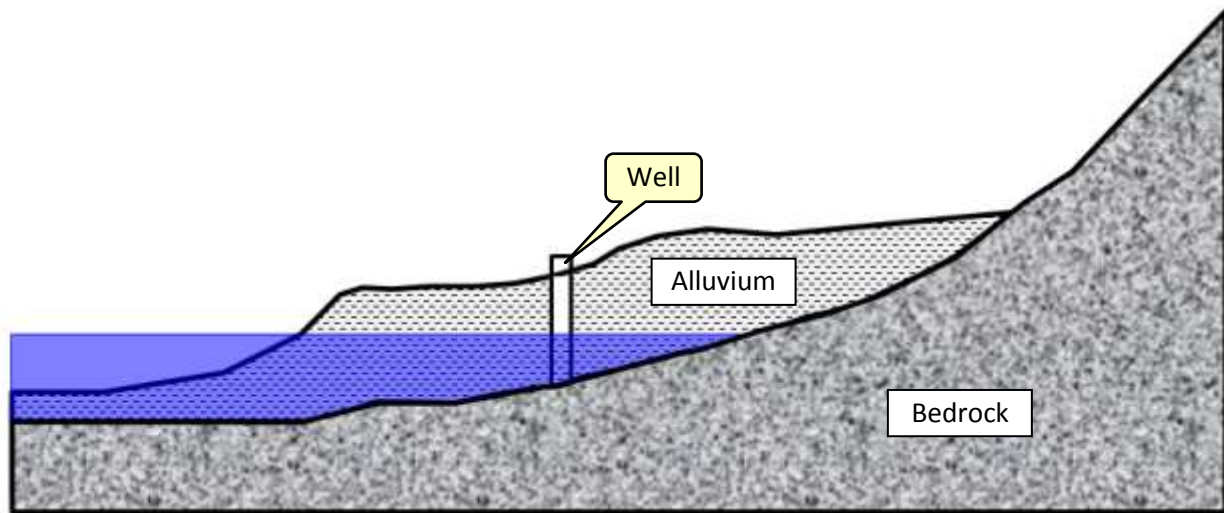


Figure 4. Schematic hydrogeologic cross-section through the Hawk Creek campground.

Geologic formations shown on Figure 5 in the vicinity of Hawk Creek campground include;

- Qa** - Quaternary alluvium
- Qlz** - Quaternary lacustrine clay and/or silt interbedded in sand
- Qls** - Quaternary lacustrine sand
- Tcr** - Tertiary Columbia River Basalt Group

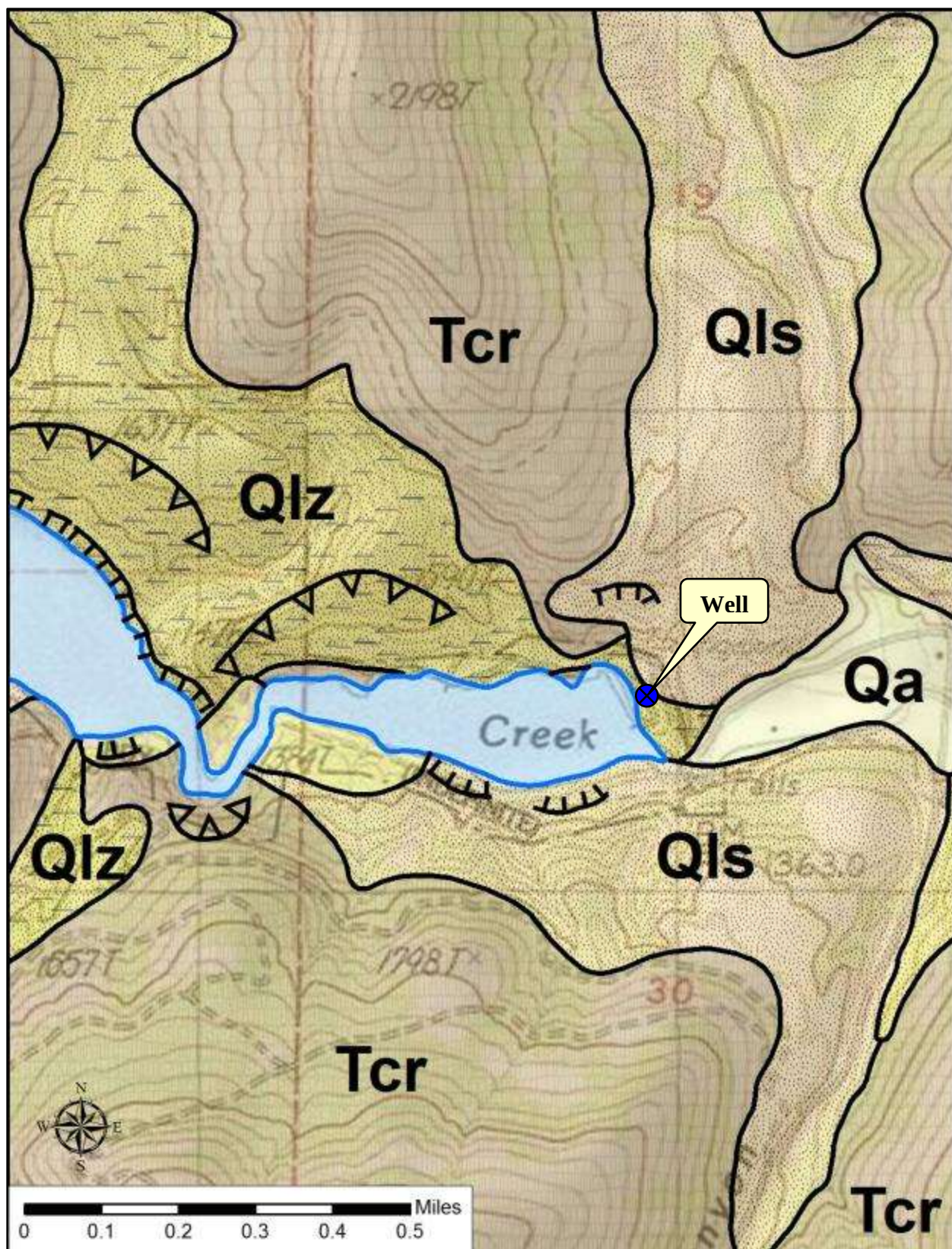


Figure 5. Geologic map of the Hawk Creek area.
From NPS Geologic Resources Inventory Program. (2009).

Previous Drilling and Well Construction

A well (not shown on map) was jetted to a depth of 15 or 20 feet by the National Park Service in 1956, and was abandoned in 1967 because it became contaminated by coliform bacteria.

Three auger holes were drilled during the 1967 USGS investigation (Anderson, 1969). Neither of the first two auger holes bored in the campground in August 1967 penetrated a suitable aquifer. The third hole was cased and perforated between 39 and 43 feet below land surface. The casing filled with silt to the top of the perforations as it was being installed indicating that the zone between 38 and 44 feet contained some silt. The well was developed with compressed air for 3 hours, at which time the water level had risen from 26.94 to 1.56 feet below land surface, indicating improvement in the well capacity. When the well was test pumped at 4 gpm, the drawdown was 21 feet. The small specific capacity of this well indicates that the interstices of the rubble are at least partly filled with silt to the depth of the perforations.

A well was constructed in the area in 1981. This is apparently the current water supply well. The well was drilled to 70 feet, encountering fine-grained sediments in the last 10 feet. The casing was pulled back and the well was completed with 2-inch, No. 20 well screen from 52-57 feet.



Figure 6. Location of test holes at Hawk Springs (1967)

TABLE 7.--Logs of three auger holes at Hawk Creek campground.
Bored by U.S. Geological Survey, 1967

	Thick- ness (feet)	Depth (feet)
<u>Auger hole 1:</u> Altitude 1,301 ft.		
Silt, brown, dry-----	11	11
Sand, fine to medium, silty, wet-----	8	19
Basalt, broken, or cobble gravel-----	--	19+
<u>Auger hole 2:</u> Altitude 1,301 ft.		
Silt, brown, dry-----	8	8
Sand, medium, silty, wet-----	6	14
Gravel, very coarse, wet-----	15	29
Basalt, broken, or cobble gravel-----	--	29+
<u>Auger hole 3:</u> Altitude 1,293 ft; 4-inch casing to 43.8 ft, perforations 39.3-43.3 ft; water level 1.56 ft below land surface, 9-27-67; yield 4 gpm for 1½ hrs, drawdown 21.03 ft.		
Sand and silt, wet-----	8	8
Gravel, very coarse, wet-----	14	22
Silt, sandy, wet-----	6	28
Sand and gravel, silty, wet-----	5	33
Basalt rubble, or very coarse gravel with thin silty layers; low gamma radiation 38-44 ft, and 52-60 ft-----	30	63

Geologic logs of auger holes constructed at Hawk Creek in 1967

Alternative Water Sources for Hawk Creek

The alluvial sediments underlying Hawk Creek campground are of very limited area extent and depth. Groundwater in the alluvial aquifer is most likely recharged by lateral infiltration from the reservoir.

Several adjacent property owners have drilled deep (300-500 feet) into the basalt to obtain a reliable supply of groundwater. The yield that might be obtained from a deep well is uncertain, but would likely be more than sufficient to meet the small demand at the campground.

Groundwater from a properly constructed deep well would alleviate the concerns regarding infiltration of surface water from the reservoir.

Conclusions

Groundwater pumped from the well at Hawk Creek campground is most likely from lateral infiltration of water from the reservoir into the sediments underlying the area. The well is dry when the water level in the reservoir is low, providing a fairly good indication that the reservoir is the source of water for the well. Therefore, we must assume that the water pumped from the well is hydraulically connected with the adjacent surface water. MPA tests should be conducted to determine the degree of filtration that occurs as the water flows from the reservoir to the well.

References

- Anderson, Henry W., 1969, *Water Supplies for Coulee Dam National Recreation Area*, Washington, U.S. Geological Survey Open-File Report OFR-69-8, 141 pp.
- Kiver E.P. and Stradling, D.F., 1995, *Geology of the Franklin D. Roosevelt Reservoir Shoreline: Glacial Geology, Terraces, Landslides, and Lineaments*, report to Bureau of Reclamation (BOR), 148 p., 21 geologic maps, scale 1:24,000 or 1:62,500
- NPS Geologic Resources Inventory Program. 2009. Digital Surficial Geologic Map of the Bangs Mountain quadrangle, Washington (NPS, GRD, GRI, LARO, BAMO digital map). NPS Geologic Resources Inventory Program. Lakewood, CO. Geospatial Dataset-1047534.

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