InterFlow Hydrology, Inc.
Hydrogeology and Water Resources Consulting

MEMORANDUM

To: Mr. Bill Quesnel, PE, Acumen Engineering

Date: June 9, 2018

Regarding: Preliminary Well Location for Sierraville Public Utility District, Sierra County, CA

From: Dwight L. Smith, PG, CHg, Principal Hydrogeologist
CA Certified Hydrogeologist No. 194

Background

Water supply to Sierraville has historically been provided from a spring known as Railroad Spring, which is situated to the south of town approximately 1 mile in the north-central part of Section 25, T20N, R14E (see Figure 1). The spring is developed by a number of subsurface lateral collection trenches with cinder blocks laid to function as tiles to allow infiltration and conveyance of flow to PVC pipelines. Records from 1982 and 1987 indicate 8 branching laterals at the Spring #1 (east) collection area and 3 collection laterals at the Spring #2 (west) collection area (Kuttel, 1982 and 1987). Spring water is conveyed to a pump house and from there to an above-ground storage tank for distribution to the unincorporated town of Sierraville.

Sierraville Public Utility District (Sierraville PUD) is planning to drill a well for water supply improvement. The existing spring source has occasional positive detections of coliform bacteria. In order to cost-effectively connect into the water system, a well near the existing facilities is desired.

Hydrogeologic Review

Potential well locations were reviewed in the field on April 11, 2018. Two general areas were reviewed – one near the water tank and the other near Railroad Spring. The water tank site is on a volcanic rock hill. While the volcanic rocks probably yield water, to develop a high capacity community well, significant water-yielding fractures will need to be encountered. Evidence for this type of fractured rock is not observed in the land surface exposures of the rocks but may be present at depth. Groundwater quality at this location is unknown.

At the eastern base of the water tank hill along Old Truckee Road is a mapped fault by Grose (2000) (see Figure 3) that presents a location of interest in regard to encountering fractures and developing a high capacity well. In my cursory field review, no obvious drilling areas were identified due to slope and road constraints.

Railroad Spring is situated along the regional Mohawk Valley Fault Zone, a series of faults trending in a northwest to southeast direction and forming part of the southern boundary of Sierra Valley (Figure 2). The spring discharges from volcanic rocks of Tertiary age (Grose, 2000), which are concealed by a thin veneer of alluvium and eroded volcanic rock materials. While the local geologic mapping by Grose (2000) does not indicate a mapped fault at the discharge location (Figure 3), the groundwater discharging at the spring is likely associated with flow along the fault zone or intersecting fault zone structures. A potential well site was identified up-gradient of the Spring #1 that has access to a drilling rig and may intersect the higher permeability fractures that are associated with the source of water to the springs (Figure 4).

A successfully drilled well near the Railroad Spring could provide the community of Sierraville with two main enhancements to the water system: protection against coliform bacteria that is occasionally present in the spring source, and a higher level of reliability in yield as compared to the spring source. These enhancements are discussed below.

A well near Railroad Spring has the advantage of likely producing similar water quality as the spring source, but without the potential influences of rapid infiltration of precipitation or runoff that can convey coliform bacteria into the present spring water collection system. A 50-ft sanitary seal for a new well will eliminate, or significantly reduce, the possibility of rapid infiltration events negatively affecting water quality. Additional dissolved minerals could however be encountered at depth in a well, and will need to be reviewed during drilling. The final depth of the well will be determined based both on the volume of water being produced, and observed water quality with depth.

Use of a well near Railroad Spring is expected to capture some of the source of discharge from the springs. However, another advantage of having a well at the spring location is that yield from a well will not be dependent upon climatic variabilities. Spring discharges vary depending on climate and associated water level (pressure head) fluctuations, whereas, deep well yields are not typically affected by similar levels of water level fluctuation. Well yield should be reliable in drought conditions that could otherwise cause significant impacts to available spring flow.

To the extent that a new well near Railroad Spring is successfully drilled, it will also provide water quality improvement to the source of supply to the neighboring LDS camp. The LDS camp also relies upon Railroad Spring, tapping into the Sierraville PUD spring water collection pipeline below the infiltration galleries approximately 400 to 600 ft, at the booster pump. It is envisioned that a new well source will connect into the same water transmission line above the booster pump and up-stream of the LDS lateral. Since a well would not pump continuously, a storage tank or pump control system may be needed to assure sufficient available flow is present in the pipeline when needed by the LDS camp.

Drilling at the Railroad Spring location will encounter andesite volcanic rocks, and should be accomplished using air-rotary drilling methods so that water yield and water quality with depth may be assessed. Drilling plans are to go down to approximately 600 feet, but it may not be necessary to drill to this depth if sufficient water-bearing fracture zones are encountered at a shallower depth.

A common way to approach the drilling is to start with a small diameter test hole to determine potential yield and water quality. If results are favorable, the borehole is reamed open to construct either a test well or production well. A test well would be constructed of low-cost 4 to 6-inch diameter casing sufficient to conduct a multi-day pumping test and to collect water quality samples.

A production well for this size of community would normally be completed using 8-inch diameter casing - sufficient for the size of a submersible pump to be installed to produce up to several hundred gallons per minute. Continuous-slot wire-wrap screen is recommended to provide high inflow efficiency at the fracture zones. Also, for a new municipal well completed in fractured bedrock, longer-duration pumping tests are necessary to determine the sustainable yield – as required by the California Code of Regulations, Title 22, (CCR) Section 64554 "New and Existing Source Capacity". These requirements are for a successfully completed 3-day or 10-day constant rate pumping test, in order to gain source capacity approval for 25% or 50% of the demonstrated well yield, respectively.

References

Grose, T.L.T., 2000, Geologic Map of the Sierraville 15' Quadrangle, Sierra and Plumas Counties, California, California Department of Conservation, Division of Mines and Geology, DMG Open-File Report 2000-24, 1:62,500.

Kenneth D. Schmidt and Associates, 2011, Sierraville PUD Well Project letter, June 9, 2011, prepared for Walters Engineering, 2 pages.

Kuttel, Carl, 1982 and 1987, drawings of the spring collection/diversion systems at Spring #1 and Spring #2, maintenance inspection documentation, Kuttel Construction.

Saucedo, G.J., and Wagner, D.L., 1992, Geologic Map of the Chico Quadrangle: California Division of Mines and Geology Regional Geologic Map Series Map No. 7A, 1:250:000.

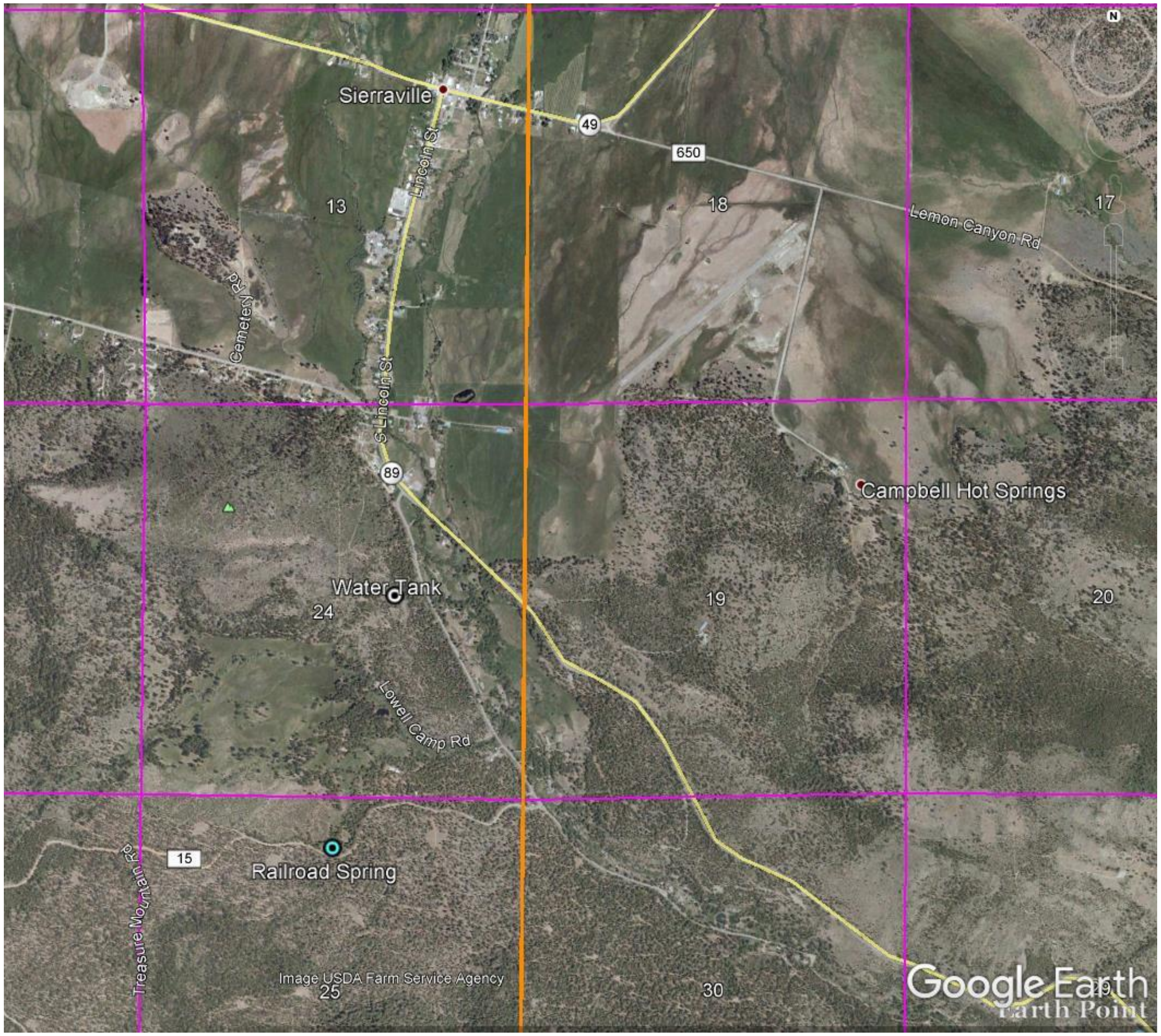

Figure 1 – Location of Railroad Spring, Section 25, T20N, R14E

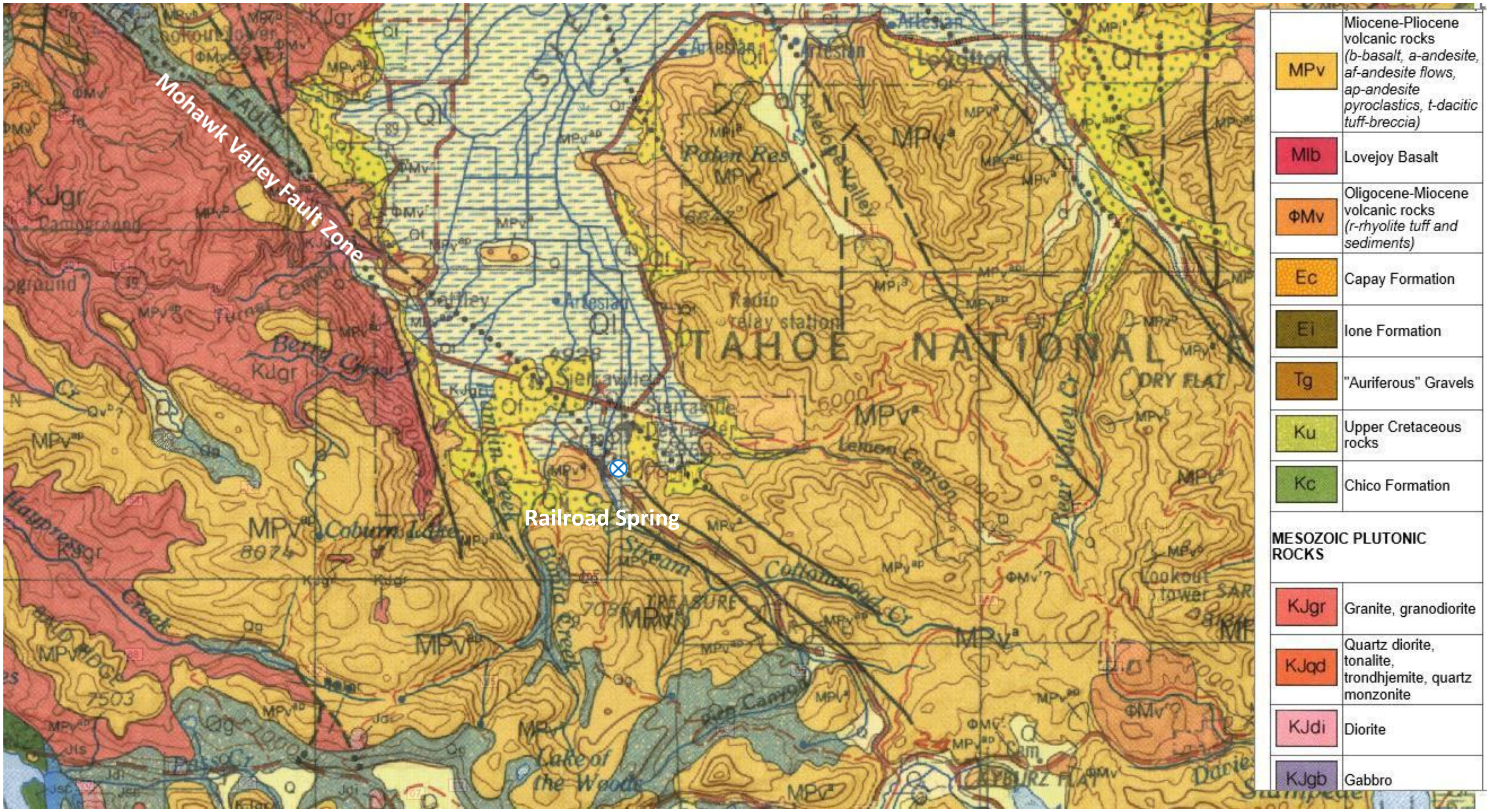

Figure 2 – Regional Geology Map (portion of Saucedo and Wagner, 1992)

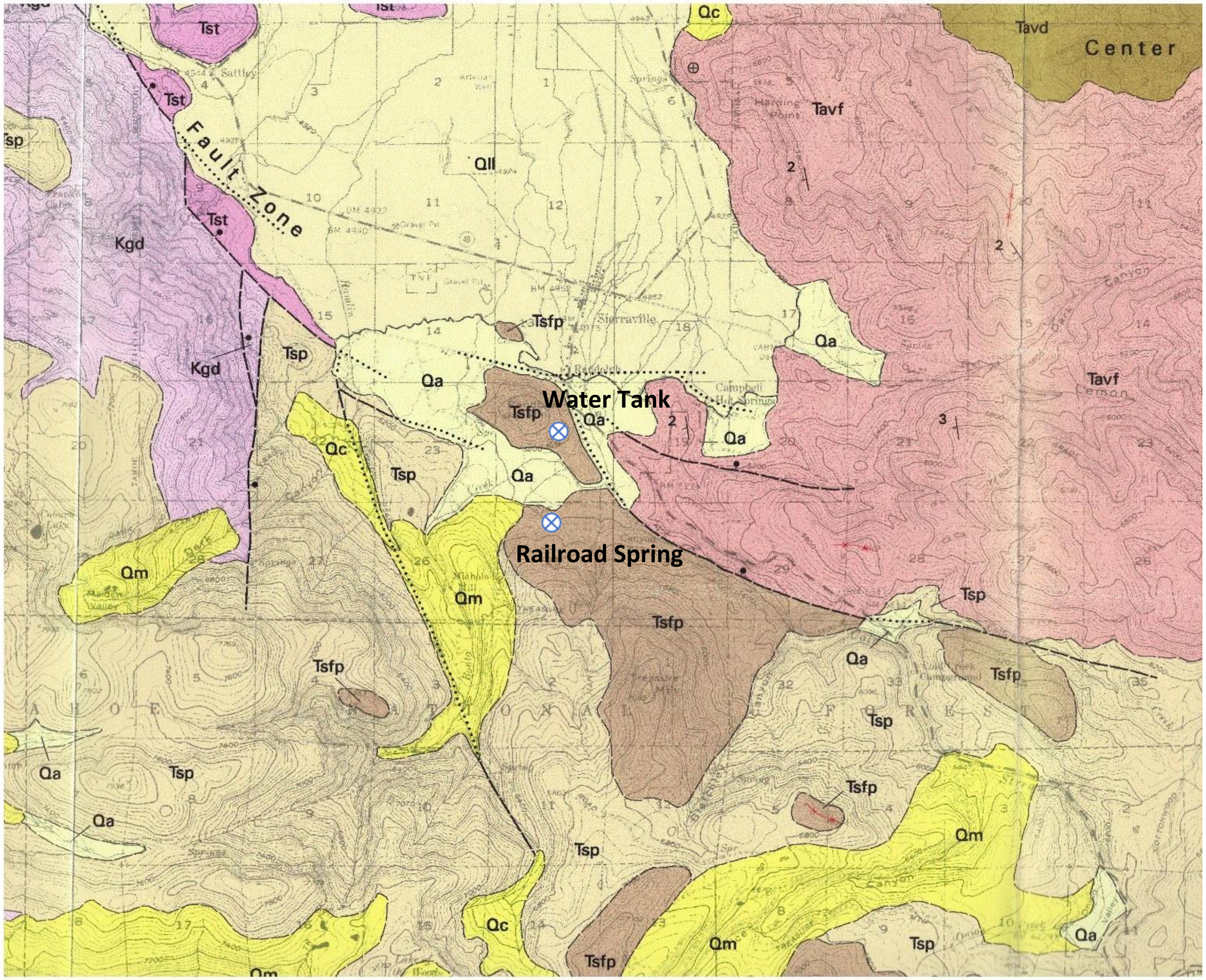

Figure 3 – Local Geology Map (portion of Grose, 2000)

Figure 4: Proposed Well Location, Latitude: 39°33'42.66"N, Longitude: 120°22'17.34"W