



Clearwater Geosciences, LLP
Ground Water Development and Exploration

June 2, 2010

Mr. Neil Schoenenberger
1157 S. Old Hwy 191
Malad City, ID 83252

RE: HYDROLOGICAL ASSESSMENT FOR NEW WATER RIGHTS

Dear Mr. Schoenenberger,

The purpose of this letter is to evaluate if your applications for water rights might have a negative impact on neighboring wells.

Background Hydrogeology

The Schoenenberger property is located near Woodruff, Idaho in Oneida County approximately 2 miles north of the Utah border. This location is within a narrow corridor at the outlet of IDWR Basin Number 15. The surrounding mountains and the geologic faults that formed them are part of the Rocky Mountain Basin and Range Providence. Two major tectonic regimes created the mountains and the separating sedimentary basins. First, thrust faulting foreshortened the geologic section and second, extension created normal faults where the basins were down dropped relative to the mountains. This formed mountains composed of very old rocks with valleys in between filled with younger sediment. To the east of the Schoenenberger property the rocks at the core of the mountains range in age from 65 to 600 million years. Figure 1 shows the general location of the Schoenenberger property, the basin bounding fault to the east and the ancient shoreline of Lake Bonneville.

During the last 10 million years predecessor valleys to the Salt Lake Valley were filled with water creating large inland lakes. Volcanic eruptions at the time formed interlayered beds of volcanic ash, lake sediment and stream deposits which is now called the Salt Lake Formation. Subsequently the Salt Lake Formation was uplifted and is exposed in the mountains to the east. The white ash layer seen to the east of the Schoenenberger property is part of the Salt Lake Formation. The average age of these rocks is about 9½ million years before present. More recently, during the ice ages, the Salt Lake Valley was filled with water forming Lake Bonneville. Waxing and waning of the lake levels created a number of shorelines that can still be seen along the flanks of the valley.

Sixteen well logs for the area were collected from the Idaho Water Resources Department data files. These well logs show variable water bearing capacity for wells in the area depending on the sediment encountered during drilling. No wells were found that produced significant water from the older, deeper rock to the east, thus for the purposes of this study, the water bearing materials forming the aquifer are understood to consist primarily of the sediments filling the valley.

Hydrogeologic Conceptual Model

The black line running more or less northwest to southeast in Figure 1 is the probable location of the fault on the east side of the basin. This line correlates roughly to preliminary geologic mapping by Idaho State University slightly modified based on stereoscopic air photograph analysis performed as part of this investigation. The white line to the east is the very approximate location of the Provo Shore line for Lake Bonneville.



Geologic mapping and drillers well logs indicate that the aquifer in this area is between 2 and 3 miles wide in a narrow corridor (outlet gap) near the southern end of basin 15. The east and west sides of the aquifer are formed by the contact of valley fill sediments with the surrounding mountains.

Figure 2 shows the boundaries of the conceptual model. The black rectangle is approximately 24,000 ft long and 15,000 ft wide. The east and west sides are considered to be no flow boundaries caused by the basin bounding faults on either side of the basin. Ground water is allowed to enter the model domain through the north and south boundaries. Your two points of diversion (POD) are 3000 ft west of the eastern no flow boundary. An observation well is situated 2,300 ft south of the commercial water right (POD_{com}) and a mile south of the irrigation water right (POD_{irr}). The POD_{obs} well represents the approximate location of Richards's wells. These locations and offsets are approximate as the proposed wells have not been drilled, however the locations are sufficiently accurate to represent potential impacts from pumping.

The aquifer thickness is assumed to be 200 ft based on drillers' well logs and geophysical data (Pluhowski, 1969). Inputs were derived from regional studies and textbook values for similar geologic materials. Hydraulic conductivity was assumed to range from 40 ft/day to 200 ft/day based upon review of estimates presented in Burnham et al., 1969 and WGI, 2001. The assumed storage coefficient is 0.0001, which is typical for storage coefficient for confined aquifers (Driscoll, 1986). These aquifer parameters are basically taken from another nearby hydrological evaluations performed by IDWR (see footnote table 1), so the predicted aquifer drawdown will be consistent with IDWR estimates. Other assumptions included a six month pumping duration at 75% of peak diversion (4 cfs) rate for the irrigation water right and a one year pumping duration at 50% of the diversion rate (1 cfs) for the commercial water right.

Predicted Drawdown from Pumping

The U.S. Geological Survey numerical ground water modeling code, MODFLOW, was used to calculate the drawdown. For three different scenarios 1) 15-7259 pumping alone for 365 days, 2) 15-7276 pumping alone for 180 days and 3) both pumping simultaneously for 180 days. The predicted drawdown for the different scenarios and the associated aquifer parameters are presented in Table 1.

Table 1. Drawdown for pumping scenarios as calculated using the MODFLOW groundwater model.

Water Right	Aquifer Transmissivity ¹ (ft ² /day)	Time (days)	Aquifer Storativity	Aquifer Thickness (ft)	Pumping Rate (gpm)	Draw-down POD _{com} (ft)	Draw-down POD _{irr} (ft)	Draw-down POD _{obs} (ft)
15-7259	8,000	365	0.0001	200	225	6.7	2.7	2.4
15-7259	80,000	365	0.0001	200	225	0.67	0.27	0.23
15-7276	8,000	180	0.0001	200	1,350	18.2	50.2	12.5
15-7276	80,000	180	0.0001	200	1,350	1.8	5.0	1.2
both	8,000	180	0.0001	200	1,575	24.9	52.9	14.9
both	80,000	180	0.0001	200	1,575	2.5	5.3	1.5

¹ The aquifer properties including transmissivity and storativity values are the same values as used by the Idaho Department of Water Resources in a hydrological evaluation for a nearby water right, permit 15-7307 (IDWR memo dated September 4, 2009 from Mike McVay to Ernie Carlson).



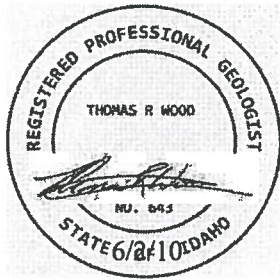
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In summary the worse case scenario is for 15 ft of drawdown at the Richardson(s) well. I think that the drawdown will be less than 15 ft depending on the quality of the water bearing formations tapped by the new wells.

Respectfully,

A handwritten signature in black ink, appearing to read "Thomas R. Wood".

Thomas R. Wood, PhD, PG



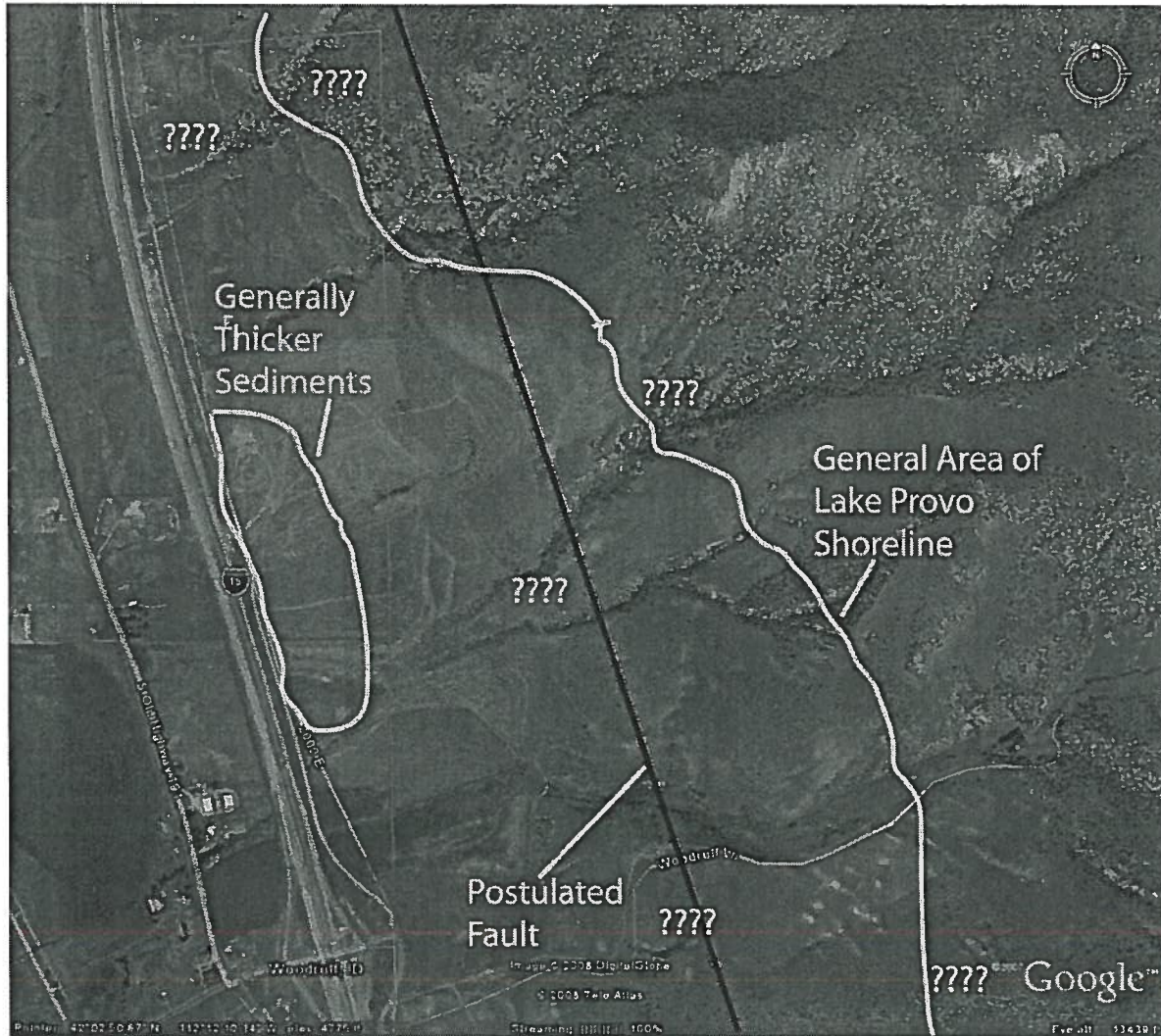


Figure 1 Map of area showing geologic features and trends of the area.



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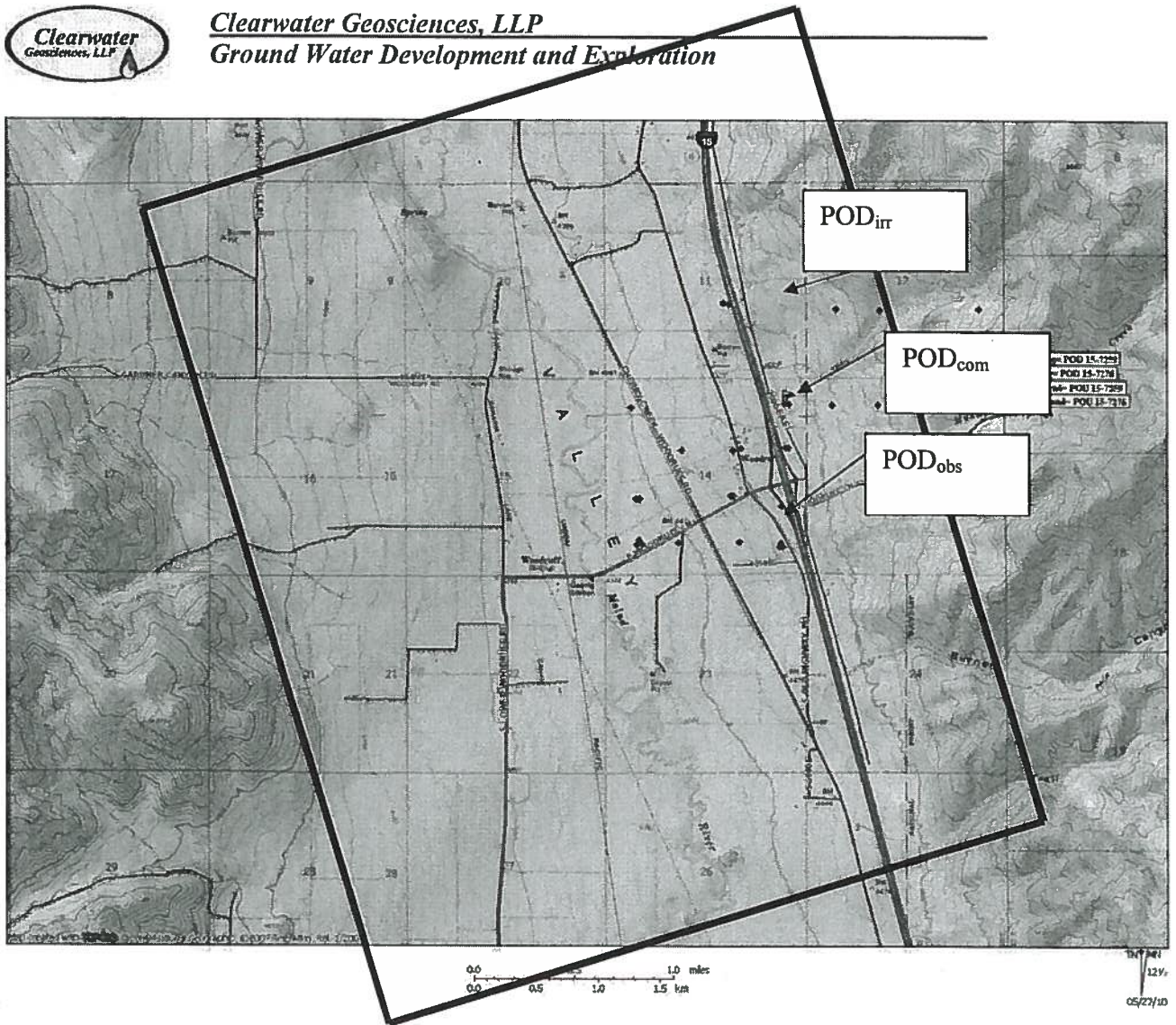


Figure 2 Map showing conceptual model of the area. Black lines are no-flow boundaries (i.e. water cannot enter the model domain). Blue lines are constant head boundaries where water can enter the model domain.