

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date April 7, 2015
 FROM: Groundwater Section Aurora C. Bouchier / Karl C. Wozniak
Reviewer's Name
 SUBJECT: Application G- 17993 Supersedes review of na
Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525. Department staff review groundwater applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. This review is based upon available information and agency policies in place at the time of evaluation.*

A. GENERAL INFORMATION: Applicant's Name: Nelson and Lyle Kuenzi County: Marion

A1. Applicant(s) seek(s) 0.38 cfs (171 gpm) from 3 well(s) in the Willamette Basin,
Molalla-Pudding subbasin Quad Map: Stayton NE

A2. Proposed use Irrigation of 30.5 acres Seasonality: March 1 – October 31

A3. Well and aquifer data (**attach and number logs for existing wells; mark proposed wells as such under logid**):

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
1	MARI 53358	1	Tertiary Marine Bedrock	0.051	T7S/R1W-S18 SE-SE	400' N, 200' W fr SE cor S 18
2	Proposed	2	CRB	0.330	T7S/R1W-S19 NW-NE	975' S, 1475' W fr NE cor S 19
3	Proposed	3	CRB	0.330	T7S/R1W-S19 NE-NE	450' S, 725' W fr NE cor S 19
4						
5						

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
1	225	184	57	6/2/1998	215	0 -- 39	+1 -- 39	-15 -- 215	195 -- 215	23		
2	301				250-400	100 +/-	100 +/-					
3	278				250-400	100 +/-	100 +/-					

Use data from application for proposed wells.

A4. **Comments:** The application requests water from 2 sources: the Tertiary Marine Volcanic and Sedimentary Rock aquifer from existing well MARI 53358 (well 1), and a Columbia River Basalt Group (CRBG) aquifer from 2 proposed wells (wells 2 & 3). Since the application specifies a rate of 23 gpm (0.051 cfs) from MARI 53358, and does not distribute the remaining rate between the proposed basalt wells, this review is based on 23 gpm from well 1 and the remaining rate of 148 gpm (0.330 cfs) from each of wells 2 & 3 (non-distributed).

A5. **Provisions of the Willamette** Basin rules relative to the development, classification and/or management of groundwater hydraulically connected to surface water **are**, or **are not**, activated by this application. (Not all basin rules contain such provisions.)

Comments: The applicant's wells will produce from confined aquifers, so the pertinent rules (OAR 690-502-2040) do not apply.

A6. **Well(s) #** _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction. Name of administrative area: _____
 Comments: _____

B. GROUNDWATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

B1. **Based upon available data**, I have determined that groundwater* for the proposed use:

- a. is over appropriated, is not over appropriated, or **cannot be determined to be** over appropriated during any period of the proposed use. * This finding is limited to the groundwater portion of the over-appropriation determination as prescribed in OAR 690-310-130;
- b. **will not** or **will** likely be available in the amounts requested without injury to prior water rights. * This finding is limited to the groundwater portion of the injury determination as prescribed in OAR 690-310-130;
- c. **will not** or **will** likely to be available within the capacity of the groundwater resource; or
- d. **will, if properly conditioned**, avoid injury to existing groundwater rights or to the groundwater resource:
 - i. The permit should contain condition #(s) Existing well (well 1 – MARI 53358): 7N;
 - i. The permit should contain condition #(s) Basalt wells (wells 2 & 3): 7I, Large water use reporting;
 - ii. The permit should be conditioned as indicated in item 2 below.
 - iii. The permit should contain special condition(s) as indicated in item 3 below;

- B2. a. **Condition** to allow groundwater production from no deeper than _____ ft. below land surface;
- b. **Condition** to allow groundwater production from no shallower than _____ ft. below land surface;
- c. **Condition** to allow groundwater production only from the _____ groundwater reservoir between approximately _____ ft. and _____ ft. below land surface;
- d. **Well reconstruction** is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Groundwater Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): _____

B3. **Special Conditions:**

1. Each basalt well shall be cased and continuously sealed from land surface to a depth of at least 50 feet to preclude hydraulic connection to nearby streams.
2. Each basalt well shall be open to a single aquifer of the Columbia River Basalt Group and shall meet the applicable well construction standards (OAR 690-200 and OAR 690-210). In addition, the open interval in each well shall be no greater than 100 feet. An open interval of greater than 100 feet may be allowed if substantial evidence of a single aquifer completion can be demonstrated to the satisfaction of the Department Hydrogeologists, using information from a video log, downhole flowmeter, water chemistry and temperature, or other downhole geophysical methods. These methods shall characterize the nature of the basalt rock and assess whether water is moving in the borehole. Any discernable movement of water within the well bore when the well is not being pumped shall be assumed as evidence of the presence of multiple aquifers in the open interval. If during well construction, it becomes apparent that the well can be constructed to eliminate interference with hydraulically connected streams in a manner other than specified in this permit, the permittee can contact the Department Hydrogeologist for this permit or the Ground Water/Hydrology Section Manager to request approval of such construction. The request shall be in writing, and shall include a rough well log and a proposed construction design for approval by the Department. The request can be approved only if it is received and reviewed prior to placement of any permanent casing and sealing material. If the request is made after casing and seal are placed, the requested modification will not be approved. If approved, the new well depth and construction specifications will be incorporated into any certificate issued for this permit.
3. A dedicated water-level measuring tube shall be installed in each well. The measuring tube shall meet the standards described in OAR 690-215-0060. When requested, access to the wells shall be provided to Department staff in order to make water-level measurements.

4. The applicant shall coordinate with the driller to ensure that drill cuttings are collected at 10-ft intervals and at changes in formation in each well. A split of each sampled interval shall be provided to the Department.
5. Copies of all geologic and hydrogeologic reports completed for the permittee during the development of the wells, including geophysical well logs and borehole video logs, shall be provided to the Department. Except for borehole video logs, two paper copies, or a single electronic copy, shall be provided of each report. Digital tables of any data shall be provided upon request.

Remarks:

The applicant's proposed basalt wells will produce from one or more water-bearing zones in the Columbia River Basalt Group (CRBG), a series of lava flows with composite thickness around 200 feet in this area (Conlon et al., 2005). Each flow is characterized by a series of internal features, including a thin rubble zone at the contact between flows and a thick, dense, low porosity and low permeability interior zone. In some cases, sedimentary layers were deposited during the time between basalt flow emplacements. A flow top, sedimentary interbed, and flow bottom are collectively referred to as an interflow zone. Unconfined groundwater occurs near the weathered top of the basalts, but most water occurs in interflow zones at the contacts between lava flows. CRBG flow features result in a series of stacked, thin aquifers that are confined by dense flow interiors. The low permeability of the basalt flow interiors usually results in little connection between stacked aquifers, which generally results in tabular aquifers with unique water level heads (Reidel et al., 2002).

Constructing a well that is open to multiple water-bearing zones with distinct water level heads can commingle multiple aquifers. When the pump is off, water migrates through the well bore from an aquifer of higher pressure to an aquifer of lower pressure. Over time, this can depressurize the aquifers and exacerbate water level decline. Well construction conditions are specified to protect the resource and other existing users.

Vertical offset is mapped along the northwest trending normal faults mapped in the vicinity of this well. The faults juxtapose the Silver Falls Basalt of the Frenchman Springs Basalt Member of the Wanapum Basalt Formation against the Sand Hollow Basalt of the Frenchman Springs Basalt Member of the Wanapum Basalt Formation. The Scott Mills Formation (Tertiary marine sediments) is also vertically offset and mapped against the Silver Falls Basalt (Tolan and Beeson, 1999). Vertical offset of CRBG flows can cause juxtaposition of permeable interflows with dense flow interiors, resulting in a low flow boundary at the fault trace. At the subject site, the degree of compartmentalization by faulting is unknown.

Compartmentalization could buffer or delay well-to-well impacts, while also limiting the aquifer extent. The CRBG overlies Tertiary marine sediments, which are typically low-permeability, fractured and consolidated rocks. The unconformity between the marine sediments and the basalts locally limits the thickness and extent of individual CRBG aquifers.

Ground water elevations in the area suggest the water-bearing zone in the applicant's wells may be shared by other groundwater users (see attached hydrographs). Long term trends indicate relatively stable water levels in the immediate area (within 1 mile), with no significant losses in head within the CRBG aquifers at the current level of use. Because the aquifers are confined (storativity is estimated to be 0.0001), pumping impacts will propagate outward at rapid rates and are likely to reach aquifer boundaries (streams, faults, and truncated basalt flow margins) within a few minutes. Using aquifer parameters appropriate for the basalts, it can be shown that the cone of depression from a pumped well will produce measureable impacts at a distance of 1 mile within minutes. Therefore, hydraulic interference with nearby wells, springs, and streams will occur rapidly once pumping begins if nearby streams and wells are connected to the same aquifer that is open in the well. Water levels in relatively nearby (1 - 2 miles) basalt wells show declines ranging from 0 to >30 feet since the mid 1990's (see attached hydrographs and location map) indicating that the resource may be close to being over allocated. It should be noted that the water level record is insufficient to determine long term trends for many of the relatively nearby basalt wells. These wells are not called out on the attached map.

Generally, pumping drawdown effects can be detected at distances of a mile or greater within minutes of turning on a pump in a CRBG aquifer. For these reasons, the potential for the proposed use to interfere with senior groundwater rights, both permitted and exempt, is significant. Additionally, there is uncertainty that the resource can sustain the proposed use. To protect existing users and monitor the resource, the condition 7I (Willamette Basin Basalt Groundwater Condition) is recommended. The 7I decline condition, as stipulated by OAR 690-502-0250, should provide some protection for the resource and for senior users should declines become evident in the future.

C. GROUNDWATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	Tertiary Marine Bedrock	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Columbia River Basalt	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Columbia River Basalt	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Basis for aquifer confinement evaluation: The static water level in MARI 53358 is considerably higher than the first water bearing zone, suggesting that the aquifer is confined.

The Columbia River basalt aquifers are confined by the dense flow zones that restrict vertical movement of groundwater. Nearby CRBG well logs report static water levels above the water-bearing zone, indicating a confined aquifer or series of aquifers.

C2. **690-09-040 (2) (3):** Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
1	1	Pudding River	165	152-195	2590	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	1	Pudding River	~190	152-195	3110	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	1	Pudding River	~190	152-195	2890	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	2	Beaver Creek	165	152-239	3430	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	2	Beaver Creek	~190	152-239	5300	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	2	Beaver Creek	~190	152-239	4400	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Basis for aquifer hydraulic connection evaluation: Local geologic maps indicate that the productive water bearing zones in the basalt wells will have at least 50 ft of very low permeability flow interior between them and the overlying local streams. This should effectively isolate the productive zone from local stream. Predicated on the basalt wells being constructed as specified in section B, we expect no effective hydraulic connection to the local streams.

Water Availability Basin the well(s) are located within: Watershed ID #: 152: Pudding R> Molalla R-ab Howell Prairie

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% natural flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells.** Otherwise same evaluation and limitations apply as in C3a above.

	SW #	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Comments: _____

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	4	%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.													
(B) = 80 % Nat. Q													
(C) = 1 % Nat. Q													
(D) = (A) > (C)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100		%	%	%	%	%	%	%	%	%	%	%	%

Non-Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	%	%	%	%	%	%	%	%	%	%	%	%

Well Q as CFS													
Interference CFS													
(A) = Total Interf.													
(B) = 80 % Nat. Q													
(C) = 1 % Nat. Q													
(D) = (A) > (C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100	%	%	%	%	%	%	%	%	%	%	%	%	%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation: _____

C4b. **690-09-040 (5) (b) The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.**

C5. **If properly conditioned**, the surface water source(s) can be adequately protected from interference, and/or groundwater use under this permit can be regulated if it is found to substantially interfere with surface water:
 i. The permit should contain condition #(s) _____;
 ii. The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions** _____

References Used: _____
Conlon, T.D., Wozniak, K.C., Woodcock, D., Herrera, N.B., Fisher, B.J., Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, Ground-water hydrology of the Willamette Basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5168.
Gannett, M.W. and Caldwell, R., 1998, Geologic framework of the Willamette Lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-A, 32 p.
Reidel, S.P., Johnson, V.G., and Spane, F.A., 2002, Natural gas storage in basalt aquifers of the Columbia Basin, Pacific Northwest USA—A guide to site characterization: Richland, Wash., Pacific Northwest National Laboratory, 277 p.
Tolan, Terry L. and Beeson, Marvin H., 1999, Geologic Map of the Stayton NE 7.5 Minute Quadrangles, Northwest Oregon: A Digital Database: USGS Open File Report 99-141.
Woodward, D.G., Gannett, M.W., and Vaccaro, J.J., 1998, Hydrogeologic framework of the Willamette Lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-B, 82 p.
 US Geological Survey Topographic Quadrangle Maps.
 OWRD water level database, includes reported water levels, accessed March 2015.

D. WELL CONSTRUCTION, OAR 690-200

D1. Well #: _____ Logid: _____

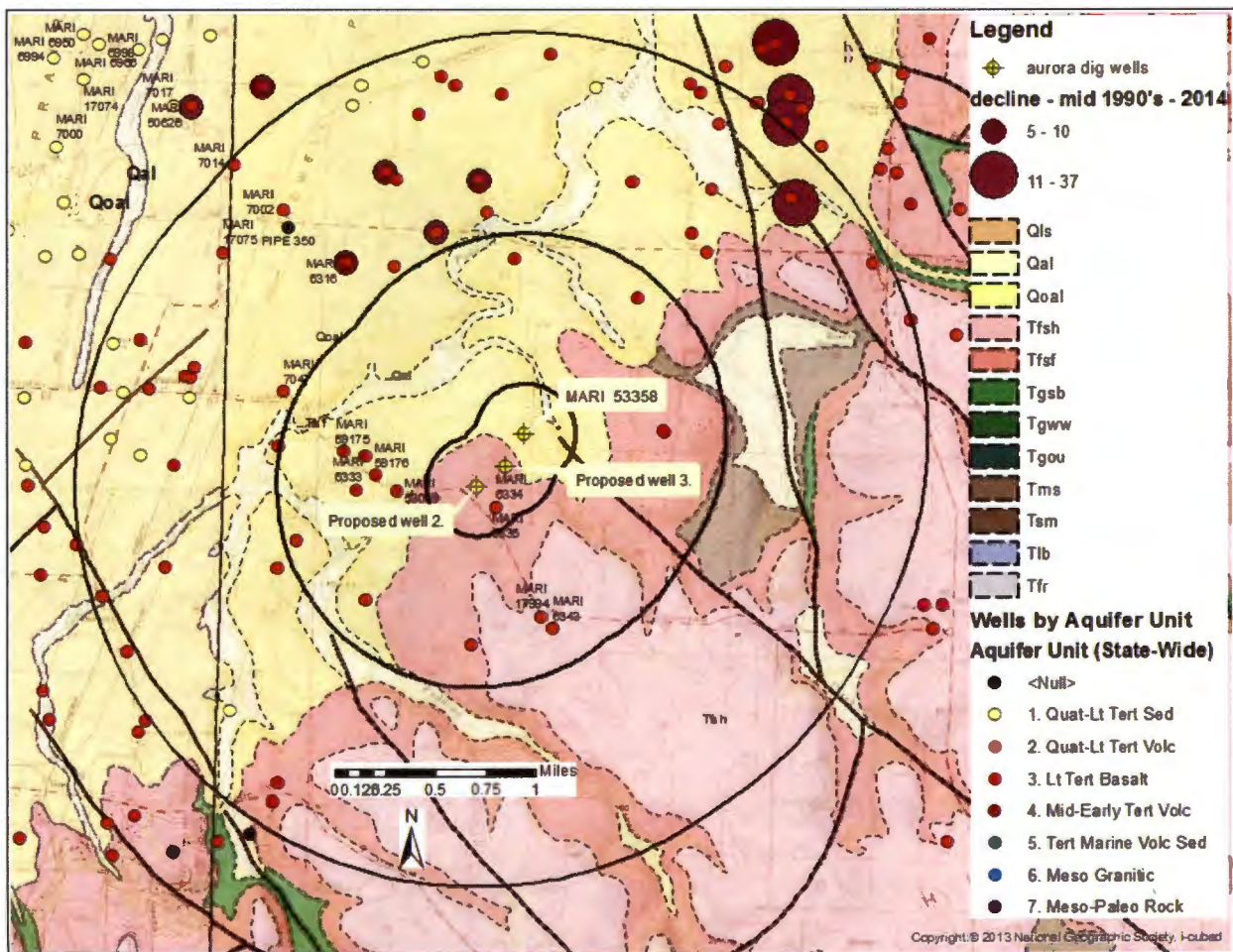
D2. **THE WELL does not appear to meet current well construction standards based upon:**

- a. review of the well log;
- b. field inspection by _____;
- c. report of CWRE _____;
- d. other: (specify) _____

D3. **THE WELL construction deficiency or other comment is described as follows:** _____

D4. Route to the Well Construction and Compliance Section for a review of existing well construction.

Location Map



Water Level Trends

