WATER RESOURCES DEPARTMENT

MEMO **18 June 2015**

TO: **Application G-17985**

FROM: **GW: Gerald H. Grondin**
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES
The source of appropriation is within or above a Scenic Waterway
☒ NO

☐ YES
Use the Scenic Waterway condition (Condition 7J)
☒ NO

☐ Per ORS 390.835, the Groundwater Section is **able** to calculate ground water interference with surface water that contributes to a Scenic Waterway. The calculated interference is distributed below.

☒ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway.**

DISTRIBUTION OF INTERFERENCE
Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is *unable to make a Preponderance of Evidence finding.*

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

TO: Water Rights Section **Date 18 June 2015**

FROM: Ground Water/Hydrology Section **Gerald H. Grondin**
Reviewer's Name

SUBJECT: Application **G-17985** Supersedes review of **N.A.**
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 ground water 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: **Surprise Valley Electrification Corp** County: **Lake**

A1. Applicant(s) seek(s) **0.325 (146 gpm)** cfs from **1** well(s) in the **Goose and Summer Lakes** Basin, **Chewaucan River** sub basin Quad Map: **Paisley**

A2. Proposed use: **General Industrial (235.5 ac-ft/yr)** Seasonality: **Year Round**

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	**LAKE 1628 LAKE 1626 LAKE 52582**	**1 Little Hot**	**Basin Fill Caved-in**	**0.325**	**33S/18E-sec 23 ACD**	***310' N, 1,386' W fr E qtr cor S 23**

* 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	**4465**	**92**	**96.5****	**02/27/14**	**432*****	**0-23**	**0-270**	**+2-300**	**100-240**	**150**	**83**	**P**

Use data from application for proposed wells.

A4. **Comments:**

The proposed maximum pumping rate is 146 gpm (0.325 cfs). The proposed total annual volume is 235.5 acre-feet.

The application notes SVEC will consult with OWRD to resolve the potential for substantial interference finding.

***The metes and bounds location put the well west of the OWRD determined location. The OWRD location agrees with NAIP 2014 imagery.**

****Static water level in the table above was measured by the Lakeview OWRD Watermaster.**

***** Video log indicates well has caved-filled-in from 432 ft depth to bottom of casing (270 ft depth)**

The proposed aquifer is identified as basin fill sediments. The water well report (well log) for LAKE 1628 (original well) and LAKE 1626 (deepening) indicate predominantly basin fill materials with 62 feet of basalt from 298 to 360 feet depth. Hot water was encountered. The temperature was reported as 104 degrees when the well was originally constructed and 175 degrees after the well was deepened. Walker (1963) shows the site in an area mapped as sedimentary deposits (QTs) that are bounded by volcanic and sedimentary rocks (Tvb) to the west and alluvium (Qal) to the east. QTs is described as lacustrine, fluviatile, and Aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel, mostly in pluvial basins that correlates to water laid volcanic deposits of Wells and Peck (1961). Tvb is described as basalt flows. Qal is described as unconsolidated fluviatile gravel, sand, and silt. In places, it can include talus, fanglomerate, lakebed deposits, and wind blown sand.

A5. ☐ **Provisions of the Goose & Summer Lakes** Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☐ **are**, *or* ☒ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: **OAR 690-513-0050 (Chewaucan Subbasin) does not apply. The proposed well and use appear to be within the allowable ground water classifications for the subbasin OAR 690-513-0050 (2).**

A6. ☐ **Well(s) # N.A.** , _____ , _____ , _____ , _____ , tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: _____
Comments: **Currently, no administrative area.**

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

B1. **Based upon available data**, I have determined that ground water* 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 ground water 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 ground water 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 ground water resource; or

d. ☒ **will, if properly conditioned**, avoid injury to existing ground water rights or to the ground water resource:
i. ☒ The permit should contain condition #(s) **7B, 7N, 7P, 7T modified, and other conditions noted**
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 ground water production from no deeper than _____ ft. below land surface;

b. ☐ **Condition** to allow ground water production from no shallower than _____ ft. below land surface;

c. ☐ **Condition** to allow ground water production only from the _____ ground water 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 Ground Water 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. **Ground water availability remarks:**

If a permit is issued, recommend conditions 7B, 7N, 7P, 7T, and the following additional condition.

The water rights "large" permit condition requiring a totalizing flow meter and reporting.

Reports for the Goose and Summer Lakes Basin indicate ground water occurs in alluvium, basin fill sediments, and different basalt units. The water well report (well log) for LAKE 1628 (original well) and LAKE 1626 (deepening) indicate predominantly basin fill materials with 62 feet of basalt from 298 to 360 feet depth. Hot water was encountered. The temperature was reported as 104 degrees Fahrenheit when the well was originally constructed and 175 degrees Fahrenheit after the well was deepened. Since then, the well has caved-filled-in from 432 feet depth to 270 feet depth (bottom of casing). Walker (1963) shows the site in an area mapped as sedimentary deposits (QTs) that are bounded by volcanic and sedimentary rocks (Tvb) to the west and alluvium (Qal) to the east. QTs is described as lacustrine, fluviatile, and Aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel, mostly in pluvial basins that correlates to water laid volcanic deposits of Wells and Peck (1961). Tvb is described as basalt flows. Qal is described as unconsolidated fluviatile gravel, sand, and silt. In places, it can include talus, fanglomerate, lakebed deposits, and wind-blown sand.

The nearest state observation well with long term data is state observation well 374 (well LAKE 1633) completed in basin fill. It is located about 1.8 miles northeast of the proposed POA well LAKE 1628. The ground water level data is from 1963 through 2015. The annual groundwater level trend shows rising water level s from 1965 to 1975, stable levels from 1970 to 1975, and an ongoing decline from 1975 to present. The decline is about 17 feet total. The decline rate varies, but on average, the decline rate is about 0.5 feet annually.

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

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

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Basin Fill**	☐	☒
2		☐	☐
3		☐	☐
4		☐	☐

Basis for aquifer confinement evaluation:

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. This appears consistent with observations Miller (1984 and 1986) made for the Fort Rock Basin and with observations Morgan (1988) made for the Goose Lake subbasin.

The proposed aquifer is identified as basin fill sediments. The water well report (well log) for LAKE 1628 (original well) and LAKE 1626 (deepening) indicate predominantly basin fill materials with 62 feet of basalt from 298 to 360 feet depth. Hot water was encountered. The temperature was reported as 104 degrees when the well was originally constructed and 175 degrees after the well was deepened. Since then, the well has caved-filled-in from 432 feet depth to 270 feet depth (bottom of casing). Walker (1963) shows the site in an area mapped as sedimentary deposits (QTs) that are bounded by volcanic and sedimentary rocks (Tvb) to the west and alluvium (Qal) to the east. QTs is described as lacustrine, fluviatile, and Aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel, mostly in pluvial basins that correlates to water laid volcanic deposits of Wells and Peck (1961). Tvb is described as basalt flows. Qal is described as unconsolidated fluviatile gravel, sand, and silt. In places, it can include talus, fanglomerate, lakebed deposits, and wind blown sand.

Morgan (1988) notes for the Goose Lake subbasin that ground water flow is generally from upland recharge areas to lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows, and streams. Large quantities of ground water move through complexly interbedded, discontinuous, unconsolidated sand, gravel, silt, and clay deposits. Morgan characterizes the upper portion of ground water as unconfined with confined-like conditions increasing with depth. This appears related to anisotropic hydraulic conductivities with horizontal hydraulic conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimated ratios ranged from 2:1 to 179:1. There is no indication of shallower ground water being separated from deeper ground water by a confining layer.

Miller (1984 and 1986) notes the main groundwater reservoir in the Fort Rock Basin occurs as a single flow system under both unconfined and confined conditions. The unconfined-confined variability reflects the permeability variation of the overlying units.

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? YES	NO	ASSUMED	Potential for Subst. Interfer. Assumed? YES	NO
1	**1**	**Chewaucan River**	**4368.5**	**4390**	**950**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation:

The reach of the Chewaucan River closest to the proposed POA (well LAKE 1628) is about 950 feet away and about 4390 feet in elevation. At this location, the river appears to be above the static groundwater level. The river quickly drops in elevation to the static groundwater level at the proposed POA well. The groundwater level appears to slope down to the east. The level in Paisely is about 4345 feet elevation.

Despite appearing anomalous, previous reviews related to this proposed POA well used the driller reported static water level of 120 feet below land surface (4,345 feet elevation) measured on 18 March 1987 as reported on the deepening well log (LAKE 1626). It was the most recent data at the time.

More recent data indicate groundwater at the proposed well is actually higher.

The Lakeview OWRD watermaster measured the groundwater level at the proposed POA well as 96.5 feet below land surface (4,368.5 feet elevation). That is the elevation shown in the table above. That elevation at the Chewaucan River is 2,110 feet (0.40 mile) from the proposed POA well.

In 2015, SVEC submitted a March 2015 groundwater level measurement of 86.97 feet below land surface (4,378.03 feet elevation). That elevation at the Chewaucan River is 1,340 feet (0.254 mile) from the proposed POA well

As previously noted, the groundwater level in Paisely is about 4345 feet elevation. That elevation was used to determine the groundwater-river intercept until better data showing the groundwater potentiometric surface becomes available. The 4345 foot river elevation is about 5,000 feet away from the proposed POA.

Hydraulic connection explanation:

1. The Chewaucan River is a perennial stream.

2. The river quickly drops in elevation to below the groundwater level and intercepts groundwater east of the POA.

Water Availability Basin the well(s) are located within: CHEWAUCAN R > L ABERT – AT MOUTH

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?
1	**1**	☐	☐	**N.A.**	**N.A.**	☐	**32.80**	☐	**28.2**	☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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?
			☐			☐		☐		☐
			☐			☐		☐		☐
			☐			☐		☐		☐

Comments:

The proposed POA well is less than 1-mile from the Chewaucan River, and it is less than 1-mile from where hydraulic connection with the river begins.

The calculated interference with the river at the end of 30 days is greater than 25 percent. The percent interference is independent of the pumping rate (the same for any pumping rate). See condition below to address this issue.

Hunt (1999) was used to calculate the interference with the Chewaucan River. The parameters used were a horizontal hydraulic conductivity of 29.8 feet/day (transmissivity = 26,820 ft2/day based on specific capacity data for LAKE 4448), 0.001 intermediate value for the storage coefficient, a stream width of 50 feet average, a streambed conductivity of 0.30 feet/day (aquifer horizontal conductivity/100), a streambed thickness of 20 feet (a thicker streambed given this is a river), and the distance to the river where hydraulic connection occurs (5,000 feet) rather than the distance to the nearest river reach (950 feet). The aquifer hydraulic parameters are within the ranges found in Morgan (1988) and in Gonthier (1985).

The calculation used the proposed pumping rate of 0.325 cfs (146 gpm). The pumping rate used is inconsequential because the percent interference is independent of the pumping rate (the same for any pumping rate).

PSI Avoidance Condition: "Before a permit is issued, the potential for substantial interference trigger of greater than 25-percent interference at the end of 30 days shall be resolved with the Department's consultation and approval."

In this regard, the application proposes using a transmissivity of 339.88 ft2/day based on the specific capacity data related to the proposed POA well to reduce the calculated interference with the river. Resolving the appropriate transmissivity value will require conducting an aquifer test with one or more observation wells, pumping for 24 hours or longer, and measuring and recording drawdown and recovery data for 24 hours or longer each.

The PSI finding can be offset by a mitigation plan approved by the Department.

The applicant is also considering an agreement with the Town of Paisley to make this proposed groundwater use part of the Town's existing groundwater right, which would make this application moot.

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
		%	%	%	%	%	%	%	%	%	%	%	%
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													
(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:

No calculation, analysis.

The proposed POA well is less than 1-mile from the Chewaucan River, and it is less than 1-mile from where hydraulic connection with the river begins.

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 ground water 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**_____

The proposed well LAKE 1628 is less than 1-mile from the Chewaucan River, and it is less than 1-mile from where hydraulic connection with the river begins.

The proposed groundwater use at the POA well automatically triggers an assumed potential for substantial interference given it is determined to be in hydraulic connection with the Chewaucan River, and the calculated interference with the river at the end of 30 days is greater than 25 percent. The percent interference is independent of the pumping rate (the same for any pumping rate). See condition below to address this issue.

If a permit is issued, recommend conditions 7B, 7N, 7P, 7T, and the following additional condition.

The water rights "large" permit condition requiring a totalizing flow meter and reporting.

PSI Avoidance Condition: "Before a permit is issued, the potential for substantial interference trigger of greater than 25-percent interference at the end of 30 days shall be resolved with the Department's consultation and approval."

General Information:

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. This appears consistent with observations Miller (1984 and 1986) made for the Fort Rock Basin and with observations Morgan (1988) made for the Goose Lake subbasin.

The proposed aquifer is identified as basin fill sediments. The water well report (well log) for LAKE 1628 (original well) and LAKE 1626 (deepening) indicate predominantly basin fill materials with 62 feet of basalt from 298 to 360 feet depth. Hot water was encountered. The temperature was reported as 104 degrees when the well was originally constructed and 175 degrees after the well was deepened. Since then, the well has caved-filled-in from 432 feet depth to 270 feet depth (bottom of casing). Walker (1963) shows the site in an area mapped as sedimentary deposits (QTs) that are bounded by volcanic and sedimentary rocks (Tvb) to the west and alluvium (Qal) to the east. QTs is described as lacustrine, fluviatile, and Aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel, mostly in pluvial basins that correlates to water laid volcanic deposits of Wells and Peck (1961). Tvb is described as basalt flows. Qal is described as unconsolidated fluviatile gravel, sand, and silt. In places, it can include talus, fanglomerate, lakebed deposits, and wind-blown sand.

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Miller (1984 and 1986) notes the main groundwater reservoir in the Fort Rock Basin occurs as a single flow system under both unconfined and confined conditions. The unconfined-confined variability reflects the permeability variation of the overlying units.

References Used:

Davis, Leland, Jill Haizlip, and Sabodh Garg. 2013, Multi-well interference test of the Paisley geothermal reservoir: Geologica, memorandum report dated 19 April 2013, 12 p.

Gonthier, J.B. 1985, A description of aquifer units in eastern Oregon: USGS Water Resources Investigations Report 84-4095, 39 p., 4 plates.

Miller, D.W., 1984, Appraisal of ground-water conditions in the Fort Rock Basin, Lake County, Oregon: Oregon Water Resources Department, Open File Report, 157 p.

Miller, D.W., 1986, Appraisal of ground-water conditions in the Fort Rock Basin, Lake County, Oregon: Oregon Water Resources Department, Ground Water Report No. 31, 196 p and plates.

Morgan, D.S., 1988, Geohydrology and numerical model analysis of ground-water flow in the Goose Lake Basin, Oregon and California: USGS Water Resources Investigations Report 87-4058, 92 p.

Oregon Water Resources Department, 1989, Goose and Summer Lakes Basin report: OWRD Basin Report, 112 p.

Peterson, N.V. and McIntyre, J.R., 1970, The reconnaissance geology and mineral resources of eastern Klamath County and western Lake County, Oregon: DOGAMI Bulletin 66, 70 p.

Peterson, N.V., and Brown, D.E., 1980, Preliminary geology and geothermal resource potential of the Lakeview area, Oregon: DOGAMI Open-File Report O-80-09, 57 p., 1:62,500 maps.

Phillips, K.N. and VanDenburgh, A.S., 1971, Hydrology and geochemistry of Abert, Summer, and Goose Lakes, and other closed-basin lakes in south-central Oregon: USGS Professional Paper 502-B, 86p.

Walker, G.W., 1963, Reconnaissance geologic map of the eastern half of the Klamath Falls (AMS) quadrangle, Lake and Klamath Counties, Oregon: USGS Mineral Investigations Field Studies Map MF-260.

Walker, G.W. and Reppening, C.A., 1965, Reconnaissance geologic map of the Adel quadrangle, Lake, Harney, and Malheur Counties, Oregon: USGS Miscellaneous Geologic Investigations Map I-446.

Waring, G.A., 1908, Geology and water resources of a portion of south-central Oregon: USGS Water Supply Paper 220, 85 p.

Wells, F.G., and Peck, D.L., 1961, Geologic map of Oregon west of the 121st meridian: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-325.

Goose and Summer Lakes Basin Program rules (OAR 690-513).

State Obesrvation Well SOW 374 (well LAKE 1633)

Water well reports for proposed well LAKE 1628 and well LAKE 1626 and LAKE 52582.

USGS Paisley, Oregon quadrangle map (1:24,000)

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #**: _____1_____ **Logid:** _____LAKE 1628/LAKE 1626/LAKE 52582_____

D2. **THE WELL does not 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**:
- a. ☐ constitutes a health threat under Division 200 rules;
- b. ☐ commingles water from more than one ground water reservoir;
- c. ☐ permits the loss of artesian head;
- d. ☐ permits the de-watering of one or more ground water reservoirs;
- e. ☐ other: (specify)

D4. **THE WELL construction deficiency is described as follows:** _____

D5. **THE WELL**
- a. ☐ **was**, *or* ☐ **was not** constructed according to the standards in effect at the time of original construction or most recent modification.
- b. ☐ I don't know if it met standards at the time of construction.

D6. ☒ **Route to the Enforcement Section.**

Well enforcement staff needs to determine whether the well with latest alteration (LAKE 52582) meets well construction standards. The application notes OWRD in July 2014 approved proposed alterations to the well and the alteration was executed in August 2014. This reviewer could not find a copy of the OWRD July 2014 approval in his paper files or e-mail files or electronic files. Perhaps it resides with well enforcement staff or the Lakeview OWRD Watermaster. The alteration was intended to meet the following condition related to file LL-1508: "The POA well shall be reconstructed to meet current well construction standards prior to a permit being issued. Well reconstruction shall be approved by Department well enforcement staff and Department Groundwater Section hydrogeologist."

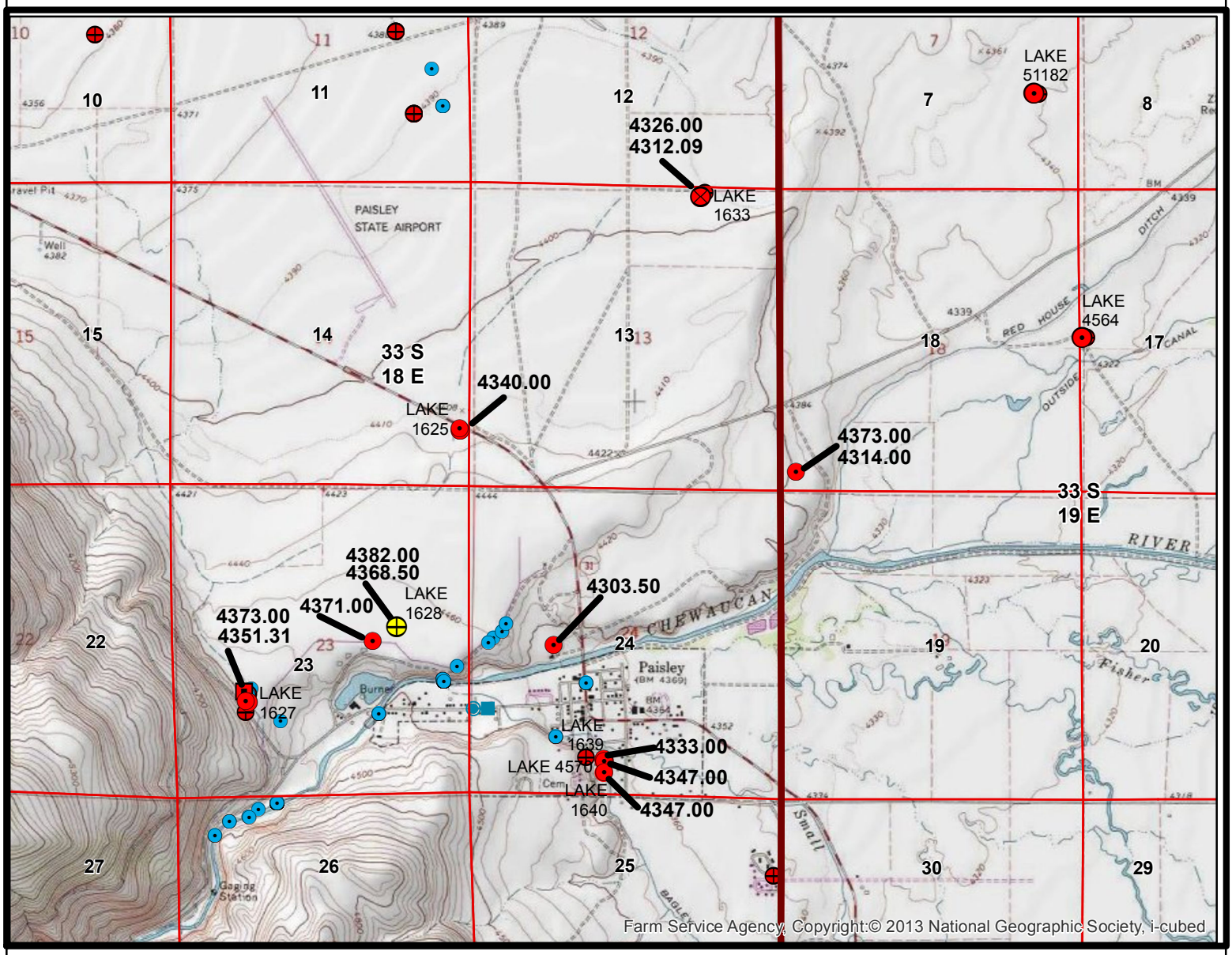
THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

D7. ☐ Well construction deficiency has been corrected by the following actions: _____

_____ _____, 200____.
(Enforcement Section Signature)

D8. ☐ **Route to Water Rights Section (attach well reconstruction logs to this page).**

Groundwater Permit Application G-17985
Surprise Valley Electric



0 0.5 1 2 3

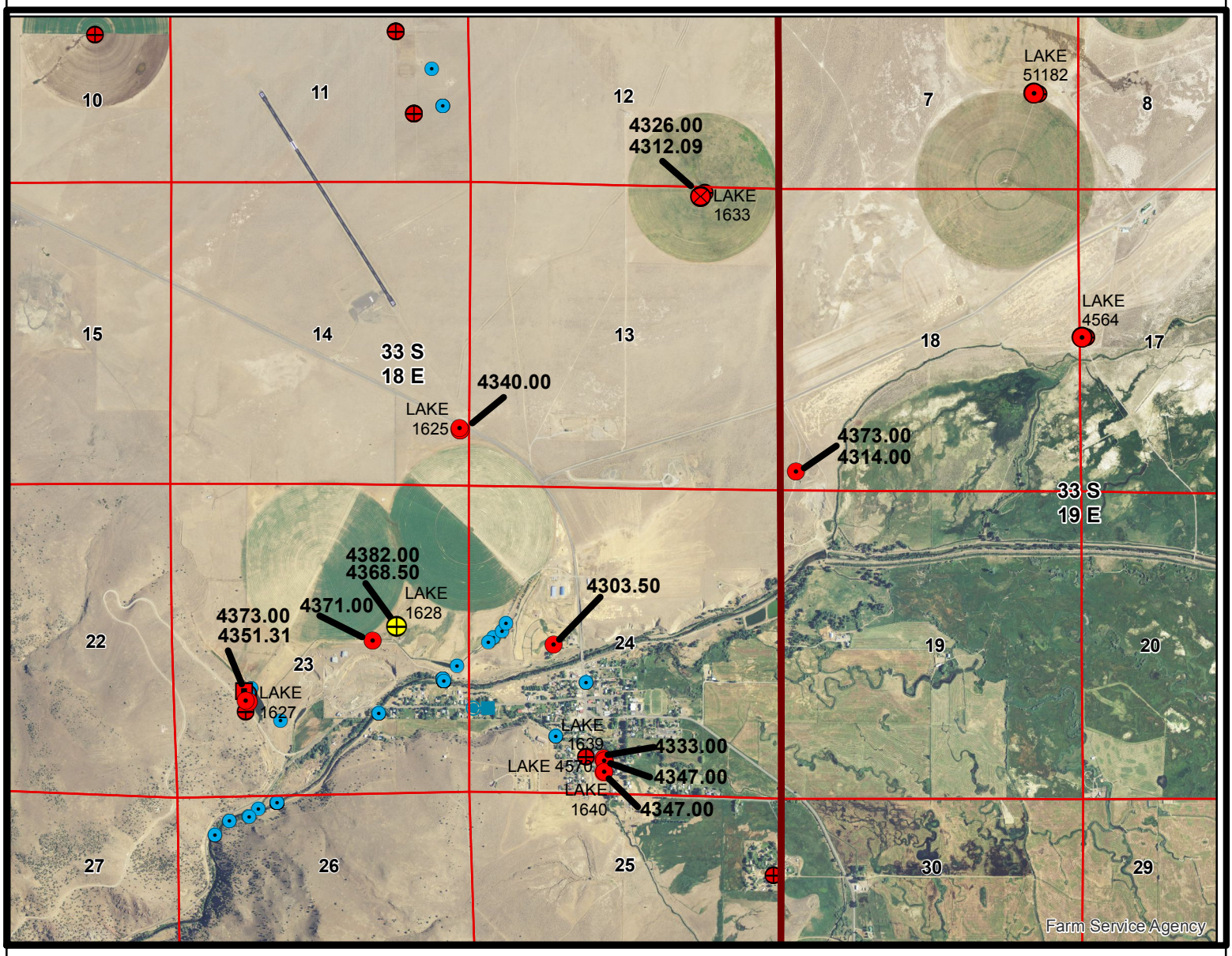
Miles

Yellow = Application Noted Well(s)
Red = Other Existing or Proposed Wells

Blue and Other = surface water rights

N

Groundwater Permit Application G-17985
Surprise Valley Electric



0 0.5 1 2 3

Miles

Yellow = Application Noted Well(s)
Red = Other Existing or Proposed Wells

Blue and Other = surface water rights

N

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

RECEIVED APR 7 1964 STATE ENGINEER SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

Lake 1628

State Well No. 33/18-23G

State Permit No. .....

(1) OWNER:
Name Ross Colohan
Address Paisley, Oregon

(2) LOCATION OF WELL:
County Lake Driller's well number
SW ¼ NE ¼ Section 23 T. 33S R. 18 E W.M.
Bearing and distance from section or subdivision corner
1½ miles NW of Paisley, Oregon

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
16 " Diam. from 0 ft. to 270 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used Mills
Size of perforations ¼ in. by 4 in.
1400 perforations from 100 ft. to 240 ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal puddled clay
Depth of seal 22 ft. Was a packer used? no
Diameter of well bore to bottom of seal 22 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 83 ft. below land surface Date 4/3/64
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Contractor
Yield: 150 gal./min. with 83 ft. drawdown after 3 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 104 Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well below casing 8
Depth drilled 315 ft. Depth of completed well 315 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
soil zone, gravelly	0	3
loose gravel and sand, med.	3	11
clay&sand, brown	11	35
volcanic gravel & clay, brn.	35	92
gravel, med. seepage of wat	92	94
gravel & clay, brn.	94	110
med. gravel & brn.	110	112
hard-packed sand and clay,	112	118
soft sandy clay, brown	118	121
sticky clay & gravel, brn.	121	124
loose gravel, fine waterbe	124	125
boulders & clay, gray	125	159
sandy clay , brown	159	176
fine gravel, waterbearing	176	182
sticky clay & gravel, gray	182	194
fine sand, white, waterbe	194	199
clay & gravel, brn.	199	220
fine sand, wht. & pink, wat	220	225
sandy clay & gravel,fine	225	230
med. gravel, waterbearing	230	234
sticky clay, brn.	234	298
basalt rock w/ clay string-ers, brown	298	315

Work started 3/7/64 19 Completed 4/3/ 1964
Date well drilling machine moved off of well 4/4 1964

(13) PUMP:
Manufacturer's Name
Type: H.P.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Jack Stooksberry, Jr. (Person, firm or corporation) (Type or print)
Address Route 2, Box 47, Lakeview, Ore.
Drilling Machine Operator's License No. 45
[Signed] Jack Stooksberry Jr. (Water Well Contractor)
Contractor's License No. 211 Date 4/3, 19 64

(USE ADDITIONAL SHEETS IF NECESSARY)

Lake 1626

33S/18E-23aC
Leap.

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

(1) OWNER:

Name Ross Colohan & Son Owner's Well Number: _____

Address P.O. Box

City Paisely State Oreg. Zip 97636

(2) TYPE OF WORK:

☐ New Well ☒ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD:

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Other _____

(5) BORE HOLE CONSTRUCTION:

Depth of Completed Well 415 ft.

Special Standards date of approval _____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
8"	306	430	xxx	not disturbed		

How was seal placed? Method ☐ A ☐ B ☐ C ☐ D ☐ E

☐ Other not disturbed

Backfill placed from _____ ft. to _____ ft. Material _____

Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8"	+2	300	.188	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) _____

(7) PERFORATIONS/SCREENS:

☐ Perforations Method none

☐ Screens Type _____ Material _____

rom	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Pumping level	Drill stem at	Time
			½ hr
50		415	1 hr

Temperature of water 175* Depth Artesian Flow Found _____

Was a water analysis done? ☐ Yes By whom no

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other no

Depth of strata: _____

(9) LOCATION OF WELL by legal description:

County Lake Latitude ___ ' ___ " Longitude ___ ' ___ "

Township 33S N or S, Range 18E E or W, WM.

Section 23 SW ¼ NE ¼

Tax Lot _____ Lot _____ Block _____ Subdivision _____

Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL:

120 ft. below land surface. Date Mar. 18-87

Artesian pressure _____ lb. per square inch. Date _____

(11) WELL LOG:

Ground elevation unknown

Material	From	To	WB?	SWL
Hard Grey Basalt	306	329		
Mild Brown Lava	329	331		
Hard Grey Basalt	331	337		
Mild Brown Lava	337	339		
Broken Lava, W/B	339	353	WB-	
Hard Basalt	353	360		
White Clays	360	375		
Brown & Blue Clays	375	430		
Brown & Blue Clays	430	432		

Date started Mar. 9-87 Completed Mar. 18-87

(unbonded) Water Well Constructor Certification:

I constructed this well in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Signed _____ Date Mar. 22-87

(bonded) Water Well Constructor Certification:

I accept responsibility for construction of this well and its compliance with all Oregon water well standards. This report is true to the best of my knowledge and belief.

Signed _____ Date 4-9-87

Company Orvail Buckner Well Drilling, Inc. Co. Reg. No.

9809C 10/85

LAKE 52582

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L

START CARD # 209512

(1) LAND OWNER

Owner Well I.D. 33/18-23G

First Name Ross Last Name Colhan

Company

Address 38650 HWY 31

City Paisley State Or Zip 97636

(2) TYPE OF WORK

☐ New Well ☐ Deepening ☐ Conversion
☑ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☒ ~~Cable~~ ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other

(4) PROPOSED USE

☐ Domestic ☒ ~~Irrigation~~ ☐ Community
☑ Industrial/ Commericial ☐ Livestock ☐ Dewatering
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)

Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
			Neat Cmnt	0	23		35

How was seal placed: Method ☑ A ☐ B ☐ C ☐ D ☐ E

☐ Other

Backfill placed from _____ ft. to _____ ft. Material _____

Filter pack from _____ ft. to _____ ft. Material _____ Size _____

Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____

Temp casing ☐ Yes Dia _____ From _____ To _____

(7) PERFORATIONS/SCREENS

Perforations Method _____

Screens Type _____ Material _____

Perf/S creen	Casing/ Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

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NOV 18 2014
SALEM, OR

(9) LOCATION OF WELL (legal description)

County LAKE Twp 33 S N/S Range 18 E E/W WM

Sec 23 SW 1/4 of the NE 1/4 Tax Lot 1300

Tax Map Number _____ Lot _____

Lat ° ' " or _____ DMS or DD

Long ° ' " or _____ DMS or DD

○ Street address of well ○ Nearest address

1-1/2 miles NW of Paisely, Oregon

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well				

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(11) WELL LOG

Ground Elevation _____

Material	From	To
Remove original puddled clay seal with overshot — replace with 24" cement seal to 23'		

Date Started 7.30.14 Completed 7.30.14

(unbonded) Water Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number _____ Date _____

Password : (if filing electronically) _____

Signed _____

(bonded) Water Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1946 Date 11-12-14

Password : (if filing electronically) _____

Signed _____

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.96

WATER SUPPLY WELL REPORT
continuation page

LAKE 52582

LL I.D. # L ___________

START CARD # 209512

(5) BORE HOLE CONSTRUCTION

BORE HOLE Dia	From	To

SEAL Material	From	To	Amt	sacks/ lbs

FILTER PACK

From	To	Material	Size

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

(7) PERFORATIONS/SCREENS

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units
		RECEIVED BY OWRD		
		NOV 18 2014		

SALEM, OR

(10) STATIC WATER LEVEL

Water Bearing Zones

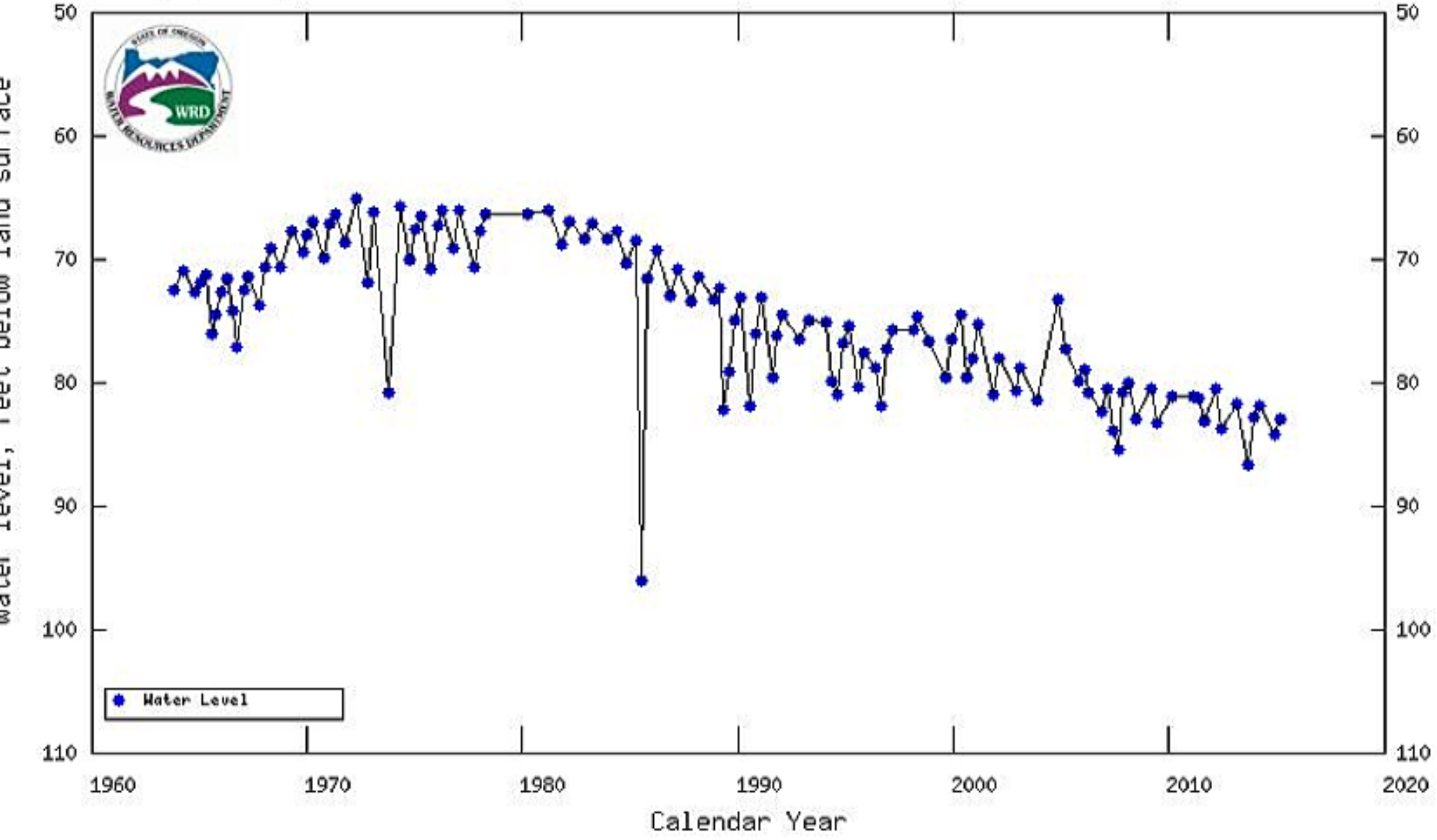
SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(11) WELL LOG

Material	From	To

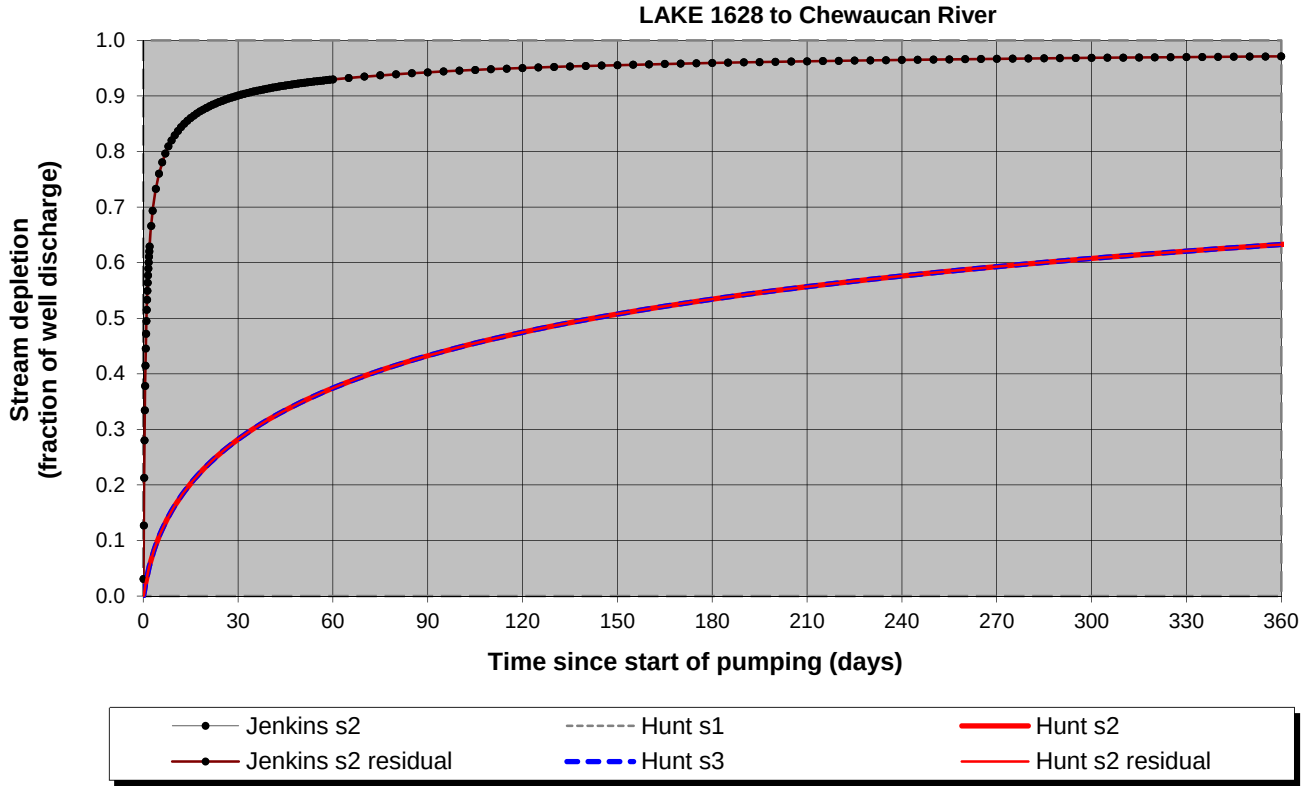
Comments/Remarks

Oregon Water Resources Department (OWRD) Well Location	33.00S/18.00E-13AAB
OWRD Logid	LAKE 1633
OWRD Well Tag (Well ID)	----
OWRD State Observation Well Number	374
Total well depth (feet below land surface)	230
Land surface elevation (feet above mean sea level)	----
Primary use of well	----
Primary aquifer system	----



G-17985: Surprise Valley Electric											
Analysis of Well Data											
Date = 6 March 2014											
Log_ID 1	LAKE 1627	LAKE 52506	LAKE 1628	None	LAKE 1639	LAKE 1640	LAKE 4570	LAKE 51059	LAKE 1625	LAKE 1633	LAKE 51588
Log_ID 2	LAKE 4448		LAKE 1626								
Log_ID 3			LAKE 52582								
Owner Well ID	SVE 1	SVE 4	Little Hot	8 inch	Paisley 1974	Paisley 1969	Paisley 1995	ZX Geothermal	OWRD Located	OWRD Obs	ZX Simplot
Land Elev. (feet)	4,495.00	4,465.00	4,465.00	4,395.00	4,385.00	4,380.00	4,385.00	4,395.00	4,415.00	4,395.00	4,320.00
Basin Fill Bottom (ft blsd)	775.00	not reached	not reached	no data	not reached	not reached	not reached	1,412.00	not reached	not reached	630.00
Basin Fill Bottom (ft elev.)	3,720.00	not reached	not reached	no data	not reached	not reached	not reached	2,983.00	not reached	not reached	3,690.00
Casing Depth (ft blsd)	22.00	315.00	270.00	no data	205.00	190.00	124.00	215.00	74.00	102.00	21.00
Casing Depth (ft elev.)	4,473.00	4,150.00	4,195.00	no data	4,180.00	4,190.00	4,261.00	4,180.00	4,341.00	4,293.00	4,299.00
Seal Depth (ft blsd)	21.00	20.00	23.00	no data	40.00	21.00	23.00	215.00	18.00	no data	21.00
Seal Depth (ft elev.)	4,474.00	4,445.00	4,442.00	no data	4,345.00	4,359.00	4,362.00	4,180.00	4,397.00	no data	4,299.00
Well Bottom (ft blsd)	983.00	378.00	432.00	no data	205.00	216.00	124.00	1,412.00	610.00	605.00	833.00
Well Bottom (ft elev.)	3,512.00	4,087.00	4,033.00	no data	4,180.00	4,164.00	4,261.00	2,983.00	3,805.00	3,790.00	3,487.00
First Water (ft blsd)	no data	83.00	92.00	no data	67.00	no data	30.00	216.00	75.00	90.00	640.00
First Water (ft elev.)	no data	4,382.00	4,373.00	no data	4,318.00	no data	4,355.00	4,179.00	4,340.00	4,305.00	3,680.00
Other Water (ft blsd)	no data	no data	124.00	no data	no data	no data	43.00	no data	400.00	no data	no data
Other Water (ft elev.)	no data	no data	4,341.00	no data	no data	no data	4,342.00	no data	4,015.00	no data	no data
Driller Temperature (F)	220.00	118.00	104.00	no data	64.00	56.00	40.00	78.00	175.00	no data	70.00
Driller Rate (gpm)	800.00	<100.00	150.00	no data	130.00	125.00	120.00	no data	300.00	1,600.00	500.00
Driller SWL (ft blsd)	122.00	no data	83.00	no data	38.00	33.00	52.00	22.00	75.00	69.00	38.00
Driller SWL (ft elev.)	4,373.00	no data	4,382.00	no data	4,347.00	4,347.00	4,333.00	4,373.00	4,340.00	4,326.00	4,282.00
Driller SWL Date	10/22/1980	no data	04/03/1964	no data	08/15/1974	06/30/1969	05/08/1995	10/25/2000	03/06/1987	03/11/1959	09/30/2004
Watermaster SWL (ft blsd)	143.69	94.00	96.50	91.50	no data	no data	no data	81.00	no data	82.91	39.55
Watermaster SWL (ft elev.)	4,351.31	4,371.00	4,368.50	4,303.50	no data	no data	no data	4,314.00	no data	4,312.09	4,280.45
Watermaster SWL Date	02/27/2014	02/27/2014	02/27/2014	02/27/2014	no data	no data	no data	02/27/2014	no data	12/06/2013	02/27/2014
Comment			caved to 270								
			Review used 4345 ft groundwater elevation based on Paisley groundwater elevation								

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999)



Output for Hunt Stream Depletion, Scenerio 2 (s2): **Time pump on = 365 days**

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325
Jenk SD %	0.901	0.930	0.943	0.950	0.956	0.959	0.962	0.965	0.967	0.969	0.970	0.971
Jen SD cfs	0.293	0.302	0.306	0.309	0.311	0.312	0.313	0.314	0.314	0.315	0.315	0.316
Hunt SD %	0.282	0.374	0.433	0.475	0.508	0.534	0.557	0.576	0.593	0.608	0.621	0.633
Hunt SD cfs	0.092	0.122	0.141	0.154	0.165	0.174	0.181	0.187	0.193	0.197	0.202	0.206

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.325	0.325	0.325	cfs
Distance to stream	a	5000	5000	5000	ft
Aquifer hydraulic conductivity	K	29.8	29.8	29.8	ft/day
Aquifer thickness	b	900	900	900	ft
Aquifer transmissivity	T	26820	26820	26820	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	50	50	50	ft
Streambed hydraulic conductivity	Ks	0.3	0.3	0.3	ft/day
Streambed thickness	bs	20	20	20	ft
Streambed conductance	sbc	0.75	0.75	0.75	ft/day
Stream depletion factor (Jenkins)	sdf	0.932140194	0.932140194	0.932140194	days
Streambed factor (Hunt)	sbf	0.139821029	0.139821029	0.139821029	

Transmissivity from Specific Capacity using the Theis Equation

Adapted from Vorhis (1979)

Theis Equation: T = [Q/(4*s*pi)][W(u)]
u = (r*r*S)/(4*T*t)
W(u) = (-ln u)-(0.5772157)+(u/1*1!)-(u*u/2*2!)+(u*u*u/3*3!)-(u*u*u*u/4*4!)+...

T = transmissivity (L*L/T)
s = drawdown (L)
S = storage coefficient (dimensionless)
pi = 3.141592654
r = radial distance (L)
t = time (T)
u = dimensionless
W(u) = well function

Note: Transmissivity is derived using an iterative process
The calculations use a known or assumed Storage Coeficient (S) provided by the user
Specific Capacity (Q/s) is used to first approximate the Transmissivity (T) used to calculate u in the first Theis equation iteration
The Transmissivity of the previous iteration is used to calculate u in a given Theis equation iteration
Total Theis Equation iterations = 25 iterations
Can accept answer if difference in calculated Transmissivity for the last 2 iterations is < 0.0001
Can accept answer if u in the last iteration is < 7.1

Note: Well efficiency is not included in the calculations

References:

Theis, C.V. 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground water storage. American Geophysical Union Transactions, 16 annual meeting, vol. 16, pg. 519-524.

Vorhis, R.C. 1979. Transmissivity from pumped well data. Well Log, National Water Well Association newsletter, vol. 10, no. 11, Dec. 1979, pg. 50-52.

Data Entry	Enter Data Below (yellow boxes only)	
Well Log ID or Comment for Records	LAKE 4448	
Pumping Rate (gpm) = Q =	800.00	(gpm)
Drawdown (feet) = s =	8.00	(feet)
Time (hours) = t =	4.0000	(hours)
Storage Coefficient = S =	0.001000	(dimensionless)
Well Diameter (inches) = d =	12.0000	(inches)
	Press F9 to Calculate	

Calculated Results	Calculated Results	
Transmissivity (ft2/day) = T =	26,820.35	(ft2/day)
Transmissivity (gpd/ft) = T =	200,630.17	(gpd/ft)
Transmissivity Difference = (last 2 iterations)	0.0000E+00 okay to use T if diff < 0.0001	(ft2/day)
u = (last iteration)	1.3982E-08 okay to use T if u <7.1	

Drawdown s (feet)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft3/sec)	Time t (days)	Distance r = d/2 (feet)	u	W(u)	Transmissivity T (ft2/day)	Transmissivity difference from previous	Comments	Theis Equation Iteration
Note: yellow grid areas are where values are calculated						Note : W(u) calculation valid when u < 7.1					
						7.0000	1.1545E-04			W(u) calculation test	
8.00	0.00100	800.00	1.78	0.17	0.50			19,250.00		T = Q/s	
8.00	0.00100	800.00	1.78	0.17	0.50	1.9481E-08	17.1766	26,312.31	7.0623E+03	T = Theis Equation	1.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.4252E-08	17.4892	26,791.05	4.7875E+02	T = Theis Equation	2.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3997E-08	17.5072	26,818.68	2.7622E+01	T = Theis Equation	3.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3983E-08	17.5082	26,820.25	1.5785E+00	T = Theis Equation	4.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	9.0162E-02	T = Theis Equation	5.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	5.1497E-03	T = Theis Equation	6.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	2.9413E-04	T = Theis Equation	7.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	1.6799E-05	T = Theis Equation	8.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	9.5951E-07	T = Theis Equation	9.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	5.4803E-08	T = Theis Equation	10.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	3.1323E-09	T = Theis Equation	11.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	1.7462E-10	T = Theis Equation	12.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	13.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	14.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	15.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	16.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	17.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	18.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	19.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	20.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	21.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	22.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	23.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	24.00
8.00	0.00100	800.00	1.78	0.17	0.50	1.3982E-08	17.5083	26,820.35	0.0000E+00	T = Theis Equation	25.00

Water Availability Analysis

CHEWAUCAN R > L ABERT - AT MOUTH
GOOSE & SUMMER LAKE BASIN
Water Availability as of 6/18/2015

Watershed ID #: 31300602 (Map)
Exceedance Level: 80%
Date: 6/18/2015
Time: 10:06 AM

Download Data

Water Availability

Select any Watershed for Details

Nesting Order	Watershed ID #	Stream Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sto
1	31300602	CHEWAUCAN R> L ABERT- AT MOUTH	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes

Limiting Watersheds

Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Limiting Watershed ID #	Stream Name	Water Available?	Net Water Available
JAN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	33.00
FEB	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	63.80
MAR	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	79.20
APR	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	48.30
MAY	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	14.90
JUN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-15.10
JUL	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-0.76
AUG	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-0.14
SEP	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	1.93
OCT	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	19.80
NOV	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	33.80
DEC	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	32.10
ANN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	66,600.00

Detailed Reports for Watershed ID #31300602

CHEWAUCAN R > L ABERT - AT MOUTH
GOOSE & SUMMER LAKE BASIN
Water Availability as of 6/18/2015

Watershed ID #: 31300602 (Map)
Exceedance Level: 80%
Date: 6/18/2015
Time: 10:06 AM

Water Availability Calculation

Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available

JAN	33.80	0.82	33.00	0.00	0.00	33.00
FEB	64.90	1.10	63.80	0.00	0.00	63.80
MAR	103.00	23.80	79.20	0.00	0.00	79.20
APR	161.00	113.00	48.30	0.00	0.00	48.30
MAY	314.00	299.00	14.90	0.00	0.00	14.90
JUN	234.00	249.00	-15.10	0.00	0.00	-15.10
JUL	81.90	82.70	-0.76	0.00	0.00	-0.76
AUG	47.40	47.50	-0.14	0.00	0.00	-0.14
SEP	42.30	40.40	1.93	0.00	0.00	1.93
OCT	42.20	22.40	19.80	0.00	0.00	19.80
NOV	34.40	0.63	33.80	0.00	0.00	33.80
DEC	32.80	0.68	32.10	0.00	0.00	32.10
ANN	120,000.00	53,400.00	66,600.00	0.00	0.00	66,600.00

Detailed Report of Consumptive Uses and Storage

Consumptive Uses and Storages in Cubic Feet per Second

Month	Storage	Irrigation	Municipal	Industrial	Commercial	Domestic	Agricultural	Other	Total
JAN	0.62	0.00	0.00	0.17	0.00	0.02	0.01	0.00	0.82
FEB	0.90	0.00	0.00	0.17	0.00	0.02	0.01	0.00	1.10
MAR	1.29	22.30	0.00	0.17	0.00	0.02	0.01	0.00	23.80
APR	2.32	110.00	0.00	0.17	0.00	0.02	0.01	0.00	113.00
MAY	3.72	295.00	0.00	0.17	0.00	0.02	0.01	0.00	299.00
JUN	1.88	247.00	0.00	0.17	0.00	0.02	0.01	0.00	249.00
JUL	0.55	81.90	0.00	0.17	0.00	0.02	0.01	0.00	82.70
AUG	0.30	47.00	0.00	0.17	0.00	0.02	0.01	0.00	47.50
SEP	0.32	39.90	0.00	0.17	0.00	0.02	0.01	0.00	40.40
OCT	0.32	21.90	0.00	0.17	0.00	0.02	0.01	0.00	22.40
NOV	0.43	0.00	0.00	0.17	0.00	0.02	0.01	0.00	0.63
DEC	0.48	0.00	0.00	0.17	0.00	0.02	0.01	0.00	0.68

Detailed Report of Reservations for Storage and Consumptive Uses

Reserved Streamflow in Cubic Feet per Second

No reservations were found for this watershed.

Detailed Report of Instream Flow Requirements

Instream Flow Requirements in Cubic Feet per Second

No instream flow requirements were found for this watershed.