

MEMO

7 November, ~~200~~ 2012

FROM: GW: GERALD H. GRONQIN
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

YES

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

YES

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

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

X Per ORS 390.835, the Ground Water 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.**

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.

[illegible]

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

TO: Water Rights Section

Date 7 November 2012FROM: Ground Water/Hydrology Section Gerald H. Grondin

Reviewer's Name

SUBJECT: Application G-17572

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: Dennis & Pamela Amsbaugh County: LakeA1. Applicant(s) seek(s) 1.99 (895 gpm) cfs from 1 well(s) in the Goose and Summer Lakes Basin,
Goose Lake sub basin Quad Map: Crane CreekA2. Proposed use: Primary Irrigation (430 acres) Seasonality: 1 March to 31 October (245 days)

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

Well 1	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 2851	1	Basin Fill	1.99	40S/20E-sec 15 CDC	130' N, 67'E fr SW cor SESW S 15
2						

* 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	4720	73	0.00	6/6/2012	500	0-19	+1-19	-2-500	145-500	1000	?	P
2												

Use data from application for proposed wells.

A4. Comments:

The proposed use is a maximum rate of 895 gpm (1.99 cfs) and a maximum volume of 1290 ac-ft per year for irrigating 430 primary acres. The proposed maximum rate is less than the maximum rate typically allowed for 430 acres (5.38 cfs = 2412 gpm) and the proposed maximum annual volume is the maximum typically allowed for 430 acres. NOTE: the maximum proposed rate will yield 969 ac-ft total in 245 days which is less than the total requested.

The proposed well is well LAKE 2851. The driller reported static water level was 15.0 feet below land surface in 1981. The static water level reported in the permit application is 0.00 feet below land surface in June 2012. The application does not indicate whether water was flowing from the well or not.

The aquifer at the proposed well is identified as basin fill sediments. Peterson and Brown (1980) mapped the site as undifferentiated alluvium and sediments (Qal/Qs) that includes lacustrine and fluvial gravel, sand, and silt. Water well reports for wells in sections 2, 3, 10, 11, 14, and 15 indicate sand, silt, clay, and gravel deposits in the area and irrigation, well yields exceeding 1,000 gpm. This site is west of an area Peterson and Brown (1980) mapped as alluvial fan deposits (Qf) that includes unconsolidated to partially cemented stratified sand, gravel, and boulders.

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 690-513-0030 (Goose Lake Subbasin) does not apply. The proposed well and use appear to be within the allowable ground water classifications for the subbasin OAR 690-513-0030 (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, 7T, and "large" flow meter condition
 - 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: _____

Recommend conditions 7B, 7N, 7T, and "large" flow meter condition.

Reports for the Goose and Summer Lakes Basin indicate ground water occurs in alluvium, basin fill sediments, and different basalt units. Peterson and Brown (1980) mapped the site as undifferentiated alluvium and sediments (Qal/Qs) that includes lacustrine and fluvial gravel, sand, and silt. Water well reports for wells in sections 2, 3, 10, 11, 14, and 15 indicate sand, silt, clay, and gravel deposits in the area and irrigation, well yields exceeding 1,000 gpm. This site is west of an area Peterson and Brown (1980) mapped as alluvial fan deposits (Qf) that includes unconsolidated to partially cemented stratified sand, gravel, and boulders.

The nearest state observation well with long term data is state observation well 301 (well LAKE 2424). It is located about 7.8 miles north of the proposed well. The ground water level data is from 1965 through September 2012. The annual trend prior to and after 1990 is different and an explanation for the difference is not yet known by this reviewer. The data from 1965 to 1990 shows an annual decline. In the early 1990s, the ground water level rose above the original 1965 level and the subsequent annual trend appears climate influenced with no apparent decline.

A somewhat closer state observation well with primarily 1970s data is state observation well 464 (well LAKE 2202). It is located about 7.1 miles northwest of the proposed well. The data is from 1968 to 1978. It shows an annual decline similar to what was noted above for state observation well 301 (well LAKE 2424) for the period from 1965 to 1990.

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 Sediments	☐	☒
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.

The aquifer at the proposed well is identified as basin fill sediments. Peterson and Brown (1980) mapped the site as undifferentiated alluvium and sediments (Qal/Qs) that includes lacustrine and fluvial gravel, sand, and silt. Water well reports for wells in sections 2, 3, 10, 11, 14, and 15 indicate sand, silt, clay, and gravel deposits in the area and irrigation, well yields exceeding 1,000 gpm. This site is west of an area Peterson and Brown (1980) mapped as alluvial fan deposits (Qf) that includes unconsolidated to partially cemented stratified sand, gravel, and boulders.

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.

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	Goose Lake	4720	4701	5175	☒	☐	☐	☐	☒
1	2	Crane Creek	4720	4720	6500	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: _____

The proposed well location is less than 1-mile from Goose Lake and more than 1-mile from Crane Creek.

Ground water elevation based upon the 6 June 2012 groundwater level reported for LAKE 2851 in the groundwater permit application and the land surface elevation on the Crane Creek, Oregon USGS topographic map (1:24,000 scale). That map shows flowing wells in the vicinity of the proposed well where land surface at those wells is more than 4710 feet elevation.

Ground water is determined to be hydraulically connected to Goose Lake and Crane Creek due to ground water at the proposed well is above Goose Lake, and for Crane Creek, data indicating it is perennial, and a Morgan (1988) map showing ground water elevation contours upgradient of the proposed well having elevations near or above the creek.

Water Availability Basin the well(s) are located within: N.A. (no water availability values for this well location)

- 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 < 1/4 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.	☐	N.A.	☐	>45	☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

- 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 well is less than 1.0 mile from Goose Lake.

No water availability values calculated for Goose Lake were found.

Hunt (1999) was used to calculate the interference with Goose Lake. The parameters used were a horizontal hydraulic conductivity of 10 feet/day (transmissivity = 5000 ft²/day based on specific capacity data for LAKE 2840, LAKE 2845 and LAKE 3066), 0.001 for the storage coefficient, a stream width of 3000 feet (less than the actual lake width given the model became unstable with a more appropriate larger width), a streambed conductivity of 0.02 feet/day and a streambed thickness of 50 feet (both from Morgan (1988)). The transmissivity parameters are within the ranges found in Morgan (1988) and in Gonthier (1985). They are higher than determined for the immediate Lakeview vicinity. A pumping rate of 1.99 cfs (895 gpm) was used. This pumping rate is the maximum rate requested. It was used, because it is less than a pro-rated rate (2.65 cfs) based on the total volume requested (1290 ac-ft) divided by the total irrigation period (245 days).

A potential for substantial interference with Goose Lake is assumed given the well is less than 1-mile from the lake and the calculated interference is more than 25 percent of the rate of appropriation. The percent interference is the same for any pumping rate.

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													
		%	%	%	%	%	%	%	%	%	%	%	%
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													

(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: _____

The proposed well is more than 1.0 mile from Crane Creek.

No water availability values calculated for Crane Creek were found.

Drawdown at the nearest reach of Crane Creek was estimated using the Theis drawdown equation. The calculations used a transmissivity of 5000 ft²/day which is within the ranges found in Morgan (1988) and in Gonthier (1985). The value used was derived from specific capacity data from irrigation wells LAKE 2840, LAKE 2845 and LAKE 3066. Additionally, the calculation used an assumed intermediate storage coefficient (0.001). A pumping rate of 1.99 cfs (895 gpm) was used. This pumping rate is the maximum rate requested. It was used, because it is less than a pro-rated rate (2.65 cfs) based on the total volume requested (1290 ac-ft) divided by the total irrigation period (245 days).

The estimated drawdown for 30 days was about 5.88 feet and for 245 days was about 11.47 feet.

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 _____

If a permit is issued, include conditions 7B, 7N, 7T, and "large" flow meter condition.

A potential for substantial interference with Goose Lake is assumed given the well is less than 1-mile from the lake and the calculated interference is more than 25 percent of the rate of appropriation. The percent interference is the same for any pumping rate.

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement.

The aquifer at the proposed well is identified as basin fill sediments. Peterson and Brown (1980) mapped the site as undifferentiated alluvium and sediments (Qal/Qs) that includes lacustrine and fluvial gravel, sand, and silt. Water well reports for wells in sections 2, 3, 10, 11, 14, and 15 indicate sand, silt, clay, and gravel deposits in the area and irrigation, well yields exceeding 1,000 gpm. This site is west of an area Peterson and Brown (1980) mapped as alluvial fan deposits (Qf) that includes unconsolidated to partially cemented stratified sand, gravel, and boulders.

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.

References Used:

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

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

State Observation Well SOW 381 (well LAKE 2424) located in T39S/R20E-sec 09 and SOW 464 (well LAKE 2202) located in T39S/R19E-sec 13.

Water well reports for wells located in sections 2, 3, 10, 11, 14, and 15, particularly wells LAKE 2840, LAKE 2845, LAKE 2851, and LAKE 3066.

D. WELL CONSTRUCTION, OAR 690-200D1. Well #: 1 Logid: LAKE 2851D2. **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.

THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNELD7. ☐ 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).

WATER WELL REPORT
STATE OF OREGON

RECEIVED

SEP 11 1981

WATER RESOURCES DEPT
SALEM, OREGON

State Well No.

State Permit No.

405/20E-15C

(1) OWNER:

Name Lyle Garrett

Address

City Lakeview

State Oregon

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary Air ☐ Driven ☐ Domestic ☐ Industrial ☐ Municipal ☐
Rotary Mud ☒ Dug ☐ Irrigation ☒ Test Well ☐ Other ☐
Cable ☐ Bored ☐ Thermal: Withdrawal ☐ ReInjection ☐

(4) PROPOSED USE (check):

(5) CASING INSTALLED:

Steel ☒ Plastic ☐
Threaded ☐ Welded ☐
24" Diam. from +1 ft. to 19 ft. Gauge 250
" Diam. from ft. to ft. Gauge

1 LINER INSTALLED: 425 .250

14" Diam. from -400 ft. to 500 ft. Gauge 250

(6) PERFORATIONS:

Perforated? ☒ Yes ☐ No

Type of perforator used Factory

Size of perforations 3/16 in. by 3 in.
17920 perforations from 145 ft. to 425 ft.
2730 perforations from 400 ft. to 500 ft.
perforations from ft. to ft.

(7) 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.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Ag Center

1000 gal/min. with ft. drawdown after hrs.

Air test gal/min. with drill stem at ft. hrs.

Bailer test gal/min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Special standards: Yes ☐ No ☒

Well seal—Material used Neat cement

Well sealed from land surface to 19 ft.

Diameter of well bore to bottom of seal 28 in.

Diameter of well bore below seal 23 in.

Number of sacks of cement used in well seal 30 sacks

How was cement grout placed? Pumped

Was pump installed? NO Type HP Depth ft.

Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of Water? depth of strata

Method of sealing strata off

Was well gravel packed? ☒ Yes ☐ No Size of gravel: 1/4 in.

Gravel placed from 0 ft. to 2 ft.

(10) LOCATION OF WELL:

County Lake Driller's well number
SW 1/4 SW 1/4 Section 15 T.405 R. 20E W.M.

Tax Lot # Lot Blk Subdivision

Address at well location:

(11) WATER LEVEL: Completed well.

Depth at which water was first found 73 ft.

Static level 15 ft. below land surface. Date

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 23

Depth drilled 500 ft. Depth of completed well 500 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand & gravel	0	12	
Brown clay	12	28	
Brwn clay & sand fine	28	60	
Gray clay soft	60	73	
Fine gravel & coarse sand	73	77	
Tan clay soft	77	90	
Gray clay soft & fine			
gravel	90	160	
Gray & brown clay	160	166	
Gravel fine to med	166	172	
Gray clay & gravel fine	172	187	
Gray silt	187	194	
Tan clay	194	225	
Gray sandy silt & fine			
gravel	225	235	
Gray clay soft	235	239	
Gray silt & gravel layers	239	374	
Gray clay	374	396	
Gray silt & gravel fine	396	431	
Gray silt	431	436	
Gray clay	436	500	

Work started 19 Completed 19
Date well drilling machine moved off of well 7-20 & 9-9 19 81

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Gary Wilson Date 9-10, 1981
(Drilling Machine Operator)

Drilling Machine Operator's License No. 1366

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 W. Aqua Irrigation Drilling, Inc.
(Person, firm or corporation) (Type or print)

Address P. O. Box 1310, Lakeview, Or.

[Signed] W. Williams
(Water Well Contractor)

Contractor's License No. 665 Date 9-10, 19 81

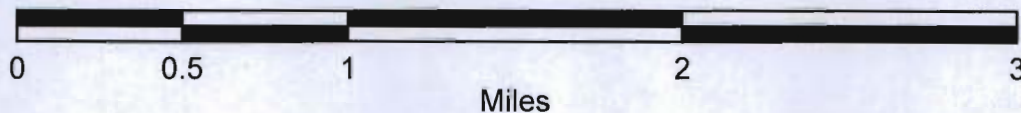
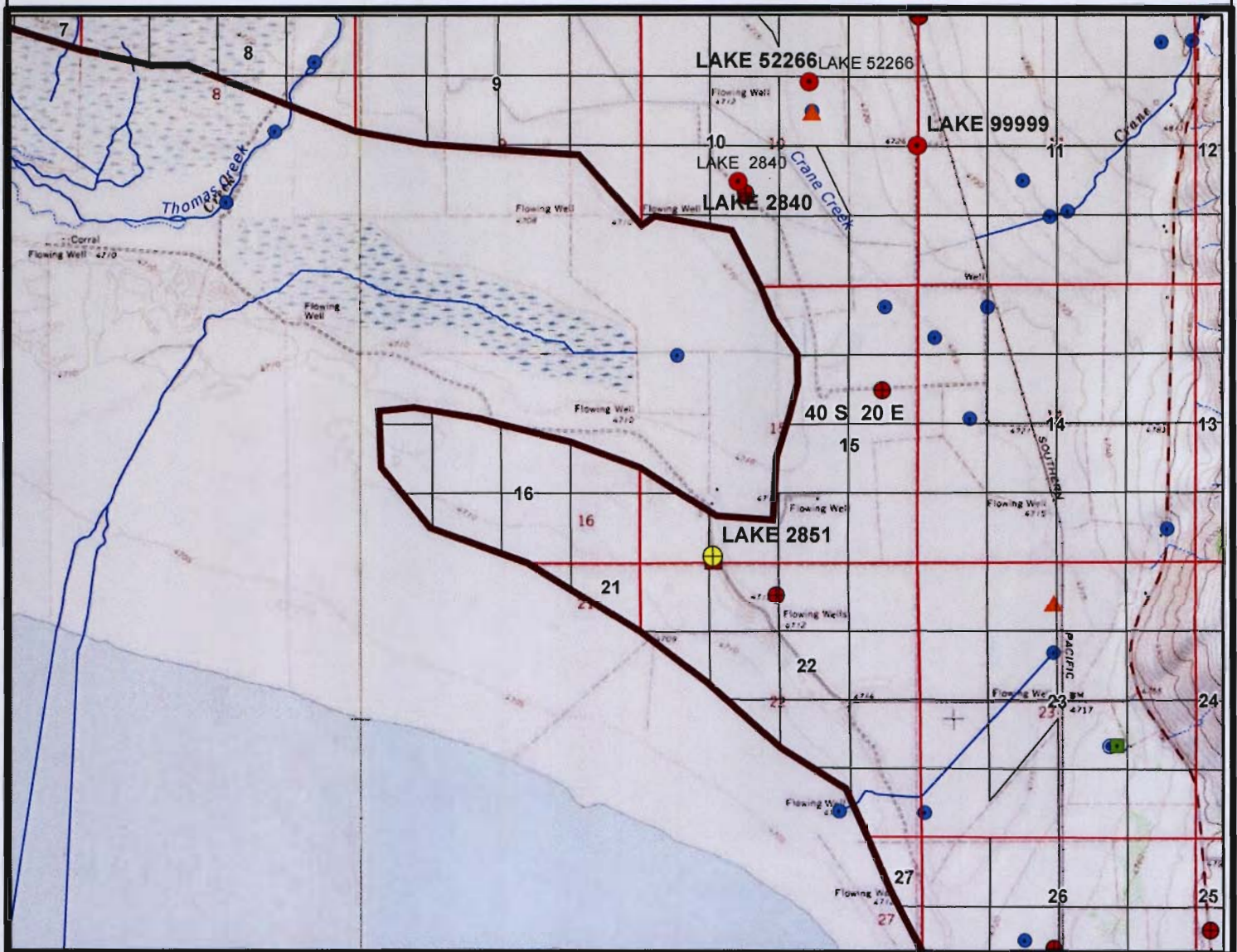
NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report
are to be filed with the

WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*12658-690

Groundwater Right Application: G-17572

Dennis & Pamela Amsbaugh

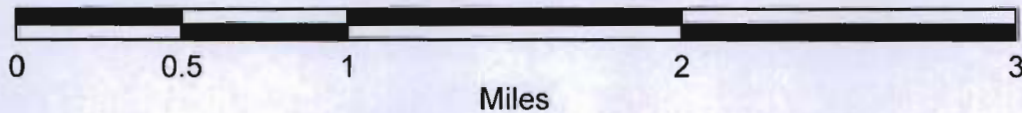


Yellow = Application Noted Well(s)
Red = Other Existing or Proposed Wells
Blue and Other = surface water rights



Groundwater Right Application: G-17572

Dennis & Pamela Amsbaugh

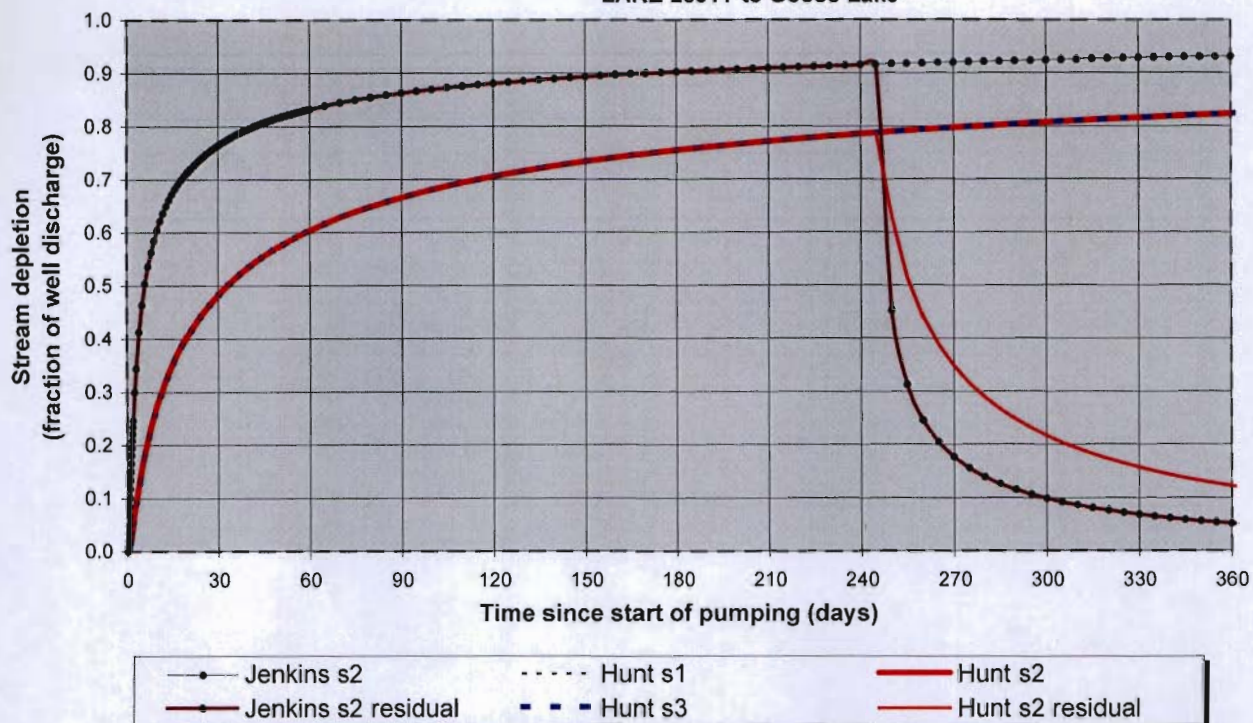


Yellow = Application Noted Well(s)
Red = Other Existing or Proposed Wells
Blue and Other = surface water rights



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

LAKE 28517 to Goose Lake



Output for Hunt Stream Depletion, Scenerio 2 (s2):

Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	1.990	1.990	1.990	1.990	1.990	1.990	1.990	1.990	1.990	1.990	1.990	1.990
Jenk SD %	0.765	0.833	0.863	0.881	0.894	0.903	0.910	0.916	0.177	0.099	0.069	0.053
Jen SD cfs	1.523	1.657	1.717	1.754	1.778	1.797	1.811	1.823	0.353	0.198	0.138	0.105
Hunt SD %	0.484	0.605	0.667	0.707	0.735	0.756	0.773	0.787	0.349	0.218	0.158	0.123
Hunt SD cfs	0.962	1.203	1.327	1.406	1.462	1.505	1.538	1.566	0.694	0.433	0.314	0.245

Parameters:

		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	1.99	1.99	1.99	cfs
Distance to stream	a	5175	5175	5175	ft
Aquifer hydraulic conductivity	K	10	10	10	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	5000	5000	5000	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	3000	3000	3000	ft
Streambed hydraulic conductivity	Ks	0.02	0.02	0.02	ft/day
Streambed thickness	bs	50	50	50	ft
Streambed conductance	sbc	1.2	1.2	1.2	ft/day
Stream depletion factor (Jenkins)	sdf	5.356125	5.356125	5.356125	days
Streambed factor (Hunt)	sbf	1.242	1.242	1.242	

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$
 $u = (r^2 S)/(4 \cdot T \cdot t)$
 $W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1) - (u^2/2 \cdot 2) + (u^3/3 \cdot 3) - (u^4/4 \cdot 4) + \dots$

s = drawdown (L)
 T = transmissivity (L²/T)
 S = storage coefficient (dimensionless)
 π = 3.141592654
 r = radial distance (L)
 t = time (T)
 u = dimensionless
 $W(u)$ = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Comments
Note: yellow grid areas are where values are calculated											
Application G-17572 LAKE 2851 to Crane Creel											
37,402.60	5,000.00	0.00100	895.00	1.9941	30.00	6,500.00	3.14	0.0704	2.1453	5.8825	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	60.00	6,500.00	3.14	0.0352	2.8042	7.6891	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	90.00	6,500.00	3.14	0.0235	3.1981	8.7692	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	120.00	6,500.00	3.14	0.0176	3.4799	9.5421	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	150.00	6,500.00	3.14	0.0141	3.6996	10.1444	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	180.00	6,500.00	3.14	0.0117	3.8796	10.6379	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	210.00	6,500.00	3.14	0.0101	4.0321	11.0561	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	240.00	6,500.00	3.14	0.0088	4.1643	11.4188	Continuous Pumping at Full Rate
37,402.60	5,000.00	0.00100	895.00	1.9941	245.00	6,500.00	3.14	0.0086	4.1848	11.4748	Continuous Pumping at Full Rate
Note: W(u) calculation valid when u < 7.1									7.0000	1.1545E-04	W(u) calculation test