

WATER RESOURCES DEPARTMENT

MEMO

15 August, 2014

TO: Application G- 17883

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. **SEE ATTACHED MEMO**

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 **Klamath River** 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

SEE ATTACHED MEMO

In 2012 the United States Geological Survey (USGS), in cooperation with OWRD and the US Bureau of Reclamation, completed groundwater flow and management models for the Upper Klamath Basin. The 2012 groundwater flow model uses generally accepted hydrogeologic methods and the relevant field data to model the cumulative effects of groundwater pumping within the Klamath Scenic Waterway, and provides a comprehensive methodology for analyzing the relevant field data necessary to determine whether the cumulative use of groundwater in the Klamath Basin will measurably reduce the surface water flow necessary to maintain the free-flowing character of the Klamath Scenic Waterway.

In September 2012 the OWRD Groundwater Section conducted two model simulations. The two simulations used the 2012 USGS flow model, incorporating groundwater permits issued (61.96 cfs) since adoption of the 1995 Scenic Waterway Act amendment up through 2004. Each simulation was run to steady-state, where inflows and outflows for that model run balanced. An evaluation of the water budgets showed that groundwater discharge to the Klamath Scenic Waterway decreased by 5.88 cfs as a result of the 61.96 cfs of groundwater uses issued between 1995 and 2004. These results indicate to the OWRD that a preponderance of evidence exists to establish that groundwater development occurring in the Upper Klamath Basin in Oregon since 1995 has "measurably reduced" surface water flows within the Klamath Scenic Waterway.

In January 2013 the OWRD Groundwater Section conducted flow model simulations to evaluate impacts to streams from pumping groundwater within the Lost River subbasin. Groundwater pumping was simulated by placing wells in the model that correspond to the center of 39 townships in the southeast part of the Klamath Basin in Oregon. Each of the simulations was run to steady-state, where inflows and outflows for that model run balanced. These results indicate that the scenic waterway is impacted by pumping groundwater in all of the townships evaluated in Oregon in the Lost River subbasin. In summary, a preponderance of evidence exists to establish that groundwater development occurring in Oregon since 1995 in the Upper Klamath Basin and Lost River subbasin has "measurably reduced" surface water flows within the Klamath Scenic Waterway.

References:

Gannett, M.W., Lite, K.E., Jr., La Marche, J.L., Fisher, B.J., and Polette, D.J., 2007. Ground-water hydrology of the upper Klamath Basin, Oregon and California: U.S. Geological Survey Scientific Investigations Report 2007-5050, 84p.

Gannett, M.W., Wagner, B.J., and Lite, K.E., Jr., 2012. Groundwater simulation and management models for the upper Klamath Basin, Oregon and California: U.S. Geological Survey Scientific Investigations Report 2012-5062, 92p.

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

TO: Water Rights Section Date 15 August 2014

FROM: Ground Water/Hydrology Section Gerald H. Grondin

Reviewer's Name

SUBJECT: Application G-17883 Supersedes review of _____

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: Klamath County School District County: Klamath

A1. Applicant(s) seek(s) 0.90 (404 gpm) cfs from one production well and one injection well well(s) in the Klamath Basin, in the Lost River sub basin Quad Map: Altamont

A2. Proposed use: Heat Exchange Seasonality: Year Round (365 days)

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	KLAM 13296	1 (Prod)	Basalt	+0.90	39S/10E-sec 30 BDB	1600' S, 1850' E fr NW cor S 30
2	KLAM 57685	2 (Inject)	Basalt	-0.90	39S/10E-sec 30 CBC	3620' S, 590' E fr NW cor S 30
3						

* 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	4090	23.5	21.5	08/08/88	1506	0-1152	+2-1150	None	None	1000	104	P
2	4085	9	5	12/31/10	1300	0-1034	+3-1034	None	None	650	13	P

Use data from application for proposed wells.

A4. Comments: _____

Proposed groundwater use is to increase the heat exchange for heating and cooling the Henley schools complex.

The proposed pumping rate of 0.90 cfs (404 gpm) is in addition to the current 0.67 cfs (301 gpm) allowed under certificate 85780 (file G-12011).

The proposed production well (KLAM 13296) and injection well (KLAM 57685) are within 2350 feet of each other and constructed similarly to the production well. This implies the injection well should return groundwater to the same or nearby water bearing zone in the predominant basalt unit after the heat exchange. The proposed use is non-consumptive.

The application notes: "The existing geothermal supply well (KLAM 13296, Certificate 85780) is currently used for heating and air conditioning of the Henley High School and Middle School. A new Henley Elementary School is under construction and the School District would like to improve the existing production well pump and controls to utilize the geothermal well for heating and air conditioning of the new Henley Elementary School and snowmelt system within the sidewalks in addition to the heating and air conditioning of the existing Henley High School and Middle School. In 2010, an injection well (KLAM 57685) was drilled and the geothermal return water is now discharged into this well and into the same aquifer as the geothermal production well to replenish the aquifer. The existing and proposed use is nonconsumptive."

A5. Provisions of the N.A. 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: _____

No basin rule applies. Only the Klamath River Compact ORS 542.610 to 542.630 applies to the Klamath Basin. However, that compact applies to surface water only, not ground water.

A6. Well(s) # N.A., _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.

Name of administrative area: _____

Comments: _____

Currently, there is no administrative area.

The proposed production and injection wells are in an area between two areas where groundwater levels have annually declined more than 10 feet since 2000 (see attached map). One area is to the northeast, and the attached hydrograph for well KLAM 12925 is representative. The second area is to the south, and the attached hydrograph for well KLAM 52825 is representative of the north portion of that area. No additional groundwater use should occur. Additional groundwater use (net increase in groundwater pumping) would add to ongoing groundwater level declines in the area. As a result, OWRD finds groundwater is no longer available for additional use that increases the amount of net groundwater pumping in the area. It should be noted also that wells closer to the Klamath River and Upper Klamath Lake show more stable groundwater levels or some annual recovery periods after annual decline periods. This appears related to greater river and lake influences.

This application proposes no additional (net increase) groundwater use, because it proposes to inject 100 percent of the water pumped after it has passed through the heat exchange. To ensure this occurs, no net groundwater use must be included as a permit condition where 100% of the groundwater extracted must be injected to the same water bearing zone.

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) _____
 - 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: _____

Groundwater at the proposed production and injection wells is in an area is determined to be over appropriated (see paragraph below). No additional (net increase) groundwater use should occur. This application does not propose any additional (net increase) groundwater use.

The proposed production and injection wells are in an area between two areas where groundwater levels have annually declined more than 10 feet since 2000 (see attached map). One area is to the northeast, and the attached hydrograph for well KLAM 12925 is representative. The second area is to the south, and the attached hydrograph for well KLAM 52825 is representative of the north portion of that area. No additional groundwater use should occur. Additional groundwater use (net increase in groundwater pumping) would add to ongoing groundwater level declines in the area. As a result, OWRD finds groundwater is no longer available for additional use that increases the amount of net groundwater pumping in the area. This application does not propose any additional (net increase) groundwater use. It should be noted also that wells closer to the Klamath River and Upper Klamath Lake show more stable groundwater levels or some annual recovery periods after annual decline periods. This appears related to greater river and lake influences.

This application proposes no additional (net increase) groundwater use, because it proposes to inject 100 percent of the water pumped after it has passed through the heat exchange. To ensure this occurs, no net groundwater use must be included as a permit condition where 100% of the groundwater extracted must be injected to the same water bearing zone (see below).

If a permit is issued, the following conditions should be included: 7B, 7F, 7L, 7N (modified), 7T (measuring tube for each well), the "large" water use condition (flow meter required at each well), and special conditions (see below):

7N, the measurement condition modified (change parts C and D from 25 feet to 15 feet).

7T, the measuring tube condition modified (add "For existing wells with a pump installed, installation of the measuring tube shall occur when the pump is removed or replaced and/or when the well is deepened or reconstructed or altered.").

The "large" water use condition (require a flow meter at each well; each flow meter shall be located within 50 feet of the wellhead. Adjacent to each flow meter shall be a clearly visible monument with a sign noting the flow meter. Lastly, require for each flow meter the reading, recording (monthly at minimum), and annual reporting of the flow meter data).

Special condition for no net groundwater use: "This permit is valid if and only if 100 percent of the groundwater extracted from the production well(s) is injected in the authorized injection well(s) which can be confirmed by flow meter data. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit."

Special condition for low temperature geothermal wells used for heating: "All water produced under this permit shall be injected into the authorized well(s). Prior to receiving a certificate of water right, the permit holder shall submit documentation affirming that any applicable additional requirements of the Department's Division 230 rules have been met."

Special Condition for groundwater production: "Groundwater production shall occur from the predominant basalt unit below the predominant basin fill unit by casing and sealing through the basin fill unit into the basalt unit." The currently proposed wells meet this condition.

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	Basalt Unit	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Basalt Unit	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>

Basis for aquifer confinement evaluation: _____

System is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. Generally, low transmissivity (low permeability) sediment of varying thickness overlies high transmissivity (high permeability) basalt. Groundwater occurs in both the sediment unit and the basalt unit. Groundwater is vertically connected within each unit and between each unit. This is based upon investigations by Gannett and others (2007) and Grondin (2004).

Water well reports (well logs) for wells in the general area indicate the sediment thickness varies considerably by location due to buried geologic structure. For example, the sediment thickness is less than 25 feet at well KLAM 14597 located adjacent to Stukel Mountain about 1.5 to 2.0 miles southeast of the proposed production and injection wells. The sediment thickness is more than 1,000 feet at proposed production and injection wells further away from Stukel Mountain.

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 1/4 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	Lost River	4075	4075	4730	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	1	Lost River	4075	4075	3860	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Basis for aquifer hydraulic connection evaluation: _____

The groundwater elevation in the table above is based on Gannett and others (2007) figure 21 and the December 2010 (non-irrigation recovery period) water level reported on the water well report for the proposed injection well. It is not appropriate to use the static water level data on the water well report (well log) for the proposed production well, because that measurement occurred during mid-summer when the irrigation season pumping and seasonal groundwater level drawdown is greatest.

The distance from the wells to the Lost River is to the nearest reach. It is greater than 0.25 miles for each proposed well.

The eastern Lost River sub-basin ground water investigation data (Grondin, 2004) and the USGS-OWRD cooperative Upper Klamath Basin ground water investigation (Gannett and others, 2007) indicate low yield (low hydraulic conductivity) sediments overlie higher yield (high conductivity) basalt. Many domestic wells produce from the sediments and most irrigation wells produce from the basalt. Ground water in the sediments and the basalt appear hydraulically connected. The data include similar or small differences between basalt and sedimentary ground water levels and/or data showing ground water levels at wells completed in the sediments responding to pumping ground water from basalt.

Gannett and others (2007) show groundwater flow in the vicinity toward the Lost River and toward Tule Lake. This includes flow across the proposed well site. Generally in the Upper Klamath Basin, groundwater and surface water are hydraulically connected.

Water Availability Basin the well(s) are located within: LOST R > TULE L – AT STATE LINE

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?
		<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: _____

All the proposed wells are less than 1.00 mile from the Lost River.

The application proposes and this review is based upon no net use of groundwater (net use = 0.0 gpm) where 100 percent of the groundwater extracted is injected back to the same source. So no calculation was conducted. If less than 100 percent of the groundwater extracted is injected to the same source, this review is invalid and the permit should not be issued.

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													
		%	%	%	%	%	%	%	%	%	%	%	%
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: _____

All the proposed wells are less than 1.00 mile from the Lost River.

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 _____

This review is based upon no net use of groundwater (net use = 0.0 gpm) where 100 percent of the groundwater extracted is injected back to the same source. If the capability or the intent is for less than 100 percent of the groundwater extracted to be injected to the same source, this review is invalid and the permit should not be issued.

The proposed production and injection wells are in an area between two areas where groundwater levels have annually declined more than 10 feet since 2000 (see attached map). One area is to the northeast, and the attached hydrograph for well KLAM 12925 is representative. The second area is to the south, and the attached hydrograph for well KLAM 52825 is representative of the north portion of that area. No additional groundwater use should occur. Additional groundwater use (net increase in groundwater pumping) would add to ongoing groundwater level declines in the area. As a result, OWRD finds groundwater is no longer available for additional use that increases the amount of net groundwater pumping in the area. This application does not propose any additional (net increase) groundwater use. It should be noted also that wells closer to the Klamath River and Upper Klamath Lake show more stable groundwater levels or some annual recovery periods after annual decline periods. This appears related to greater river and lake influences.

This application proposes no additional (net increase) groundwater use, because it proposes to inject 100 percent of the water pumped after it has passed through the heat exchange. To ensure this occurs, no net groundwater use must be included as a permit condition where 100% of the groundwater extracted must be injected to the same water bearing zone (see below).

If a permit is issued, the following conditions should be included: 7B, 7F, 7L, 7N (modified), 7T (measuring tube for each well), the "large" water use condition (flow meter required at each well), and special conditions (see below):

7N, the measurement condition modified (change parts C and D from 25 feet to 15 feet).

7T, the measuring tube condition modified (add "For existing wells with a pump installed, installation of the measuring tube shall occur when the pump is removed or replaced and/or when the well is deepened or reconstructed or altered.").

The "large" water use condition (require a flow meter at each well; each flow meter shall be located within 50 feet of the wellhead. Adjacent to each flow meter shall be a clearly visible monument with a sign noting the flow meter. Lastly, require for each flow meter the reading, recording (monthly at minimum), and annual reporting of the flow meter data).

Special condition for no net groundwater use: "This permit is valid if and only if 100 percent of the groundwater extracted from the production well(s) is injected in the authorized injection well(s) which can be confirmed by flow meter data. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit."

Special condition for low temperature geothermal wells used for heating: "All water produced under this permit shall be injected into the authorized well(s). Prior to receiving a certificate of water right, the permit holder shall submit documentation affirming that any applicable additional requirements of the Department's Division 230 rules have been met."

Special Condition for groundwater production: "Groundwater production shall occur from the predominant basalt unit below the predominant basin fill unit by casing and sealing through the basin fill unit into the basalt unit." The currently proposed wells meet this condition.

References Used:

Grondin, G.H., 2004. Ground Water in the Eastern Lost River Sub-Basin, Langell, Yonna, Swan Lake, and Poe Valleys of Southeastern Klamath County, Oregon. Ground Water Report 41, Oregon Water Resources Department, Salem, Oregon.

USGS, 2005. Assessment of the Klamath Project pilot water bank: a review from a hydrologic perspective. Prepared by the U.S. Geological Survey Oregon Water Science Center, Portland, Oregon for the U.S. Bureau of Reclamation Klamath Basin Area Office, Klamath Falls, Oregon, May 3, 2005.

Gannett, M.W., Lite, K.E., La Marche, J.L., Fisher, B.J., and Polette, D.J. 2007. Ground-Water Hydrology of the Upper Klamath Basin, Oregon and California. USGS Scientific Investigations Report 2007-5050.

Gannett, M.W., Wagner, B.J., and Lite, K.E. 2012. Groundwater simulation and management models for the upper Klamath Basin, Oregon and California. USGS Scientific Investigations Report 2012-5062.

Sammel, E.A. 1980. Hydrogeologic Appraisal of the Klamath Falls Geothermal Area, Oregon. USGS Professional Paper 1044-G, 45 p.

Leonard, A.R. and Harris, A.B. 1974. Groundwater in selected areas in the Klamath Basin, Oregon. OWRD Groundwater Report No. 21, 104 pgs.

Hydrographs and/or water well reports for wells KLAM 13296, KLAM 57685, KLAM 14914, KLAM 14764, KLAM 12925, and KLAM 52825.

USGS Altamont quadrangle map (1:24,000 scale)

D. WELL CONSTRUCTION, OAR 690-200

D1. Well #: 1 Logid: KLAM 13296

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.

The well meets the recommended permit conditions for well construction and groundwater production.

D6. **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section.

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).**

D. WELL CONSTRUCTION, OAR 690-200

D1. Well #: 2 Logid: KLAM 57685

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.

The well meets the recommended permit conditions for well construction and groundwater production.

D6. **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section.

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).**

GW Permit Application G-17883 Klamath County School District

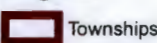


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Yellow = Proposed POAs
Red & Blue = Other Wells
Green = Surface Water Rights



Legend
 Townships
 Sections

GW Permit Application G-17883 Klamath County School District



Yellow = Proposed POAs
Red & Blue = Other Wells
Green = Surface Water Rights



Legend
Townships
Sections

GW Permit Application G-17883 Klamath County School District



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Legend

- Townships
- Sections
- 2001 to 2010 Long-Term GW Declines**
- Contour**
- 10 - 20 feet
- 20 - 30 feet
- >30 feet

Yellow = Proposed POAs
Red & Blue = Other Wells

Green = Surface Water Rights



VAN METER and DE SPAIN WELL DRILLING, INC.

Licensed - Bonded
Free Estimates

John Van Meter
P.O. Box 223
Midland, OR 97634
(503) 823-8202

Larry De Spain
3114 Boardman
Klamath Falls, OR 97601
(503) 884-6544

Date _____ 19 _____

0-	4.5	Sandy topsoil
4.5-	13	Yellow chalk
13-	62	Gray clay
62-	75	Gray shale
75-	84.5	Gray green shale
84.5-	92	Hard green shale
92-	159	Green clay
159-	262	Gray clay
262-	265	Hard gray shale
265-	267	Gray clay
267-	392	Gray clay w/black sand
392-	427	Black sandstone
427-	429	Brn sandstone
429-	432	Blk sandstone
432-	442	Gray shale
442-	448	Hard shale
448-	479	Sticky Gray
479-	491	Blk sandstone
491-	510	Brn shale
510-	512	Gray shale
512-	513	Blk sandstone
513-	525	Gray shale & coarse sand
525-	655	Gray shale
655-	700	Green clay
700-	835	Green clay & shale
835-	910	Gray shale
910-	1005	Broken gray shale
1005-	1066	Gray shale
1066-	1084	Green clay
1084-	1110	Black clay & shale
1110-	1116	Brn hard shale
1116-	1144	Hard gray basalt
1144-	1146	Brn clay
1146-	1175	Gray hard basalt
1175-	1207	Decomp basalt
1207-	1213	Green shale
1213-	1220	Blue shale
1220-	1246	Gray basalt
1246-	1248	Gray w/shale & fine blk sand
1248-	1252	Gray basalt
1252-	1254	Brn lava
1254-	1506	Gray crevice basalt

RECEIVED

OCT 14 1988

WATER RESOURCES DEPT.
SALEM, OREGON

IRRIGATION

STOCK

DOMESTIC

MUNICIPAL

BLAST HOLES

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

01-11-2011

WELL LABEL # L 104227

START CARD # 1010621

(1) LAND OWNER Owner Well I.D.

First Name HENLEY HIGH SCHOOL Last Name
Company KLAMATH COUNTY SCHOOL DISTRICT
Address 10501 WASHBURN WAY
City KLAMATH FALLS State OR Zip 97603

(2) TYPE OF WORK [X] New Well [] Deepening [] Conversion
[] Alteration (repair/recondition) [] Abandonment

(3) DRILL METHOD
[] Rotary Air [X] Rotary Mud [] Cable [] Auger [] Cable Mud
[] Reverse Rotary [] Other

(4) PROPOSED USE [] Domestic [] Irrigation [] Community
[] Industrial/ Commercial [] Livestock [] Dewatering
[] Thermal [X] Injection [] Other

(5) BORE HOLE CONSTRUCTION Special Standard [] Attach copy
Depth of Completed Well 1,300.00 ft.

Table with columns: Dia, From, To, Material, SEAL, To, Amt, sacks/lbs. Rows include Bentonite Chips and Cement.

How was seal placed: Method [] A [] B [] C [X] D [] E
[X] Other Bent. poured dry
Backfill placed from 34 ft. to 58 ft. Material 3/4 Bent. on 12" Case
Explosives used: [] Yes Type Amount

(6) CASING/LINER

Table with columns: Casing/Liner, Dia, From, To, Gauge, Stl, Plstc, Wld, Thr. Includes rows for 12" and 8" casing.

Shoe [] Inside [] Outside [X] Other Location of shoe(s) 1,034
Temp casing [] Yes Dia From To

(7) PERFORATIONS/SCREENS

Perforations Method Screens Type Material

Table with columns: Per/S, Casing/Screen, Dia, From, To, Scrp/slot width, Slot length, # of slots, Tele/pipe size.

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

[X] Pump [] Bailer [] Air [] Flowing Artesian
Yield gal/min Drawdown Drill stem/Pump depth Duration (hr)
650 13 150 4

Temperature 120 °F Lab analysis [] Yes By
Water quality concerns? [] Yes (describe below)
From To Description Amount Units

(9) LOCATION OF WELL (legal description)

County Klamath Twp 39.00 S N/S Range 10.00 E E/W WM
Sec 30 NW 1/4 of the SE 1/4 Tax Lot 1500
Tax Map Number Lot
Lat " or " or DMS or DD
Long " or " or DMS or DD
[] Street address of well [] Nearest address

8205 HWY. 39 KLAMATH FALLS, OR 97603

(10) STATIC WATER LEVEL

Table with columns: Date, SWL(psi), SWL(ft). Rows for Existing Well / Predeepening and Completed Well.

WATER BEARING ZONES Depth water was first found 9

Table with columns: SWL Date, From, To, Est Flow, SWL(psi), SWL(ft). Rows for 08-09-2010 and 12-31-2010.

(11) WELL LOG

Table with columns: Material, From, To, Ground Elevation 4,150. Lists soil and rock layers.

Date Started 07-21-2010 Completed 12-31-2010

(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.

License Number 1560 Date 01-11-2011
Electronically Filed
Signed JAMES B PINKARD (E-filed)

(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.

License Number 777 Date 01-11-2011
Electronically Filed
Signed STEPHEN R HUGHES (E-filed)
Contact Info (optional)



LEGEND

- ① INJECTION SITE
- ② EXISTING GEOTHERMAL SITE

ADKINS

CONSULTING ENGINEERS, INC.

Engineers ▲ Planners ▲ Surveyors

2950 Shasta Way Klamath Falls, Oregon 97603 · (541) 884-4666 FAX (541) 884-3335
Klamath Falls, OR · Medford, OR · Alturas, CA

12/28/11

Base.dwg

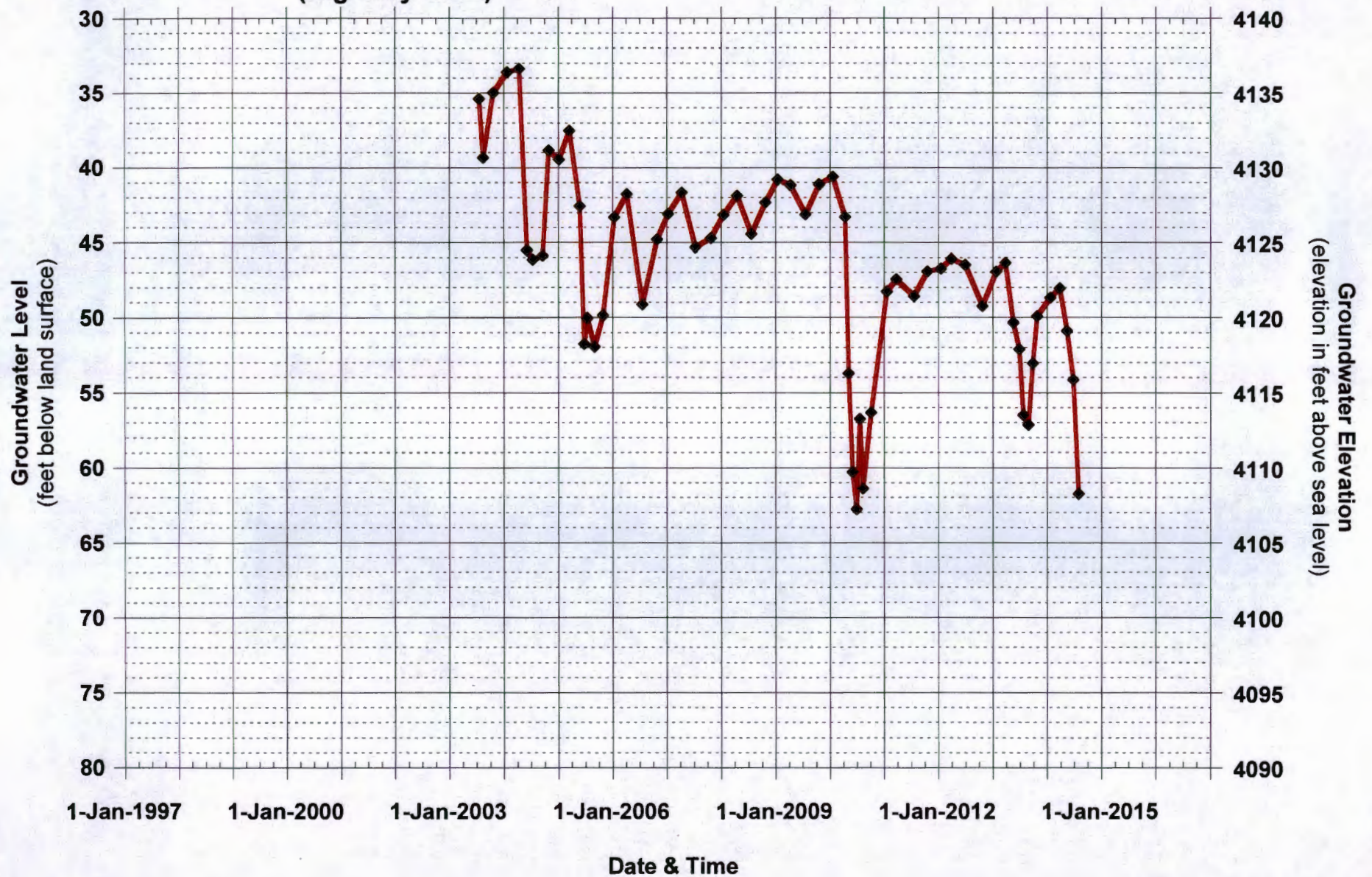
1122-19

INJECTION WELL LOCATION MAP
for
KLAMATH COUNTY SCHOOL DISTRICT

T 39S R 10E, Sec 30
Klamath County, Oregon

KLAM 12925
T39S/R10E-sec 08 cad
Altamont-Pine Grove
(Highway 140E)

Well Depth = 508 ft
Casing Depth = 79 ft
Seal Depth = 77 ft
Aquifer = Basalt



**KLAM 52825
T40S/R09E-sec 02 daa
Klamath Valley
(12080 Homedale Road)**

Well Depth = 622 ft
Casing Depth = 76.5 ft
Seal Depth = 74 ft
Aquifer = Basalt

