Water Right Conditions Tracking Slip

Ground Water/Hydrology Section

File No: G-17298

Routed To: Water Rights (Plahn)

Township/
Range-Section: 38S/10E-sec 16

Conditions Attached? (X) yes ( ) no

Remarks or Further Instructions:

* Note drawdown at High spring comments (pg 8)
* Previously urged applicant try options other than new permit
* If issued: condition with 7B, 7N, "large" (flow meter)

Reviewer: Gerald Grondin

WATER RESOURCES DEPARTMENT

MEMO 25 February, 2010

TO: **Application G-** 17298

FROM: **GW:** GERALD GRONDIN
(Reviewer's Name)

SUBJECT: **Scenic Waterway Interference Evaluation**

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

_____YES
Use the Scenic Waterway condition (Condition 7J)
_X_ NO

_____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.**

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** 25 February 2010

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

SUBJECT: Application G- **17298** 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: **Jonathan Holdaway** County: **Klamath**

A1. Applicant(s) seek(s) **(75 gpm) 0.17*** cfs from **1** well(s) in the **Klamath** Basin, **Lost River** subbasin Quad Map: **Whiteline Reservoir**

A2. Proposed use: **Irrigation (primary = 6.0 acres)** Seasonality: **1 May to 30 September (153 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 50493**	**1**	**Basalt**	**0.17***	**38S/10E-sec 16 DDC**	**1900' S, 1848'E fr center S 16***
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	**4222**	**200**	**126**	**04/14/08**	**206**	**0-60 & 100-192**	**+1-193**	**None**	**None**	**75**	**?**	**Air**

Use data from application for proposed wells.

A4. **Comments:**

The Application requests maximum pumping rate of 75 gpm (0.17 cfs). For 6 acres, 34 gpm (0.075 cfs) maximum pumping rate is typically allowed.

Metes and bounds location is from the application. It puts the well north and east of its actual location.

The well was part of a USGS survey quality GPS location and elevation survey in the summer of 2002. The results are: elevation = 4221.8 ft +/- 0.1 feet (NGVD29 datum), lat-long location = 42 deg 15 min 32.14 sec latitude and 121 deg 38 min 33.72 sec longitude, both +/- 0.01 second (NAD27 datum)

The static ground water level (125.73 ft blsd) is from a 14 April 2008 OWRD quarterly ground water level measurement by this reviewer. The level is similar to other April ground water level measurements at the well.

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, 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 and 7N and "large" water use 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:** _____

If issued, the permit should contain conditions: 7B and 7N and "Large" water use condition (flowmeter required).

Data from the upper (eastern) Lost River sub-basin ground water investigation (Grondin, 2004) and the USGS-OWRD cooperative Upper Klamath Basin ground water investigation (Gannett and others, 2007) indicate an important influence on long-term ground water levels is climate and an important influence on short-term (seasonal) ground water levels is ground water use. It is possible for ground water use to cause long term ground water level declines. Additionally, the USGS-OWRD cooperative Upper Klamath Basin ground water investigation (Gannett and others, 2007) found an exception to the basin-wide ground water level trends at wells in the vicinity of Upper Klamath Lake. Ground water levels at these wells are highly influenced by lake levels.

The proposed well (KLAM 50493) is located in southwest Swan Lake Valley. The valley is a naturally closed basin with surface water draining to Swan Lake. Artificial surface water drainage occurs at a pumping station on the west end of Pine Flat which is connected to and south of Swan Lake Valley.

The proposed well is located within the central, main portion of the Swan Lake Valley to Poe Valley sub-area described in Grondin (2004). Both Grondin (2004) and Gannett and others (2007) show ground water in Swan Lake Valley and Pine Flat flows southwest and west respectively to converge at a ground water "trough" that appears related to a geologic structure. It subsequently flows southeast along the "trough" axis to western Poe Valley where ground water discharges to the Lost River, primarily at fault controlled valley springs and secondarily via direct riverbed seepage to the river. There are senior water rights on the springs, including springs owned by Taylor High.

Well KLAM 12221 is the closest state observation well (#285) located in southwest Swan Lake Valley about 1.8 miles southeast of the proposed well. The water level data is from 1957 through 2008. The hydrograph shows both long-term climate influences and short-term (seasonal) ground water pumping influences. Net ground water levels may have declined 2 to 5 feet overall since 1957.

Additionally, there are OWRD ground water level measurements at the proposed well (KLAM 50493) from 1998 through 2009. The hydrograph also shows both long-term climate influences and short-term (seasonal) ground water pumping influences. For the period represented, the water level elevations and variability on this hydrograph are similar to those for state observation well 285 (KLAM 12221).

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**	☐	☒
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation:

The ground water system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. Water well reports (well logs) for area wells indicate low transmissivity (low permeability) basin fill sediment of varying thickness (156 feet at the proposed well) overlies higher transmissivity (higher permeability) basalt in the area. Ground water occurs in both the sediment and basalt and the ground water is hydraulically connected laterally and vertically.

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	**Swan Lake**	**4096**	**4180**	**20,900**	☐	☒	☐	☐	☒
1	2	**Lost River**	**4096**	**4095**	**29,500**	☒	☐	☐	☐	☒
1	3	**Taylor High un-named spring**	**4096**	**4095**	**37,000**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation:

The Ground water elevation shown is based upon an OWRD quarterly ground water level measurement of 125.73 ft blsd at the proposed well on 14 April 2008 by this reviewer and ground surface elevation derived from a USGS survey quality GPS location and elevation survey at the proposed well in the summer of 2002.

The surface water elevations are from the USGS Swan Lake and Dairy quadrangle maps (1:24,000 scale)

The proposed well (KLAM 50493) is hydraulically connected to the Lost River and to Taylor High un-named spring and other springs that discharge to the Lost River.

Water Availability Basin the well(s) are located within: LOST R > TULE L - AT OLENE GAP

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

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:

No evaluation. The proposed well (KLAM 50493) is more than 1.00 mile from Swan Lake, Lost River and High unnamed spring.

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
1	**1**	%	%	%	%	%	%	%	%	%	%	%	%
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 evaluation. The proposed well (KLAM 50493) is more than 1.00 mile from Swan Lake and the ground water level at the well is more than 80 feet below the lake level. Ground water directly below the lake appears to be about 40 feet below the lake level. The lake appears to lose water to ground water.

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
1	**2**	**0.60%**	**0.70%**	**0.70%**	**0.80%**	**0.00%**	**0.00%**	**0.10%**	**0.10%**	**0.20%**	**0.30%**	**0.40%**	**0.50%**
Well Q as CFS		**0.0000**	**0.0000**	**0.0000**	**0.0593**	**0.0593**	**0.0593**	**0.0593**	**0.0593**	**0.0593**	**0.0000**	**0.0000**	**0.0000**
Interference CFS		**0.000 356**	**0.000 415**	**0.000 415**	**0.000 474**	**0.000 000**	**0.000 000**	**0.000 059**	**0.000 059**	**0.000 119**	**0.000 178**	**0.000 237**	**0.000 297**
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.		**0.000 356**	**0.000 415**	**0.000 415**	**0.000 474**	**0.000 000**	**0.000 000**	**0.000 059**	**0.000 059**	**0.000 119**	**0.000 178**	**0.000 237**	**0.000 297**
(B) = 80 % Nat. Q		**165.0**	**371.0**	**391.0**	**246.0**	**178.0**	**122.0**	**118.0**	**106.0**	**92.5**	**89.7**	**94.6**	**137.0**
(C) = 1 % Nat. Q		**1.650**	**3.710**	**3.910**	**2.460**	**1.780**	**1.220**	**1.180**	**1.060**	**0.925**	**0.897**	**0.946**	**1.370**
(D) = (A) > (C)		**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
(E) = (A / B) x 100		**0.000 216**	**0.000 112**	**0.000 106**	**0.000 193**	**0.000 000**	**0.000 000**	**0.000 050**	**0.000 056**	**0.000 128**	**0.000 198**	**0.000 251**	**0.000 216**

(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 (KLAM 50493) is more than 1.00 mile (about 29,500 feet = 5.6 miles) from the Lost River and is hydraulically connected. This evaluation looks at the interference with the river via reduced ground water seepage to the river through the streambed only, not reduced flow at Taylor High un-named spring and other springs that discharge to the river.

The interference calculation used a pro-rated pumping rate (total volume allowed/total time) = 0.0593 cfs (26.62 gpm), transmissivity = 150,000 ft2/day and storage coefficient = 0.0004 (these values are from Grondin (2004) for the Swan Lake Valley to Poe Valley sub-area), sediment hydraulic conductivity Kv = 2.09 ft/day (derived from Poe Valley), sediment thickness = 100 feet, river width = 75 feet.

The calculated interference for each month all remained less than one-percent of the natural stream flow (80 percent exceedance). The results still remain less than one-percent of the natural stream flow if the proposed pumping rate of 0.17 cfs (75 gpm) is used.

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
1	**3**	%	%	%	%	%	%	%	%	%	%	%	%
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:

The proposed well (KLAM 50493) is more than 1.00 mile (about 37,000 feet = 7.0 miles) from Taylor High un-named spring and other springs that discharge to the Lost River and is hydraulically connected.

No evaluation of interference to spring flow discharge can be made at this time due to model limitations.

Ground water level drawdown at Taylor High un-named spring due to pumping the proposed well was evaluated. The calculated drawdown at the spring due to pumping the well at the proposed rate of 75 gpm (0.167 cfs) is 0.023 ft and 0.035 ft at the end of 30 days pumping and 150 days pumping respectively. The calculated drawdown at the spring due to pumping the well at the maximum allowable rate of 33.66 gpm (0.075 cfs) is 0.010 ft and 0.016 ft at the end of 30 days pumping and 150 days pumping respectively. The calculated drawdown at the spring due to pumping the well at the pro-rated rate (total volume / total time) of 26.62 gpm (0.059 cfs) is 0.008 ft and 0.012 ft at the end of 30 days pumping and 150 days pumping respectively.

The drawdown calculation used a pro-rated pumping rate (total volume allowed/total time) = 0.0593 cfs (26.62 gpm), transmissivity = 150,000 ft2/day and storage coefficient = 0.0004 (these values are from Grondin (2004) for the Swan Lake Valley to Poe Valley sub-area).

The additional drawdown at Taylor High un-named spring and other springs that discharge to the Lost River is very problematic even though it is relatively "small" (0.01 to 0.05 ft depending on the pumping scenario). However, Mr. High has discussed with Department staff periodically about possible regulation of ground water pumping to protect the spring flow.

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**

issued, the permit should contain conditions: 7B and 7N and "Large" water use condition (flowmeter required).

The proposed well is located within the central, main portion of the Swan Lake Valley to Poe Valley sub-area described in Grondin (2004). Both Grondin (2004) and Gannett and others (2007) show ground water in Swan Lake Valley and Pine Flat flows southwest and west respectively to converge at a ground water "trough" that appears related to a geologic structure. It subsequently flows southeast along the "trough" axis to western Poe Valley where ground water discharges to the Lost River, primarily at fault controlled valley springs and secondarily via direct riverbed seepage to the river. There are senior water rights on the springs, including un-named springs owned by Taylor High.

The proposed well (KLAM 50493) is hydraulically connected to the Lost River and to Taylor High un-named spring and other springs that discharge to the Lost River.

One evaluation calculated the interference with the Lost River via reduced ground water seepage to the river through the streambed, but not reduced flow at Taylor High un-named spring and other springs that discharge to the river. The calculated interference for each month all remained less than one-percent of the natural stream flow (80 percent exceedance). The results still remain less than one-percent of the natural stream flow if the proposed pumping rate of 0.17 cfs (75 gpm) is used.

Another evaluation calculated the ground water level drawdown at Taylor High un-named spring due to pumping the proposed well. At present, available models can not calculate interference with spring flow. An additional drawdown was calculated at Taylor High un-named spring for three different pumping rates and for different periods of pumping. All show additional drawdown. This is very problematic even though the drawdowns are relatively "small" (0.01 to 0.05 ft depending on the pumping scenario). Mr. High has discussed with Department staff periodically about possible regulation of ground water pumping to protect the spring flow.

References Used:

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.

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.

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.

Hunt, B., 1999, Unsteady stream depletion from ground water pumping: Ground Water, v. 37, no. 1, p. 98-102.

Hunt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, January/February, 2003.

Jenkins, C.T., 1970, Computation of rate and volume of stream depletion by wells: U.S. Geol. Survey Techniques of Water- Resources Investigations of the Unites States Geological Survey, Chapter D1, Book 4,17 p.

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

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.

Theis, 1941, The effect of a well on the flow of a nearby stream: American Geophysical Union Trans., v. 22, pt. 3, p. 734-738.

Hydrographs and ground water level data for wells KLAM 12221 (state observation well 285) and KLAM 50493

USGS Whiteline Reservoir, Swan Lake, Altamont, and Dairy quadrangle maps (1:24,000 scale)

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** 1 **Logid:** KLAM 50493

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.

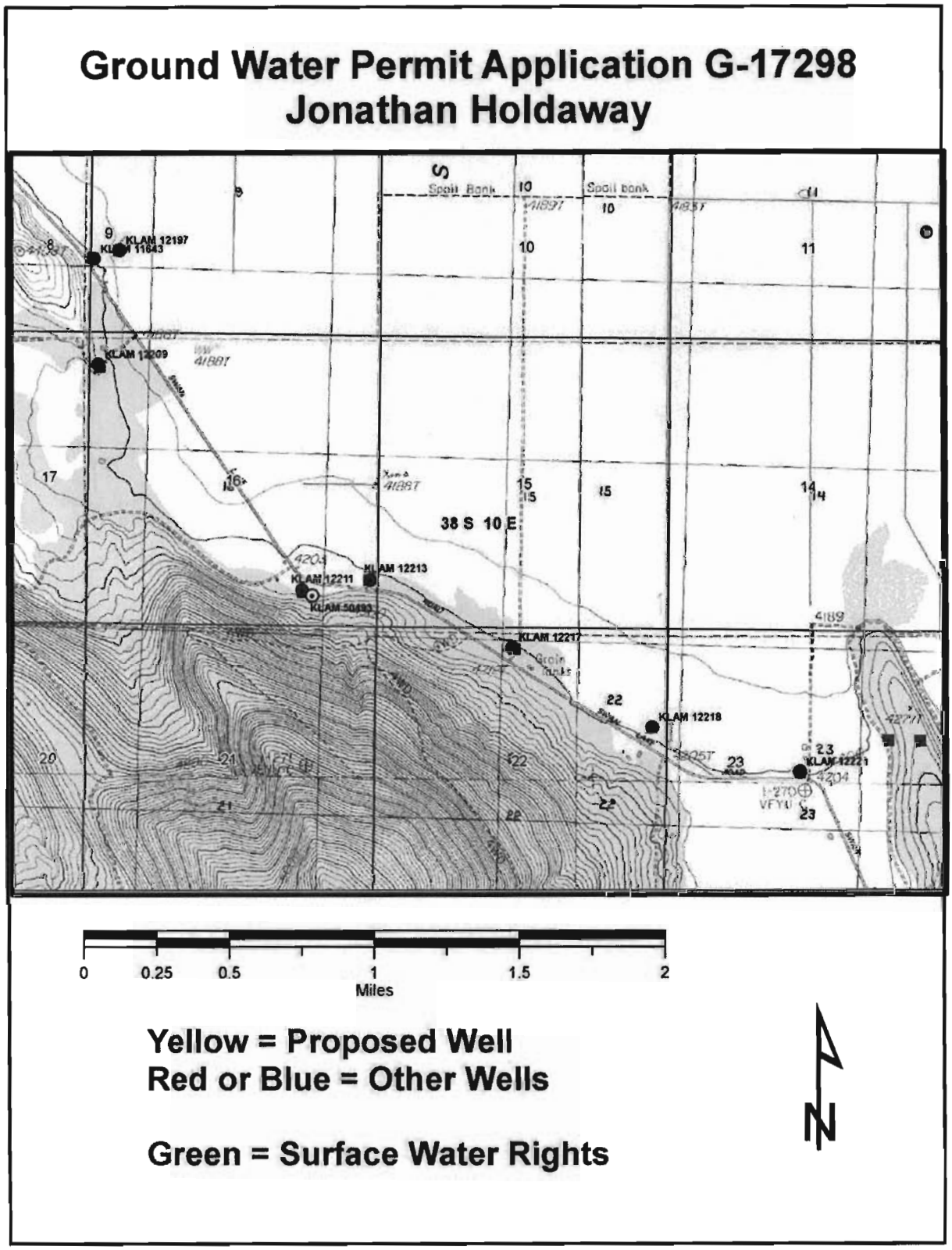
D6. ☐ **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section.

THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

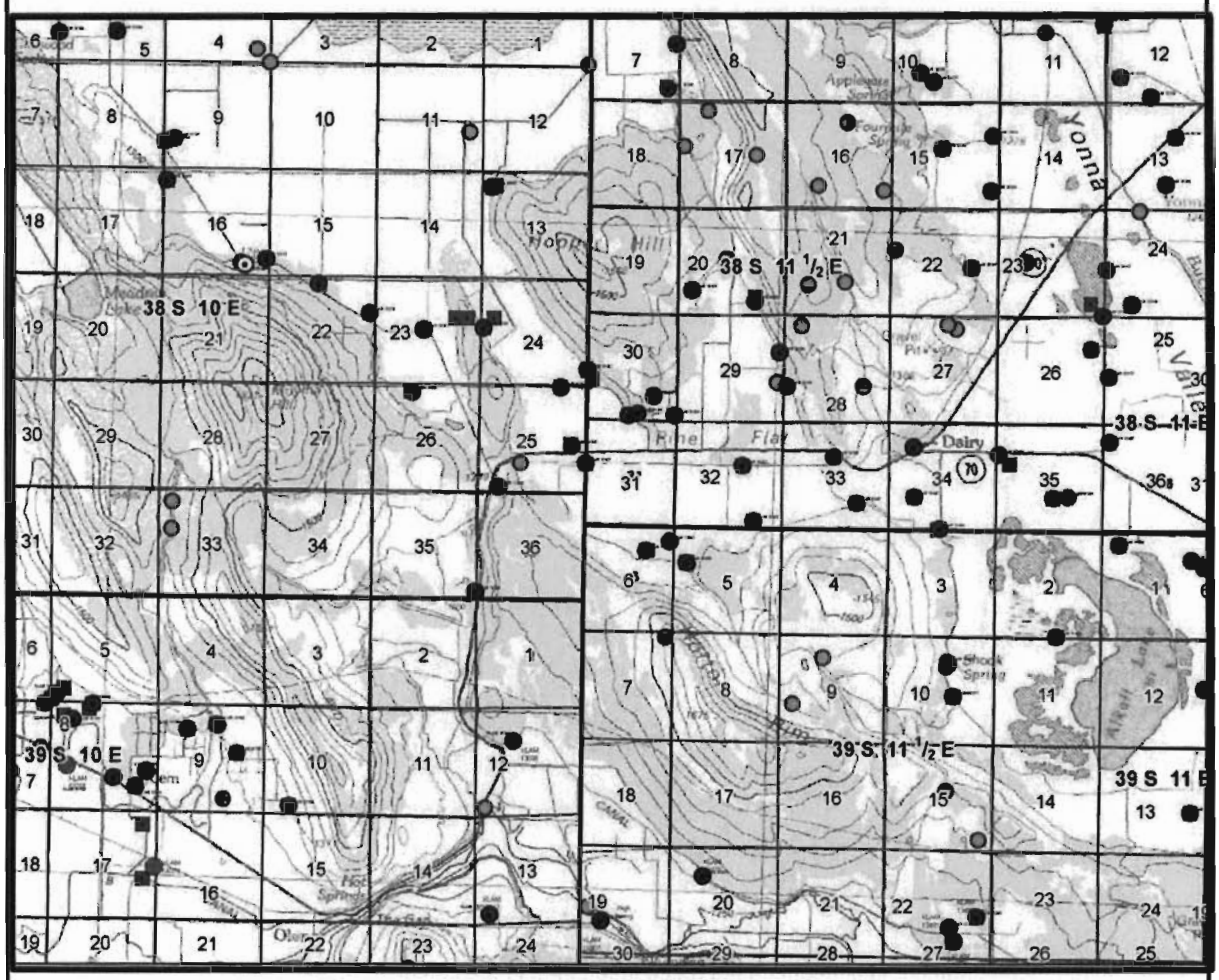
D7. ☐ Well construction deficiency has been corrected by the following actions: _____

_____ _____, 200____.
(Enforcement Section Signature)

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


Ground Water Permit Application G-17298
Jonathan Holdaway
Spoil Bank
Spoil bank
KLAM 12197
KLAM 11643
KLAM 12209
KLAM 12211
KLAM 12213
KLAM 50493
KLAM 12217
KLAM 12218
KLAM 12221
38 S 10 E
0 0.25 0.5 1 1.5 2
Miles
Yellow = Proposed Well
Red or Blue = Other Wells
Green = Surface Water Rights
N

Ground Water Permit Application G-17298
Jonathan Holdaway



Yellow = Proposed Well
Red or Blue = Other Wells

Green = Surface Water Rights

N

Application G- 17298 continued

Date 25 February 2010

KLAM 50493 WELL # 20 1501

RECEIVED
OCT 21 1996
WATER RESOURCES DEPT.
SALEM, OREGON

STATE OF OREGON WATER WELL REPORT

(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

(START CARD) # 41006

(1) OWNER: Well Number #2
Name RICHARD CZARAPATA
Address 3660 SWAN LAKE ROAD
City KLAMATH FALLS State OREGON Zip 97603

(2) TYPE OF WORK
☐ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 206 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
9 7/8	0	20	CEMENT	100	192	40 SKS
8 3/4	20	197	BENTONITE	0	60	29 SKS
6	197	206				

How was seal placed: Method ☒ A ☐ B ☐ C ☐ D ☐ E
☒ Other 690 - 210 - 340
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:	6 5/8	+1	192½	280	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) @ 192½ FEET

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ____
☐ Screens Type ____ Material ____

From	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	Drawdown	Drill stem at	Time
75		206	1 hr.

Temperature of water 60°F Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☒ Other FAIR
Depth of strata: 63 FT.

(9) LOCATION OF WELL by legal description:
County KLAMATH Latitude ____ Longitude ____
Township 38S N or S Range 10E E or W. WM.
Section 16 SE 1/4 SE 1/4
Tax Lot R380 Lot 00000 Block 03301 Subdivision 1000
Street Address of Well (or nearest address) 3660 SWAN LAKE RD

(10) STATIC WATER LEVEL:
129 ft. below land surface. Date 10/11/96
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found 63 FT

From	To	Estimated Flow Rate	SWL
200	206	75 GPM	

(12) WELL LOG:
Ground Elevation ____

Material	From	To	SWL
BOULDERS & COBBLES & BROWN CLAY	0	6	
YELLOW CLAY	6	20	
BROWN CLAY	20	28	
YELLOW CLAY	28	74	
BROWN CLAY	74	90	
DECOMPOSED BLACK LAVA	90	93	
GREY CLAY	93	135	
GREY SHALE	135	150	
GREY CLAY	150	156	
BLACK LAVA	156	185	
BLACK BASALT	185	206	

Date started 10/9/96 Completed 10/11/96

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, 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.
WWC Number ____
Signed ____ Date ____

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, 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.
WWC Number 681
Signed ____ Date 10/14/96

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

Version: 08/15/2003

Ground Water

Oregon Water Resources Department

Hydrograph for State Well KLAM 50493

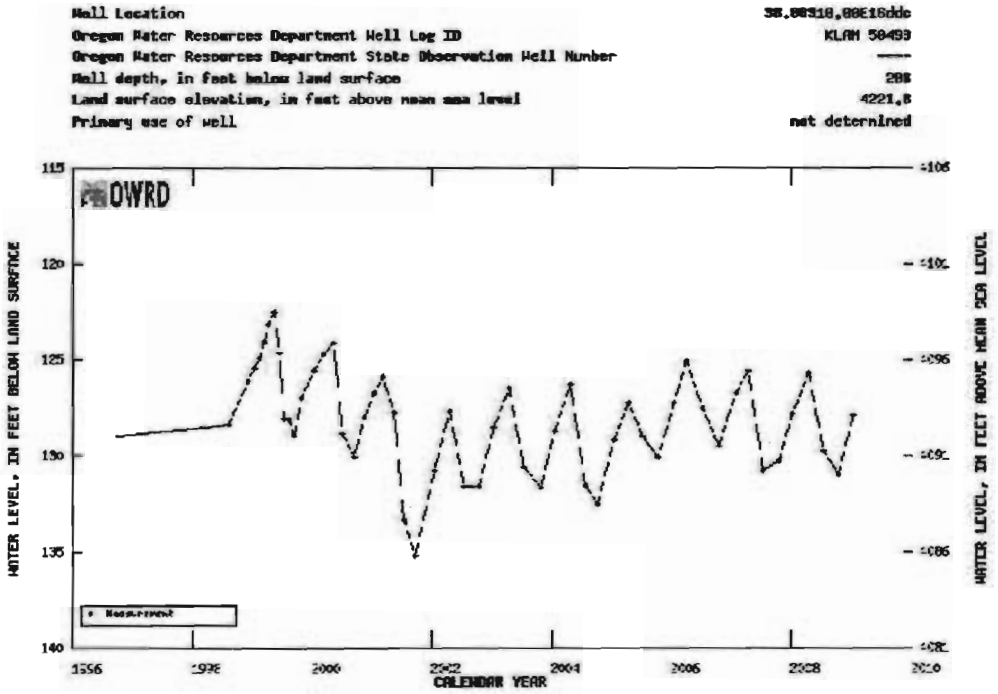
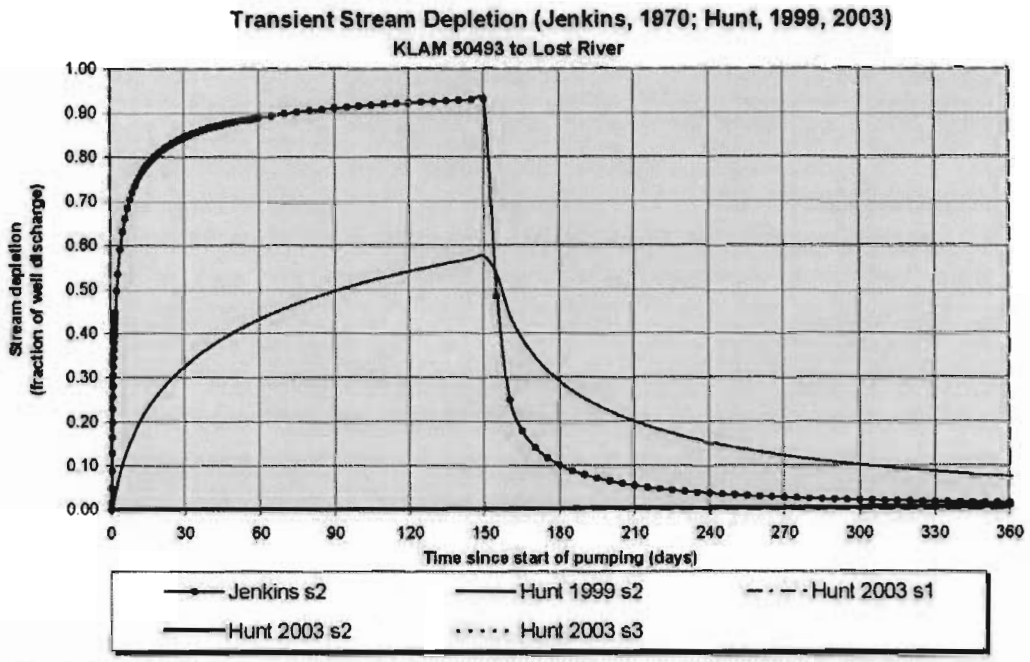


Table showing water-level data for State Well KLAM 50493



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 153 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	84.4%	88.9%	91.0%	92.2%	93.0%	10.0%	5.4%	3.7%	2.7%	2.1%	1.7%	1.4%
H SD 1999	32.6%	43.2%	49.5%	54.0%	57.4%	29.1%	19.9%	15.2%	12.2%	10.1%	8.6%	7.4%
H SD 2003	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.4%	0.5%	0.6%	0.7%	0.7%	0.8%
Qw, cfs	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059
H SD 99, cfs	0.019	0.026	0.029	0.032	0.034	0.017	0.012	0.009	0.007	0.006	0.005	0.004
H SD 03, cfs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.06	0.06	0.06	cfs
Time pump on (pumping duration)	tpon	153	153	153	days
Perpendicular from well to stream	a	29500	29500	29500	ft
Well depth	d	206	206	206	ft
Aquifer hydraulic conductivity	K	300	300	300	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	150000	150000	150000	ft*ft/day
Aquifer storativity or specific yield	S	0.0004	0.0004	0.0004	
Aquitard vertical hydraulic conductivity	Kva	2.09	2.09	2.09	ft/day
Aquitard saturated thickness	ba	100	100	100	ft
Aquitard thickness below stream	babs	100	100	100	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	75	75	75	ft
Streambed conductance (lambda)	sbc	1.567500	1.567500	1.567500	ft/day
Stream depletion factor	sdf	2.320667	2.320667	2.320667	days
Streambed factor	sbf	0.308275	0.308275	0.308275	
input #1 for Hunt's Q_4 function	t'	0.430911	0.430911	0.430911	
input #2 for Hunt's Q_4 function	K'	121.254833	121.254833	121.254833	
input #3 for Hunt's Q_4 function	epsilon'	0.002000	0.002000	0.002000	
input #4 for Hunt's Q_4 function	lamda'	0.308275	0.308275	0.308275	

G_17298_Holdaway_Swan_Lake_sd_hunt_2003_1.01.xls

Ground water drawdown calculated for Swan Lake Valley to Poe Valley sub-area

Theis Equation: s = [Q/(4*T*pi)]W(u)
W(u) = (-ln u)-(0.5772157)+(u/1*1!)-(u*u/2*2!)+(u*u*u/3*3!)-(u*u*u*u/4*4!)+...
u = (r*r*S)/(4*T*t)
s = drawdown (L)
T = transmissivity (L*L/T)
S = storage coefficient (dimensionless)
pi = 3.141592654
r = radial distance (L)
t = time (T)
u = dimensionless
W(u) = well function

Note: drawdown estimates uses Theis equation and "effective" aquifer properties which include boundary influences
Note: basalt aquifer is generally separated from Lost River by finer grained sedimentary layer
Note: no direct connection to Bonanza Big Springs

W(u) calculation test:

u	W(u)
7.0000E+00	1.1546E-04

Note: W(u) calculation valid when u < 7.1

Transmissivity T (gpd/ft)	Transmissivity T (ft2/day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft3/sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Theis Drawdown calculated s (feet)	Comments
KLAM 50493 to High Un-Named Spring											
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	30.00	37,000.00	3.14	0.0304	2.9456	0.0226	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	60.00	37,000.00	3.14	0.0152	3.6237	0.0278	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	90.00	37,000.00	3.14	0.0101	4.0241	0.0308	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	120.00	37,000.00	3.14	0.0076	4.3093	0.0330	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	150.00	37,000.00	3.14	0.0061	4.5309	0.0347	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	180.00	37,000.00	3.14	0.0051	4.7122	0.0361	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	210.00	37,000.00	3.14	0.0043	4.8656	0.0373	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	240.00	37,000.00	3.14	0.0038	4.9986	0.0383	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	270.00	37,000.00	3.14	0.0034	5.1160	0.0392	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	300.00	37,000.00	3.14	0.0030	5.2210	0.0400	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	330.00	37,000.00	3.14	0.0028	5.3160	0.0407	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	75.0000	0.1671	360.00	37,000.00	3.14	0.0025	5.4028	0.0414	Continuous Pumping at Proposed Full Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	30.00	37,000.00	3.14	0.0304	2.9456	0.0101	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	60.00	37,000.00	3.14	0.0152	3.6237	0.0125	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	90.00	37,000.00	3.14	0.0101	4.0241	0.0138	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	120.00	37,000.00	3.14	0.0076	4.3093	0.0148	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	150.00	37,000.00	3.14	0.0061	4.5309	0.0156	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	180.00	37,000.00	3.14	0.0051	4.7122	0.0162	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	210.00	37,000.00	3.14	0.0043	4.8656	0.0167	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	240.00	37,000.00	3.14	0.0038	4.9986	0.0172	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	270.00	37,000.00	3.14	0.0034	5.1160	0.0176	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	300.00	37,000.00	3.14	0.0030	5.2210	0.0179	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	33.6623	0.0750	330.00	37,000.00	3.14	0.0028	5.3160	0.0183	Continuous Pumping at Allowable Rate
4,488,312.00	600,000.00	0.00040	33.6623	0.0750	360.00	37,000.00	3.14	0.0006	6.7872	0.0058	Continuous Pumping at Allowable Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	30.00	37,000.00	3.14	0.0304	2.9456	0.0080	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	60.00	37,000.00	3.14	0.0152	3.6237	0.0099	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	90.00	37,000.00	3.14	0.0101	4.0241	0.0109	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	120.00	37,000.00	3.14	0.0076	4.3093	0.0117	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	150.00	37,000.00	3.14	0.0061	4.5309	0.0123	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	180.00	37,000.00	3.14	0.0051	4.7122	0.0128	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	210.00	37,000.00	3.14	0.0043	4.8656	0.0132	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	240.00	37,000.00	3.14	0.0038	4.9986	0.0136	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	270.00	37,000.00	3.14	0.0034	5.1160	0.0139	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	300.00	37,000.00	3.14	0.0030	5.2210	0.0142	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	330.00	37,000.00	3.14	0.0028	5.3160	0.0145	Continuous Pumping at Pro-Rated Pumping Rate
1,122,078.00	150,000.00	0.00040	26.6219	0.0593	360.00	37,000.00	3.14	0.0025	5.4028	0.0147	Continuous Pumping at Pro-Rated Pumping Rate