WATER RESOURCES DEPARTMENT

MEMO 11 July, 2012

TO: **Application G-** 16904

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
_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** 11 July 2012

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

SUBJECT: Application G-16904 Supersedes review of 11 March 2008
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: Valley Falls Ranch, Inc. County: Lake

A1. Applicant(s) seek(s) 4.46 (2000 gpm) cfs from 1 well(s) in the Goose and Summer Lakes Basin, Lake Abert (Chewaucan) sub basin Quad Map: Coglan Buttes

A2. Proposed use: Irrigation (230 acre primary) 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	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	**Not Drilled**	**1**	**Basalt**	**4.46**	**35S/20E-sec 25 BCA**	**3455'N, 1284'E fr SW cor S 25**
2						
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	**4321**	**TBD**	**TBD**	**N.A.**	**TBD**	**TBD**	**TBD**	**?**	**TBD**	**N.A.**	**N.A.**	**N.A.**
2												
3												

Use data from application for proposed wells.

A4. **Comments:**

The proposed maximum pumping rate of 4.46 cfs (2000 gpm) is greater than typically allowed for 230 acres (2.88 cfs, 1,290 gpm). The proposed total maximum annual volume of 690 ac-ft is the maximum typically allowed for 230 acres.

The proposed well is not yet drilled.

The proposed aquifer is the predominantly basalt unit below the predominantly basin-fill sediments. Geologic mapping (Walker 1963) indicates the surface geology at the proposed well site is sedimentary deposits (Qts). These deposits are described as lacustrine, fluvatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. West of the proposed well site are exposures of tuff (Ttf) and basalt (Tb). The tuff may be tuff of rhyolitic and dacitic composition, and/or tuffaceous sedimentary rocks, and/or areally restricted rhyodacitic and andesitic flows.

Two wells deeper than 500 feet located east of the proposed well site (LAKE 1756 and LAKE 1761) indicate the depth to the predominantly basalt unit within the valley the valley can exceed 500 feet. The unit appears to be encountered at 519 feet depth at well LAKE 1756 and it was not reached at well LAKE 1761 which is 610 feet total depth. It is possible the proposed well may encounter the predominantly basalt unit above 500 feet depth given it is closer to the valley margin. However, could be much deeper. It depends on the geometry of the geologic structure below the basin-fill sediments.

Water well reports (well logs) for wells in the vicinity of the proposed well site indicate multiple water bearing zones in the predominantly basin-fill sediments as well as water in the basalt. The reported static water level for each water bearing zone are very similar indicating vertical hydraulic connection.

A5. ☐ **Provisions of the** Goose & Summer Lakes Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☒ **are**, *or* ☐ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: **OAR 690-513-0050 (Chewaucan Subbasin) applies. Ground water and surface water are classified. Agricultural use is allowed.**

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, 7F, 7N, 7T, and special conditions (see below)**
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:** _____

Multiple reports for the Goose and Summer Lakes Basin indicate ground water occurs in the alluvium in stream drainages, the predominantly basin fill sediments, and the predominantly basalt units.

Due to limited data, groundwater availability can not be determined. Old water level measurements in the Crooked Creek drainage area were found for old state observation well SOW 456 (well LAKE 1808) located in T36S/R21E-sec 06 ABA, south of the proposed well. The well is a 21-foot deep hand-dug well completed in the predominantly basin-fill sediments. The water level data was from 1938 to 1962. In 1938, the water level was about 17 feet below land surface. From 1938 to 1956, the water level rose about 7 feet to about 10 feet below land surface. From 1958 to 1962, the water level declined to about 3 feet to about 13.5 feet below land surface. These annual trends appear climate controlled. Seasonal fluctuations appear to be about 1.5 feet.

Recommend conditions 7B, 7F, 7N, 7T, and special conditions (see below)

Special condition 1: water rights "large" permit condition that requires a flow meter. Please add that the flow meter must be located within 50 feet of the well with a clearly visible sign adjacent to the flow meter identifying the flow meter.

Special condition 2: monitoring well

"A monitoring well shall be constructed within the constraints described below. Additionally, OWRD access for water level data collection via periodic hand measurements and/or continuous data recorder at the monitoring well and concurrent periodic hand measurements at the proposed irrigation well shall be granted to OWRD.

The monitoring well shall be constructed within Oregon water well construction standards and the following constraints.

1. The well shall be located approximately due east of the proposed irrigation well and approximately half the distance between the proposed irrigation well and the north-south reach of Juniper Creek.

2. The well shall be approximately 50 feet depth, no less than 40 feet, no more than 60 feet.

3. The well shall be continuously cased and continuously sealed to 20 feet depth minimum or more if warranted by requirements of these constraints or conditions encountered during construction.

4. The well casing shall be steel and 2 inches diameter or larger.

5. The well open interval shall be no more than 20 feet total and open to a single water bearing zone only.

6. The well open interval and the well casing and seal shall be below any possible "hardpan" that may locally perch water.

7. Within the constraints noted above, the well may be constructed to allow future use as an exempt water well after the period of continuous data recorder use is completed.

8. A survey quality location of the completed well shall be submitted to the OWRD watermaster in Lakeview, the OWRD water rights staff in Salem, and the OWRD groundwater staff in Salem. That can include a survey metes and bounds description of the distance from a section corner or a survey quality GPS location. A map is not required.

9. A clearly visible sign noting the monitoring well shall be located adjacent to the well. If the well is enclosed in a shelter, the sign shall be mounted and clearly visible on the shelter's exterior wall.

If conditions warrant exceptions to the above constraints, each exception may be granted only by the concurrent agreement of both the OWRD groundwater section staff and OWRD well enforcement staff."

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**	☐	☒
2		☐	☐
3		☐	☐

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) predominantly basin-fill sediments of varying thickness overlies a higher transmissivity (higher permeability) predominantly basalt unit. Available data indicates ground water occurs in both the sediment and basalt. Additionally, the data indicates groundwater is also vertically hydraulically connected.

The proposed aquifer is the predominantly basalt unit below the predominantly basin-fill sediments. Geologic mapping (Walker 1963) indicates the surface geology at the proposed well site is sedimentary deposits (Qts). These deposits are described as lacustrine, fluvatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. West of the proposed well site are exposures of tuff (Ttf) and basalt (Tb). The tuff may be tuff of rhyolitic and dacitic composition, and/or tuffaceous sedimentary rocks, and/or areally restricted rhyodacitic and andesitic flows.

Two wells deeper than 500 feet located east of the proposed well site (LAKE 1756 and LAKE 1761) indicate the depth to the predominantly basalt unit within the valley the valley can exceed 500 feet. The unit appears to be encountered at 519 feet depth at well LAKE 1756 and it was not reached at well LAKE 1761 which is 610 feet total depth. It is possible the proposed well may encounter the predominantly basalt unit above 500 feet depth given it is closer to the valley margin. However, could be much deeper. It depends on the geometry of the geologic structure below the basin-fill sediments.

Water well reports (well logs) for wells in the vicinity of the proposed well site indicate multiple water bearing zones in the predominantly basin-fill sediments as well as water in the basalt. The reported static water level for each water bearing zone are very similar indicating vertical hydraulic connection.

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	**Juniper Creek**	**4310**	**4305**	**1,420**	☒	☐	☒	☐	☒
1	2	**Crooked Creek**	**4310**	**4290**	**8,225**	☒	☐	☐	☐	☒
1	3	**Willow Creek**	**4310**	**4330**	**5,335**	☒	☐	☐	☐	☒
1	4	**Chewaucan River**	**4310**	**4276**	**11,015**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation:

Each Creek noted drains to the Chewaucan River that drains to Lake Abert.

Available data indicates Crooked Creek and Willow Creek are perennial creeks. Available data indicates Juniper Creek is intermittent. The "perennial" reach of Juniper Creek is the reach closest to the proposed well, but it appears to be water diverted from Crooked Creek. Therefore, Juniper Creek will not be included in the analysis that follows.

The groundwater level is assumed 10 feet below land surface based on vicinity water well reports (well logs).

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

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

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	1	☐	☐	**N.A.**		☐	**N.A.**	☐	**N.A.**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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 location is more than 0.25 mile and less than one-mile from Juniper Creek. No interference analysis was conducted related to Juniper Creek given available data indicates Juniper Creek is intermittent. The "perennial" reach of Juniper Creek is the reach closest to the proposed well, but it appears to be water diverted from Crooked Creek.

The proposed well location is more than one-mile from Willow Creek, Crooked Creek, and the Chewaucan River.

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	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Well Q as CFS		0.00	0.00	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	0.00	0.00
Interference CFS		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

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													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(A) = Total Interf.	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
(B) = 80 % Nat. Q	8.03	13.90	22.60	44.50	55.40	26.90	9.06	6.09	6.05	6.65	7.08	7.43
(C) = 1 % Nat. Q	0.0803	0.1390	0.2260	0.4450	0.5540	0.2690	0.0906	0.0609	0.0605	0.0665	0.0708	0.0743
(D) = (A) > (C)	No	No	No	No	No	No	No	No	No	No	No	No
(E) = (A / B) x 100	0.0125	0.0072	0.0044	0.0022	0.0018	0.0037	0.0110	0.0164	0.0165	0.0150	0.0141	0.0135

(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 location is more than 1.0 mile from Crooked Creek.

Hunt (2003) was used to calculate the interference given the recommended condition that the wells obtain groundwater from the predominantly basalt unit below the predominantly basin fill sediment unit. The calculations used a horizontal hydraulic conductivity of 30 feet/day (transmissivity = 15,000 ft2/day which is consistent with Morgan (1988) and McFarland and Ryals (1991)), a vertical conductivity of 0.3 feet/day, 0.01 for the storage coefficient, and a basin-fill sediment thickness of 350 feet at the stream (based on LAKE 52274). The stream width used for the calculation (25 feet) is maybe greater than the actual stream width. A smaller stream width would result in a smaller calculated interference.

When obtaining groundwater from the predominant basalt unit, the calculated interference with the creek for each month remains less than 1.00 percent of the natural stream flow (80 percent exceedance). It should be noted that pumping groundwater from the predominantly basin-fill unit would likely result in interference with the creek that exceeds the 1.00 percent of the natural stream flow (80 percent exceedance) during some months. That is a major reason why groundwater needs to be obtained from the predominantly basalt unit only.

Application G-16904 continued **Date 11 March 2008**

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	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%
Well Q as CFS		0.00	0.00	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	0.00	0.00
Interference CFS		0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001

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													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(A) = Total Interf.	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001
(B) = 80 % Nat. Q	2.16	3.85	8.61	15.80	12.30	5.93	1.99	1.16	1.14	1.21	1.64	2.08
(C) = 1 % Nat. Q	0.0216	0.0385	0.0861	0.1580	0.1230	0.0593	0.0199	0.0116	0.0114	0.0121	0.0164	0.0208
(D) = (A) > (C)	No	No	No	No	No	No	No	No	No	No	No	No
(E) = (A / B) x 100	0.0463	0.0260	0.0116	0.0063	0.0163	0.0337	0.1005	0.1724	0.1754	0.1653	0.0610	0.0481

(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 location is more than 1.0 mile from Willow Creek.

Hunt (2003) was used to calculate the interference given the recommended condition that the wells obtain groundwater from the predominantly basalt unit below the predominantly basin fill sediment unit. The calculations used a horizontal hydraulic conductivity of 30 feet/day (transmissivity = 15,000 ft2/day which is consistent with Morgan (1988) and McFarland and Ryals (1991)), a vertical conductivity of 0.3 feet/day, 0.01 for the storage coefficient, and a basin-fill sediment thickness of 350 feet at the stream (based on LAKE 52274). The stream width used for the calculation (25 feet) is may be greater than the actual stream width. A smaller stream width would result in a smaller calculated interference.

When obtaining groundwater from the predominant basalt unit, the calculated interference with the creek for each month remains less than 1.00 percent of the natural stream flow (80 percent exceedance). It should be noted that pumping groundwater from the predominantly basin-fill unit would likely result in interference with the creek that exceeds the 1.00 percent of the natural stream flow (80 percent exceedance) during some months. That is a major reason why groundwater needs to be obtained from the predominantly basalt unit only.

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	4	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Well Q as CFS		0.00	0.00	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	0.00	0.00
Interference CFS		0.002	0.003	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002

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													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(A) = Total Interf.	0.002	0.003	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002
(B) = 80 % Nat. Q	33.80	64.90	103.00	161.00	314.00	234.00	81.90	47.40	42.30	42.20	34.40	32.80
(C) = 1 % Nat. Q	0.3380	0.6490	1.0300	1.6100	3.1400	2.3400	0.8190	0.4740	0.4230	0.4220	0.3440	0.3280
(D) = (A) > (C)	No	No	No	No	No	No	No	No	No	No	No	No
(E) = (A / B) x 100	0.0059	0.0046	0.0010	0.0006	0.0006	0.0009	0.0024	0.0063	0.0071	0.0071	0.0087	0.0061

(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 location is more than 1.0 mile from Chewaucan River.

Hunt (2003) was used to calculate the interference given the recommended condition that the wells obtain groundwater from the predominantly basalt unit below the predominantly basin fill sediment unit. The calculations used a horizontal hydraulic conductivity of 30 feet/day (transmissivity = 15,000 ft2/day which is consistent with Morgan (1988) and McFarland and Ryals (1991)), a vertical conductivity of 0.3 feet/day, 0.01 for the storage coefficient, and a basin-fill sediment thickness of 350 feet at the stream (based on LAKE 52274). The stream width used for the calculation (100 feet) is approximate to the actual stream width. A smaller stream width would result in a smaller calculated interference.

When obtaining groundwater from the predominant basalt unit, the calculated interference with the river for each month remains less than 1.00 percent of the natural stream flow (80 percent exceedance). It should be noted that pumping groundwater from the predominantly basin-fill unit would likely result in interference with the river that exceeds the 1.00 percent of the natural stream flow (80 percent exceedance) during some months. That is a major reason why groundwater needs to be obtained from the predominantly basalt unit only.

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) 7B, 7F, 7N, 7T, and special conditions (see below);
ii. ☒ The permit should contain special condition(s) as indicated in "Remarks" below;

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

Groundwater and surface water in the area is hydraulically connected.

The groundwater system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. Generally, low transmissivity (low permeability) predominantly basin-fill sediments of varying thickness overlies a higher transmissivity (higher permeability) predominantly basalt unit. Available data indicates ground water occurs in both the sediment and basalt. Additionally, the data indicates groundwater is also vertically hydraulically connected.

The proposed aquifer is the predominantly basalt unit below the predominantly basin-fill sediments. Geologic mapping (Walker 1963) indicates the surface geology at the proposed well site is sedimentary deposits (Qts). These deposits are described as lacustrine, fluvatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. West of the proposed well site are exposures of tuff (Ttf) and basalt (Tb). The tuff may be tuff of rhyolitic and dacitic composition, and/or tuffaceous sedimentary rocks, and/or areally restricted rhyodacitic and andesitic flows.

Two wells deeper than 500 feet located east of the proposed well site (LAKE 1756 and LAKE 1761) indicate the depth to the predominantly basalt unit within the valley the valley can exceed 500 feet. The unit appears to be encountered at 519 feet depth at well LAKE 1756 and it was not reached at well LAKE 1761 which is 610 feet total depth. It is possible the proposed well may encounter the predominantly basalt unit above 500 feet depth given it is closer to the valley margin. However, could be much deeper. It depends on the geometry of the geologic structure below the basin-fill sediments.

Water well reports (well logs) for wells in the vicinity of the proposed well site indicate multiple water bearing zones in the predominantly basin-fill sediments as well as water in the basalt. The reported static water level for each water bearing zone are very similar indicating vertical hydraulic connection.

Recommend conditions 7B, 7F, 7N, 7T, and special conditions (see below)

Special condition 1: water rights "large" permit condition that requires a flow meter. Please add that the flow meter must be located within 50 feet of the well with a clearly visible sign adjacent to the flow meter identifying the flow meter.

Special condition 2: monitoring well

"A monitoring well shall be constructed within the constraints described below. Additionally, OWRD access for water level data collection via periodic hand measurements and/or continuous data recorder at the monitoring well and concurrent periodic hand measurements at the proposed irrigation well shall be granted to OWRD.

The monitoring well shall be constructed within Oregon water well construction standards and the following constraints.

1. The well shall be located approximately due east of the proposed irrigation well and approximately half the distance between the proposed irrigation well and the north-south reach of Juniper Creek.

2. The well shall be approximately 50 feet depth, no less than 40 feet, no more than 60 feet.

3. The well shall be continuously cased and continuously sealed to 20 feet depth minimum or more if warranted by requirements of these constraints or conditions encountered during construction.

4. The well casing shall be steel and 2 inches diameter or larger.

5. The well open interval shall be no more than 20 feet total and open to a single water bearing zone only.

6. The well open interval and the well casing and seal shall be below any possible "hardpan" that may locally perch water.

7. Within the constraints noted above, the well may be constructed to allow future use as an exempt water well after the period of continuous data recorder use is completed.

8. A survey quality location of the completed well shall be submitted to the OWRD watermaster in Lakeview, the OWRD water rights staff in Salem, and the OWRD groundwater staff in Salem. That can include a survey metes and bounds description of the distance from a section corner or a survey quality GPS location. A map is not required.

9. A clearly visible sign noting the monitoring well shall be located adjacent to the well. If the well is enclosed in a shelter, the sign shall be mounted and clearly visible on the shelter's exterior wall.

If conditions warrant exceptions to the above constraints, each exception may be granted only by the concurrent agreement of both the OWRD groundwater section staff and OWRD well enforcement staff."

Application G- 16904 continued Date 11 March 2008

References Used: References consulted were:

Hampton, E.R., 1964, Geologic factors that control the occurrence and availability of ground water in the Fort Rock Basin, Lake County, Oregon: USGS Professional Paper 383-B, 29 p.

McFarland, W.D. and Ryals, G.N., 1991, Adequacy of available hydrogeologic data for evaluation of declining ground-water levels in the Fort Rock Basin, south-central Oregon: USGS Water Resources Investigations Report 89-4057, 47 p.

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

Miller, D.W., 1986, Ground-water conditions in the Fort Rock Basin, northern Lake County, Oregon: OWRD Ground Water Report No. 31, 196 p.

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.

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.

Sammel, E.A. and Craig, R.W., 1981, The geothermal hydrology of Warner Valley, Oregon: a reconnaissance study: USGS Professional Paper 1044-I, 147 p.

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.

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).

Old State Obesrvation Well SOW 456 (LAKE 1808).

Water well reports for wells LAKE 1750, LAKE 1752, LAKE 1753, LAKE 1756, LAKE 1761, LAKE 51477.

USGS quadrangle maps (1:24,000 scale): Coglan Buttes SE and Valley Falls

Application G-16904 continued Date 11 March 2008

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** 1 **Logid:** Well is not yet drilled

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.**

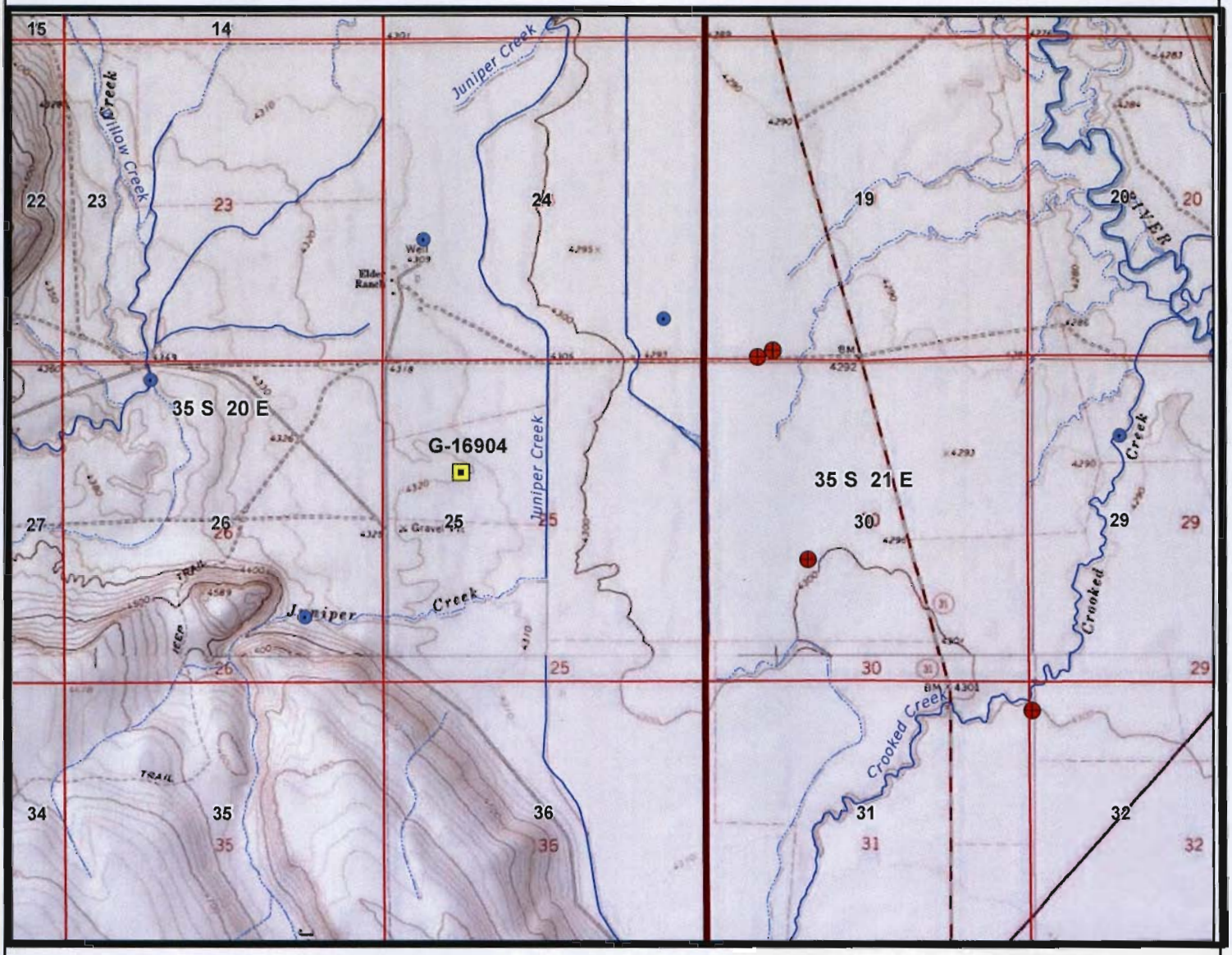
THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

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

_____ _____, 200____.
(Enforcement Section Signature)

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

Groundwater Right Application G-16904
Valley Falls Ranch Inc. (David Elder)



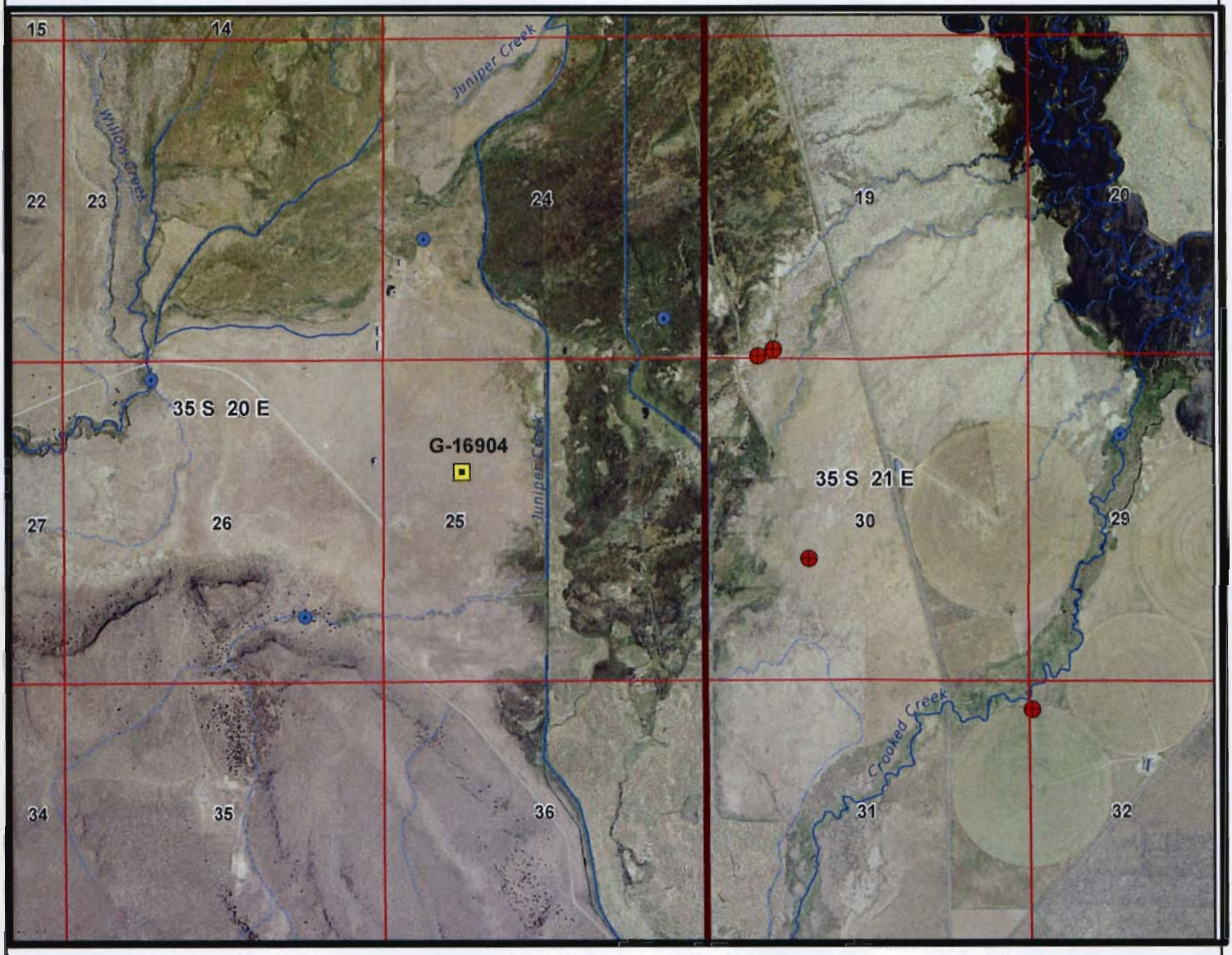
0 0.5 1 2
Miles

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

Blue and Other = surface water rights

N

Groundwater Right Application G-16904
Valley Falls Ranch Inc. (David Elder)



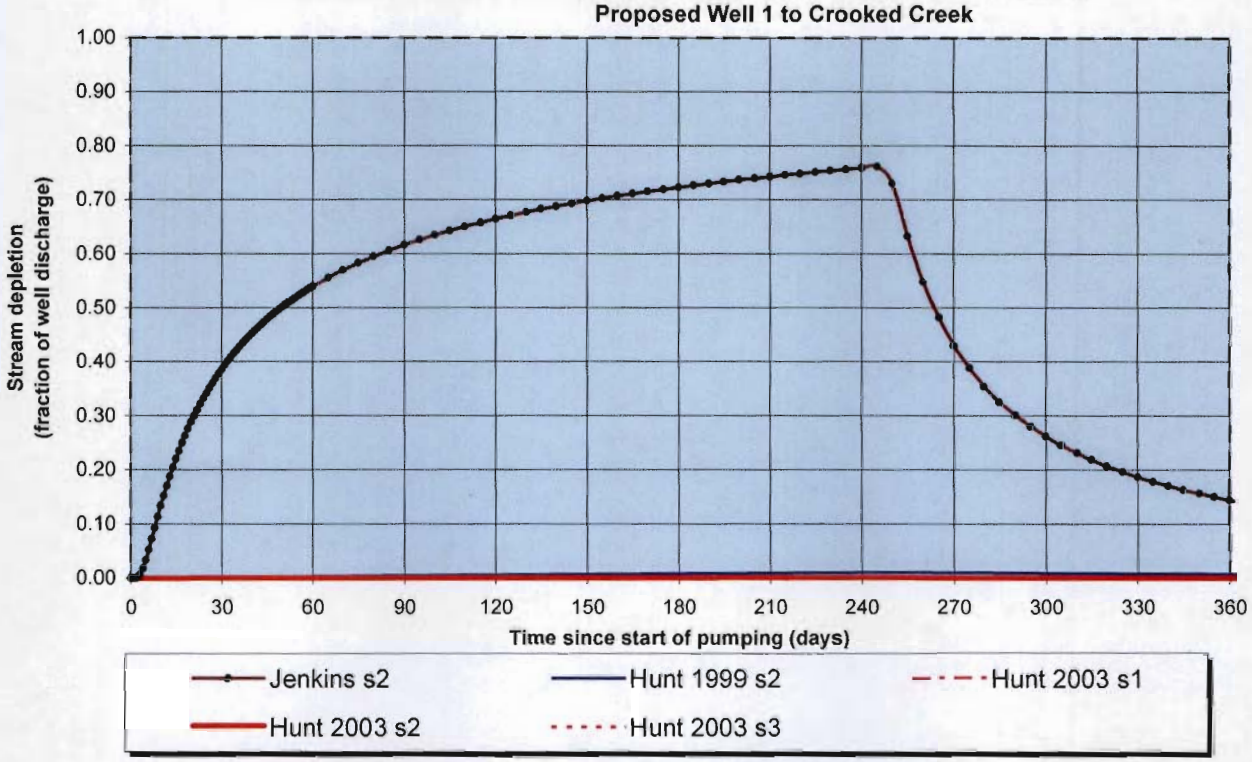
0 0.5 1 2
Miles

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

Blue and Other = surface water rights

N

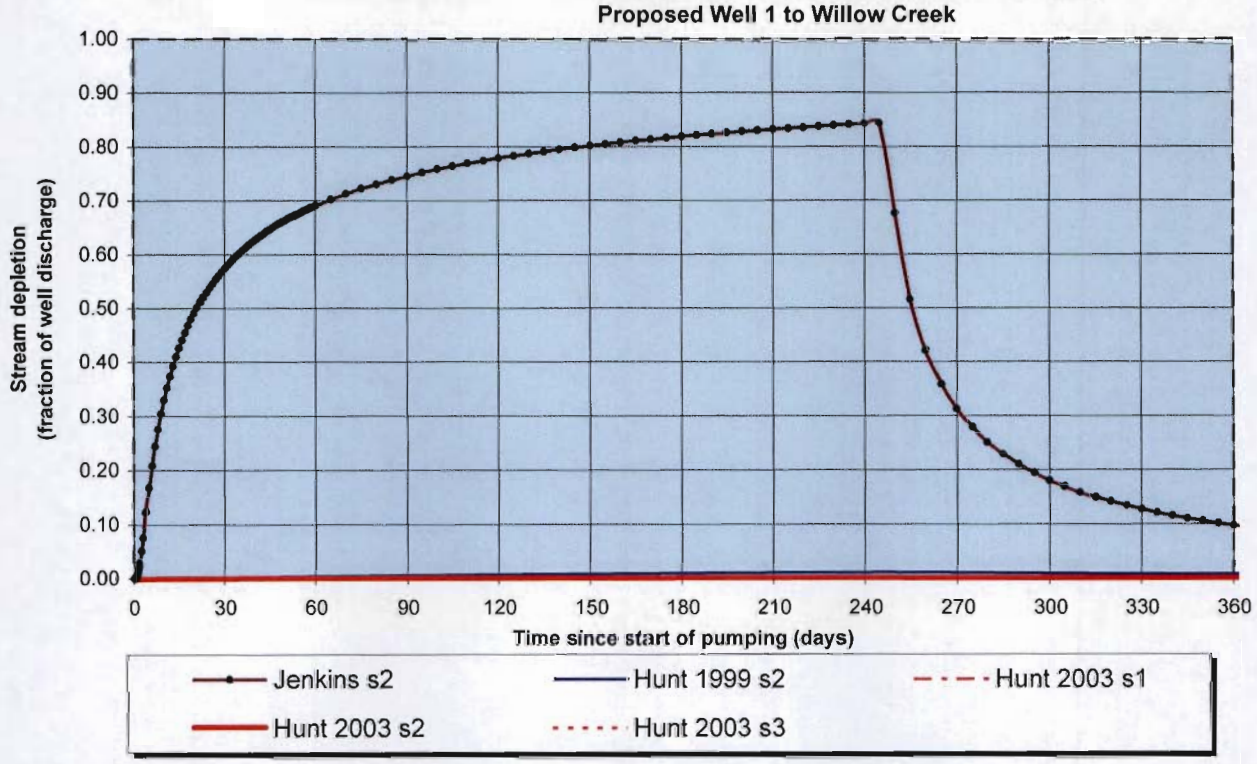
Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 245 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	38.6%	54.0%	61.7%	66.5%	69.8%	72.3%	74.3%	75.9%	43.0%	26.2%	18.7%	14.4%
H SD 1999	0.1%	0.3%	0.5%	0.6%	0.7%	0.8%	0.9%	1.0%	1.0%	0.9%	0.8%	0.8%
H SD 2003	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Qw, cfs	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420
H SD 99, cfs	0.002	0.004	0.007	0.008	0.010	0.012	0.013	0.014	0.014	0.013	0.012	0.011
H SD 03, cfs	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	1.42	1.42	1.42	cfs
Time pump on (pumping duration)	tpon	245	245	245	days
Perpendicular from well to stream	a	8225	8225	8225	ft
Well depth	d	600	600	600	ft
Aquifer hydraulic conductivity	K	30	30	30	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	15000	15000	15000	ft*ft/day
Aquifer storativity or specific yield	S	0.01	0.01	0.01	
Aquitard vertical hydraulic conductivity	Kva	0.3	0.3	0.3	ft/day
Aquitard saturated thickness	ba	350	350	350	ft
Aquitard thickness below stream	babs	350	350	350	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	25	25	25	ft
Streambed conductance (lambda)	sbc	0.021429	0.021429	0.021429	ft/day
Stream depletion factor	sdf	45.100417	45.100417	45.100417	days
Streambed factor	sbf	0.011750	0.011750	0.011750	
input #1 for Hunt's Q_4 function	t'	0.022173	0.022173	0.022173	
input #2 for Hunt's Q_4 function	K'	3.865750	3.865750	3.865750	
input #3 for Hunt's Q_4 function	epsilon'	0.050000	0.050000	0.050000	
input #4 for Hunt's Q_4 function	lamda'	0.011750	0.011750	0.011750	

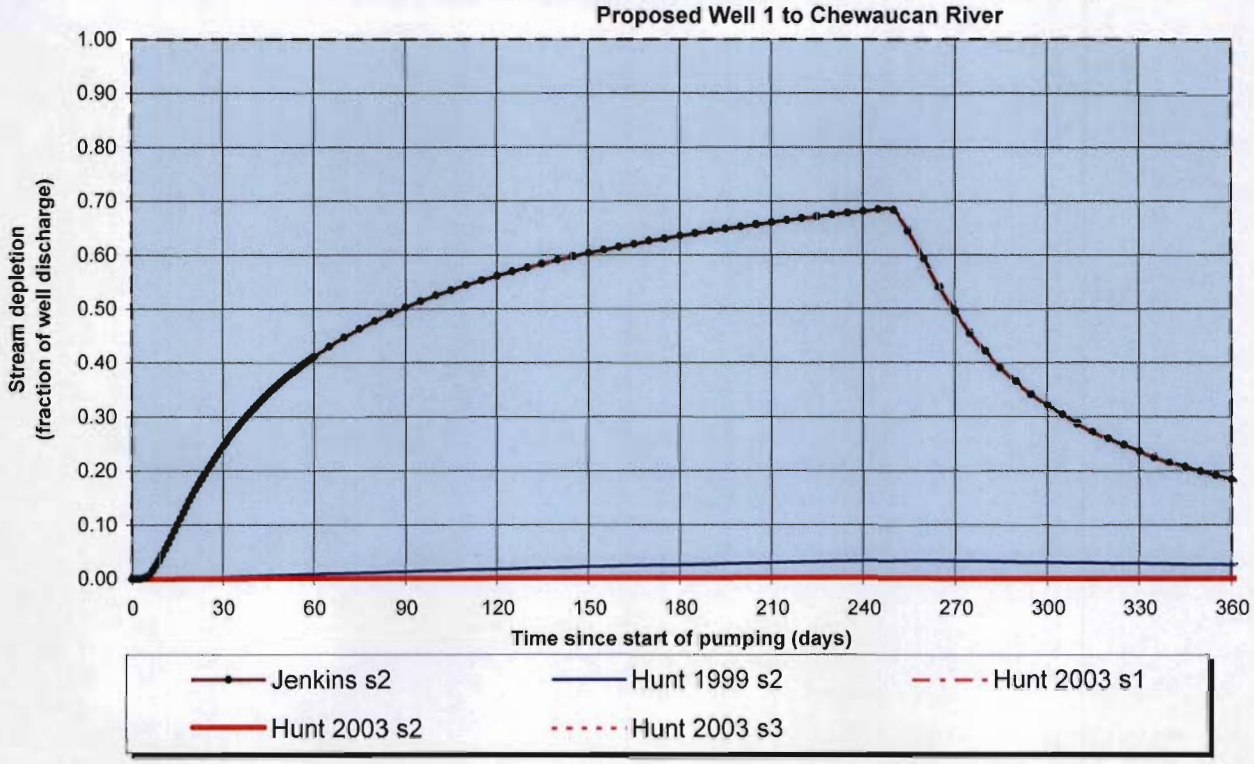
Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 245 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	57.4%	69.1%	74.5%	77.9%	80.1%	81.8%	83.2%	84.2%	31.3%	18.1%	12.7%	9.7%
H SD 1999	0.2%	0.4%	0.6%	0.7%	0.9%	1.0%	1.1%	1.2%	1.1%	0.9%	0.8%	0.8%
H SD 2003	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%
Qw, cfs	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420
H SD 99, cfs	0.003	0.006	0.009	0.010	0.012	0.014	0.015	0.017	0.015	0.013	0.012	0.011
H SD 03, cfs	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	1.42	1.42	1.42	cfs
Time pump on (pumping duration)	tpon	245	245	245	days
Perpendicular from well to stream	a	5335	5335	5335	ft
Well depth	d	600	600	600	ft
Aquifer hydraulic conductivity	K	30	30	30	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	15000	15000	15000	ft*ft/day
Aquifer storativity or specific yield	S	0.01	0.01	0.01	
Aquitard vertical hydraulic conductivity	Kva	0.3	0.3	0.3	ft/day
Aquitard saturated thickness	ba	350	350	350	ft
Aquitard thickness below stream	babs	350	350	350	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	25	25	25	ft
Streambed conductance (lambda)	sbc	0.021429	0.021429	0.021429	ft/day
Stream depletion factor	sdf	18.974817	18.974817	18.974817	days
Streambed factor	sbf	0.007621	0.007621	0.007621	
input #1 for Hunt's Q_4 function	t'	0.052701	0.052701	0.052701	
input #2 for Hunt's Q_4 function	K'	1.626413	1.626413	1.626413	
input #3 for Hunt's Q_4 function	epsilon'	0.050000	0.050000	0.050000	
input #4 for Hunt's Q_4 function	lamda'	0.007621	0.007621	0.007621	

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 245 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	24.6%	41.2%	50.3%	56.2%	60.4%	63.5%	66.1%	68.1%	49.5%	32.2%	23.6%	18.4%
H SD 1999	0.3%	0.9%	1.4%	1.8%	2.3%	2.6%	3.0%	3.3%	3.4%	3.2%	2.9%	2.8%
H SD 2003	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Qw, cfs	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420	1.420
H SD 99, cfs	0.005	0.012	0.020	0.026	0.032	0.037	0.043	0.047	0.049	0.045	0.042	0.039
H SD 03, cfs	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.003

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	1.42	1.42	1.42	cfs
Time pump on (pumping duration)	tpon	245	245	245	days
Perpendicular from well to stream	a	11015	11015	11015	ft
Well depth	d	600	600	600	ft
Aquifer hydraulic conductivity	K	30	30	30	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	15000	15000	15000	ft*ft/day
Aquifer storativity or specific yield	S	0.01	0.01	0.01	
Aquitard vertical hydraulic conductivity	Kva	0.3	0.3	0.3	ft/day
Aquitard saturated thickness	ba	350	350	350	ft
Aquitard thickness below stream	babs	350	350	350	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	100	100	100	ft
Streambed conductance (lambda)	sbc	0.085714	0.085714	0.085714	ft/day
Stream depletion factor	sdf	80.886817	80.886817	80.886817	days
Streambed factor	sbf	0.062943	0.062943	0.062943	
input #1 for Hunt's Q_4 function	t'	0.012363	0.012363	0.012363	
input #2 for Hunt's Q_4 function	K'	6.933156	6.933156	6.933156	
input #3 for Hunt's Q_4 function	epsilon'	0.050000	0.050000	0.050000	
input #4 for Hunt's Q_4 function	lamda'	0.062943	0.062943	0.062943	