PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **May 15, 2015**

FROM: Groundwater Section **Aurora C. Bouchier**
Reviewer's Name

SUBJECT: Application LL- **1582** 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 groundwater 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: **Josh Nelson** County: **Linn**

A1. Applicant(s) seek(s) **0.111** cfs from **1** well(s) in the **Willamette** Basin, **Upper Willamette** subbasin

A2. Proposed use **hazelnut establishment (irrigation 16 acres)** Seasonality: **June 1, 2015 – May 31, 2020**

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	LIN 999999	1	Alluvium	0.111	T11S/R4W-S31	10' N, 510' W fr SE cor S 31
2						
3						
4						
5						

* 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	215		18	10/24/2014	35							

Use data from application for proposed wells.

A4. **Comments:** This limited license application is for the purpose of establishing hazelnut trees. The applicant has an existing well. However, no well log has been positively identified as belonging to this well. The well construction is therefore unknown. Well diameter, total depth, and static water level measurements are from a well test invoice provided by Star Water Systems. The local Waterrmaster, Michael Mattick, suggests a 50 gpm maximum rate limited to 24 hours per week, which could be analyzed as a rate of 7.14 gpm (0.016 cfs). This review analyses the full rate requested of 50 gpm (0.111 cfs). Although the Limited License application form lists the Project Schedule as being from 6/1/2015 – 5/31/2020, this review assumes the application of water for hazelnut establishment will occur during the irrigation season (March 1 – October 31).

A5. ☒ **Provisions of the** Willamette Basin rules relative to the development, classification and/or management of groundwater hydraulically connected to surface water ☒ **are**, *or* ☐ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: The applicant's wells will produce from an unconfined aquifer and is less than ¼ mile from a surface water source, so the pertinent rules (OAR 690-502-0240) apply. However, see comments in sections B3 and C6.

A6. ☐ **Well(s) #** _____ , _____ , _____ , _____ , _____ , tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: _____
Comments: _____

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

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

d. ☒ **will, if properly conditioned**, avoid injury to existing groundwater rights or to the groundwater 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 groundwater production from no deeper than _____ ft. below land surface;

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

c. ☐ **Condition** to allow groundwater production only from the _____ groundwater 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 Groundwater 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. **Groundwater availability remarks:**
The applicant's well is located within the floodplain deposits of the Willamette River. Water levels in nearby observation wells suggest that groundwater levels are stable in this area (BENT 2544 and BENT 2545 to the north, LINN 8508 to the east, LINN 10817 to the southeast, BENT 5252 to the southwest, and BENT5004 to the west – see map below).

Condition:
As suggested by the Watermaster, Michael Mattick, limit the maximum rate to 50 gpm and limit pumping to a maximum of 24 hours per week.

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

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

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Alluvial**	☐	☒
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: The well is located within the floodplain deposits of meandering and anastomosing channels of the Willamette River and its tributaries (O'Connor et al., 2001). Locally, erosion and reworking of sediment by the river has largely removed confining material which may have been deposited.

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**	**Owl Creek**	**197**	**209-196**	**905**	☒	☐	☐	☐	☒
1	**2**	**Willamette River**	**197**	**~196**	**>1 mile**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: Published reports describe the subsurface material of the flood plain deposits of the Willamette River as unconsolidated material consisting of highly permeable zones of "substantial groundwater flow that is likely to be well connected to the surface flow in the Willamette River and major tributaries" (O'Connor et al., 2001). The highly permeable nature of these deposits is evidenced by the results of aquifer pumping tests, conducted within 1-mile of the applicant's well, which have high tranmissivity values (1,700 – 31,000 ft^2/day).

Water Availability Basin the well(s) are located within: 30200321 (WILLAMETTE R > COLUMIBA R –AB PERIWINKLW CR AT GAGE 14174)

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**	☒	☐	**NA**	**NA**	☐	**NA**	☐	**15-30**	☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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 Owl Creek stream depletion at 30 days was estimated using the Hunt 1999 model and assuming a 3 foot clogging layer beneath the streambed. The trasmissivity values calculated from nearby pumping tests (see map below) range from 1,700 to 31.000 ft^2/day. The interference at 30 days was calculated using a lower trasmissivity value of 2,000 ft^2/day (resulting in 15% interference) and an upper transmissivity value of 20,000 ft^2/day (resulting in 30% interference).

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**	27.24 %	24.73 %	0.16 %	2.58 %	6.85 %	11.45 %	15.80 %	19.74 %	23.27 %	26.42 %	29.08 %	29.21 %
Well Q as CFS		**0**	**0**	**0.111**	**0.111**	**0.111**	**0.111**	**0.111**	**0.111**	**0.111**	**0.111**	**0**	**0**
Interference CFS		**0.030**	**0.027**	**0.000**	**0.004**	**0.009**	**0.014**	**0.019**	**0.024**	**0.028**	**0.031**	**0.034**	**0.033**
(A) = Total Interf.		**0.030**	**0.027**	**0.000**	**0.004**	**0.009**	**0.014**	**0.019**	**0.024**	**0.028**	**0.031**	**0.034**	**0.033**
(B) = 80 % Nat. Q		**10100**	**11600**	**11000**	**9760**	**8430**	**5360**	**3270**	**2560**	**2540**	**2860**	**4170**	**8150**
(C) = 1 % Nat. Q		**101**	**116**	**110**	**97.6**	**84.3**	**53.6**	**32.7**	**25.6**	**25.4**	**28.6**	**41.7**	**81.5**
(D) = (A) > (C)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100		.0003%	.0002%	0%	.0000%	.0001%	.0002%	.0006%	.0009%	.0010%	.0010%	.0008%	.0004%

(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: Impacts to the Willamette River, which is greater than 1 mile from the well, were calculated even though the requested rate of 0.111 cfs is much less than 1% of the 80% natural flows for the WAB for all months of the year.

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 groundwater 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:** Owl Creek is labeled as a perennial stream on topographic maps and the National Hydro Dataset. Owl Creek flows into Colorado Lake, which in turns flows into the Dead River. The Dead River is labeled as an intermittent surface water body. Conversations with Karl C. Wozniak (May 15, 2015) question whether Owl Creek is truly a perennial water body or perhaps a temporary daylighting of groundwater flowing within the floodplain shortcutting between the meanders of the Willamette River.

References Used:

Conlon, T. D., Wozniak, K. C., Woodcock, D., Herrera, N.B., Fischer, B.J. Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, Ground-Water Hydrology of the Willamette Basin, Oregon: U. S. Geological Survey Scientific Investigations Report 2005-5168.

Gannett, Marshall W., and Caldwell, Rodney R., 1998, Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington: U. S. Geological Survey Professional Paper 1424-A.

Herra, N. B., Burns, E. R., and Conlon, T. D, 2014, Simulation of groundwater flow and the interaction of groundwater and surface water in the Willamette Basin and Central Willamette subbasin, Oregon: U.S. Geologcal Survey Scientific Investigations Report 2014-5136, 152 p., http//dx.doi.org/10.3133/sir20155136.

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

O'Connor, J. E., Sarna-Wojcicki, A., Wozniak, K. C., Polette, Polette, J. D., and Fleck, R. J., 2001, Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon: U.S. Geological Survey Professional Paper 1620.

Woodward, Dennis BG., Gannett, Marshall W., and Vaccaro, John J., 1998 Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington: U. S. Geological Survey Professional Paper 1424-B.

Nearby well logs and water level data.

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** _____ **Logid:** _____

D2. **THE WELL does not appear to 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 or other comment is described as follows:** _____

D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.**

Water Availability Tables

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE 14174

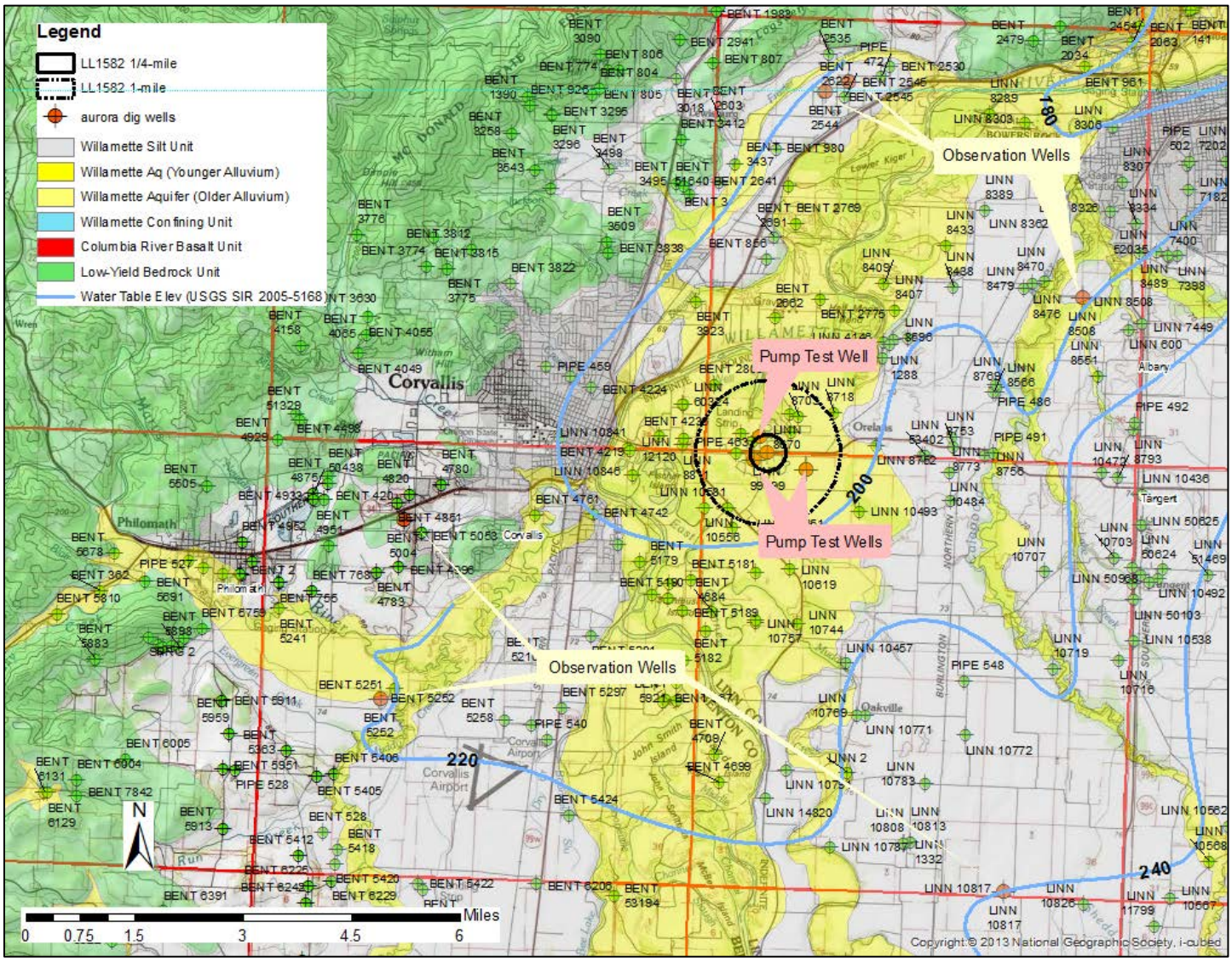
Watershed ID #: 30200321 Basin: WILLAMETTE Exceedance Level: 80
Time: 4:50 PM Date: 05/13/2015

Monthly values are in cfs.
Storage is the annual amount at 50% exceedance in ac-ft.

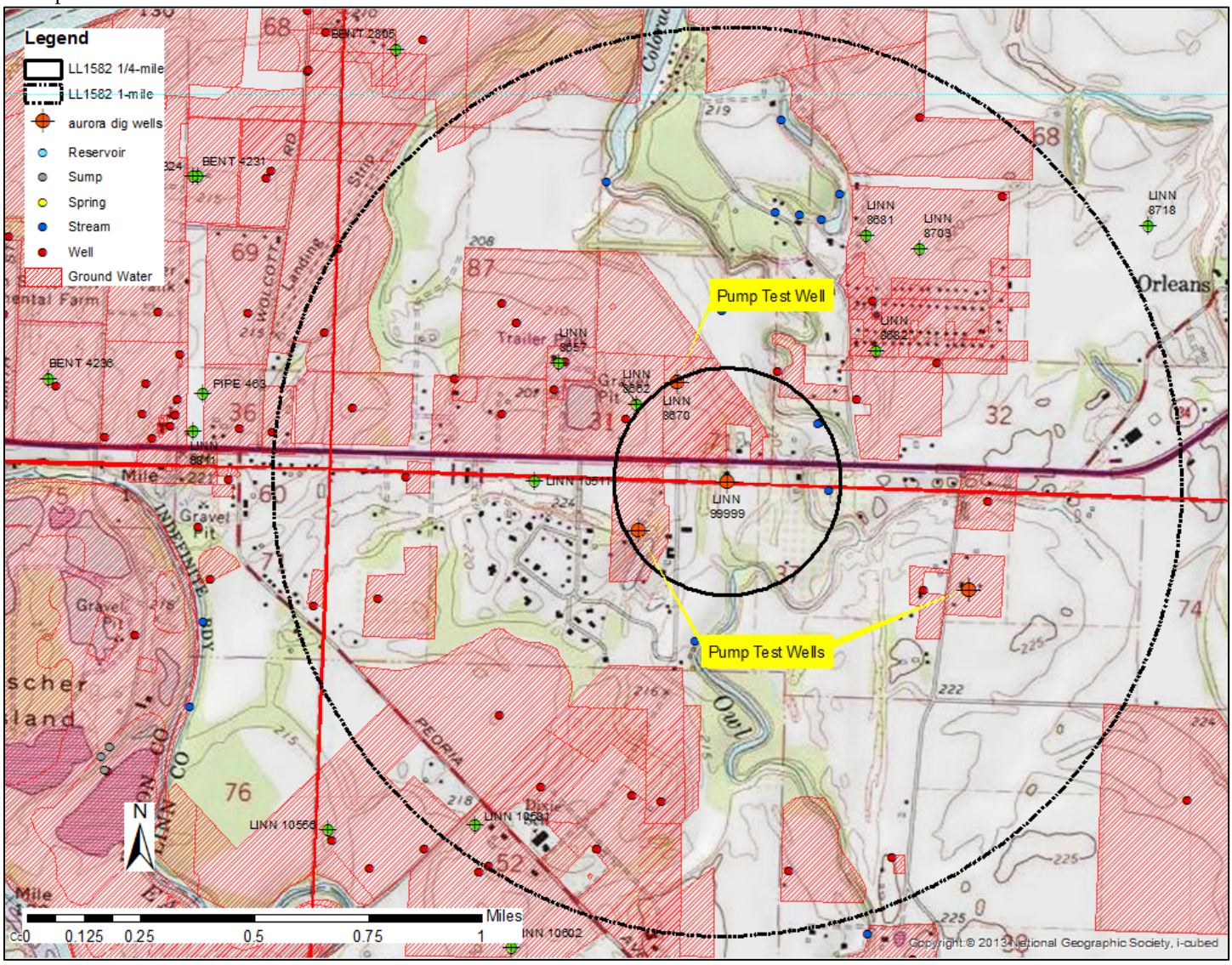
Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
JAN	10,100.00	1,370.00	8,730.00	0.00	1,750.00	6,980.00
FEB	11,600.00	4,280.00	7,320.00	0.00	1,750.00	5,570.00
MAR	11,000.00	4,560.00	6,440.00	0.00	1,750.00	4,690.00
APR	9,760.00	4,260.00	5,500.00	0.00	1,750.00	3,750.00
MAY	8,430.00	2,540.00	5,890.00	0.00	1,750.00	4,140.00
JUN	5,360.00	855.00	4,500.00	0.00	1,750.00	2,750.00
JUL	3,270.00	662.00	2,610.00	0.00	1,750.00	858.00
AUG	2,560.00	601.00	1,960.00	0.00	1,750.00	209.00
SEP	2,540.00	517.00	2,020.00	0.00	1,750.00	273.00
OCT	2,860.00	269.00	2,590.00	0.00	1,750.00	841.00
NOV	4,170.00	353.00	3,820.00	0.00	1,750.00	2,070.00
DEC	8,150.00	376.00	7,770.00	0.00	1,750.00	6,020.00
ANN	7,460,000	1,230,000	6,230,000	0	1,270,000	4,960,000

Well Location Map

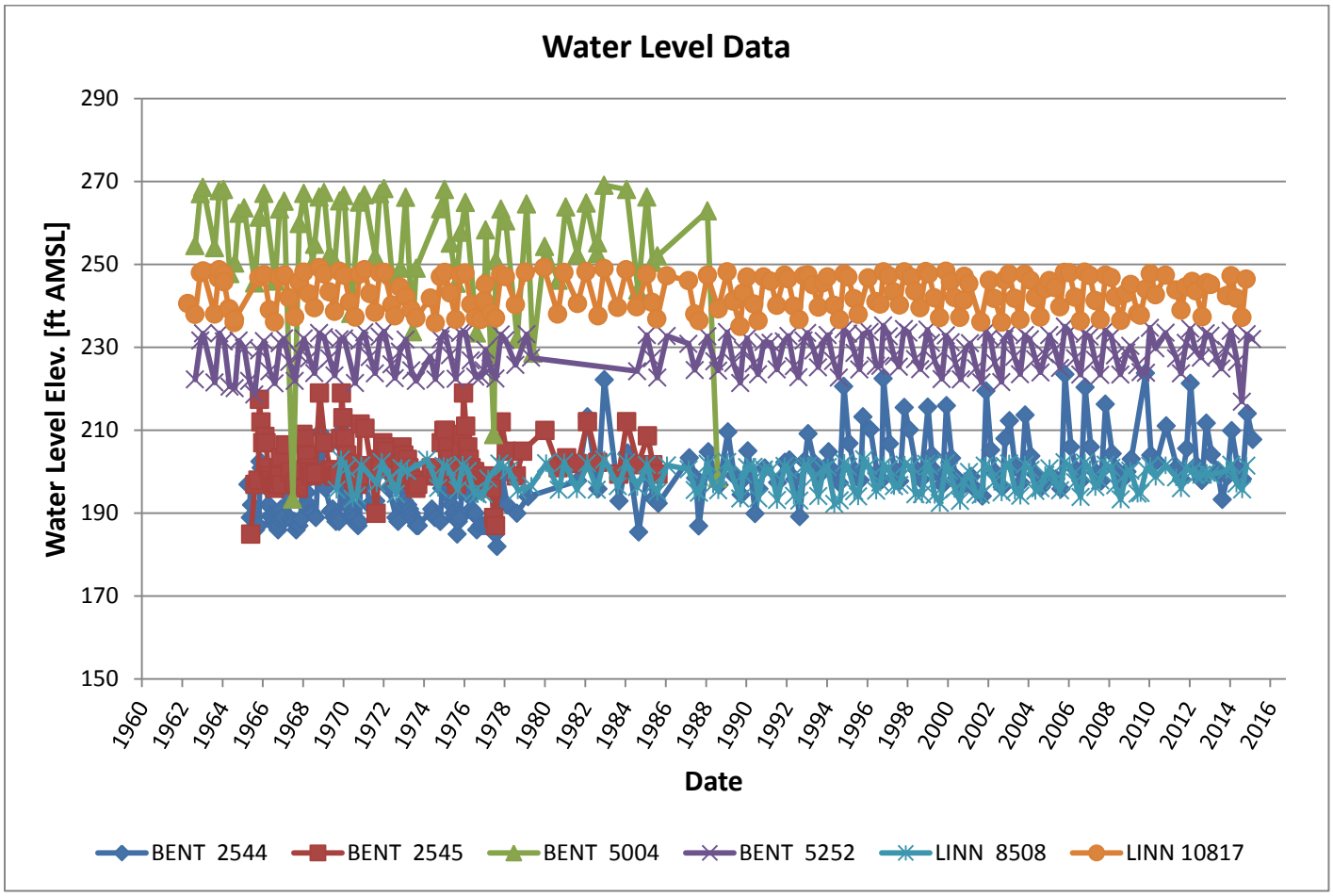
Overview



Well Location Map
Site Specific

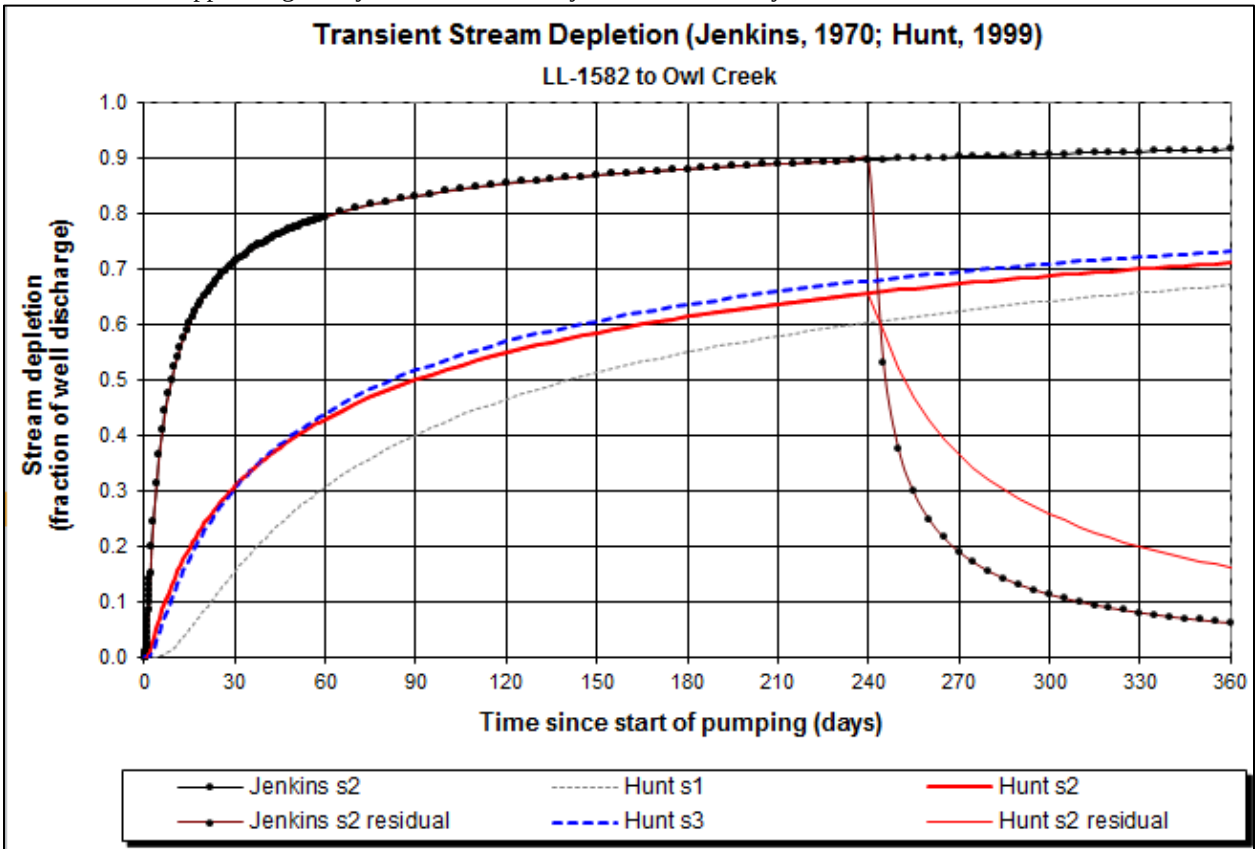


Water-Level Trends in Nearby Wells



Stream Depletion Model Results

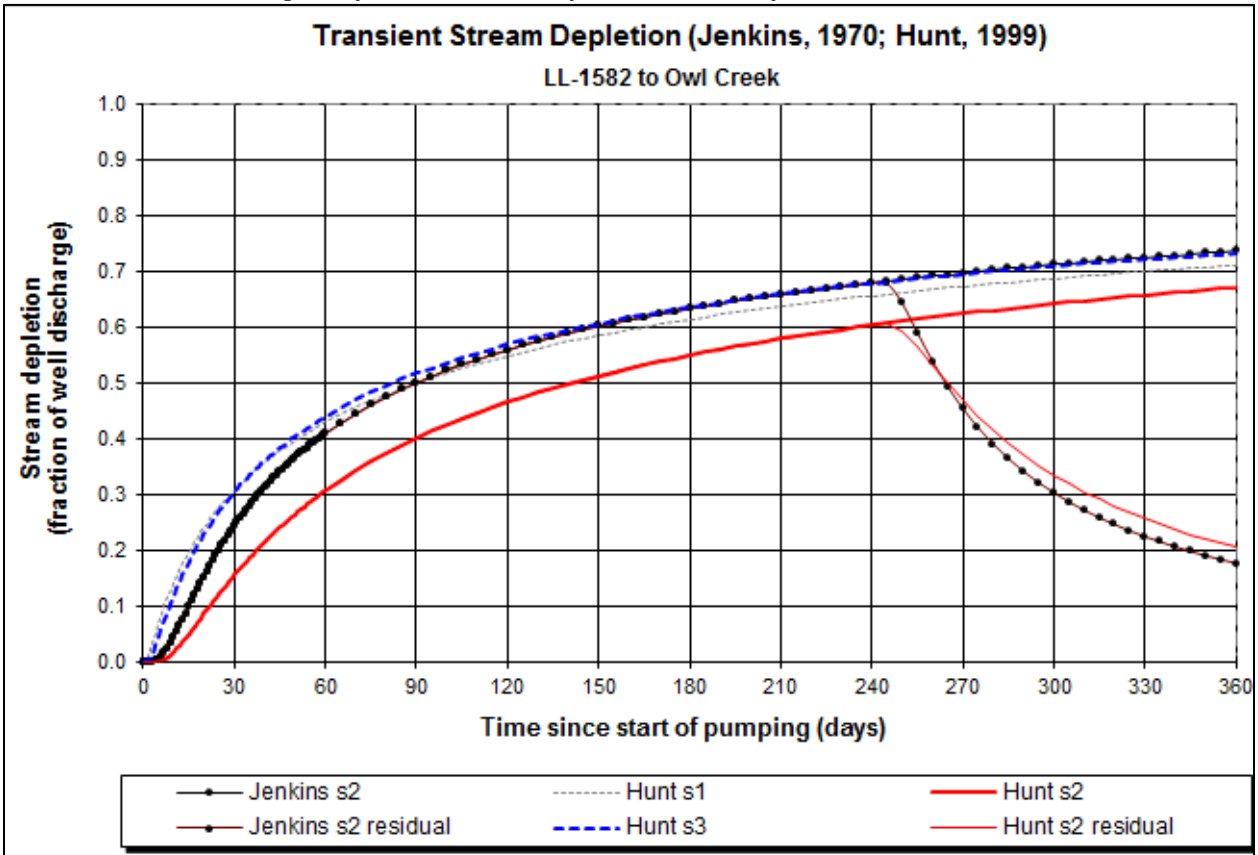
To Owl Creek – upper range of hydraulic conductivity and transmissivity values



Output for Hunt Stream Depletion, Scenerio 2 (s2):						Time pump on = 240 days						
Days	**30**	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
Jenk SD s2 %	**71.18**	79.39	83.11	85.34	86.88	88.01	88.89	89.61	19.02	11.31	8.02	6.16
Jen SD s2 cfs	0.079	0.088	0.092	0.095	0.096	0.098	0.099	0.099	0.021	0.013	0.009	0.007
Hunt SD s2 %	**30.80**	42.92	50.01	54.88	58.51	61.37	63.69	65.63	36.48	25.80	19.96	16.21
Hunt SD s2 cfs	0.034	0.048	0.056	0.061	0.065	0.068	0.071	0.073	0.040	0.029	0.022	0.018

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.111	0.111	0.111	cfs
Distance to stream	a	905	905	905	ft
Aquifer hydraulic conductivity	K	100	1000	500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	2000	20000	10000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	50	50	50	ft
Streambed hydraulic conductivity	Ks	1	1	1	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	16.66666667	16.66666667	16.66666667	ft/day
Stream depletion factor (Jenkins)	sdf	81.9025	8.19025	16.3805	days
Streambed factor (Hunt)	sbf	7.541666667	0.754166667	1.508333333	

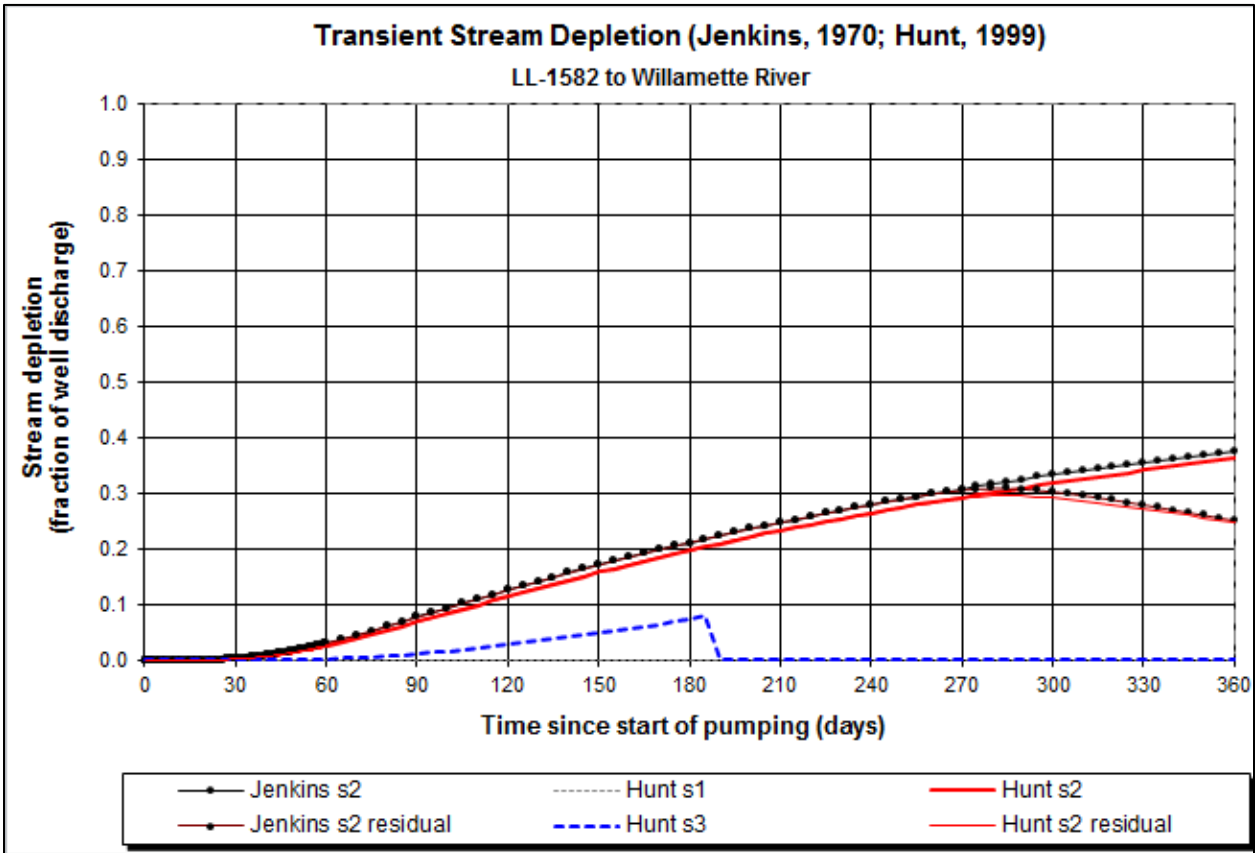
To Owl Creek – lower range of hydraulic conductivity and transmissivity values



Output for Hunt Stream Depletion, Scenerio 2 (s2):						Time pump on = 240 days						
Days	**30**	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
Jenk SD s2 %	**24.27**	40.87	50.00	55.91	60.13	63.34	65.88	67.96	45.43	30.31	22.47	17.68
Jen SD s2 cfs	0.027	0.045	0.055	0.062	0.067	0.070	0.073	0.075	0.050	0.034	0.025	0.020
Hunt SD s2 %	**15.51**	30.68	40.09	46.54	51.28	54.96	57.92	60.36	46.91	33.51	25.64	20.56
Hunt SD s2 cfs	0.017	0.034	0.045	0.052	0.057	0.061	0.064	0.067	0.052	0.037	0.028	0.023

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.111	0.111	0.111	cfs
Distance to stream	a	905	905	905	ft
Aquifer hydraulic conductivity	K	1000	100	500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	20000	2000	10000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	50	50	50	ft
Streambed hydraulic conductivity	Ks	1	1	1	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	16.66666667	16.66666667	16.66666667	ft/day
Stream depletion factor (Jenkins)	sdf	8.19025	81.9025	16.3805	days
Streambed factor (Hunt)	sbf	0.754166667	7.541666667	1.508333333	

To Willamette River



Output for Hunt Stream Depletion, Scenerio 2 (s2):						Time pump on = 240 days						
Days	**30**	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
Jenk SD s2 %	**0.22**	3.04	7.71	12.58	17.09	21.13	24.72	27.90	30.52	30.25	27.88	25.10
Jen SD s2 cfs	0.000	0.003	0.009	0.014	0.019	0.023	0.027	0.031	0.034	0.034	0.031	0.028
Hunt SD s2 %	**0.16**	2.58	6.85	11.45	15.80	19.74	23.27	26.42	29.08	29.21	27.24	24.73
Hunt SD s2 cfs	0.000	0.003	0.008	0.013	0.018	0.022	0.026	0.029	0.032	0.032	0.030	0.027

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.111	0.111	0.111	cfs
Distance to stream	a	7500	7500	7500	ft
Aquifer hydraulic conductivity	K	100	1000	500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	2000	20000	10000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	1	1	1	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	166.6666667	166.6666667	166.6666667	ft/day
Stream depletion factor (Jenkins)	sdf	5625	562.5	1125	days
Streambed factor (Hunt)	sbf	625	62.5	125	