

Groundwater Application Review Summary Form

Application # G- 18576

GW Reviewer Aurora Bouchier Date Review Completed: 4/26/2018

Summary of GW Availability and Injury Review:

[] Groundwater for the proposed use is either over appropriated, will not likely be available in the amounts requested without injury to prior water rights, OR will not likely be available within the capacity of the groundwater resource per Section B of the attached review form.

Summary of Potential for Substantial Interference Review:

[X] There is the potential for substantial interference per Section C of the attached review form.

Summary of Well Construction Assessment:

[] The well does not appear to meet current well construction standards per Section D of the attached review form. Route through Well Construction and Compliance Section.

This is only a summary. Documentation is attached and should be read thoroughly to understand the basis for determinations and for conditions that may be necessary for a permit (if one is issued).

MEMO

April 26, 2018

FROM: GW: Aurora Bouchier
(Reviewer's Name)

☐ YES☒ NO☐ YES☒ NO

□ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway.**

Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

[illegible]

MEMO



To: Kristopher Byrd, Well Construction and Compliance Section Manager
From: Joel Jeffery, Well Construction Program Coordinator
Subject: Review of Water Right Application G-18570
Date: September 24, 2018

The attached application was forwarded to the Well Construction and Compliance Section by Water Rights. Aurora Bouchier reviewed the application. Please see Aurora's Groundwater Review and the Well Log.

Applicant's Well #1 (LINN 62062): Based on a review of the Well Report, Applicant's Well #1 appears to protect the groundwater resource.

The construction of Applicants Well #1 may not satisfy hydraulic connection issues.

WELL I.D. LABEL#	U	125124
START CARD #		214125
ORIGINAL LOG #		

(1) LAND OWNER
Owner Well I.D.
First Name Ken Last Name Eichler
Company _____
Address 8250 Tucker RD
City Amity State OR Zip 97010
(2) TYPE OF WORK ☒ New Well ☐ Deepening ☐ Conversion
Alteration (complete 2a & 10) ☐ Abandonment (complete 5a)

	Dia	+	From	To	Gauge	Stl	Plste	Wld	Thrd
Casing:						☐	☐	☐	☐
	Material		From	To	Amt		sacks/lbs		
Seal:									

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other _____

☐ Industrial/ Commercial ☐ Livestock ☒ Dewatering
☐ Thermal ☐ Injection ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard ☐ (Attach copy)
Depth of Completed Well 68 ft.

BORE HOLE			SEAL			sacks lbs		
Dia	From	To	Material	From	To		Am't	
16	0	35	Cement	0	35	35		
16	35	68				Calculated	30	
						Calculated		

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other

Backfill placed from _____ ft. to _____ ft. Material _____

Filter pack from _____ ft. to _____ ft. Material _____ Size _____

Explosives used: ☐ Yes Type _____ Amount _____

Proposed Amount	Pounds	Actual Amount	Pounds
-----------------	--------	---------------	--------

Casing Liner		Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
☒	☐	10	☒	2	68	.250	☒	☐	☒	☐
☐	☐		☐				☐	☐	☐	☐
☐	☐		☐				☐	☐	☐	☐
☐	☐		☐				☐	☐	☐	☐
☐	☐		☐				☐	☐	☐	☐

Shoe ☐ Inside ☒ Outside ☐ Other Location of shoe(s) 68 1/2

Temp casing ☐ Yes ☒ No Dia _____ From _____ To _____

Perforations Method 1/4 x 1 Hot Air[illegible]

☐ Pump ☒ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
100	25		1

Temperature 58 °F Lab analysis ☐ Yes By _____

Water quality concerns? ☐ Yes (describe below) TDS amount 250

From	To	Description	Amount	Units
------	----	-------------	--------	-------

County Linn Twp 12 N S Range 4 E W WM
Sec 36 NE 1/4 of the SE 1/4 Tax Lot 203
Tax Map Number _____ Lot _____

Lat _____ ° _____ ' _____ " or _____ DMS or DD
Long _____ ° _____ ' _____ " or _____ DMS or DD

☐ Street address of well ☒ Nearest address

31040 99E Shedd, OR 97377

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Pre-Alteration				
Completed Well	8-24-17			17

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found 57

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)
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8-24-17	57	68	100		17

	Ground Elevation	
Brown Top soil	0	4
BROWN Sticky clay	4	25
Brown Sandy Clay	25	35
Brown Sand & gravel	35	50
Blue clay	50	57
Blue sand	57	60
Blue gravel (med size)	60	68
RECEIVED BY OWRD		
SEP 05 2017		
SALEM, OR		

Date Started 8-23-17 Completed 8-24-17

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number	Date
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Signed _____

I accept responsibility for the construction, deepening, 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.

License Number 1753 Date 8-24-17

Signed Pat King

Contact Info (optional) _____

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 4/26/2018
 FROM: Groundwater Section Aurora C Bouchier
 Reviewer's Name
 SUBJECT: Application G- 18570 Supersedes review of na
 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: Ken Eichler County: Linn

A1. Applicant(s) seek(s) 1.0 cfs from 1 well(s) in the Willamette Basin,
Upper Willamettee subbasin (Halsey quad)

A2. Proposed use irrigation (156.97 ac) Seasonality: March 1 through October 31

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	LINN 62062	1	Alluvium	1.0	12S/4W-36 NE-SE	2910' S, 115' W fr NE cor S 36
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	260	57	17	8/24/2017	68	0-35	-2-68	Na	62-65	200	25	B

Use data from application for proposed wells.

A4. **Comments:** _____

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 well is greater than 1/4-mile from a surface water source, and producing from a confined aquifer, so the pertinent rules (OAR 690-502-0240) do not apply.

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) 7N, large water use reporting;
 - 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 in an area that contains fine-grained sediments from land surface to a depth of 20-30 feet. A 60-80 feet thick sand and gravel layer underlies the fine-grained sediments. Approximately 180 feet of mostly fine-grained sediments containing thin sand lenses is found at beneath the sand and gravel (Gannett et al., 1998). This is likely the Lower Sedimentary Unit of Conlon et al. (2005). Most nearby wells produce water from the sand and gravel layer.

The nearest observation well (LINN 10817, located approximately 1.7 miles to the west-southwest) has been monitored since the early 1960's. The hydrograph for LINN 10817 shows a seasonal fluctuation of approximately 10-15 feet and no apparent decline, suggesting the aquifer is stable at the current level of use. However, there has recently been a large amount of groundwater applied for in this area.

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	Alluvium	☒	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: The water level is reported to rise above the water bearing zone per the well log, indicating the aquifer is more confined than unconfined.

C2. 690-09-040 (2) (3): Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
1	1	Shedd Slough	~248	242-244	2,140	☒	☐	☐	☐	☒
1	2	Calapooia River	~248	235	5,450	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: The seasonal high (springtime) groundwater elevation is coincident with or slightly above the elevation of Shedd Slough within a mile of the well, but the seasonal low (fall) groundwater elevation is below the elevation of Shedd Slough within a mile of the well. The groundwater elevation is coincident with or above the elevation of the Calapooia River at a distance of just over a mile from the well. Published water table maps show that groundwater flows towards, and discharges into, the Calapooia River in this area (Woodward et al., 1998).

Water Availability Basin the well(s) are located within: Watershed ID: 76 (Calapooia R > Willamette R – ab 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	☐	☐	na	na	☐	22.70*	☒	<25%	☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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 stream depletion of Shedd Slough at 30 days was estimated using the Hunt 2003 model. Stream depletion was calculated using the ranges of S, Kv of the streambed, Kh of the Lower Sedimentary Unit as described in Conlon et al. (2005). Results show stream depletion is less than 25% at 30 days for the range of available aquifer parameters.

*WAB 76 (Calapooia 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	27.21%	22.13%	10.89%	24.52%	33.75%	40.33%	45.30%	49.22%	52.40%	55.05%	46.41%	34.74 %
Well Q as CFS		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Interference CFS		0.272	0.221	0.109	0.245	0.337	0.403	0.453	0.492	0.524	0.551	0.464	0.347
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.		0.272	0.221	0.109	0.245	0.337	0.403	0.453	0.492	0.524	0.551	0.464	0.347
(B) = 80 % Nat. Q		592	650	575	423	234	111	49	26	22.7	29.6	133	499
(C) = 1 % Nat. Q		5.92	6.50	5.75	4.23	2.34	1.11	0.49	0.26	0.227	0.296	1.33	4.99
(D) = (A) > (C)													
(E) = (A / B) x 100		0.046 %	0.034 %	0.019 %	0.058 %	0.144 %	0.363 %	0.924 %	1.892 %	2.308 %	1.861 %	0.349 %	0.070 %

(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 stream depletion from the Calapooia River was estimated using the Hunt 1999 model. The large distance to the River likely results in stream depletion at 30 days being <25%.

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:
- ☐ The permit should contain condition #(s) _____;
 - ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

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

The large distance between the well and the hydraulically connected surface water bodies will likely result in an inefficient connection between the well and the surface water bodies. However, stream depletion will increase over time until all of the pumped water is balanced by reduced stream flow.

References Used: _____

Application files: G-18570.

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. Geological Survey Scientific Investigations Report 2014-5136, 152 p., <http://dx.doi.org/10.3133/sir20155136>.

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

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

Woodward, Dennis G., 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) _____

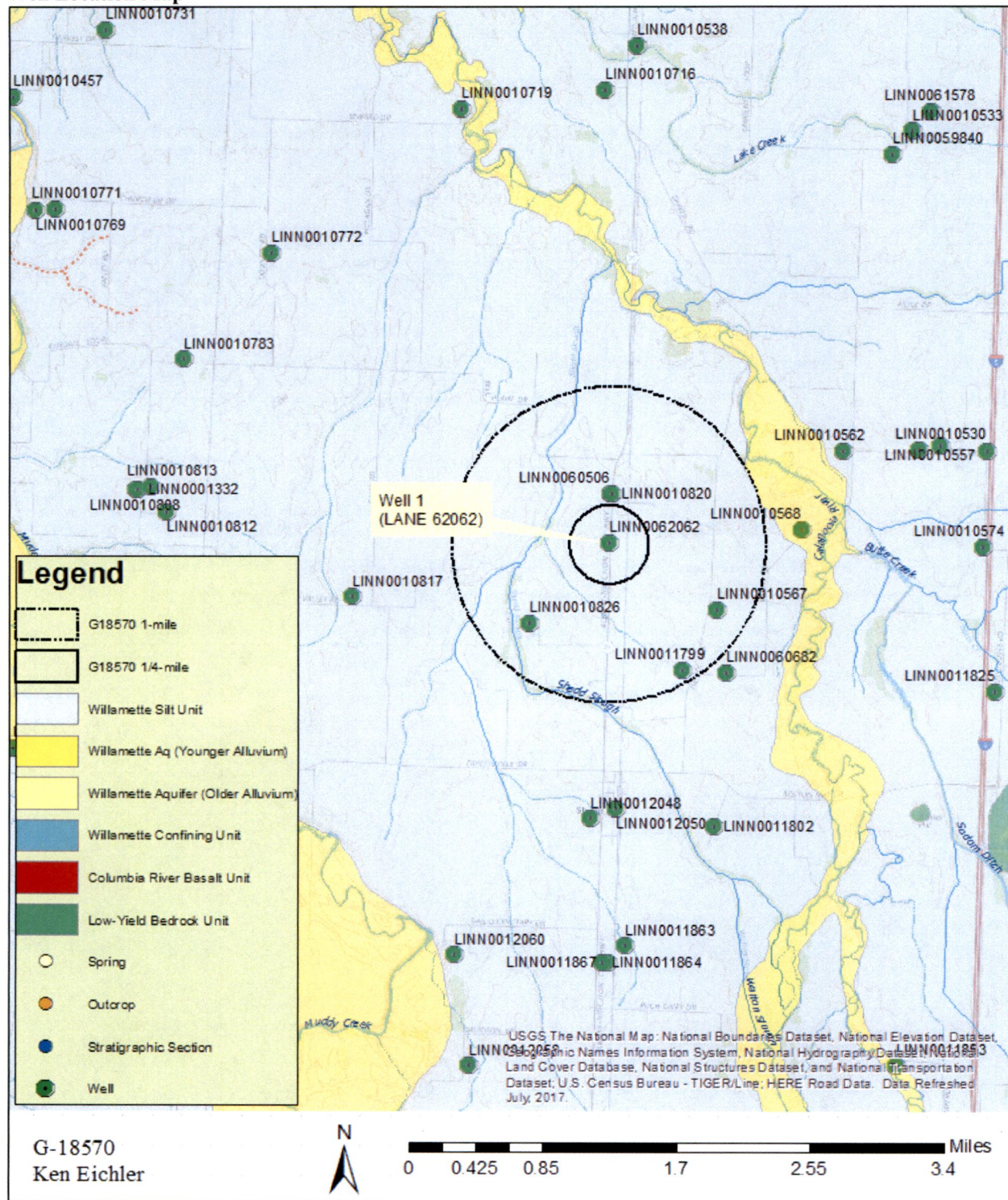
D3. **THE WELL construction deficiency or other comment is described as follows:** _____

 _____D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.****Water Availability Tables**

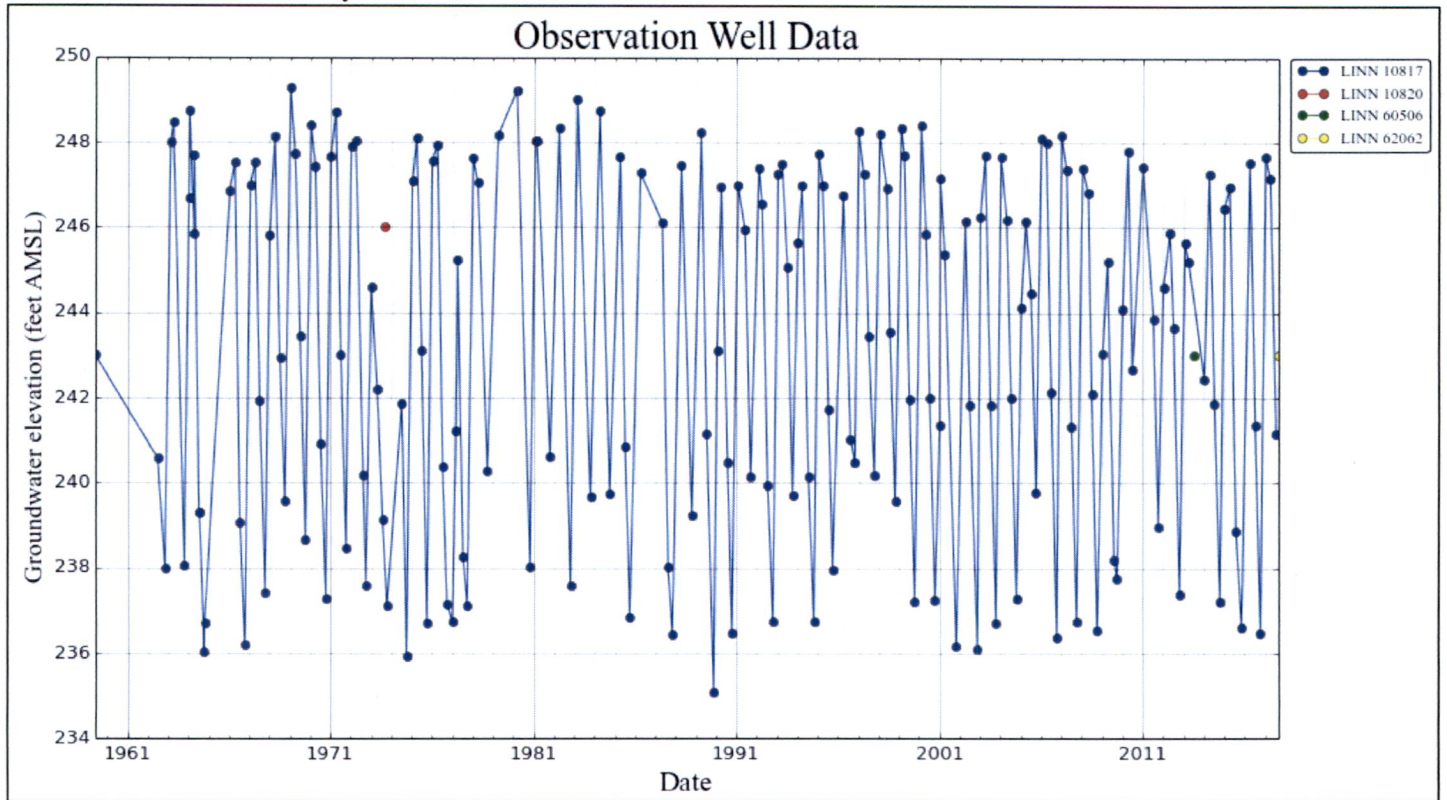
DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION						
Watershed ID #: 76		CALAPOOIA R > WILLAMETTE R - AB MOUTH			Exceedance Level: 80	
Time: 8:26 AM		Basin: WILLAMETTE			Date: 04/20/2018	
Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net water Available
Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.						
JAN	592.00	3.40	589.00	0.00	20.00	569.00
FEB	650.00	3.35	647.00	0.00	20.00	627.00
MAR	575.00	2.27	573.00	0.00	20.00	553.00
APR	423.00	1.98	421.00	0.00	20.00	401.00
MAY	234.00	7.09	227.00	0.00	20.00	207.00
JUN	111.00	12.80	98.20	0.00	20.00	78.20
JUL	49.00	19.60	29.40	0.00	20.00	9.42
AUG	26.00	14.10	11.90	0.00	20.00	-8.09
SEP	22.70	7.36	15.30	0.00	20.00	-4.66
OCT	29.60	1.92	27.70	0.00	20.00	7.68
NOV	133.00	2.41	131.00	0.00	20.00	111.00
DEC	499.00	3.36	496.00	0.00	20.00	476.00
ANN	404,000	4,830	399,000	0	14,500	385,000

DETAILED REPORT OF INSTREAM REQUIREMENTS													
Watershed ID #: 76		CALAPOOIA R > WILLAMETTE R - AB MOUTH										Basin: WILLAMETTE	
Time: 8:26 AM												Date: 04/20/2018	
Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monthly values are in cfs.													
MF76A	CERTIFICATE	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.00	20.0
MAXIMUM		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

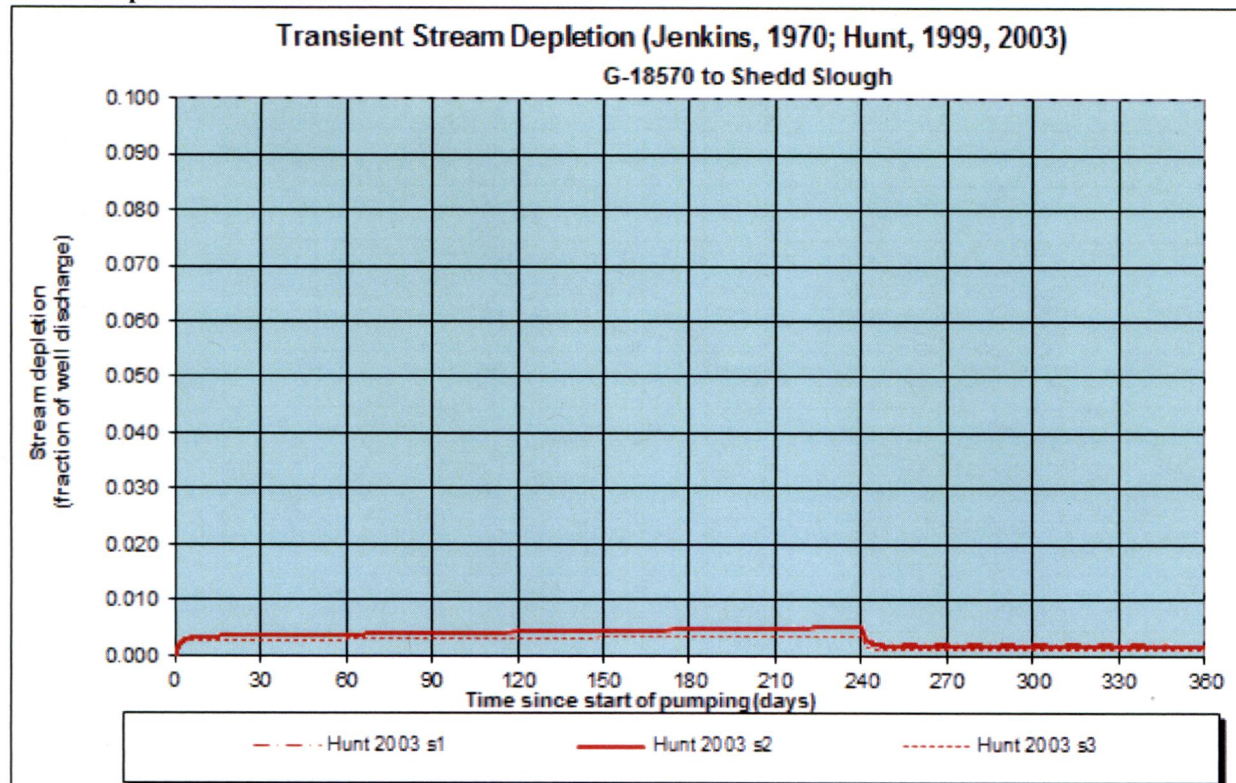
Well Location Map



Water-Level Trends in Nearby Wells



Stream Depletion Model Results



Output for Stream Depletion, Scenierio 2 (s2):						Time pump on (pumping duration) = 240 days							
Days	30	60	90	120	150	180	210	240	270	300	330	360	
J SD	87.3%	91.0%	92.7%	93.6%	94.3%	94.8%	95.2%	95.5%	8.4%	5.0%	3.5%	2.7%	
H SD 1999	2.8%	4.2%	5.2%	6.1%	6.9%	7.5%	8.1%	8.7%	6.4%	5.5%	4.9%	4.5%	
H SD 2003	0.36%	0.38%	0.40%	0.43%	0.45%	0.47%	0.49%	0.52%	0.18%	0.18%	0.17%	0.17%	
Qw, cfs	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
H SD 99, cfs	0.028	0.042	0.052	0.061	0.069	0.075	0.081	0.087	0.064	0.055	0.049	0.045	
H SD 03, cfs	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.002	0.002	0.002	0.002	
Parameters:													
		Scenario 1		Scenario 2		Scenario 3				Units			
Net steady pumping rate of well	Qw	1.00		1.00		1.00				cfs			
Time pump on (pumping duration)	tpon	240		240		240				days			
Perpendicular from well to stream	a	2140		2140		2140				ft			
Well depth	d	68		68		68				ft			
Aquifer hydraulic conductivity	K	25		50		200				ft/day			
Aquifer saturated thickness	b	60		60		60				ft			
Aquifer transmissivity	T	1500		3000		12000				ft*ft/day			
Aquifer storativity or specific yield	S	0.001		0.001		0.001							
Aquitard vertical hydraulic conductivity	Kva	0.01		0.01		0.01				ft/day			
Aquitard saturated thickness	ba	20		20		20				ft			
Aquitard thickness below stream	babs	10		10		10				ft			
Aquitard porosity	n	0.2		0.2		0.2							
Stream width	ws	20		20		20				ft			
Streambed conductance (lambda)	sbc	0.020000		0.020000		0.020000				ft/day			
Stream depletion factor	sdf	3.053067		1.526533		0.381633				days			
Streambed factor	sbf	0.028533		0.014267		0.003567							
input #1 for Hunt's Q_4 function	t'	0.327540		0.655079		2.620316							
input #2 for Hunt's Q_4 function	K'	1.526533		0.763267		0.190817							
input #3 for Hunt's Q_4 function	epsilon'	0.005000		0.005000		0.005000							
input #4 for Hunt's Q_4 function	lamda'	0.028533		0.014267		0.003567							

