WATER RESOURCES DEPARTMENT

MEMO August 10 ,2016

TO: **Application G-** 18288

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

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES
The source of appropriation is within or above a Scenic Waterway
☒ NO

☐ YES
Use the Scenic Waterway condition (Condition 7J)
☒ NO

☐ Per ORS 390.835, the Groundwater Section is **able** to calculate ground water interference with surface water that contributes to a Scenic Waterway. The calculated interference is distributed below.

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

DISTRIBUTION OF INTERFERENCE

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

Exercise of this permit is calculated to reduce monthly flows in _____ 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 GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **August 10, 2016**

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

SUBJECT: Application G- **18288** 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: **Joan Cooper** County: **Clackamas**

A1. Applicant(s) seek(s) **0.495** cfs from **1** well(s) in the **Willamette** Basin, **Molalla-Pudding** subbasin

A2. Proposed use **Irrigation (39.6 acres)** Seasonality: **March 1 – 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	Proposed	1	Alluvial	0.495	4S/2E-32 SE-NE	2080' S, 730' W fo NE cor S 32
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	282		**~30**		Est 200-300	Est 0-18	Est 0-200					

Use data from application for proposed wells.

A4. **Comments:** The water levels listed on the well logs for nearby wells (CLAC 14273, CLAC 55308, and CLAC 60360) are approximately 30 feet below land surface.

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: Well should produce from a confined aquifer, so the pertinent rule (OAR 690-502-0240) does 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**;
   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 **alluvial** 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:**

Over 900 feet of alluvial sediments occur beneath land surface in the vicinity of the proposed POA (Gannett and Caldwell, 1998). The water table occurs 30-50 feet below land surface. Productive sand and gravel beds occur throughout the sequence separated by beds of lower permeability silt and clay which progressively confine deeper water-bearing zones (Woodward et al., 1998).

Nearby observation wells indicate relatively stable long-term water-level for wells in the immediate vicinity of the proposed POA trends (see attached graph) but increased ground-water development in the area speaks to the need for additional water-level monitoring.

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 logs for nearby wells list static water levels above the water-bearing zones at which water was first encountered, indicating confined conditions.

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**	**Unnamed Trib to Molalla River**	**~240-260**	**246-304**	**2340***	☒	☐	☐	☐	☒
1	**2**	**Molalla River**	**~250-260**	**238-257**	**3750**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: Nearby wells (CLAC 14273, CLAC 55308, AND CLAC 60360) with multiple years of water level records indicated that the seasonal high water table is likely between around 240-260 feet above sea level at the location of the applicant's wells. Published water table maps in the area indicate that groundwater flows towards, and discharges into the Molalla River (Woodward et al., 1998, and Conlon et al., 2005).

* The adjacent reach of the unnamed tributary to the Molalla River is located less than ¼-mile from each of the proposed well. However, at the adjacent reach, the elevation of the stream is above the likely seasonal high elevation of the groundwater at the well. The distance listed on the table above is the distance to the location along the ditched portion of the unnamed tributary to the Molalla River which is coincident with the likely seasonal high groundwater elevation (260 feet above sea level).

Water Availability Basin the well(s) are located within: 70747: MOLALLA R > WILLAMETTE R – AB MILK CR

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**	☐	**54.50**	☐	**~4%**	☐
1	**2**	☐	☐	**IS 70747**	**78.70**	☐	**54.50**	☐	**<<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: Interference at 30 days between the well and the surface water sources was estimated using the Hunt 2003 model. The distance between the well and the streams results in an inefficient connection between the aquifer and the streams, therefore the interference at 30 days is much less than 25%. However, stream depletion will increase over time until all of the pumped water is reduced stream flow from this and other streams.

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													

Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													

(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:

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:**

The distance between the well and the streams results in an inefficient connection between the aquifer and the streams, therefore the interference at 30 days is much less than 25%. However, stream depletion will increase over time until all of the pumped water is reduced stream flow from the Molalla River and other streams.

References Used:

Application file: G-18288, and nearby G-16728, G-16795, G-17309, G-17522

Conlon and others, 2005, Ground-water hydrology of the Willamette Basin, Oregon: U.S Geological Survey Scientific Investigations Report 2005-5168.

Gannett and Caldwell, 1998, Geologic framework of the Willamette lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-A,

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

Woodward and others, 1998, Hydrogeologic framework of the Willamette lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-B.

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

WATER AVAILABILITY TABLE

MOLALLA R > WILLAMETTE R - AB MILK CR
Watershed ID #: 70747 Basin: WILLAMETTE Exceedance Level: 80
Time: 4:32 PM Date: 08/09/2016

Nest	# Watershed ID	Stream Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	STOR
1	181	WILLAMETTE R > COLUMBIA R - AT MOUTH	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	69796	MOLALLA R > WILLAMETTE R - AT MOUTH	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES
3	135	MOLALLA R > WILLAMETTE R - AB GRIBBLE CR	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES
4	70747	MOLALLA R > WILLAMETTE R - AB MILK CR	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	YES	YES

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

MOLALLA R > WILLAMETTE R - AB MILK CR
Watershed ID #: 70747 Basin: WILLAMETTE Exceedance Level: 80
Time: 4:33 PM Date: 08/09/2016

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	531.00	1.28	530.00	0.00	300.00	230.00
FEB	541.00	1.27	540.00	0.00	300.00	240.00
MAR	569.00	1.30	568.00	0.00	300.00	268.00
APR	591.00	1.57	589.00	0.00	300.00	289.00
MAY	466.00	4.87	461.00	0.00	300.00	161.00
JUN	207.00	6.85	200.00	0.00	200.00	0.15
JUL	85.90	12.10	73.80	0.00	100.00	-26.20
AUG	55.70	9.81	45.90	0.00	78.70	-32.80
SEP	54.50	4.00	50.50	0.00	88.90	-38.40
OCT	90.40	1.38	89.00	0.00	166.00	-77.00
NOV	273.00	1.25	272.00	0.00	300.00	-28.30
DEC	560.00	1.29	559.00	0.00	300.00	259.00
ANN	454,000	2,850	451,000	0	165,000	287,000

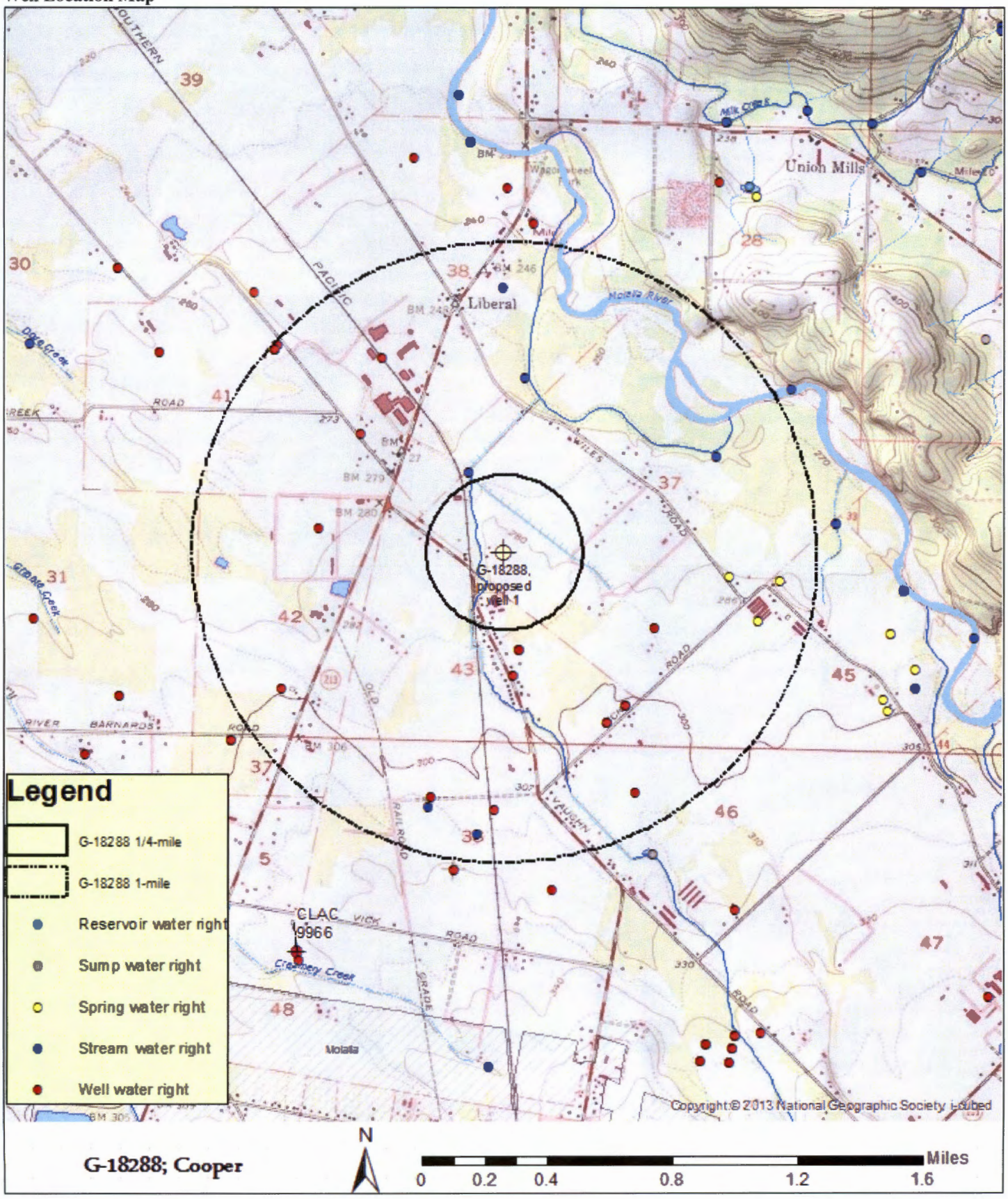
DETAILED REPORT OF INSTREAM REQUIREMENTS

MOLALLA R > WILLAMETTE R - AB MILK CR
Watershed ID #: 70747 Basin: WILLAMETTE
Time: 4:33 PM Date: 08/09/2016

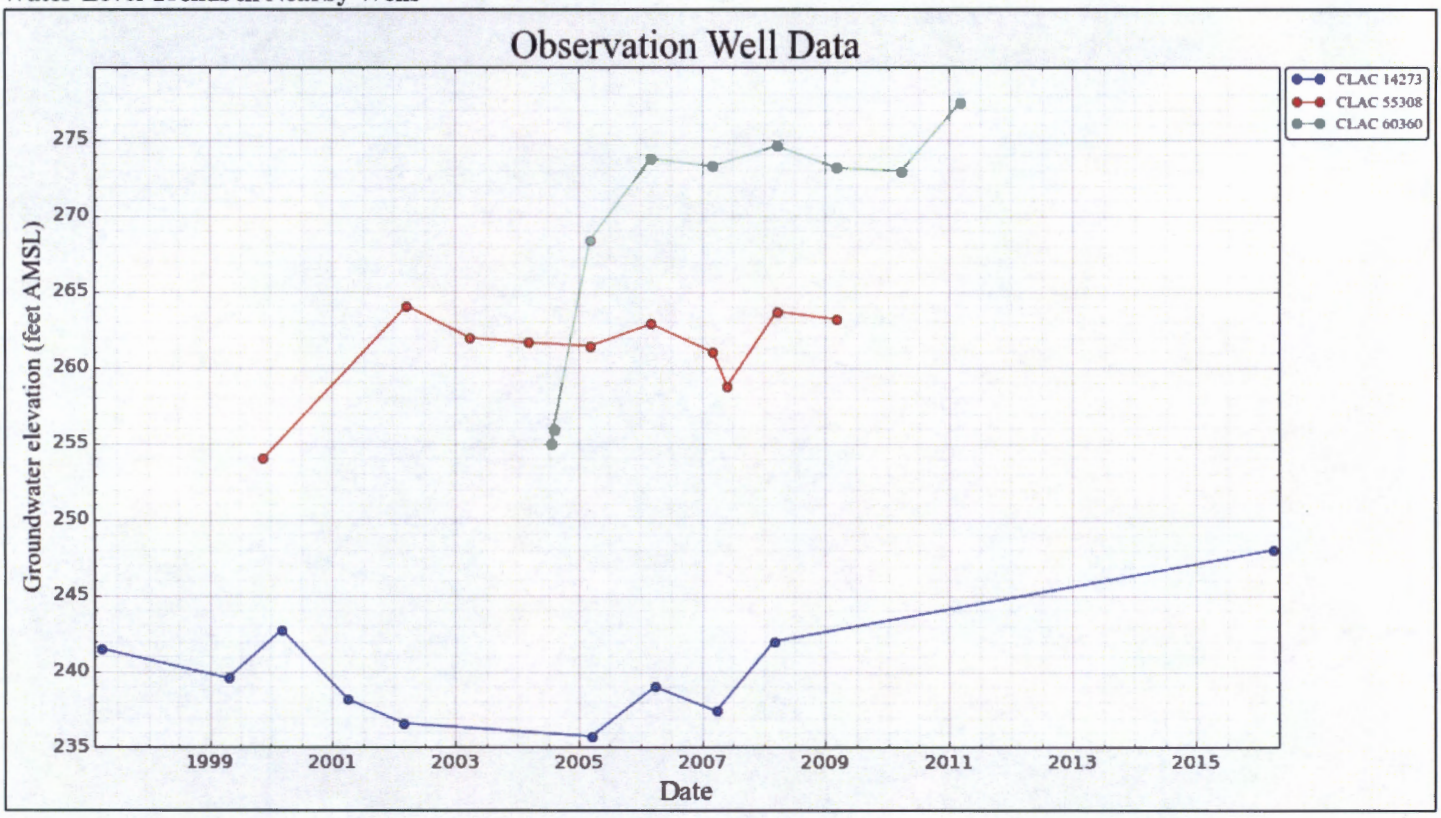
Monthly values are in cfs.

Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
IS70747A	CERTIFICATE	300.0	300.0	300.0	300.0	300.0	200.0	100.0	78.7	88.9	166.0	300.00	300.0
MAXIMUM		300.0	300.0	300.0	300.0	300.0	200.0	100.0	78.7	88.9	166.0	300.0	300.0

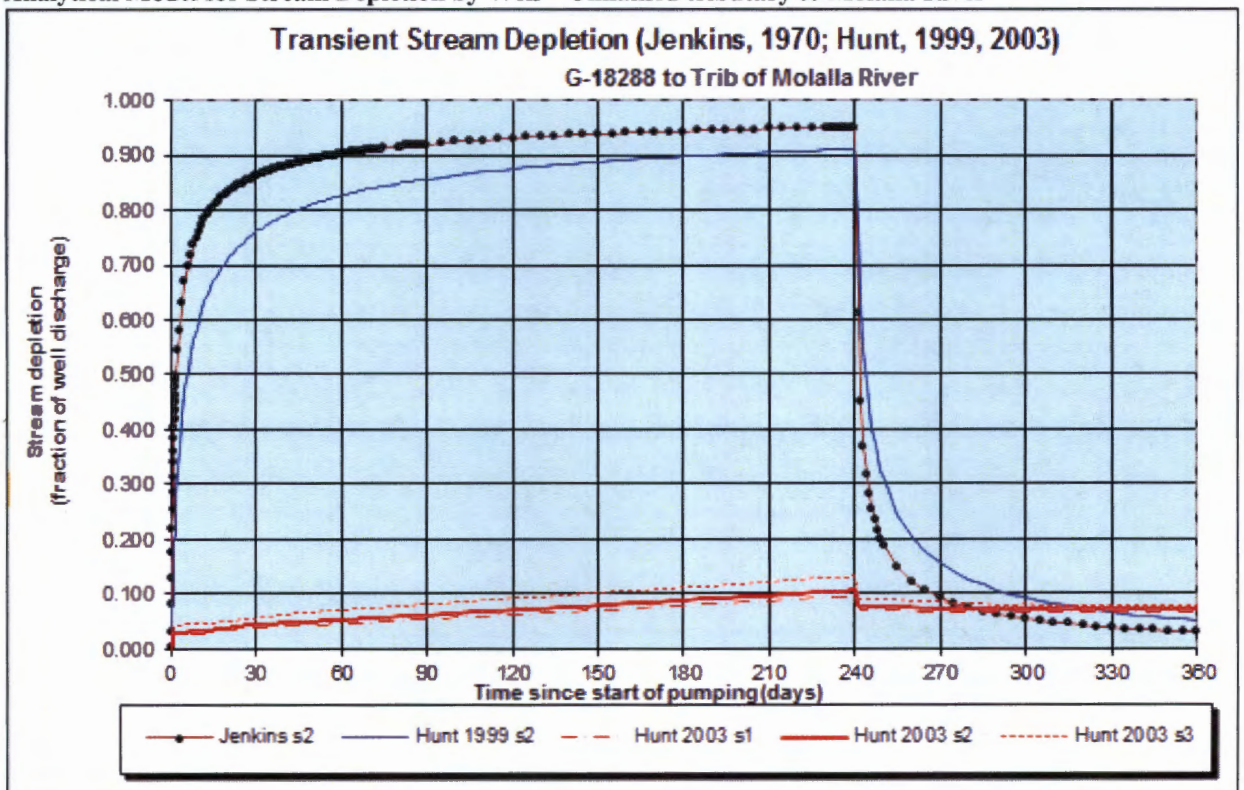
Well Location Map



Water-Level Trends in Nearby Wells



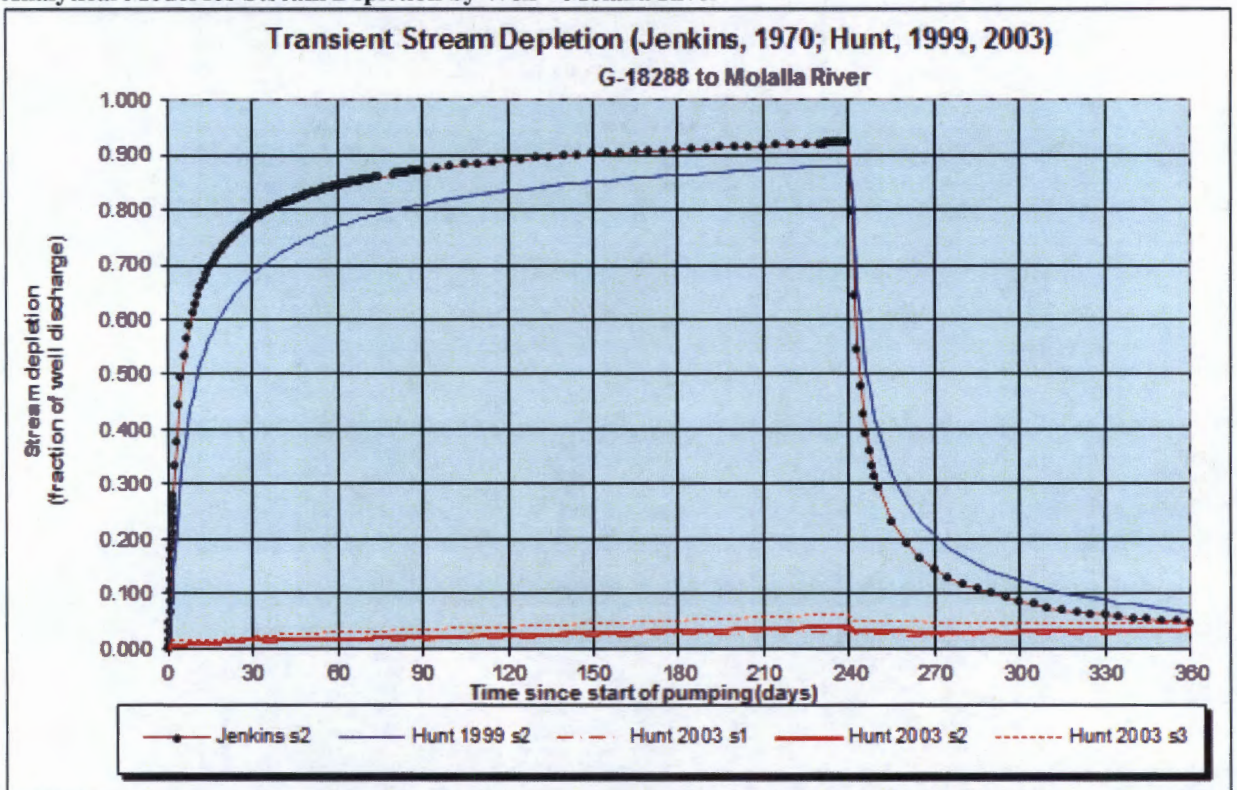
Analytical Model for Stream Depletion by Well – Unnamed tributary to Molalla River



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 240 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	86.2%	90.2%	92.0%	93.1%	93.8%	94.3%	94.7%	95.1%	9.2%	5.4%	3.8%	2.9%
H SD 1999	75.9%	82.7%	85.7%	87.5%	88.8%	89.7%	90.4%	91.0%	15.6%	9.2%	6.6%	5.1%
H SD 2003	4.44%	5.29%	6.17%	7.08%	7.97%	8.84%	9.73%	10.65%	7.08%	7.18%	7.09%	7.06%
Qw, cfs	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495
H SD 99, cfs	0.376	0.409	0.424	0.433	0.439	0.444	0.447	0.450	0.077	0.046	0.032	0.025
H SD 03, cfs	0.022	0.026	0.031	0.035	0.039	0.044	0.048	0.053	0.035	0.035	0.035	0.035

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	222.00	222.00	222.00	gpm
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	2340	2340	2340	ft
Well depth	d	200	200	200	ft
Aquifer hydraulic conductivity	K	25	30	50	ft/day
Aquifer saturated thickness	b	100	100	100	ft
Aquifer transmissivity	T	2500	3000	5000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.1	0.1	0.1	ft/day
Aquitard saturated thickness	ba	30	30	30	ft
Aquitard thickness below stream	babs	3	3	3	ft
Aquitard porosity	n	0.5	0.5	0.5	
Stream width	ws	100	100	100	ft
Streambed conductance (lambda)	sbc	3.333333	3.333333	3.333333	ft/day
Stream depletion factor	sdf	2.190240	1.825200	1.095120	days
Streambed factor	sbf	3.120000	2.600000	1.560000	
input #1 for Hunt's Q_4 function	t'	0.456571	0.547885	0.913142	
input #2 for Hunt's Q_4 function	K'	7.300800	6.084000	3.650400	
input #3 for Hunt's Q_4 function	epsilon'	0.002000	0.002000	0.002000	
input #4 for Hunt's Q_4 function	lamda'	3.120000	2.600000	1.560000	

Analytical Model for Stream Depletion by Well – Molalla River



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 240 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	78.0%	84.3%	87.2%	88.9%	90.1%	90.9%	91.6%	92.1%	14.6%	8.6%	6.1%	4.7%
H SD 1999	68.1%	76.9%	81.0%	83.4%	85.1%	86.3%	87.3%	88.1%	20.6%	12.3%	8.8%	6.8%
H SD 2003	1.54%	1.83%	2.13%	2.48%	2.83%	3.28%	3.67%	4.13%	3.02%	3.13%	3.34%	3.48%
Qw, cfs	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495	0.495
H SD 99, cfs	0.337	0.381	0.400	0.413	0.421	0.427	0.432	0.436	0.102	0.061	0.043	0.033
H SD 03, cfs	0.008	0.009	0.011	0.012	0.014	0.016	0.018	0.020	0.015	0.015	0.017	0.017

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	222.00	222.00	222.00	gpm
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	3750	3750	3750	ft
Well depth	d	200	200	200	ft
Aquifer hydraulic conductivity	K	25	30	50	ft/day
Aquifer saturated thickness	b	100	100	100	ft
Aquifer transmissivity	T	2500	3000	5000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.1	0.1	0.1	ft/day
Aquitard saturated thickness	ba	30	30	30	ft
Aquitard thickness below stream	babs	3	3	3	ft
Aquitard porosity	n	0.5	0.5	0.5	
Stream width	ws	100	100	100	ft
Streambed conductance (lambda)	sbc	3.333333	3.333333	3.333333	ft/day
Stream depletion factor	sdf	5.625000	4.687500	2.812500	days
Streambed factor	sbf	5.000000	4.166667	2.500000	
input #1 for Hunt's Q_4 function	t'	0.177778	0.213333	0.355556	
input #2 for Hunt's Q_4 function	K'	18.750000	15.625000	9.375000	
input #3 for Hunt's Q_4 function	epsilon'	0.002000	0.002000	0.002000	
input #4 for Hunt's Q_4 function	lamda'	5.000000	4.166667	2.500000	