

Approved: 

# MEMO

**To:** Kristopher Byrd, Well Construction and Compliance Section Manager  
**From:** Travis Kelly, Well Construction Program Coordinator  
**Subject:** Review of Water Right Application G-18903  
**Date:** February 4, 2021

The attached application was forwarded to the Well Construction and Compliance Section by the Groundwater Section. Mike Thoma reviewed the application. Please see Mike's Groundwater Review.

Applicant's Well #1 (Proposed Well): Well #1 is a proposed well, therefore it cannot be reviewed for construction. Construction of the proposed well shall be completed in a manner that protects ground water resources as required under Oregon Administrative Rules 690-200 through 690-240. During construction of the well, specific attention should be paid to ensure sealing requirements are met and that the well does not commingle aquifers.

The proposed Well #1 may not satisfy hydraulic connection issues.

Applicant's Well #2 (Proposed Well): Well# 2 is a proposed well, therefore it cannot be reviewed for construction. Construction of the proposed well shall be completed in a manner that protects ground water resources as required under Oregon Administrative Rules 690-200 through 690-240. During construction of the well, specific attention should be paid to ensure sealing requirements are met and that the well does not commingle aquifers.

The proposed Well #2 may not satisfy hydraulic connection issues.

Applicant's Well #3 (Proposed Well): Well #3 is a proposed well, therefore it cannot be reviewed for construction. Construction of the proposed well shall be completed in a manner that protects ground water resources as required under Oregon Administrative Rules 690-200 through 690-240. During construction of the well, specific attention should be paid to ensure sealing requirements are met and that the well does not commingle aquifers.

The proposed Well #3 may not satisfy hydraulic connection issues.

Applicant's Well #4 (No Well Report): There is no well report associated with this well that shows how it was originally constructed to verify compliance with well construction standards.

My recommendation is that the Department **not issue** a permit for Applicant's Well #4 unless it is brought into compliance with current minimum well construction standards or information is provided showing that it is constructed to meet current minimum well construction standards.

The repair of Applicant's Well #4 may not satisfy hydraulic connection issues.

# Groundwater Application Review Summary Form

Application # G- 18903

GW Reviewer M. Thoma Date Review Completed: 09/16/2020

## 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:

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).*

**WATER RESOURCES DEPARTMENT**

**MEMO**

**09/06/2020**

**TO:**            **Application G- 18903**

**FROM:**        **GW: M. Thoma**  
                    (Reviewer's Name)

**SUBJECT: Scenic Waterway Interference Evaluation**

**YES**            The source of appropriation is hydraulically connected to a State Scenic  
 **NO**             Waterway or its tributaries

**YES**  
 **NO**             Use the Scenic Waterway Condition (Condition 7J)

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 [Enter] 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 09/16/2020  
 FROM: Groundwater Section M. Thoma  
Reviewer's Name  
 SUBJECT: Application G- 18903 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: Jerry Stroud; Mobile RV/Auto Park County: Lane

A1. Applicant(s) seek(s) 0.64 cfs from 4 well(s) in the Willamette Basin,  
Upper Willamette subbasin

A2. Proposed use: Irrigation (26 acres); Nursery (2 acres) Seasonality: Irrigation: March-October; Nursery: Year-Round

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	Unknown	0.64	16S-04W-28 SWNE	1500 ft S, 2700 ft E of NW cor S 28
2	PROPOSED	2	Unknown	0.64	15S-04W-03 SENE	2525 ft S, 210 ft W of NE cor S 03
3	PROPOSED	3	Unknown	0.64	15S-04W-33 SENW	2700 ft S, 2000 ft E of NW cor S 33
4	NO LOG	4	Unknown	0.64	15S-04W-33 SWNE	2450 ft S, 2800 ft E of NW cor S 33

\* 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	360				Unknown							
2	305											
3	320											
4	320											

Use data from application for proposed wells.

A4. **Comments:** The applicant is proposing irrigation on 26 acres total but three separate tracts of land each in a different section and the proposed POAs themselves are separated by as much as 5 miles. The application lists well-specific rates in Section 3 but also a single, maximum rate; WRIS reflects a single maximum rate of 0.64 cfs and not well-specific rates so a single rate is what will be evaluated in this application. The application does not list a proposed depth or source aquifer for any of the wells.  
The applicant lists Well #4 as "Existing" but no well log was provided with the application

A5.  **Provisions of the** Willamette (OAR 690-502) 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: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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 Department has not performed an official calculation of recharge versus existing appropriation for the Willamette aquifer system so Over-Appropriation cannot be addressed as defined in OAR 690-400-0010(11). Three of the four proposed POAs are in areas densely populated by rural development (i.e., domestic wells) and also existing groundwater rights. The nearest permitted groundwater POAs to each of the proposed POAs are 377 ft to POA #1, 3990 ft to POA #2, 480 ft to POA #3, and 580 ft to POA #4. The nearest possible domestic wells are 50 ft to POA #1, 1930 ft to POA #2, 715 ft to POA #3, and 290 ft to POA #4. Transmissivity estimates from pumping test on wells in the area range from approximately 2000 ft<sup>2</sup>/d to 50,000 ft<sup>2</sup>/d and storativity is likely to be 0.01 to 0.0001 (see Herrera et al., 2014). Using these values and distances in a Theis-Drawdown model, seasonal interference to existing wells, either domestic or permitted, could reasonably exceed 20 ft at a distance of 50 ft and 10 ft at distances around 300 ft. Many wells in the vicinity of the proposed POAs are 50-100 ft deep with reported SWLs near 10 ft below land surface. **A 20 ft, or even 10 ft, increase in seasonal interference could result in injury to existing water users.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**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	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Alluvium	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Alluvium	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Alluvium	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Basis for aquifer confinement evaluation:** There is no well construction proposed so minimum case and seal depth are assumed, in which case the proposed POAs would be producing from shallow, unconsolidated alluvial deposits; shallow wells in the vicinity of the proposed POAs report SWLs near land surface and coincident with nearby surface water elevations.

**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	Flat Creek	350	350-360	2000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	2	Muddy Creek	295	290-310	5000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	3	Unnamed Slough > Willamette River	310	310-320	4490	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	3	Unnamed Slough > Willamette River	310	310-320	3750	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Basis for aquifer hydraulic connection evaluation:** groundwater elevations are similar to surface water elevations implying water can move between the aquifer and surface water; the alluvial aquifer is unconfined and offers little resistance to vertical groundwater movement.

**Water Availability Basin the well(s) are located within:**

WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE 14174 (ID# 30200321)

**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 (SW) source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that SW source, 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	<input type="checkbox"/>	<input type="checkbox"/>	N/A		<input type="checkbox"/>	2540	<input type="checkbox"/>	<< 25%	<input type="checkbox"/>
2	2	<input type="checkbox"/>	<input type="checkbox"/>	N/A		<input type="checkbox"/>	2540	<input type="checkbox"/>	<< 25%	<input type="checkbox"/>
3	3	<input type="checkbox"/>	<input type="checkbox"/>	N/A		<input type="checkbox"/>	2540	<input type="checkbox"/>	> 25%	<input checked="" type="checkbox"/>
4	3	<input type="checkbox"/>	<input type="checkbox"/>	N/A		<input type="checkbox"/>	2540	<input type="checkbox"/>	> 25%	<input checked="" type="checkbox"/>

**Comments:** Stream-depletion was estimated using the Hunt-1999 stream-depletion model with model parameters taken from the OWRD Pump Test Database and Herrera et al., (2014). Stream-depletion estimates are shown below.

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?
			<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
			<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Comments: \_\_\_\_\_  
 \_\_\_\_\_

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.

<b>Non-Distributed Wells</b>													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
<b>Distributed Wells</b>													
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													
(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 applicant’s proposed POAs would be producing from an aquifer system that is unconfined and found to be hydraulically-connected to surface water – specifically tributaries to the Willamette River. The distance between the POAs and surface water is less than 1 mile for all proposed POAs. Stream-depletion estimates using the Hunt-1999 model estimated that interference to surface water from POAs #1 and #2 is not likely to result in the Potential for Substantial Interference (as defined in OAR 690-0090) but **interference from POAs #3 and #4 is likely to result in the Potential for Substantial Interference.**

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**References Used:**

Gannett, M. W. and R. R. Caldwell. 1998. *Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington*. USGS Professional Paper 1424-A.

Herrera, N. B., Burns, E. R., and T. D. Conlon. 2014. *Simulation of Groundwater Flow and the Interaction of Groundwater and Surface Water in the Willamette Basin and Central Willamette Subbasin*, Oregon. USGS Scientific Investigations Report 2014-5136.

Hunt, B. 1999. *Unsteady Stream Depletion from Ground Water Pumping*. Journal of Hydrologic Engineering, Vol 8(1), pp 12-19

McClaghry, J. D., T. J. Wiley, M. L. Ferns, and I. P Madin. 2010. *Digital Geologic Map of the Southern Willamette Valley, Benton, Lane, Linn, Marion, and Polk Counties, Oregon*. Oregon Dept. of Geology and Mineral Industries. Open File Report O-10-13.

OWRD Well Log Database – Accessed 09/16/2020

Woodward, D. G., M. W. Gannett, and J. J. Vaccaro. 1998. *Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington*. USGS Professional Paper 1424-B.

**D. WELL CONSTRUCTION, OAR 690-200**

D1. Well #: 4 Logid: No Log

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) No Well Log was provided with the application

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

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



Water Availability Tables

## Water Availability Analysis Detailed Reports

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

Water Availability as of 9/16/2020

Watershed ID #: 30200321 ([Map](#))

Exceedance Level:

Date: 9/16/2020

Time: 10:08 AM

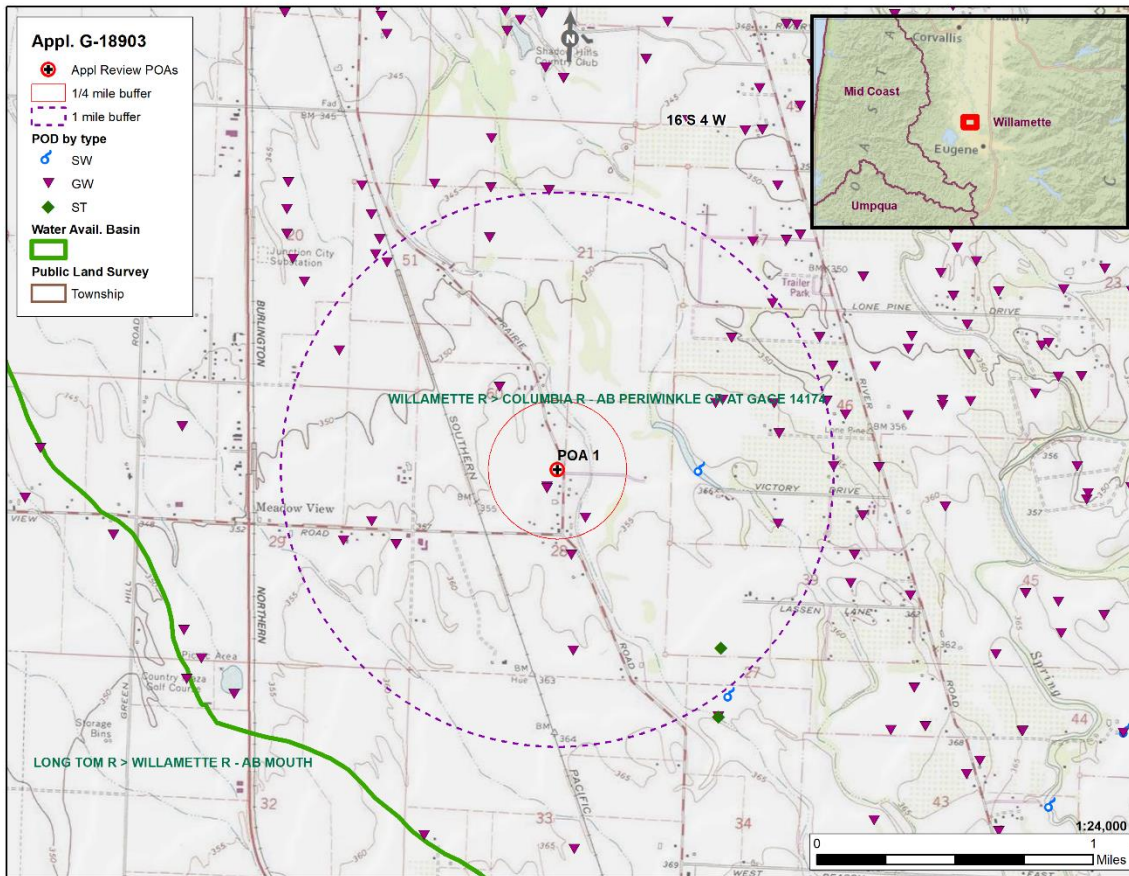
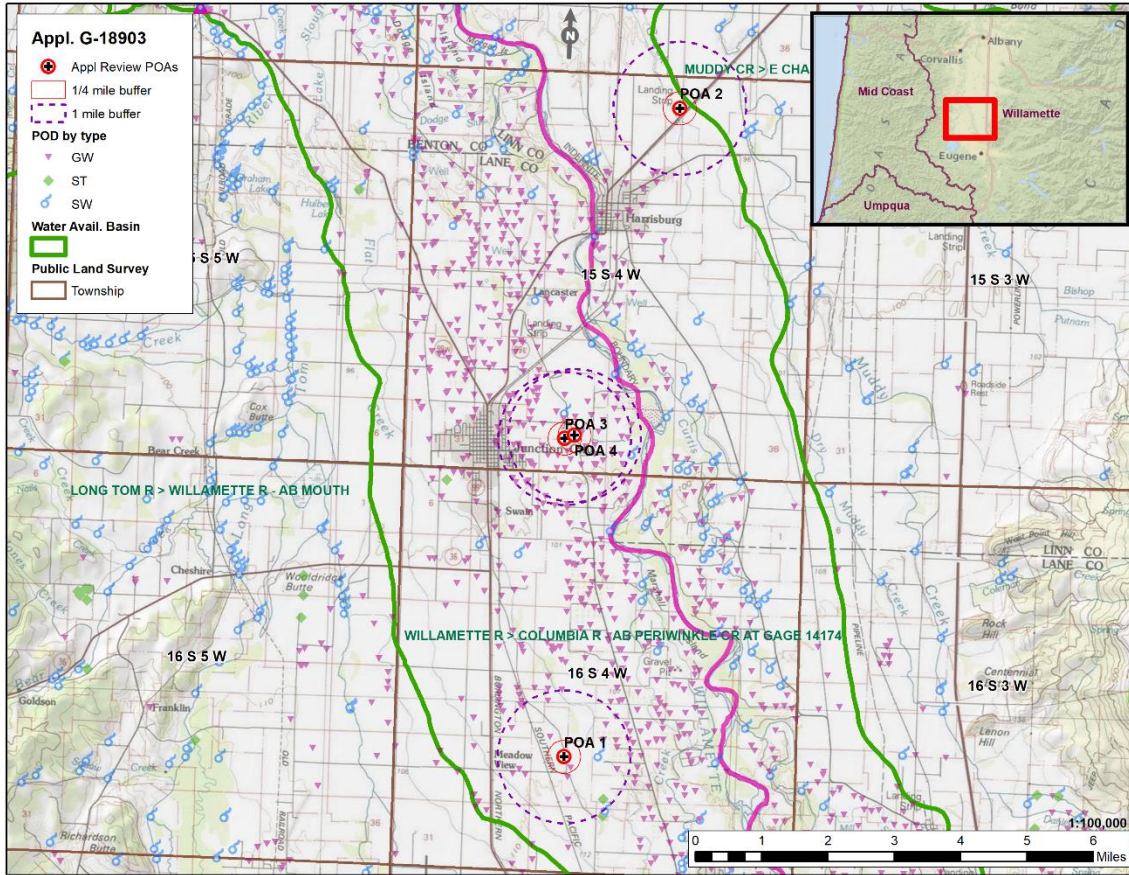
Water Availability Calculation	Consumptive Uses and Storages	Instream Flow Requirements	Reservations
	Water Rights		Watershed Characteristics

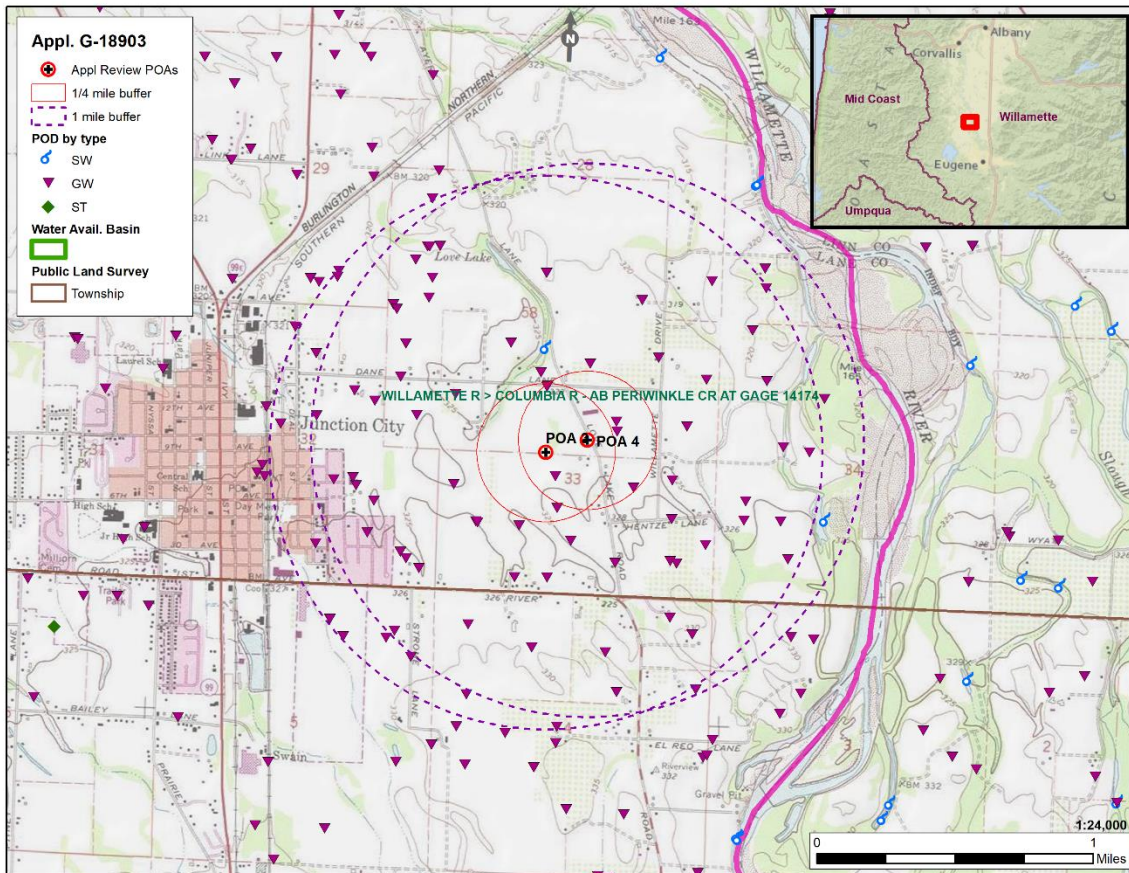
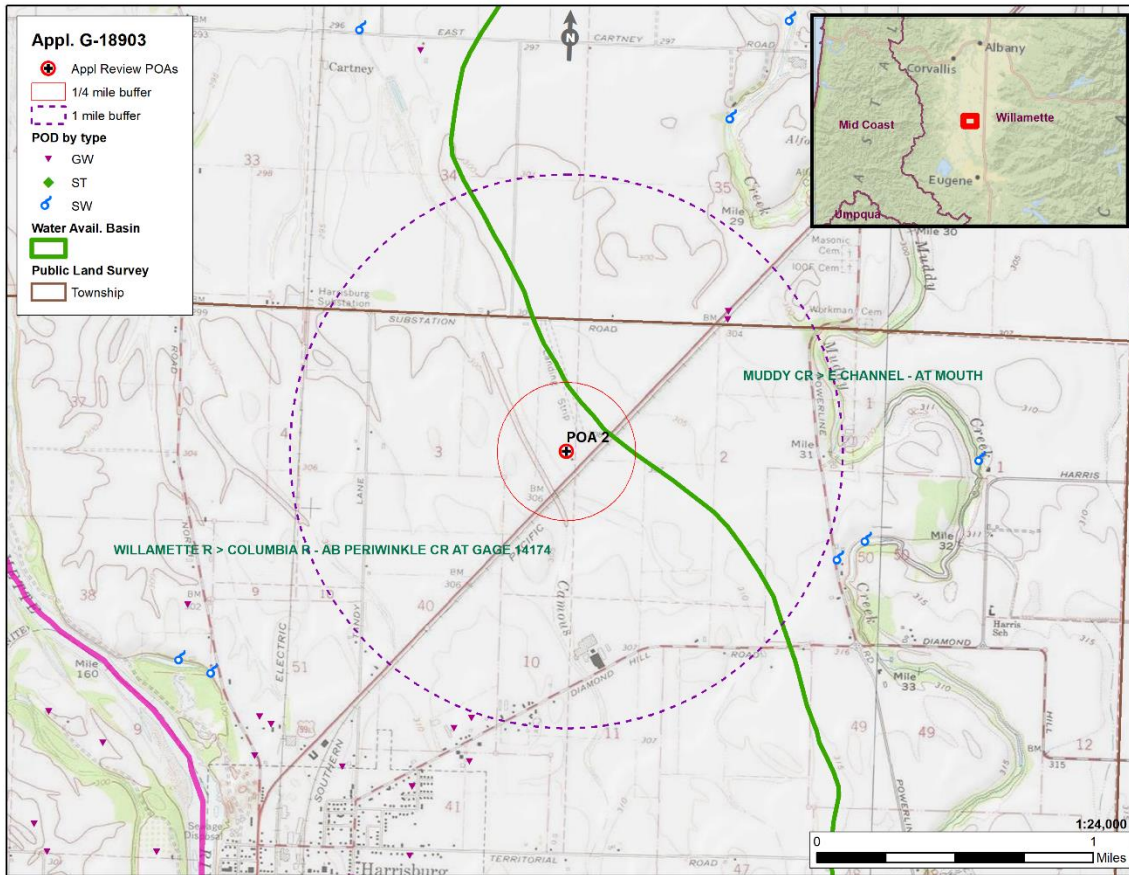
### Water Availability Calculation

Monthly Streamflow in Cubic Feet per Second  
Annual Volume at 50% Exceedance in Acre-Feet

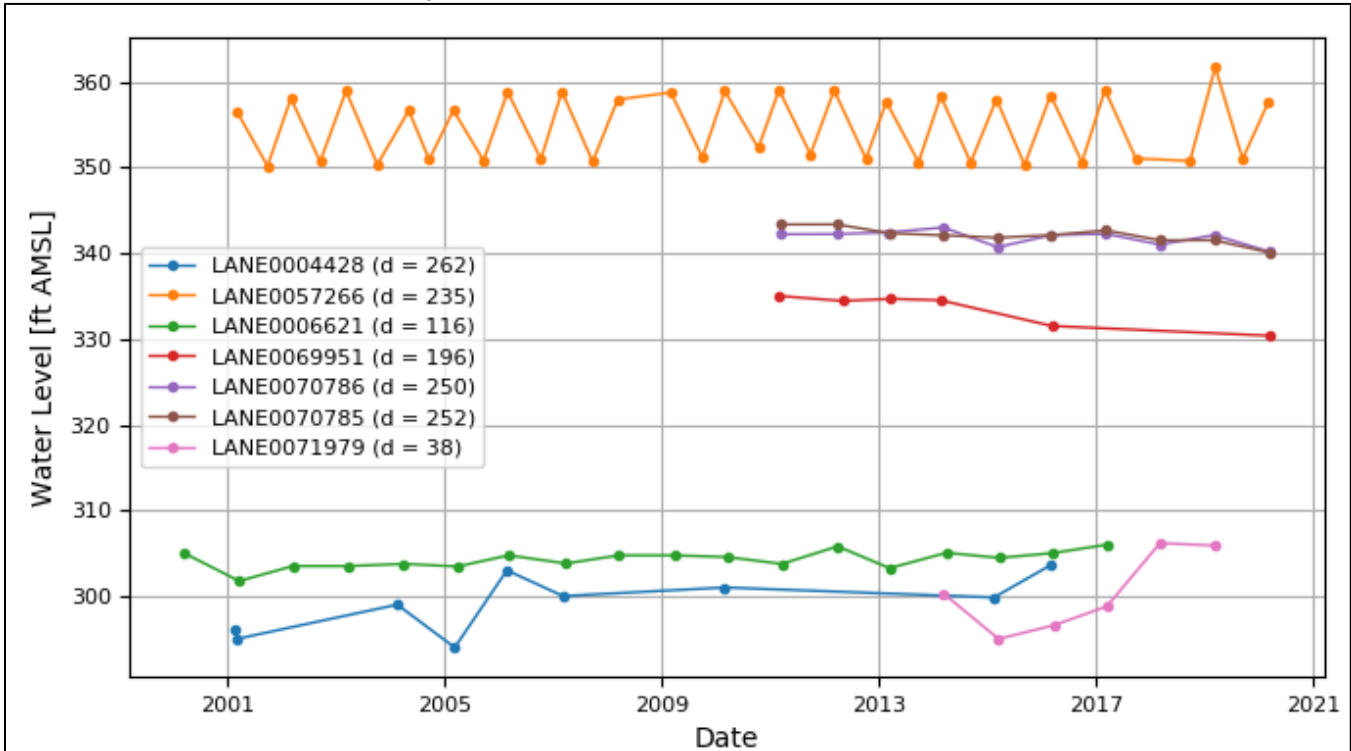
Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	10,100.00	1,370.00	8,730.00	0.00	1,750.00	6,980.00
FEB	11,600.00	4,290.00	7,310.00	0.00	1,750.00	5,560.00
MAR	11,000.00	4,560.00	6,440.00	0.00	1,750.00	4,690.00
APR	9,760.00	4,260.00	5,500.00	0.00	1,750.00	3,750.00
MAY	8,430.00	2,560.00	5,870.00	0.00	1,750.00	4,120.00
JUN	5,360.00	856.00	4,500.00	0.00	1,750.00	2,750.00
JUL	3,270.00	665.00	2,610.00	0.00	1,750.00	855.00
AUG	2,560.00	604.00	1,960.00	0.00	1,750.00	206.00
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	354.00	3,820.00	0.00	1,750.00	2,070.00
DEC	8,150.00	379.00	7,770.00	0.00	1,750.00	6,020.00
ANN	7,460,000.00	1,240,000.00	6,230,000.00	0.00	1,270,000.00	4,960,000.00

Well Location Maps

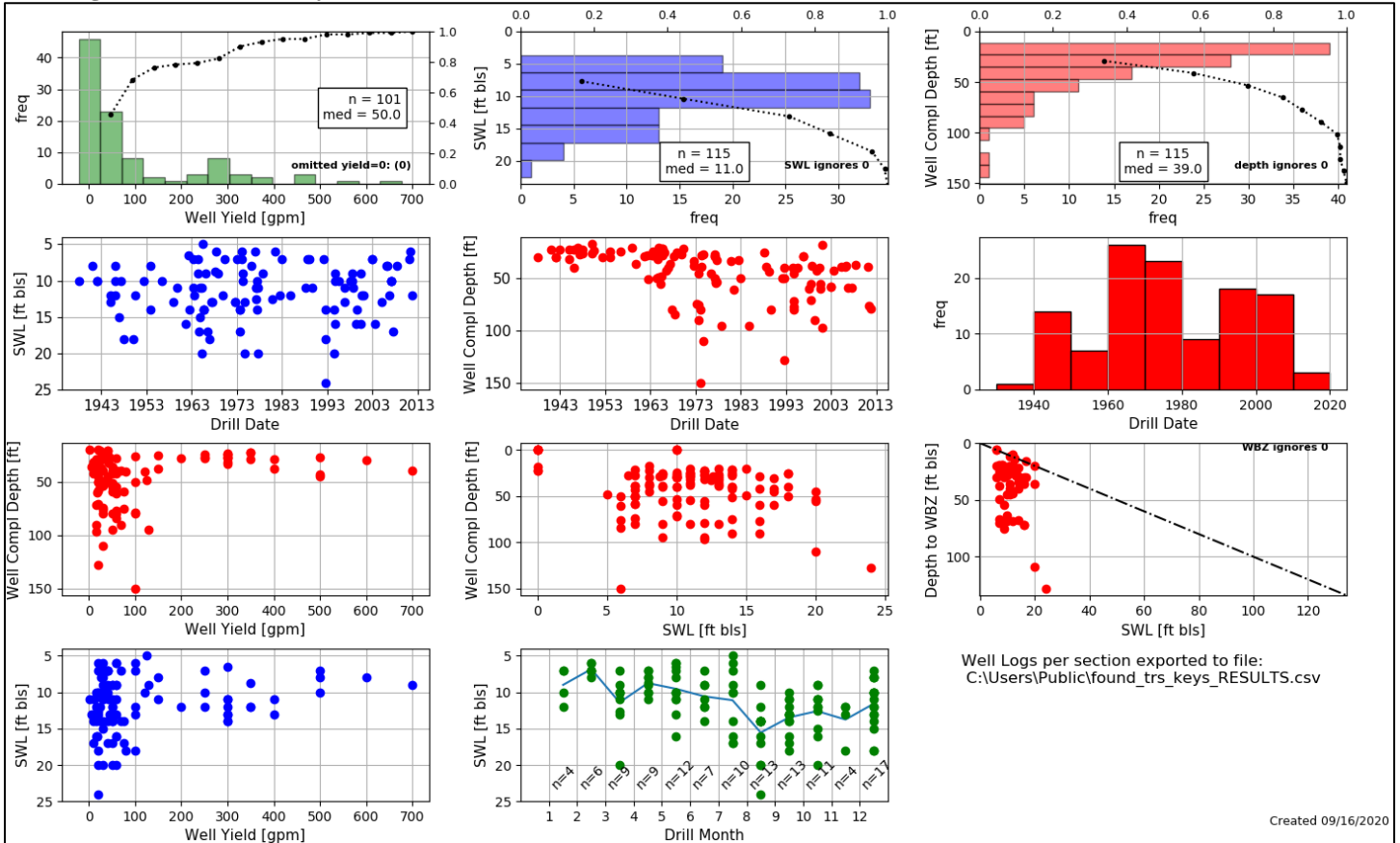




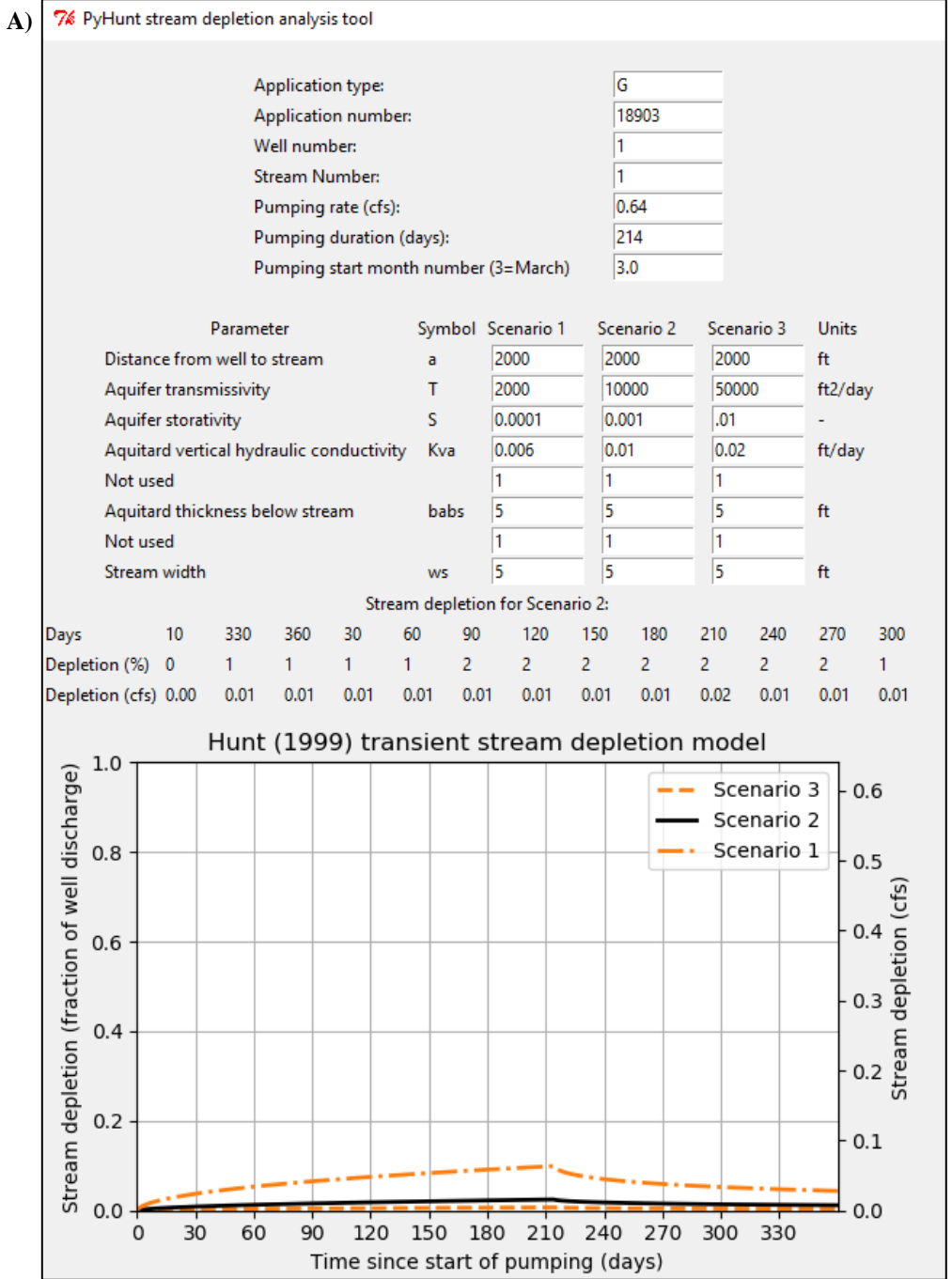
### Water-Level Measurements in Nearby Wells



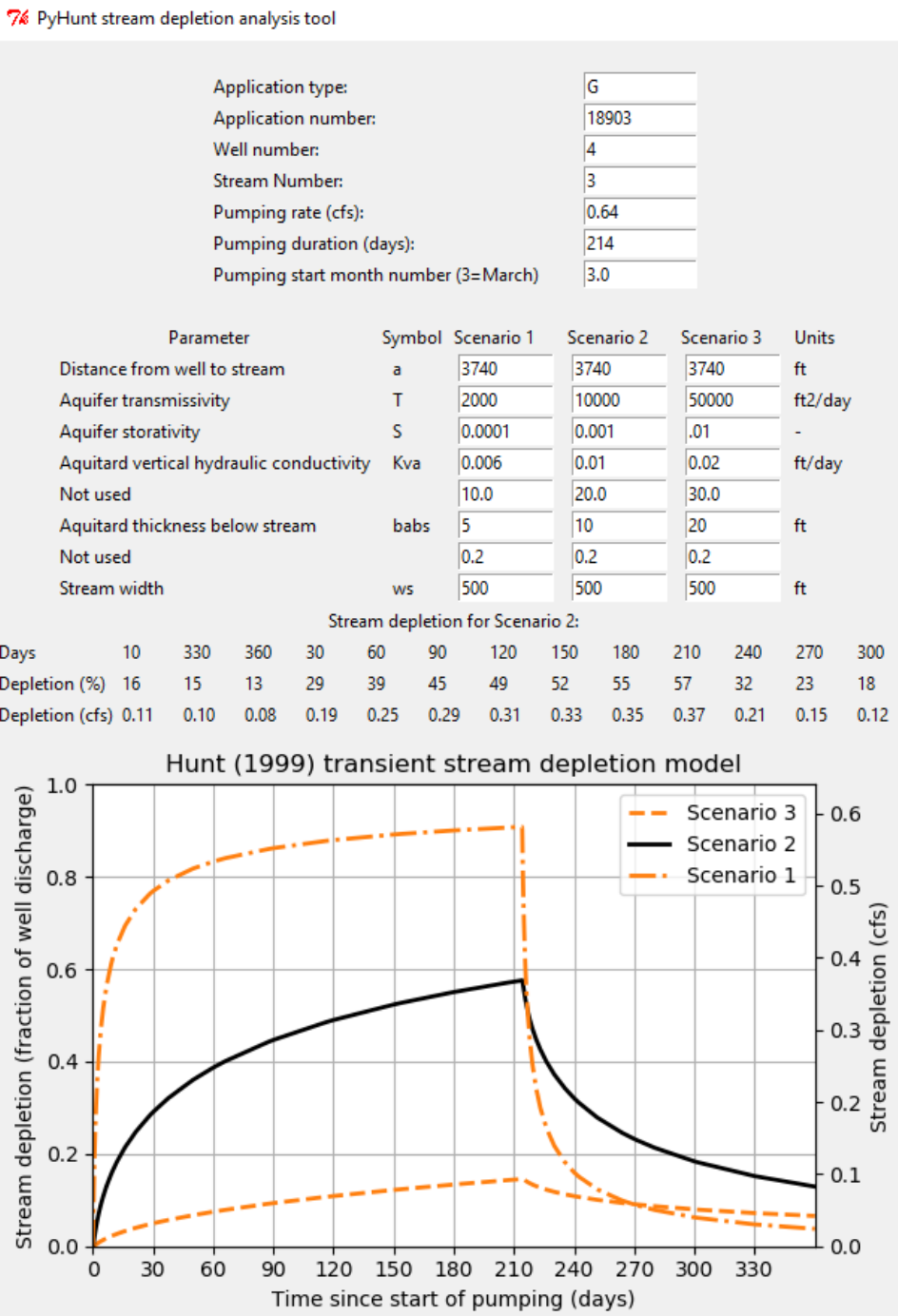
### Well Log Statistics in Vicinity of POAs



**Stream-Depletion Estimates for (A) POA #1 and (B) POA #4. Stream-depletion for POA #2 will be similar to POA #1 and stream-depletion for POA #3 will be similar to POA #4**



B)

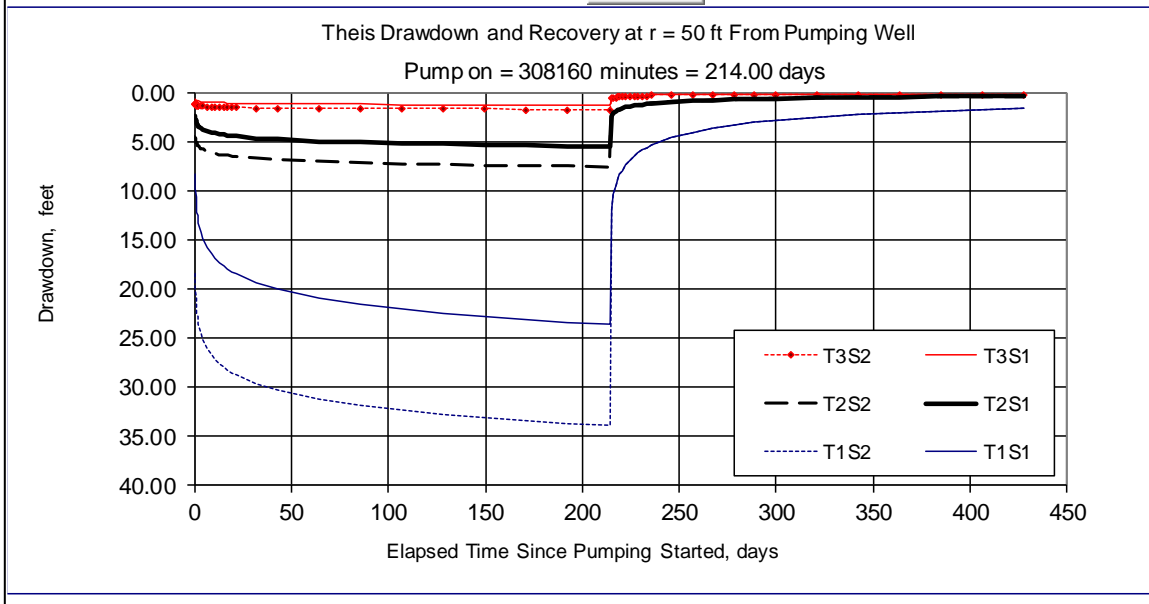


**Estimated interference for POA #1 to (A) nearest domestic well and (B) nearest permitted water right; POA #1 represents the shortest distances and thus highest likelihood of interference**

**A) Thisis Time-Drawdown Worksheet** v.3.00  
 Calculates Thisis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.  
 Written by Karl C. Wozniak September 1992. Last modified December 30, 2014

Input Data:	Var Name	Scenario 1	Scenario 2	Scenario 3	Units	
Total pumping time	t		214		d	
Radial distance from pumped well:	r		50.00		ft	<b>Q conversions</b>
Pumping rate	Q		0.650		cfs	291.72 gpm
Hydraulic conductivity	K	20.000	100.000	500.000	ft/day	0.65 cfs
Aquifer thickness	b		100		ft	39.00 cfm
Storativity	S_1		0.01000			56,160.00 cfd
	S_2		0.00010			1.29 af/d
<b>Transmissivity Conversions</b>	T_ft2pd	2,000	10,000	50,000	ft2/day	
	T_ft2pm	1.3889	6.9444	34.7222	ft2/min	
	T_gpdpft	14,960	74,800	374,000	gpd/ft	

**Recalculate** Use the Recalculate button if recalculation is set to manual



**B) Thisis Time-Drawdown Worksheet** v.3.00

Calculates Thisis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.  
 Written by Karl C. Wozniak September 1992. Last modified December 30, 2014

Input Data:	Var Name	Scenario 1	Scenario 2	Scenario 3	Units	
Total pumping time	t		214		d	
Radial distance from pumped well:	r		377.00		ft	<b>Q conversions</b>
Pumping rate	Q		0.650		cfs	291.72 gpm
Hydraulic conductivity	K	20.000	100.000	500.000	ft/day	0.65 cfs
Aquifer thickness	b		100		ft	39.00 cfm
Storativity	S_1		0.01000			56,160.00 cfd
	S_2		0.00010			1.29 af/d
Transmissivity Conversions	T_f2pd	2,000	10,000	50,000	ft <sup>2</sup> /day	
	T_ft2pm	1.3889	6.9444	34.7222	ft <sup>2</sup> /min	
	T_gpdpft	14,960	74,800	374,000	gpd/ft	

**Recalculate** Use the Recalculate button if recalculation is set to manual

