

Groundwater Transfer Review Summary Form

Transfer/PA # T- 13480 (James & Alexa vanBelle)

GW Reviewer Gerald H. Grondin

Date Review Completed: 8 October 2020

Summary of Same Source Review:

☐ The proposed change in point of appropriation is not within the same aquifer as per OAR 690-380-2110(2).

Summary of Injury Review:

☐ The proposed transfer will result in another, existing water right not receiving previously available water to which it is legally entitled or result in significant interference with a surface water source as per 690-380-0100(3).

Summary of GW-SW Transfer Similarity Review:

☐ The proposed SW-GW transfer doesn't meet the definition of "similarly" as per OAR 690-380-2130.

This is only a summary. Documentation is attached and should be read thoroughly to understand the basis for determinations.

☒ **None of the Above**



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Ground Water Review Form:

- ☒ Water Right Transfer
☐ Permit Amendment
☐ GR Modification
☐ Other

Application: T-**13480**

Applicant Name: **James & Alexa vanBelle**

Proposed Changes: ☐ POA ☒ APOA ☐ SW→GW ☐ RA
☐ USE ☐ POU ☐ OTHER

Reviewer(s): **Gerald H. Grondin**

Date of Review: **8 October 2020**

Date Reviewed by GW Mgr. and Returned to WRSD: JTI 20201008

The information provided in the application is insufficient to evaluate whether the proposed transfer may be approved because:

- ☐ The water well reports provided with the application do not correspond to the water rights affected by the transfer.
- ☐ The application does not include water well reports or a description of the well construction details sufficient to establish the ground water body developed or proposed to be developed.
- ☐ Other _____

1. Basic description of the changes proposed in this transfer: _____

This transfer application (T-13480) relates to 2 certificates (44625 and 55398), 2 authorized existing POA wells (LAKE 1712 related to certificate 44625 and LAKE 1714 related to certificate 55398), 1 proposed APOA well (LAKE 1717) for both certificates, and no change to 155.3 POU acres and 70.1 POU acres respectively nor to the combined total maximum pumping rate of 2.82 cfs (1.94 cfs related to certificate 44625 and 0.88 cfs related to certificate 55398). Note: the transfer application includes well LAKE 51171 as associated with LAKE 1712, but no association with well LAKE 1712 nor with certificate 44625 could be found by this review.

2. Will the proposed POA develop the same aquifer (source) as the existing authorized POA?

☒ Yes ☐ No Comments: _____

Yes, the same source. All the authorized POA wells and the proposed APOA well are constructed to obtain groundwater from the shallower and lower permeability predominantly basin fill sediment unit that overlies the deeper and higher permeability volcanic rock and sediment unit (some identify the unit as predominantly basalt).

Reports for the Goose and Summer Lakes Basin indicate groundwater occurs in both the predominantly basin fill sediment unit and predominantly volcanic rock and sediment unit. The groundwater is likely hydraulically connected, making a single groundwater system occurring in different geologic units with different permeability for each unit. A higher permeability and transmissivity generally occurs in the predominantly volcanic rock and sediment unit and a lower permeability and transmissivity generally occurs in the predominantly basin fill sediment unit.

Given the predominantly basin fill sediment unit and predominantly volcanic rock and sediment unit often have notably different hydraulic properties despite being hydraulically connected, they should be considered different regarding this portion of the review.

3. a) Is there more than one source developed under the right (e.g., basalt and alluvium)?

☐ Yes ☒ No _____

The same source is developed. See item 2 above.

b) If yes, estimate the portion of the right supplied by each of the sources and describe any limitations that will need to be placed on the proposed change (rate, duty, etc.): _____

4. a) Will this proposed change, at its maximum allowed rate of use, likely result in an increase in interference with another ground water right?

☒ Yes ☐ No Comments: _____

Yes. The proposed APOA will increase groundwater pumping closer to groundwater right wells in sections 15, 22, 23, and 27 increasing the seasonal groundwater level decline at those wells. The calculated increase in seasonal drawdown at the closest water right well east of the proposed APOA well ranges from 5.4 to 11.4 feet. It should be less at wells further away. These impacted wells should be able to accommodate the additional seasonal drawdown. The long-term (annual) impact should remain the same.

b) If yes, would this proposed change, at its maximum allowed rate of use, likely result in another groundwater right not receiving the water to which it is legally entitled?

☐ Yes ☒ No If yes, explain: _____

See part a above.

5. a) Will this proposed change, at its maximum allowed rate of use, likely result in an increase in interference with **another surface water source**?

☒ Yes ☐ No Comments: _____

Yes, the proposed change moves pumping closer to the Chewaucan River, which will increase interference with the river. The seasonal groundwater level drawdown at the river is calculated to increase 0.7 to 2.4 feet. The calculated interference with the river increases from about 36 percent of the pumping rate to about 40 percent of the pumping rate by the end of the irrigation season. That translates to an increased seasonal interference (depletion) of the river by 0.030 to 0.061 cfs (13.5 to 27.4 gpm) at the end of 30 days pumping and 0.045 to 0.092 cfs (20.2 to 41.3 gpm) at the end of the irrigation season (see attached calculations).

- b) If yes, at its maximum allowed rate of use, what is the expected change in degree of interference with any **surface water sources** resulting from the proposed change?

Stream: **Chewaucan River** ☒ Minimal ☐ Significant

Stream: _____ ☐ Minimal ☐ Significant

Provide context for minimal/significant impact: _____

The proposed change increases the calculated seasonal interference (depletion) of the river by about 0.3 percent of the lowest natural stream flow (32.8 cfs) estimated for the Chewaucan River (see attached). The calculated interference with the river increases about 4 percent of the pumping rate by the end of the irrigation season (from 36 percent of the pumping rate to about 40 percent of the pumping rate).

Any increase in seasonal interference (depletion) with the river will likely add to existing-ongoing concerns expressed to OWRD about river flow.

The long-term (annual) interference (depletion) with the river should likely remain the same. Long-term groundwater level data related to well LAKE 1719 (state observation well 375) indicates more than 10 feet of decline since the 1960s (see attached) with post 2010 groundwater levels likely near the elevation of the Chewaucan River bed. If the decline is real and continues, the river will likely become perched and become a perennial losing stream. The proposed change will likely not change the local groundwater level hydrographs.

6. For SW-GW transfers, will the proposed change in point of diversion affect the surface water source similarly (as per OAR 690-380-2130) to the authorized point of diversion specified in the water use subject to transfer?

☐ Yes ☐ No Comments: _____

Not Applicable

7. What conditions or other changes in the application are necessary to address any potential issues identified above: _____

The following are technical groundwater review recommendations. It is recognized that one or more technically recommended conditions may or may not be allowed under the transfer process rules and statutes. This technical groundwater review relies on other appropriate and authorized Department staff to make that determination.

“Large” flow meter condition for all the “From” POA and the proposed “To” POA wells to prevent enlargement. Require the flow meter for each well be properly installed and maintained. Each meter shall be either within 50 feet of the well head with a clearly visible monument adjacent to the meter or a surveyed location shall be provided and a clearly visible monument adjacent to the meter shall be installed for each meter more than 50 feet from the well head.

Condition 7P (well tag condition) for all the “To” and “From” POA wells.

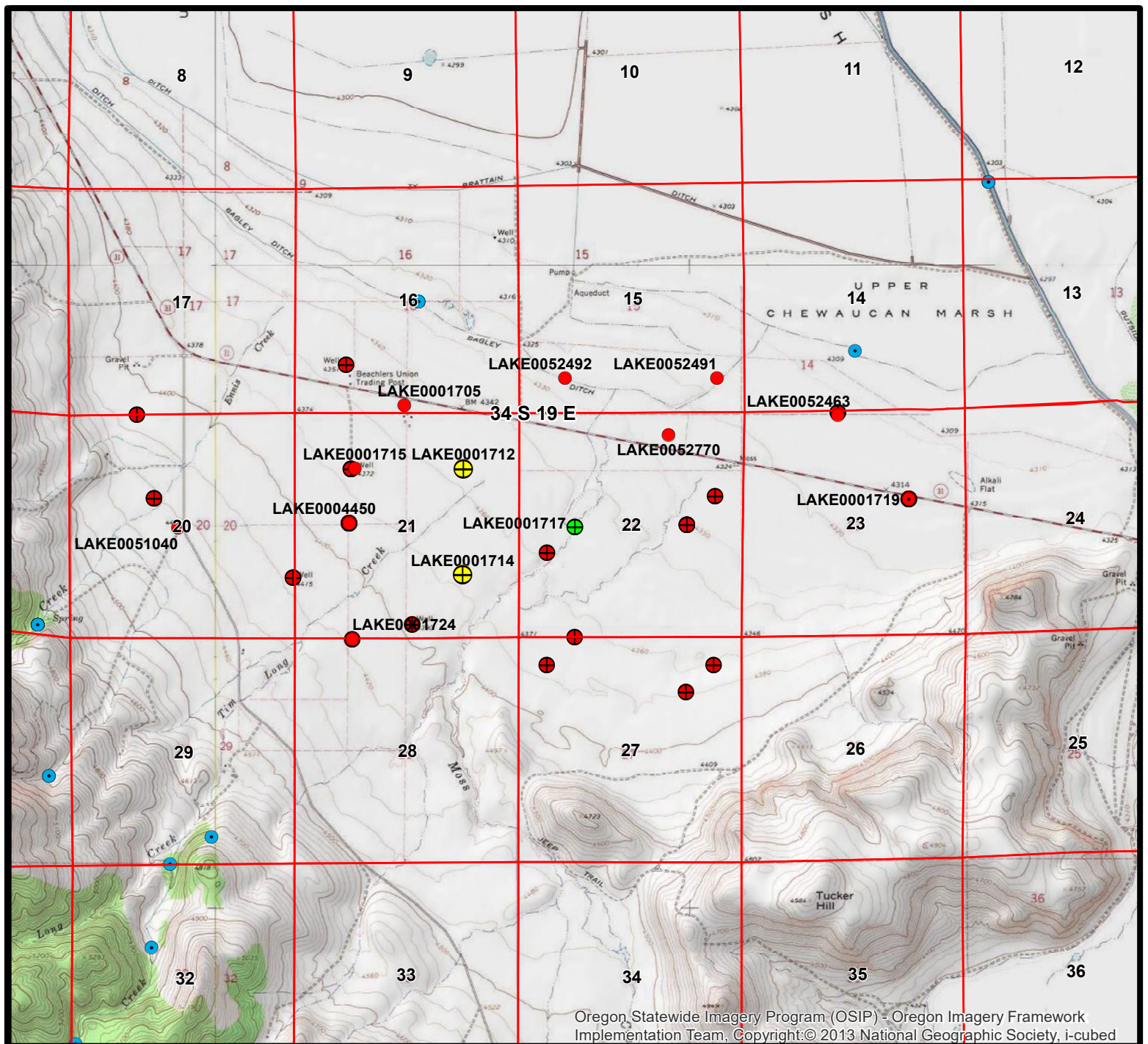
Condition 7T (modified) for both the existing POA wells and the proposed APOA well: “Prior to use, the existing POA wells and the proposed APOA well shall be configured to allow a strictly clean water (no oil) static water level measurements with an electric-tape. That can include measurement access via an unobstructed vertical discharge pipe that allows the groundwater level to fluctuate freely within the discharge pipe (no valves, etc.). Otherwise, a dedicated measuring tube must be installed prior to use. The tube must be unobstructed, have a diameter of ¾ inch (0.75 inch) or greater, and pursuant to figure 200-5 in OAR 690-200.”

8. Any additional comments: _____

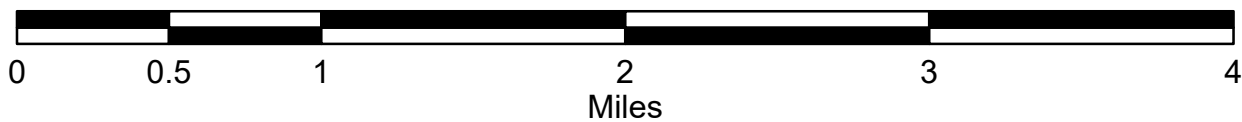
The proposed APOA will increase groundwater pumping closer to groundwater right wells in sections 15, 22, 23, and 27 increasing the seasonal groundwater level decline at those wells. The calculated increase in seasonal drawdown at the closest water right well east of the proposed APOA well ranges from 5.4 to 11.4 feet. It should be less at wells further away. These impacted wells should be able to accommodate the additional seasonal drawdown. The long-term (annual) impact should remain the same.

The proposed change moves pumping closer to the Chewaucan River, which will increase interference with the river. The seasonal groundwater level drawdown at the river is calculated to increase 0.7 to 2.4 feet. The calculated interference with the river increases from about 36 percent of the pumping rate to about 40 percent of the pumping rate by the end of the irrigation season. That translates to an increased seasonal interference (depletion) of the river by 0.030 to 0.061 cfs (13.5 to 27.4 gpm) at the end of 30 days pumping and 0.045 to 0.092 cfs (20.2 to 41.3 gpm) at the end of the irrigation season (see attached calculations). Any increase in seasonal interference (depletion) with the river likely adds to concerns expressed about river flow. The long-term (annual) interference (depletion) with the river should likely remain the same.

James & Alexa vanBelle



Oregon Statewide Imagery Program (OSIP) - Oregon Imagery Framework
Implementation Team, Copyright:© 2013 National Geographic Society, i-cubed



Yellow = Authorized Wells

Green = Proposed Well

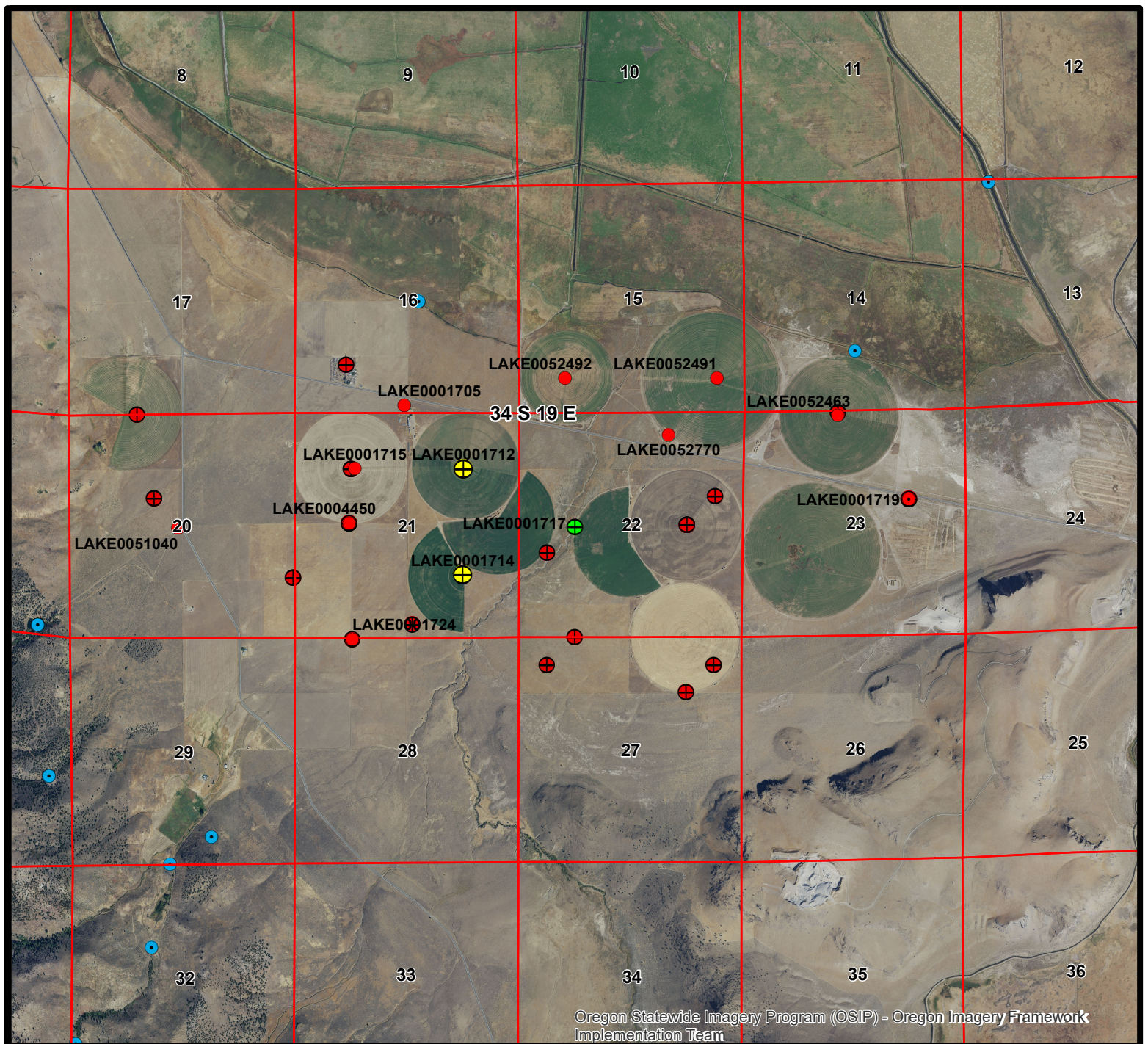
Red = Groundwater PODs & Obs Wells

Blue = Surface Water PODs



Groundwater Transfer Application T-13480

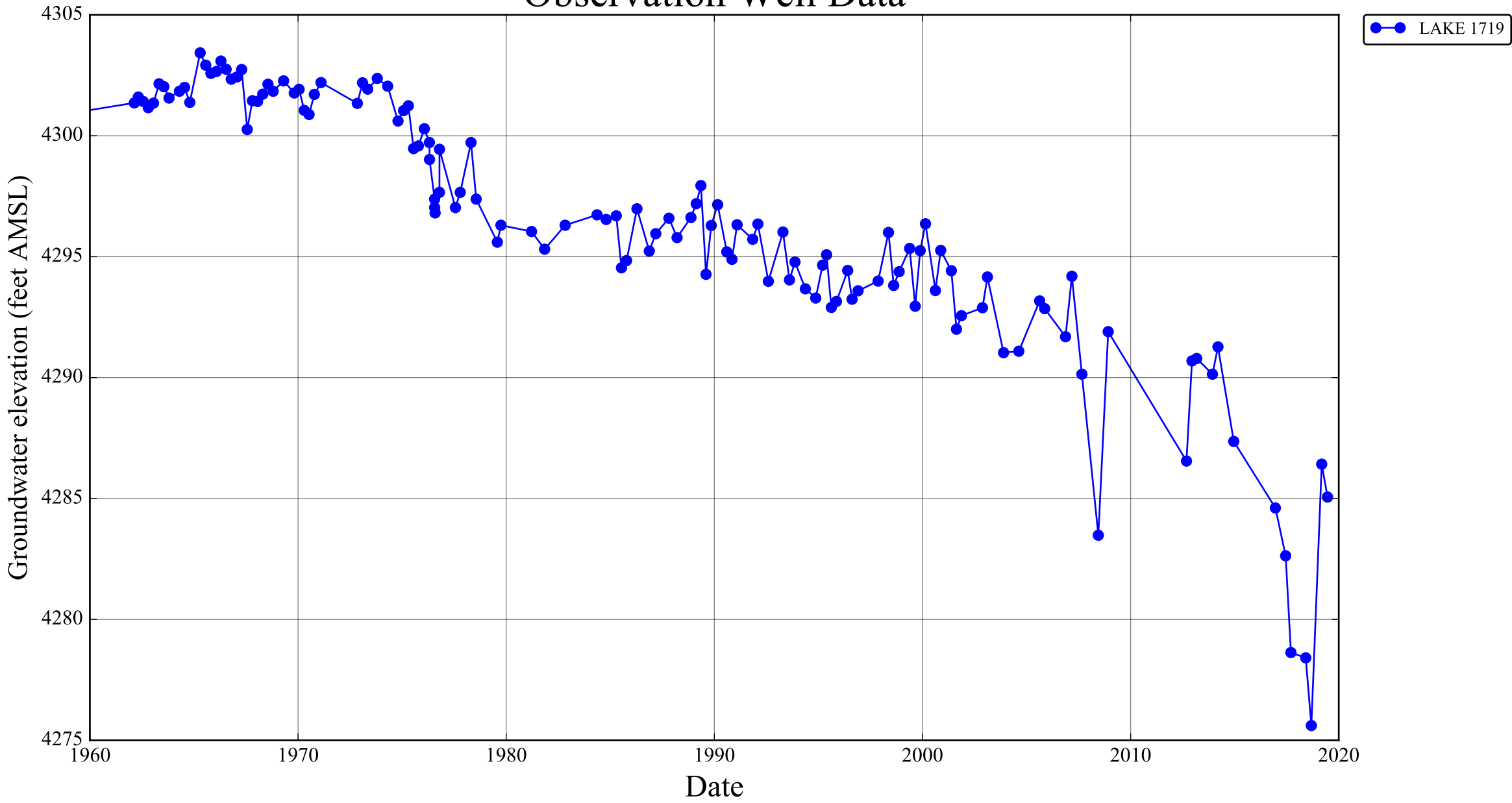
James & Alexa vanBelle



Yellow = Authorized Wells
Green = Proposed Well
Red = Groundwater PODs & Obs Wells
Blue = Surface Water PODs



Observation Well Data



Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$

$u = (r^2 S)/(4 \cdot T \cdot t)$

$W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

s = drawdown (L)

T = transmissivity (L²/T)

S = storage coefficient (dimensionless)

$\pi = 3.141592654$

r = radial distance (L)

t = time (T)

u = dimensionless

W(u) = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Drawdown Change s (feet)	Well	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Note: yellow grid areas are where values are calculated													
"From" POA wells to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	871.29	1.94	30.00	5,450.00	3.14	0.1020	1.8047	9.9298		LAKE 1712	Continuous Pumping at Full Rate (Basin Fill Unit)
18,145.79	2,425.74	0.00100	393.29	0.88	30.00	5,435.00	3.14	0.1015	1.8097	4.4945		LAKE 1714	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						14.42			
"To" POA well to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	1,264.58	2.82	30.00	2,650.00	3.14	0.0241	3.1713	25.3254		Lake 1717	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						25.33	10.9011		
"From" POA wells to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	430.31	0.96	30.00	5,450.00	3.14	0.1020	1.8047	4.9041		LAKE 1712	Continuous Pro-Rated Pumping (Basin Fill Unit)
18,145.79	2,425.74	0.00100	194.24	0.43	30.00	5,435.00	3.14	0.1015	1.8097	2.2198		LAKE 1714	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						7.12			
"To" POA well to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	624.55	1.39	30.00	2,650.00	3.14	0.0241	3.1713	12.5077		Lake 1717	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						12.51	5.3838		

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$

$u = (r^2 S)/(4 \cdot T \cdot t)$

$W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

s = drawdown (L)

T = transmissivity (L²/T)

S = storage coefficient (dimensionless)

$\pi = 3.141592654$

r = radial distance (L)

t = time (T)

u = dimensionless

W(u) = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Drawdown Change s (feet)	Well	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Note: yellow grid areas are where values are calculated													
"From" POA wells to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	871.29	1.94	245.00	5,450.00	3.14	0.0125	3.8177	21.0059		LAKE 1712	Continuous Pumping at Full Rate (Basin Fill Unit)
18,145.79	2,425.74	0.00100	393.29	0.88	245.00	5,435.00	3.14	0.0124	3.8231	9.4953		LAKE 1714	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						30.50			
"To" POA well to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	1,264.58	2.82	245.00	2,650.00	3.14	0.0030	5.2503	41.9283		Lake 1717	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						41.93	11.4271		
"From" POA wells to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	430.31	0.96	245.00	5,450.00	3.14	0.0125	3.8177	10.3743		LAKE 1712	Continuous Pro-Rated Pumping (Basin Fill Unit)
18,145.79	2,425.74	0.00100	194.24	0.43	245.00	5,435.00	3.14	0.0124	3.8231	4.6896		LAKE 1714	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						15.06			
"To" POA well to Solheim Well #2 (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	624.55	1.39	245.00	2,650.00	3.14	0.0030	5.2503	20.7075		Lake 1717	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						20.71	5.6436		

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$

$u = (r^2 S)/(4 \cdot T \cdot t)$

$W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

s = drawdown (L)

T = transmissivity (L²/T)

S = storage coefficient (dimensionless)

pi = 3.141592654

r = radial distance (L)

t = time (T)

u = dimensionless

W(u) = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Drawdown Change s (feet)	Well	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Note: yellow grid areas are where values are calculated													
"From" POA wells to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	871.29	1.94	30.00	14,130.00	3.14	0.6859	0.3839	2.1126		LAKE 1712	Continuous Pumping at Full Rate (Basin Fill Unit)
18,145.79	2,425.74	0.00100	393.29	0.88	30.00	15,130.00	3.14	0.7864	0.3183	0.7907		LAKE 1714	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						2.90			
"To" POA well to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	1,264.58	2.82	30.00	12,240.00	3.14	0.5147	0.5423	4.3311		Lake 1717	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						4.33	1.4279		
"From" POA wells to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	430.31	0.96	30.00	14,130.00	3.14	0.6859	0.3839	1.0434		LAKE 1712	Continuous Pro-Rated Pumping (Basin Fill Unit)
18,145.79	2,425.74	0.00100	194.24	0.43	30.00	15,130.00	3.14	0.7864	0.3183	0.3905		LAKE 1714	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						1.43			
"To" POA well to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	624.55	1.39	30.00	12,240.00	3.14	0.5147	0.5423	2.1391		Lake 1717	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						2.14	0.7052		

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$

$u = (r^2 S)/(4 \cdot T \cdot t)$

$W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

s = drawdown (L)

T = transmissivity (L²/T)

S = storage coefficient (dimensionless)

pi = 3.141592654

r = radial distance (L)

t = time (T)

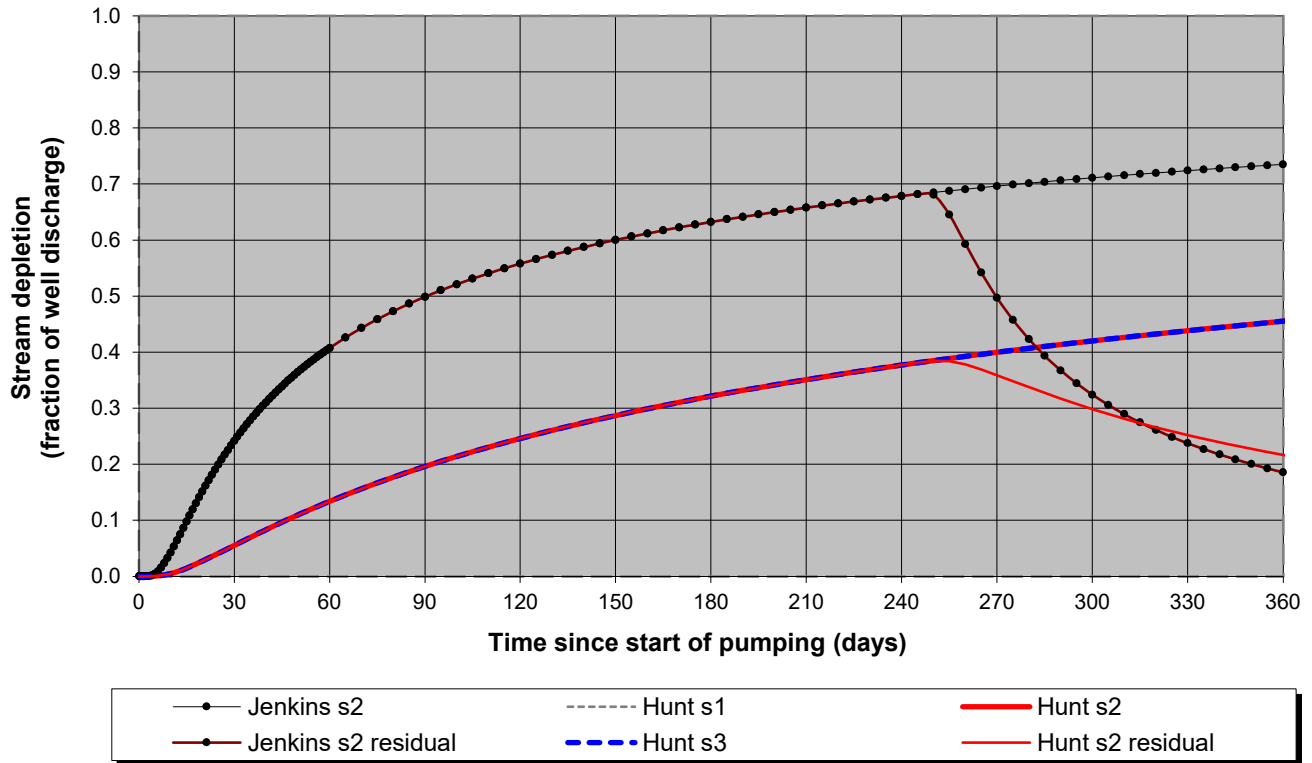
u = dimensionless

W(u) = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Drawdown Change s (feet)	Well	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Note: yellow grid areas are where values are calculated													
"From" POA wells to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	871.29	1.94	245.00	14,130.00	3.14	0.0840	1.9821	10.9061		LAKE 1712	Continuous Pumping at Full Rate (Basin Fill Unit)
18,145.79	2,425.74	0.00100	393.29	0.88	245.00	15,130.00	3.14	0.0963	1.8571	4.6125		LAKE 1714	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						15.52			
"To" POA well to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	1,264.58	2.82	245.00	12,240.00	3.14	0.0630	2.2491	17.9610		Lake 1717	Continuous Pumping at Full Rate (Basin Fill Unit)
			1,264.58	2.82						17.96	2.4424		
"From" POA wells to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	430.31	0.96	245.00	14,130.00	3.14	0.0840	1.9821	5.3863		LAKE 1712	Continuous Pro-Rated Pumping (Basin Fill Unit)
18,145.79	2,425.74	0.00100	194.24	0.43	245.00	15,130.00	3.14	0.0963	1.8571	2.2780		LAKE 1714	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						7.66			
"To" POA well to closest reach of Chewaucan River (Transmissivity from specific capacity data: Used S = 0.001)													
18,145.79	2,425.74	0.00100	624.55	1.39	245.00	12,240.00	3.14	0.0630	2.2491	8.8706		Lake 1717	Continuous Pro-Rated Pumping (Basin Fill Unit)
			624.55	1.39						8.87	1.2063		

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

LAKE 1712 to Chewaucan River



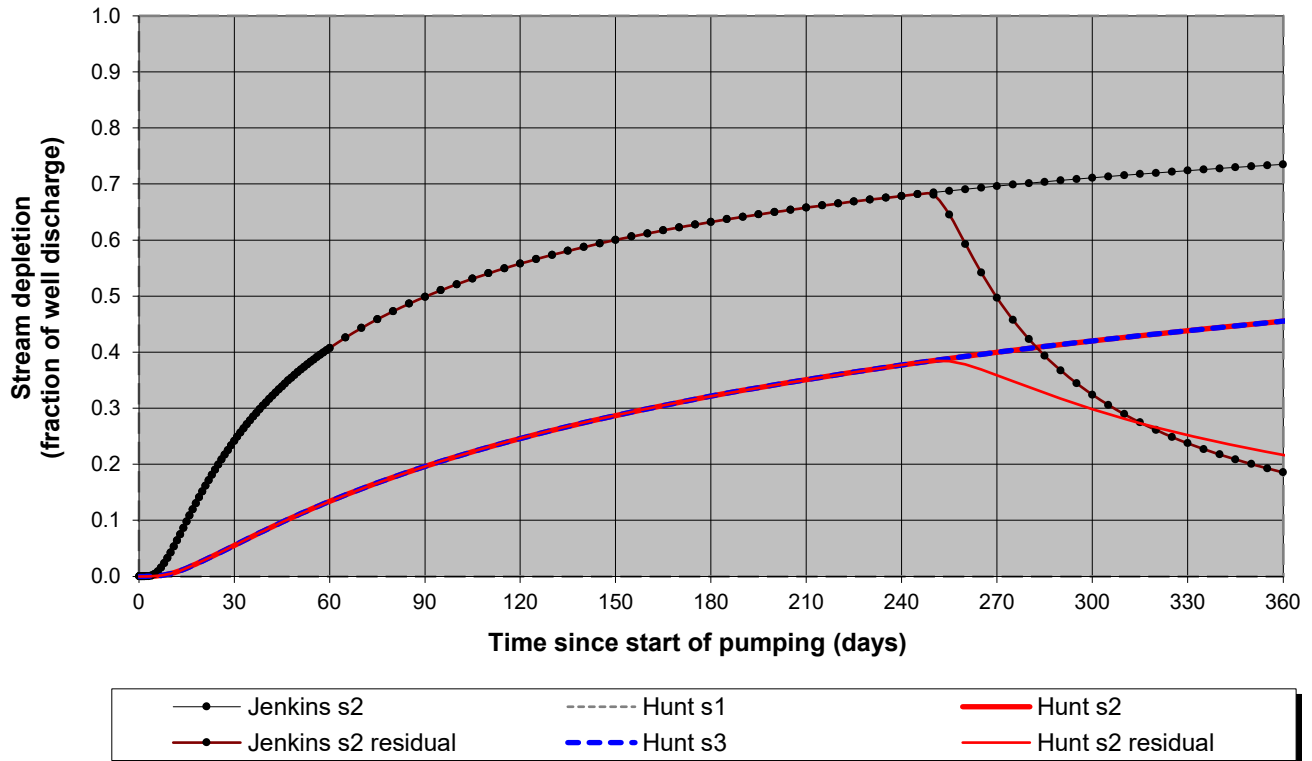
Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0551	0.1337	0.1960	0.2458	0.2868	0.3213	0.3510	0.3768	0.3588	0.2983	0.2518	0.2168
Qw, cfs	1.940	1.940	1.940	1.940	1.940	1.940	1.940	1.940	1.940	1.940	1.940	1.940
H SD s2, cfs	0.107	0.259	0.380	0.477	0.556	0.623	0.681	0.731	0.696	0.579	0.488	0.421

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	1.94	1.94	1.94	cfs
Distance to stream	a	14130	14130	14130	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	82.33274227	82.33274227	82.33274227	days
Streambed factor (Hunt)	sbf	1.362306804	1.362306804	1.362306804	

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

LAKE 1712 to Chewaucan River



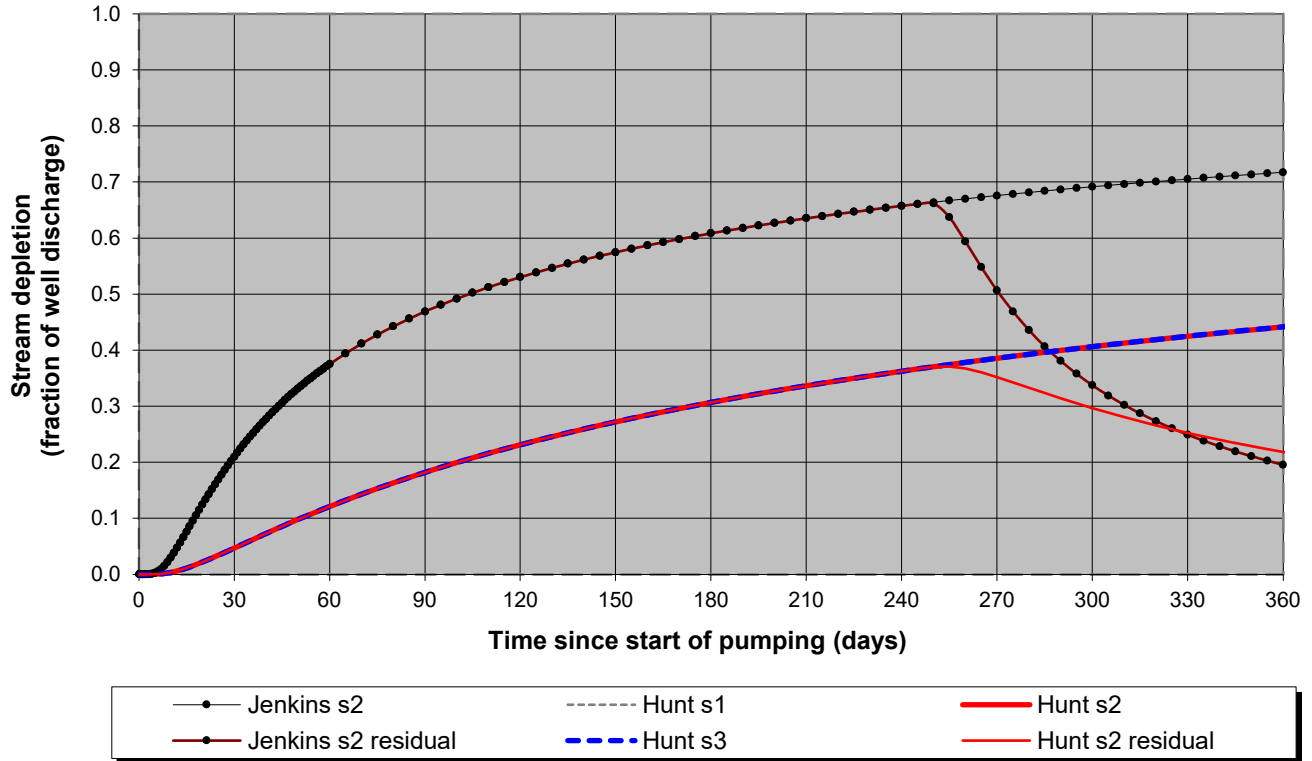
Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0551	0.1337	0.1960	0.2458	0.2868	0.3213	0.3510	0.3768	0.3588	0.2983	0.2518	0.2168
Qw, cfs	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960
H SD s2, cfs	0.053	0.128	0.188	0.236	0.275	0.308	0.337	0.362	0.344	0.286	0.242	0.208

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.96	0.96	0.96	cfs
Distance to stream	a	14130	14130	14130	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	82.33274227	82.33274227	82.33274227	days
Streambed factor (Hunt)	sbf	1.362306804	1.362306804	1.362306804	

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

LAKE 1714 to Chewaucan River



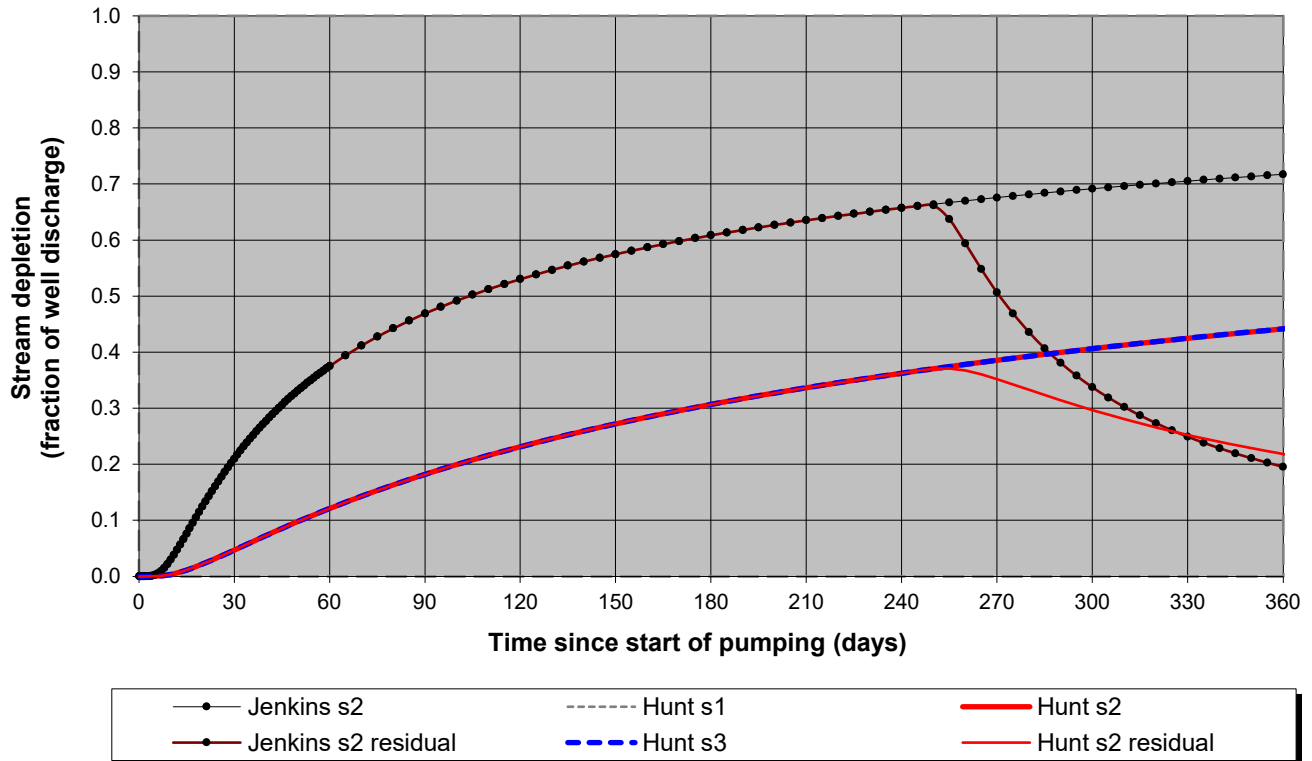
Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0467	0.1209	0.1818	0.2311	0.2720	0.3066	0.3364	0.3624	0.3517	0.2967	0.2522	0.2181
Qw, cfs	0.880	0.880	0.880	0.880	0.880	0.880	0.880	0.880	0.880	0.880	0.880	0.880
H SD s2, cfs	0.041	0.106	0.160	0.203	0.239	0.270	0.296	0.319	0.309	0.261	0.222	0.192

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.88	0.88	0.88	cfs
Distance to stream	a	15130	15130	15130	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	94.39872165	94.39872165	94.39872165	days
Streambed factor (Hunt)	sbf	1.458719175	1.458719175	1.458719175	

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

LAKE 1714 to Chewaucan River



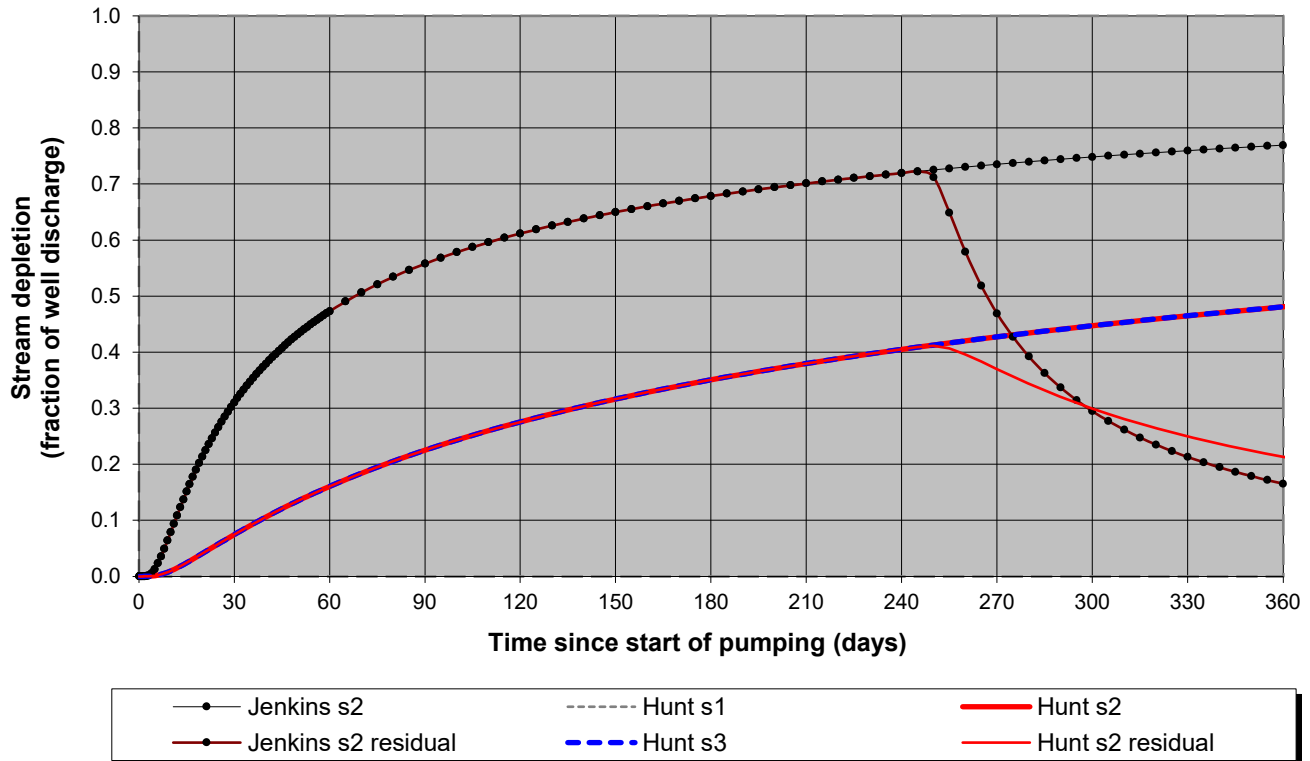
Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0467	0.1209	0.1818	0.2311	0.2720	0.3066	0.3364	0.3624	0.3517	0.2967	0.2522	0.2181
Qw, cfs	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430
H SD s2, cfs	0.020	0.052	0.078	0.099	0.117	0.132	0.145	0.156	0.151	0.128	0.108	0.094

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.43	0.43	0.43	cfs
Distance to stream	a	15130	15130	15130	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	94.39872165	94.39872165	94.39872165	days
Streambed factor (Hunt)	sbf	1.458719175	1.458719175	1.458719175	

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

LAKE 1717 to Chewaucan River



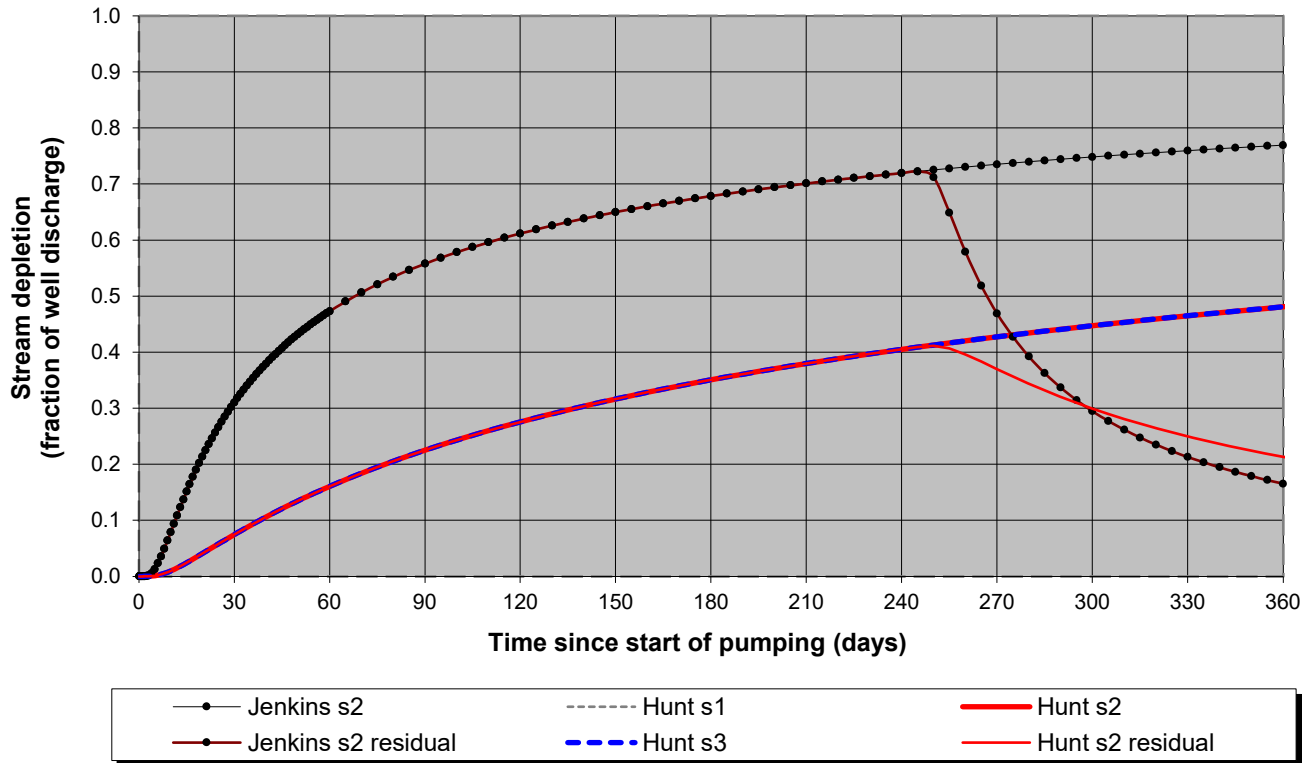
Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0743	0.1604	0.2250	0.2754	0.3163	0.3505	0.3796	0.4049	0.3696	0.2993	0.2495	0.2132
Qw, cfs	2.820	2.820	2.820	2.820	2.820	2.820	2.820	2.820	2.820	2.820	2.820	2.820
H SD s2, cfs	0.209	0.452	0.634	0.777	0.892	0.988	1.071	1.142	1.042	0.844	0.703	0.601

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	2.82	2.82	2.82	cfs
Distance to stream	a	12240	12240	12240	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	61.78045361	61.78045361	61.78045361	days
Streambed factor (Hunt)	sbf	1.180087423	1.180087423	1.180087423	

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

LAKE 1717 to Chewaucan River



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0743	0.1604	0.2250	0.2754	0.3163	0.3505	0.3796	0.4049	0.3696	0.2993	0.2495	0.2132
Qw, cfs	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390
H SD s2, cfs	0.103	0.223	0.313	0.383	0.440	0.487	0.528	0.563	0.514	0.416	0.347	0.296

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	1.39	1.39	1.39	cfs
Distance to stream	a	12240	12240	12240	ft
Aquifer hydraulic conductivity	K	4.85	4.85	4.85	ft/day
Aquifer thickness	b	500	500	500	ft
Aquifer transmissivity	T	2425	2425	2425	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	70	70	70	ft
Streambed hydraulic conductivity	Ks	0.0835	0.0835	0.0835	ft/day
Streambed thickness	bs	25	25	25	ft
Streambed conductance	sbc	0.2338	0.2338	0.2338	ft/day
Stream depletion factor (Jenkins)	sdf	61.78045361	61.78045361	61.78045361	days
Streambed factor (Hunt)	sbf	1.180087423	1.180087423	1.180087423	

Theis_Equation_specific_capacity_to_transmissivity					
From Driller Water Well Report Recorded Pump Test Data					
Basin_Fill					
Well County	Well Num	Transmissivity	Transmissivity	Open Interval	Conductivity
		gpd/ft	ft2/day	feet	ft/day
From Wells					
LAKE	1712	5,187.30	693.44	435.00	1.59
LAKE	1714	4,869.60	650.97	365.00	1.78
LAKE	1717	3,657.33	488.91	464.00	1.05
LAKE	1715	17,137.04	2,290.89	252.00	9.09
LAKE	1719	71,089.20	9,503.24	284.00	33.46
LAKE	1724	6,934.26	926.98	297.00	3.12
		18,145.79	2,425.74	Average	8.35

NOTICE TO WATER WELL CONTRACTOR

The original and first copy
of this report are to be
filed with the

STATE ENGINEER, SALEM, OREGON 97310

within 30 days from the date
of well completion.

RECEIVED

JUN 25 1970

WATER WELL REPORT

STATE OF OREGON
(Please type or print)
(Do not write above this line)

STATE ENGINEER
SALEM, OREGON

State Well No. 34/19-21aState Permit No. 6-4826?

(1) OWNER:

Name Harold Buffeorn
Address 1698 Iler St. Salem, Ore.

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

CASING INSTALLED:

Threaded ☐ Welded ☒

4" Diam. from 0' ft. to 357' ft. Gage 1/4"
10" Diam. from 347' ft. to 470' ft. Gage 3/16"
" Diam. from " ft. to " ft. Gage "

(6) PERFORATIONS:

Perforated? ☐ Yes ☐ No.

of perforator used

Size of perforations in. by in.
(2) 1/4 to 3/8" - 26" perforations from 35' ft. to 55' ft.
Slots/ft. perforations from 134' ft. to 139' ft.
Torch Perfs. perforations from 195' ft. to 296' ft.
perforations from 327' ft. to 360' ft.
(4) 1/8 x 5" Slots/ft. from 347' ft. to 470' ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.
Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.

(8) WATER LEVEL: Completed well.

Static level 31 ft. below land surface Date 6/14/70

Artesian pressure _____ lbs. per square inch Date _____

(9) WELL TESTS:

Drawdown is amount water level is
lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Rogers Mach.

Yield: 700 gal./min. with 300' ft. drawdown after 96 hrs.

" 269' " " "

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water 56° Was a chemical analysis made? ☐ Yes ☒ No

(10) CONSTRUCTION:

Well seal—Material used Gravel & Cement

Depth of seal 30' ft.

Diameter of well bore to bottom of seal 20" in.

Were any loose strata cemented off? ☒ Yes ☐ No Depth 5' to 20'

Was a drive shoe used? ☐ Yes ☒ No

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ depth of strata _____

Method of sealing strata off _____

Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4"

Gravel placed from 30' ft. to 357' ft.

(11) LOCATION OF WELL:

County Lake Driller's well number Paisley #1
1/4 NE 1/4 Section 21 T. 34S. R. 19E. W.M.

Bearing and distance from section or subdivision corner

1320' S. and 1320' W. from NE corner
of Sec 21, T 34S, R 19E W.M.

(12) WELL LOG:

Diameter of well below casing

Depth drilled 470' ft. Depth of completed well 470' ft.

Formation: Describe color, texture, grain size and structure of materials;
and show thickness and nature of each stratum and aquifer penetrated,
with at least one entry for each change of formation. Report each change
in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Top Soil	0	5	
Gravel	5	20	
Clay	20	32	
Sand + Gravel	32	55	
Gravel + Brks Rock	55	85	
Course Gravel + Rock	85	134	
Sand	134	139	
Gravel + Sand	139	195	
Sand + Gravel	195	296	
Hd. Sand + Gravel	296	327	
Loose sand + Gravel	327	462	
Course Gravel + Rock	462	470	

Work started 4/23/70 19 Completed 6/8/70 19

Date well drilling machine moved off of well 6/8/70 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Al Ellsworth Date 6/18, 19 70
(Drilling Machine Operator)

Drilling Machine Operator's License No. 667

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Land, Lake, Livestock Inc.
(Person, firm or corporation) (Type or print)

Address 1698 Iler St So, Salem Ore

[Signed] Donald Buffeorn
(Water Well Contractor)

Contractor's License No. 531 Date 6/22/70, 19

NOTICE TO WATER WELL CONTRACTOR
The original and first copy
of this report are to be
filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date
of well completion.

WATER WELL REPORT

STATE OF OREGON

(Please type or print)

(Do not write above this line)

RECEIVED

NOV 2 1976

State Well No.

WATER RESOURCES DEPT.

State Permit No.

(1) OWNER:

Name Bar-C Ranch

Address Paisley, Oregon

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒
12" Diam. from 0 ft. to 320 ft. Gage 250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☒ Yes ☐ No.

Type of perforator used torch

Size of perforations 3/16 in. by 6 in.
2240 perforations from 40 ft. to 320 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is
lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? driller
300 gal./min. with 110 ft. drawdown after 24 hrs.

Ball test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water 54 Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used cement

Well sealed from land surface to 20 ft.

Diameter of well bore to bottom of seal 30 in.

Diameter of well bore below seal 22 in.

Number of sacks of cement used in well seal 26 sacks

Number of sacks of bentonite used in well seal sacks

Brand name of bentonite

Number of pounds of bentonite per 100 gallons
of water lbs./100 gals.

Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/8

Gravel placed from 20 ft. to 320 ft.

(10) LOCATION OF WELL:

County Lake Driller's well number

NW 1/4 SW 1/4 Section 21 T. 34 R. 19 W.M.

Bearing and distance from section or subdivision corner

6 1/2 miles southeast of Paisley, OR

(11) WATER LEVEL: Completed well.

Depth at which water was first found 72 ft.

Static level 50 ft. below land surface. Date 11/1/76

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 10

Depth drilled 405 ft. Depth of completed well 320 ft.

Formation: Describe color, texture, grain size and structure of materials;
and show thickness and nature of each stratum and aquifer penetrated,
with at least one entry for each change of formation. Report each change in
position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
soil zone, sandy	0	3	
sand, fine, brown	3	6	
packed clay & gravel, brown	6	58	
clay & gravel, brown	58	72	
gravel, med., brn.	72	75	50
clay & gravel, brn.	75	92	
cemented gravel	92	98	
clay & gravel, brn.	98	115	
clay & gravel, w/loose layers	115	130	
clay & gravel	130	178	
gravel, med., brn.	178	203	
clay & gravel, brn.	203	223	
gravel, med., brn.	223	250	
clay & gravel	250	265	
gravel, med.	265	270	
clay & gravel, brn.	270	405	

Work started 10/11 1976 Completed 11/1 1976

Date well drilling machine moved off of well 11/3 1976

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision.
Materials used and information reported above are true to my
best knowledge and belief.

[Signed] Gary Stooksberry Date 11/1, 1976
(Drilling Machine Operator)

Drilling Machine Operator's License No. 801

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is
true to the best of my knowledge and belief.

Name Jack Stooksberry, Jr.
(Person, firm or corporation) (Type or print)

Address Rte. 2, Box 47, Lakeview, OR 97630

[Signed] Jack Stooksberry, Jr.
(Water Well Contractor)

Contractor's License No. 211 Date 11/1, 1976

NOTICE TO WATER WELL CONTRACTOR

The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
SEP 21 1970
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT

STATE OF OREGON

(Please type or print)
Do not write above this line)

6-5319

State Well No. 34/19-226

State Permit No. _____

(1) OWNER:

Name Harold Ruffcorn
Address 1698 Iler St. Salem Ore

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒
12 3/4" O.D. Diam. from 0 ft. to 379 ft. Gage 1/4"
8 5/8" O.D. Diam. from 368 ft. to 489 ft. Gage 3/16"

(6) PERFORATIONS:

Perforated? ☐ Yes ☐ No.

Type of perforator used Torch Cut
Size of perforations 1/8 in. by 6" in.
8 Per ft. perforations from 25 ft. to 379 ft.
" " " perforations from 369 ft. to 489 ft.
" " " perforations from _____ ft. to _____ ft.
" " " perforations from _____ ft. to _____ ft.
" " " perforations from _____ ft. to _____ ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.
Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.

(8) WATER LEVEL: Completed well.

Static level 32 ft. below land surface Date 8/12/70
Artesian pressure _____ lbs. per square inch Date _____

(9) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Owner's
Yield: 525 gal./min. with 260 ft. drawdown after 40 hrs.

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water 57° Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:

Well seal—Material used Bentonite + Cement
Depth of seal 20 ft.

Diameter of well bore to bottom of seal 15 in.

Were any loose strata cemented off? ☐ Yes ☒ No Depth _____

Was a drive shoe used? ☐ Yes ☒ No

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ depth of strata _____

Method of sealing strata off _____

Was well gravel packed? ☐ Yes ☒ No Size of gravel: _____

Gravel placed from _____ ft. to _____ ft.

(11) LOCATION OF WELL: Paisley #3

County Lake Driller's well number _____
NW 1/4 1/4 Section 22 T. 34 S. R. 19 E. W.M.

Bearing and distance from section or subdivision corner

2640' S. + 1320' E. from the NW corner of Section 22, T. 34 S., R. 19 E. W.M.

(12) WELL LOG:

Diameter of well below casing _____

Depth drilled 489 ft. Depth of completed well 489 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Top Soil	0	3	
Hd. Cemented Gravel + Rocks	3	18	
Clay w/ Strks gravel + Rock	18	60	
Gravel + Sand	60	150	
Clay + Gravel	150	180	
Sand + Gravel	180	250	
Sand Gravel + Clay	250	325	
Sand + Gravel	325	375	
Gravel, Sand, Clay	375	391	
Sand gravel + Clay	391	489	

Memo—
15" Hole 0' To 391'
12 3/4" Csg To 379' (Stopped)
11" Hole 379' - 489'
8 5/8" O.D. Liner set 368' - 489'

Work started 7/11/70 19 Completed 8/12/70 19

Date well drilling machine moved off of well 8/13/70 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Al E. Edwards Date 8/12/70 19
(Drilling Machine Operator)

Drilling Machine Operator's License No. 667

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Lake Lake and Limestone
(Person, firm or corporation) (Type or print)

Address 1698 Iler St. S.W. Salem, Oregon

[Signed] Harold Ruffcorn
(Water Well Contractor)

Contractor's License No. 531 Date August 20, 1970