

Groundwater Production Well 3E - SVRP Aquifer Whitworth Water District



Gene St.Godard, P.G., L.Hg., CWRE
Principal Hydrogeologist, Owner
Water & Natural Resource Group, Inc.
509-953-9395 / wnrgroup@comcast.net

Prepared for

3rd Annual Water Law in Eastern Washington Conference

– May 28th, 2026



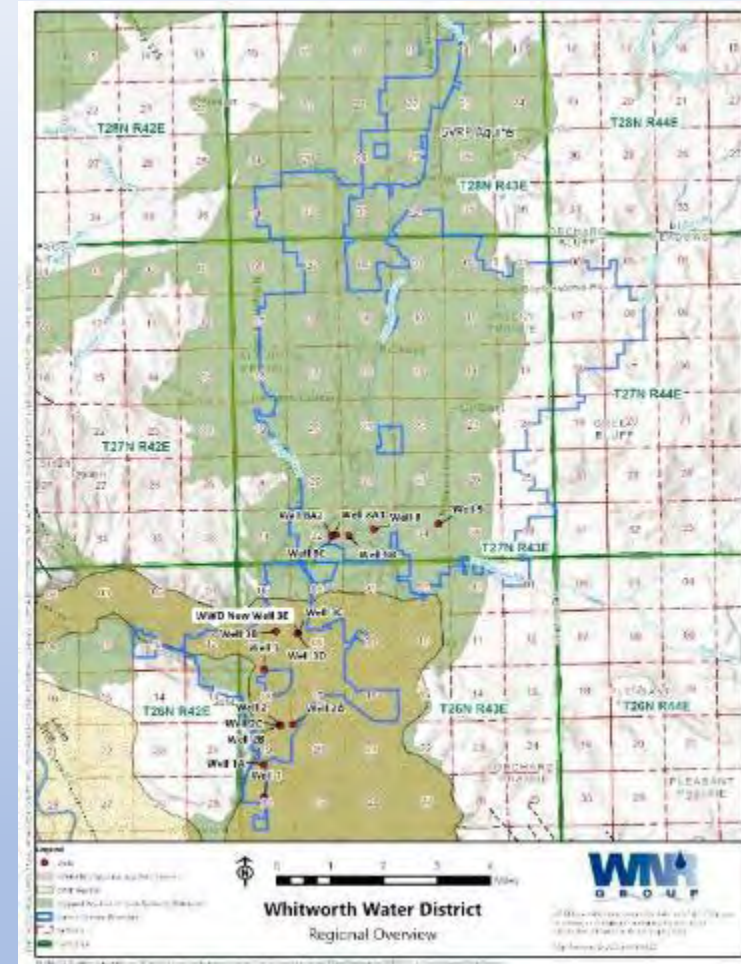
KEY PROJECT TEAM MEMBERS

- Tim Murrell – Whitworth Water District
 - General Manager
- Matt Wright, P.E. – Whitworth Water District
 - District Superintendent
- Necia Maiani, P.E. – Welch Comer Engineers
 - Vice President-Spokane Valley Office Manager
- Gene St.Godard, P.G., L.Hg., CWRE – WNR Group, Inc.
 - Owner/Principal Hydrogeologist



Whitworth Water District

- WWD is a municipal water provider serving a 55 square-mile area stretching from Spokane to Chattaroy.
- WWD serves approximately 11,000 active connections providing water service to approximately 30,000 customers.
- WWD's system includes 15 groundwater wells
 - System 1-3 withdraw from the SVRP Aquifer (Zone 3 wells)
 - System 8-9 withdraws from the LSR Aquifer (Zone 8 wells)
- WWD best producing wells are the well 3 well field. Expanding this well field with new high production wells.



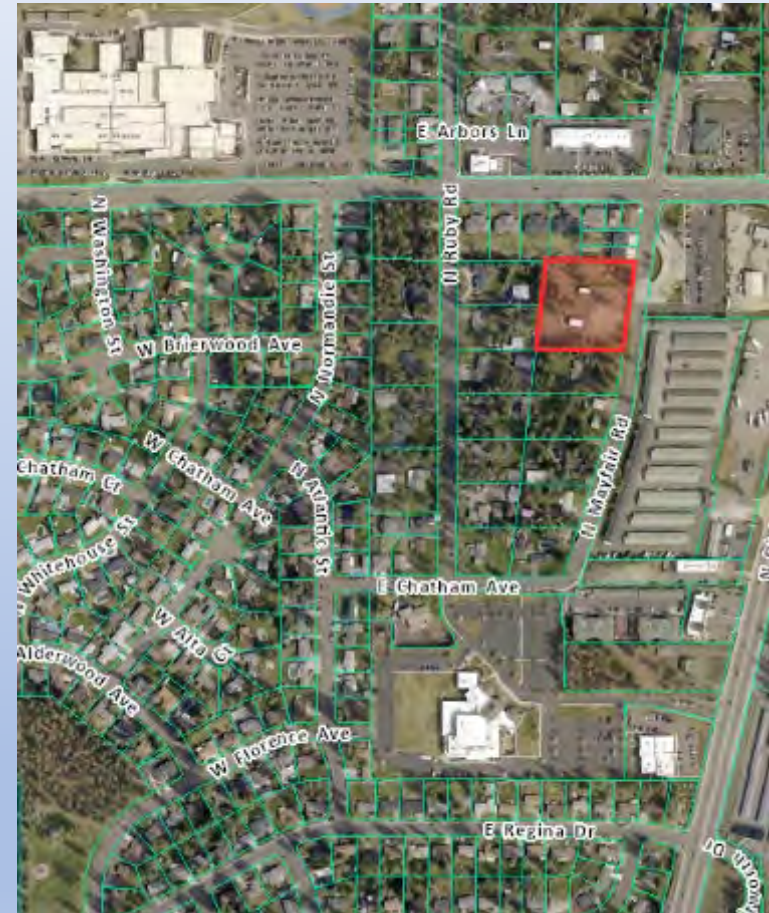
WWD Well 3E Pump Test

Why This Project?

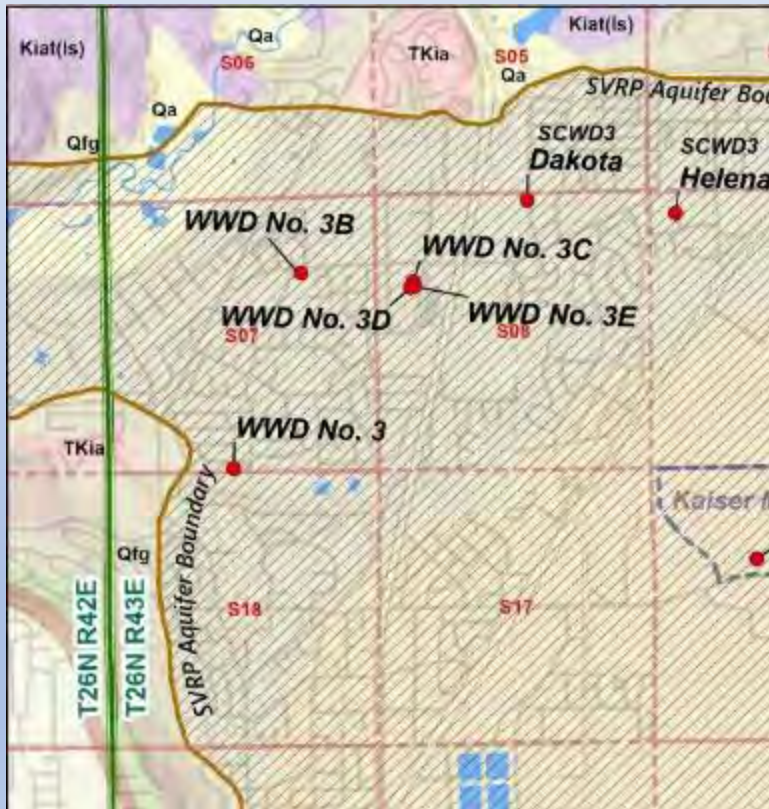
- WWD is upgrading the Well 3 system due to Growth and for the required WWD Water System redundancy and maintenance.
 - Recent water right actions that support this project
 - 400 AF Mitigated Permit – water right swap that took 400 AF out of production in the LSR, as prioritized by the WRIA 55 Watershed Group, in exchange for a new mitigated water right in the SVRP.
 - An additional new 6,620 gpm Qi water right to operate the new upgraded water system more efficiently
 - Upgrades for utilizing the existing SVRP water portfolio that WWD currently owns.
 - Infrastructure upgrades to the Water Delivery System also occurring throughout the system.

Conducting the Required Pump Test on WWD Well 3E

- Objectives
 - Operate a groundwater production well that can yield a minimum 6,000+ gpm.
 - Well field to operate 13,000+ gpm.
- Challenges of Conducting Pump Test
 - Site is in a suburban area
 - Disruption to active water supply system.
 - 6,000+ gpm – where to discharge?
 - No sewer availability
 - No disruption to local traffic/commerce
 - No effect on local residences/businesses
 - Therefore - Have to discharge on site.
- Pump Test Limitations
 - **Modify/Conduct Pump Test due to:**
 - Discharge of Pump Test Water
 - Keeping Water System Operational
 - Requested/Received a Variance from DOH Pump Testing Guidance Requirements



WWD SVRP Water Right Portfolio (14 Rights)



SVRP WATER RIGHTS			
Water Right No.	Qi	Qa	Notes
805-D	1,000.0	332.0	P
4172-A	750.0	1,200.0	P
4176-A	1,150.0	776.0	P
6276-A	500.0	67.5	P
4989-A	1,000.0	829.0	P
4990-A	1,000.0		NA1 (1161 AF non-additive)
G3-00326C	1,200.0	185.0	P
6360-A	500.0		NA2 (159 AF non-additive)
G3-20621C(A)	1,800.0	2,903.2	P
G3-26134C	---	3,639.0	P
G3-26134C	3,000.0		NA3 (4800 AF non-additive)
G3-26135C	3,000.0	2,000.0	P
Cert Total	14,900.0	11,931.7	
Permit No.	Qi	Qa	Notes
G3-30073P	5,000.0	0.0	P
G3-30980P	1,200.0	400.0	P-NA4
G3-30984P	6,620.0	0.0	P-NA5
Permit Total	12,820.0	24,263.4	
TOTAL	27,720.0	36,195.1	
GWC5591-A(A)	75.3	45.0	Spokane River Mitigation for G3-30980

Q(i): Instantaneous quantity in Gallons per minute

Q(a): Annual quantity in Acre-feet per year

P: Primary water right; **NA:** Non-Additive water right provision- see below

NA1: Total annual withdrawal under 4990-A not to exceed 1161 acre-feet less any amount withdrawn under 805-D and 4989-A

NA2: Total annual withdrawal under 6360-A not to exceed 159 acre-feet less any amount withdrawn under G3-00326C.

NA3: Total annual withdrawal under G3-26134C not to exceed 4800 acre-feet less any amount withdrawn under 805-D and 4989-A.

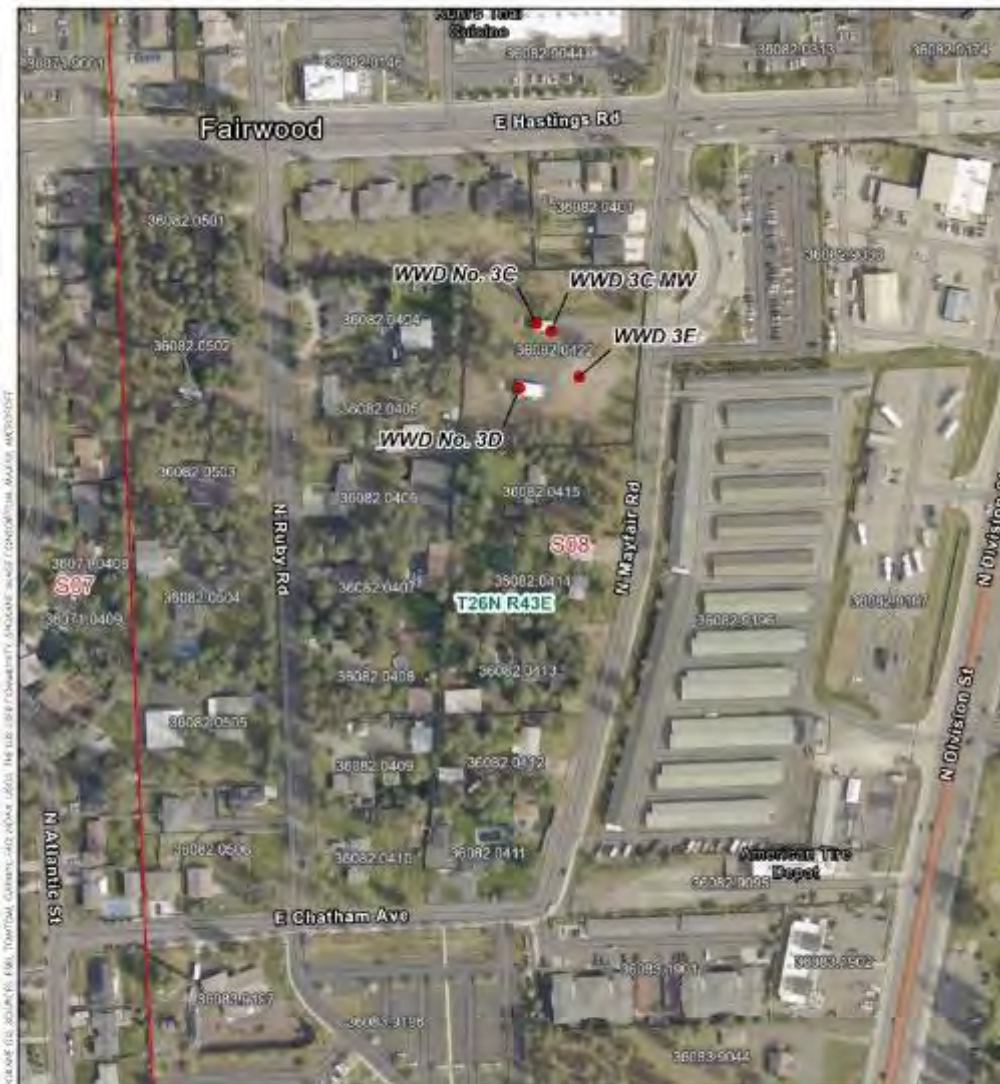
NA4: Mitigated Water Right with a priority July 31, 1964 right GWC-5591-A currently in State Water Trust Program

NA5: Qi only water right permit.

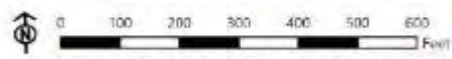
(): The Qa quantity in parentheses is that amount which is **non-additive**.



WWD Well 3E- Well Field



- Legend**
- Wells
 - WWD Parcel
 - - - Sections
 - ▭ Townships



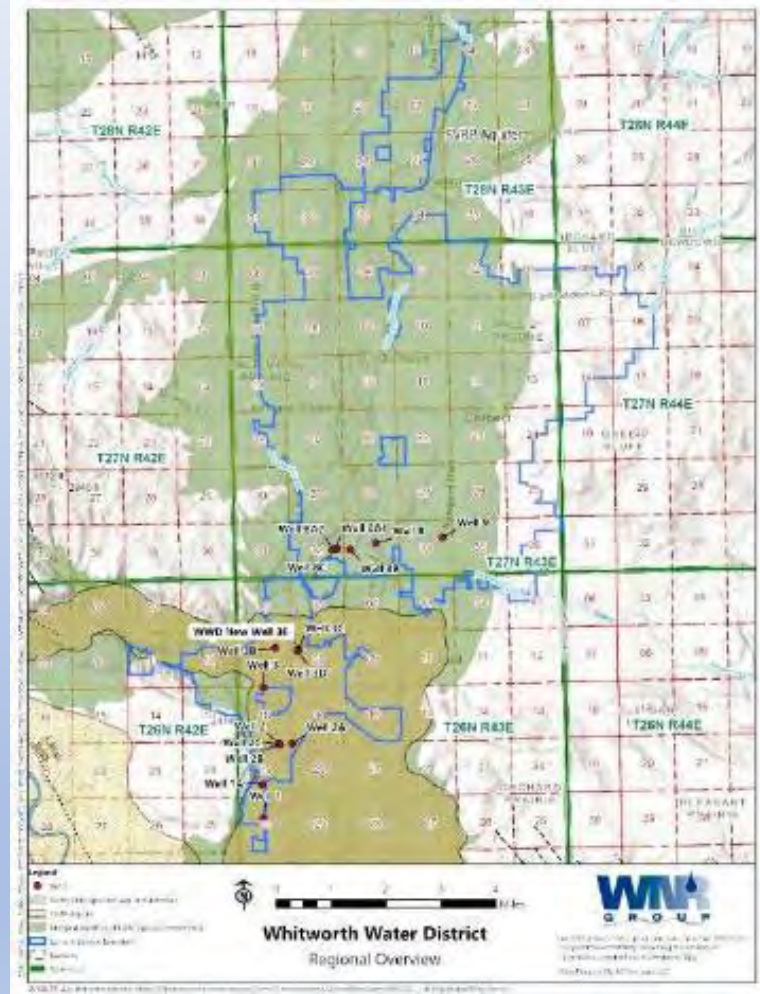
Whitworth Water District Well 3E



Aerial Map

AC GEO provides these geographic data "as is." AC GEO makes no guarantee or warranty concerning the accuracy or reliability of the data contained in the geographic data.
Map Produced By AC Geospatial LLC

Aerial Imagery: 2024
Project Name: Whitworth Water District Well 3E



Whitworth Water District
Regional Overview



New Wells Installed

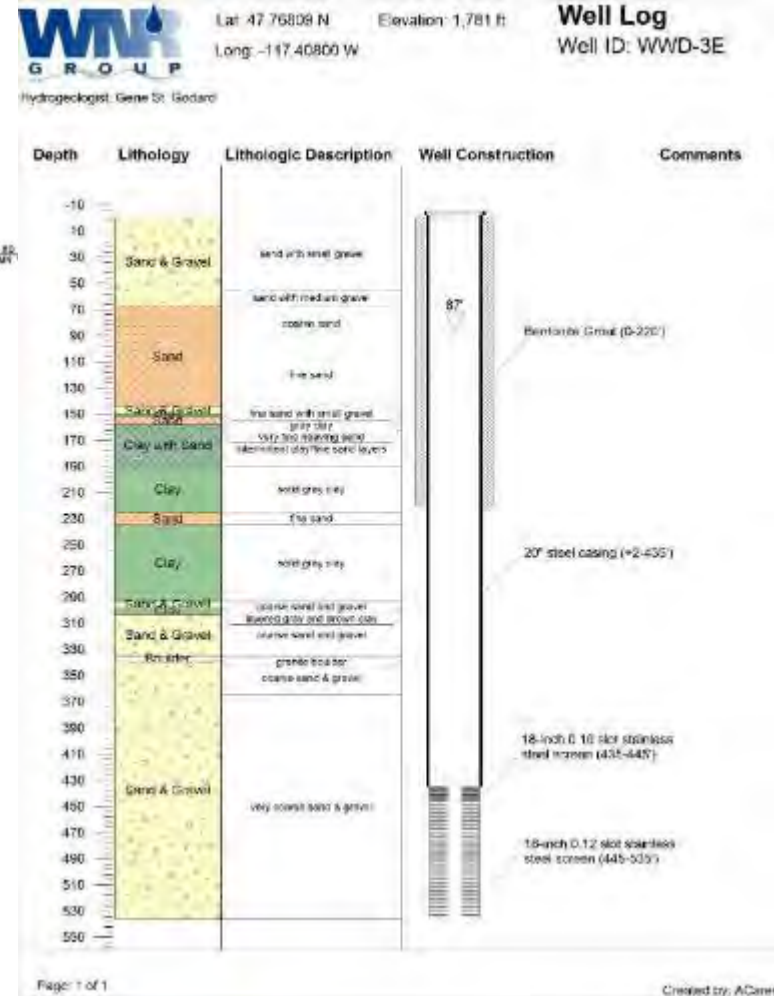
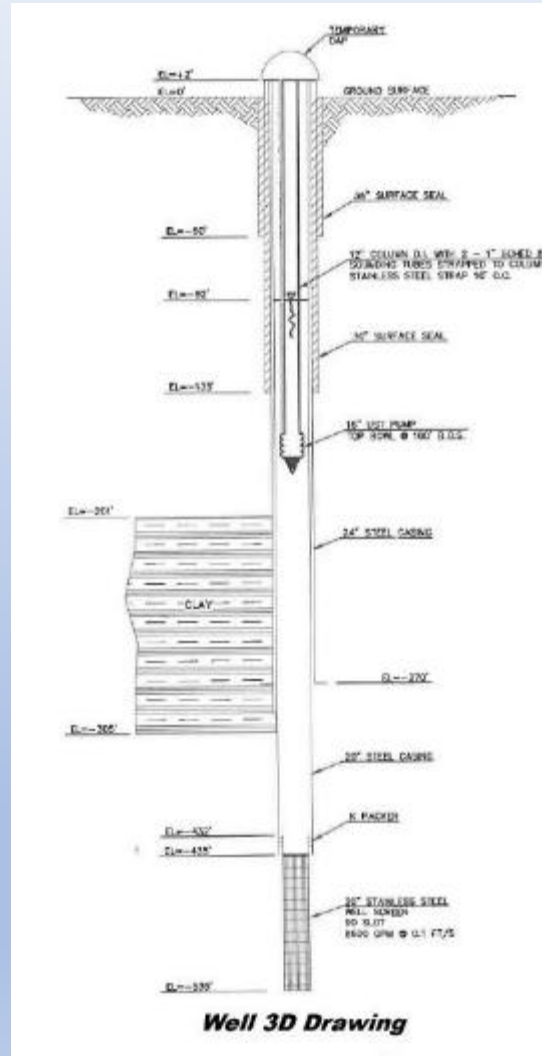
Well 3D-

- 20-inch well
- TD-535 ft
- 100 ft 90 Slot Screen (8600 gpm)

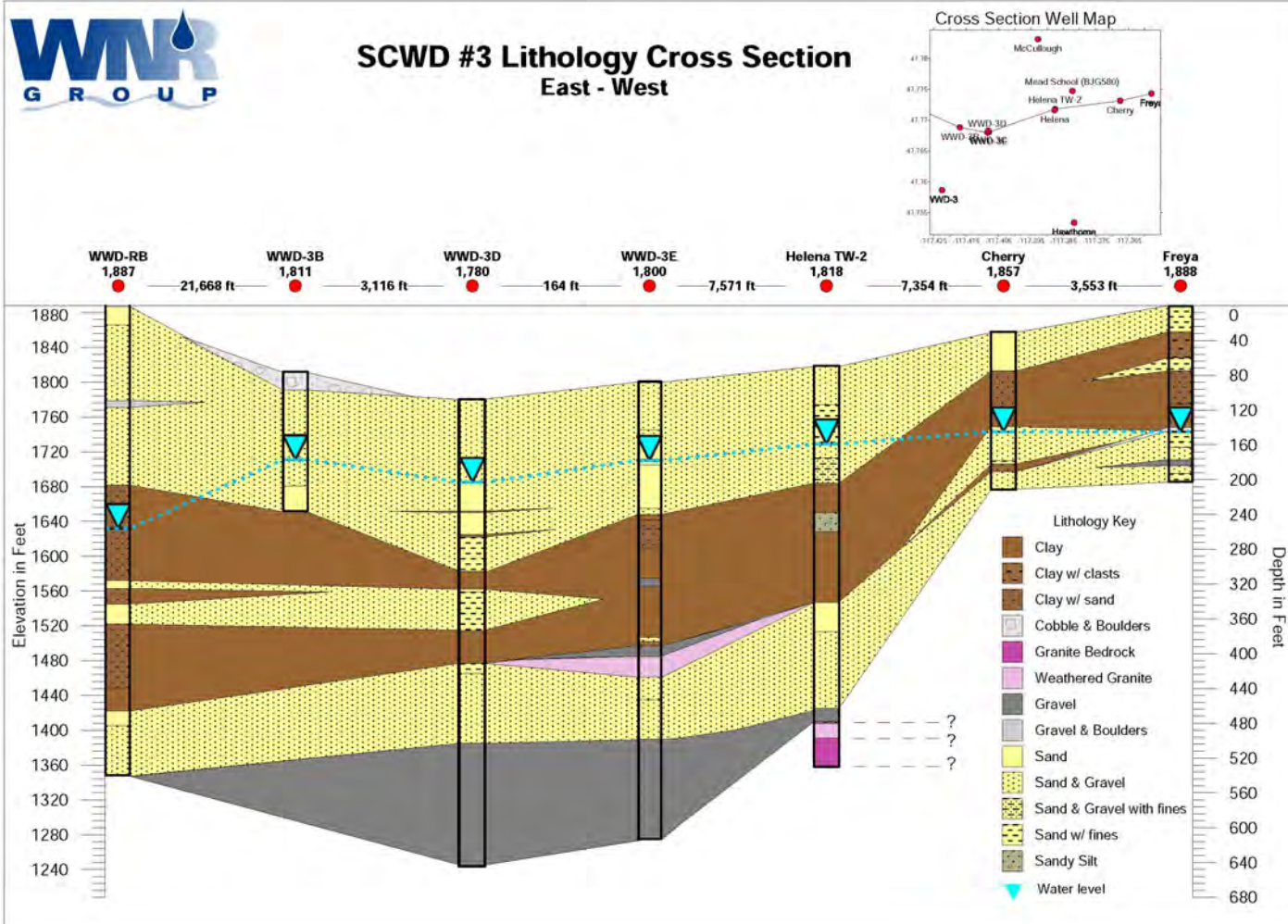
Well 3E-

- 20-inch well
- TD-535 ft
- 10 ft 100 slot over 90 ft 120 slot screen

Both Wells Screened in lower SVRP semi-confined aquifer



SVRP North Hillyard Trough Area



Testing Program

- Three specific aquifer tests were conducted for the project. These included:
 - A 1.5 hour step drawdown test consisting of 5 step pumping rates;
 - A 5-hour constant rate test conducted at 6,407 gpm; and
 - A 3 hour well field test that included pump 3E at 6300 gpm, 3D at 4300 gpm, and well 3C at 3100 gpm, for a total pumping rate of 13,700 gpm from the well field.
- Wells in system not operating during testing program. Filled storage night before and shut down wells 8 hours before testing program.
- Monitoring Wells: Well 3D = 95 feet from PW; Well 3C-MW = 88 feet away from PW.

WWD Well 3E – Step Drawdown Test

SWL – 92.08' below TOC

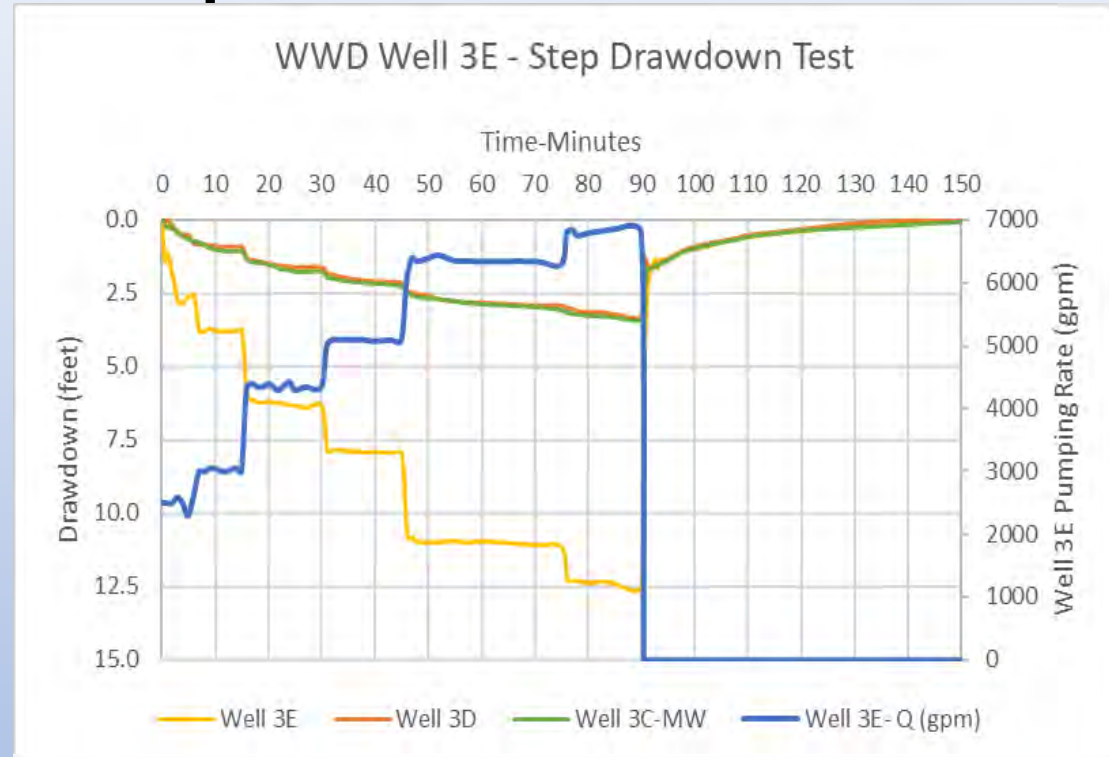
Qi (gpm)

- Step 1: 15 minutes @ 3,041 gpm (6.78 cfs); ds = 3.8 feet.
- Step 2: 15 minutes @ 4228 gpm (9.42 cfs); ds = 6.37 feet.
- Step 3: 15 minutes @ 5077 gpm (11.31 cfs); ds = 8.01 feet.
- Step 4: 30 minutes @ 6,372 gpm (14.2 cfs); ds = 11.17 feet.
- Step 5: 15 minutes @ 6747 gpm (15.03 cfs); ds=12.46 feet.

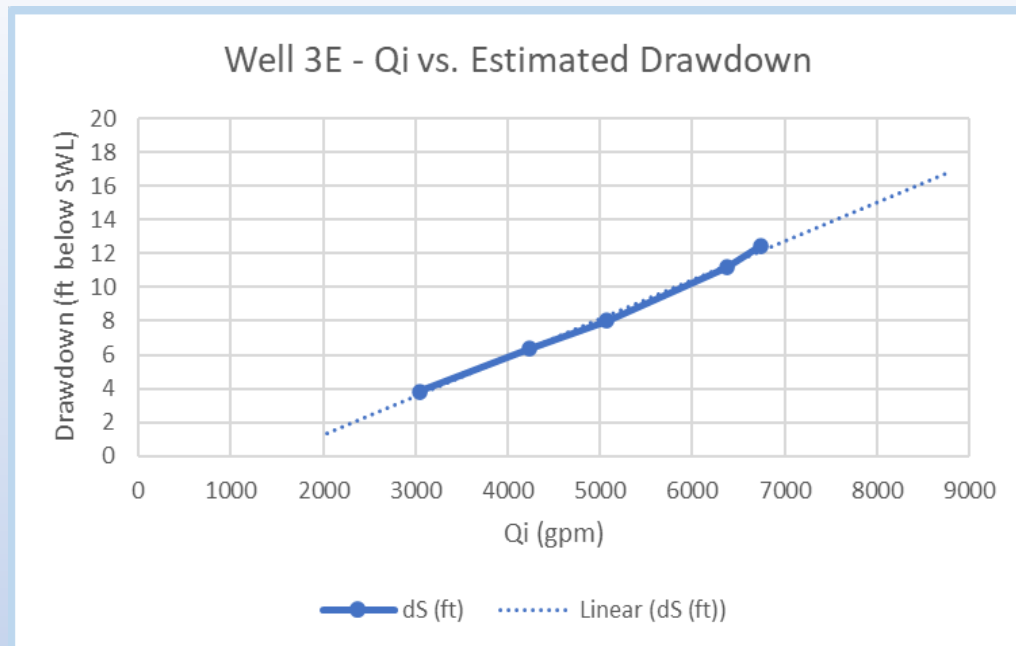
- All wells equalized to same SWL within 1 minute.

- Recovery to 95% of static in 20 minutes, 99% of static occurred within 1 hour.

- Total gallons removed from step test = 53,040,294.



Well 3E Qi (gpm)	3E ds (ft)	3D ds (ft)	3C-MW ds (ft)	Step interval
3041.0	3.80	0.90	1.08	0-15 min
4227.6	6.37	1.60	1.78	15-30 min
5077.1	8.01	2.13	2.28	30-45 min
6372.2	11.17	2.90	3.08	45-75 min
6747.4	12.46	3.20	3.38	75-90 min



Utilizing the shown trendlines, at a pumping rate of 6,000 gpm, an expected drawdown within the well will be approximately 10 (theoretical) feet.

Qi (gpm)	dS (ft)	ds (ft) Step	Specific Capacity (gpm/ft)
3041.0	3.80	3.80	800.3
4227.6	6.37	2.57	663.7
5077.1	8.01	1.64	633.8
6372.2	11.17	3.16	570.5
6747.4	12.46	1.29	541.5

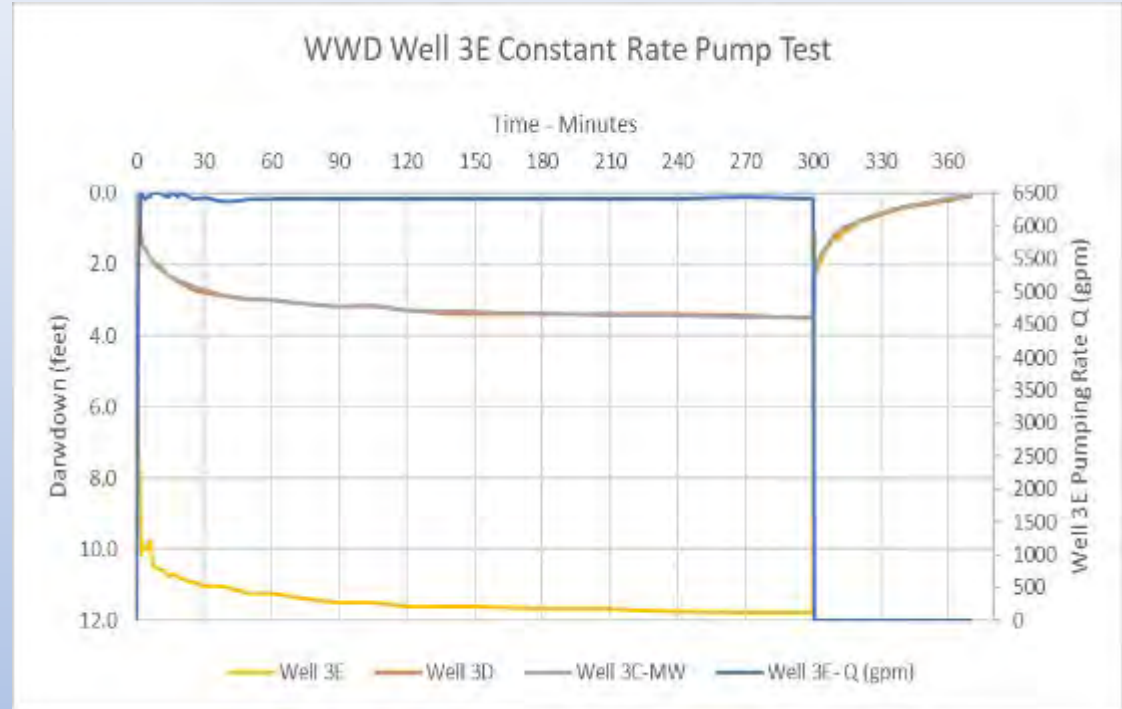
WWD Well 3E – Constant Rate Test

$Q_i = 6407$ Q_i (14.277 cfs)

SWL 3E = 92.12 ft

Duration = 5 hrs.

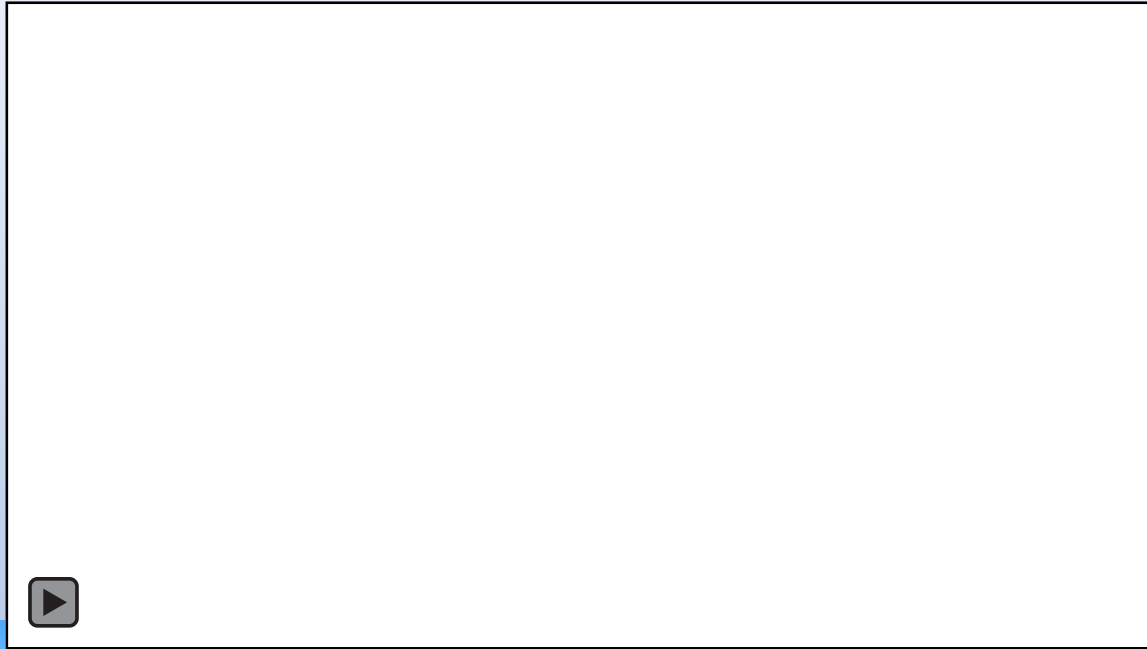
- The drawdown within the pumping well fell 7.23 feet below static in the first minute (61.4% of the total drawdown).
- At one hour into the test, the water was at 11.23 feet below static (95.3% of total drawdown),
- Then to 11.59 feet after two hours (98.4% of total drawdown),
- Then generally stabilized at approximately 11.7 feet at **three hours** through the end of the test, at which time a maximum drawdown of **11.78 ft** had occurred.
- 1,922,229 gallons (5.9 acre-feet) of groundwater pumped over the 5 hour test.



Observation Wells:

- Immediate drawdown upon initiation of pumping.
- After 5 hours, 3.5 feet of drawdown.
- 86% of drawdown in first hour (3 ft).
- The two observation wells & pumping well hit 95% recovery at approximately 60 minutes and 98% recovery in approximately 70 minutes.

Pump Testing Discharge at 6407 gpm



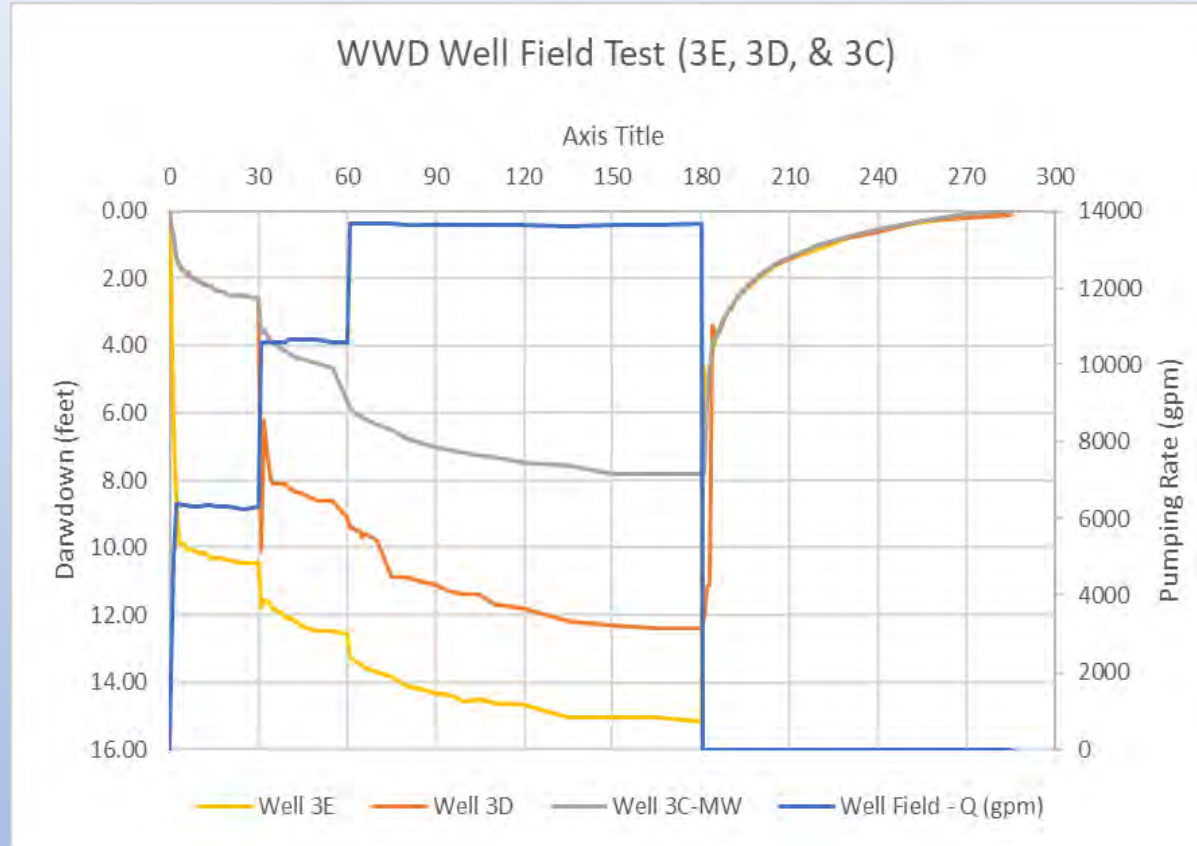
WWD Well 3E – Well Field Test

The Well Field test was run in three steps. During the test, groundwater drawdown in well 3E, 3D and 3C-MW was monitored.

- Well 3E was operated at a pumping rate of approximately 6300 gpm for 30-minutes. Wells 3C and 3D remained off;
- Well 3E (6300 gpm) and 3D (4300 gpm) were operated at a combined withdrawal rate of approximately 10,600 gpm from 30 to 60 minutes. Well 3C remained off.
- Well 3E (6300 gpm), 3D (4300 gpm) and 3C (3100 gpm) were operated at a combined rate of approximately 13,700 gpm from 60 through 180 minutes (2 hrs).

After 180 minutes of pumping, all pumping wells were turned off and recovery of the aquifer was monitored.

Drawdown in well 3E was 15.17 feet, in well 3D at 12.40 feet, and 3C at 7.82 feet.

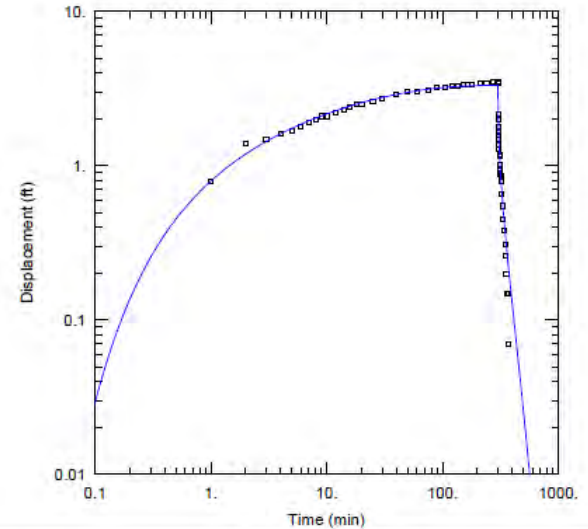


The recovery was generally consistent throughout the three wells. Well 3E achieved 98% recovery within 45 minutes, and wells 3D and 3C-MW within an hour.

WWD Well 3E – AQTESOLV Analysis

TABLE 6: Summary of AQTESOLV Modeling Results for BKW-524 (3E) from Data Collected During Constant Rate Pumping Test (b=233 ft)

Aquifer Type	Analyses	Transmissivity (ft ² /d)	K	Storativity	T-Ratio
			(ft/d)		
Confined	Cooper-Jacob	1.995x10 ⁵	856.2	0.0063	31.7
	Papadopoulos-Cooper	2.540x10 ⁵	1090.3	0.0010	24.66
	Theis-Hantusch	4.335x10 ⁵	1860.4	0.0121	49.9
Aquifer Type	Analyses	Transmissivity (gpd/ft)	K (gpd/ft ²)		
Leaky / Semi-Confined Aquifer	Hantush (early time)	3.658 x10 ⁵	1569.9	0.0147	1.751
	Hantush-Jacob (Aquitard w/o storage)	3.137x10 ⁵	1346.2	0.0291	24.73
	Cooley-Case (wtr table aquitard)	1.454 x10 ⁵	623.9	0.0110	21.7
	Neuman-Witherspoon (two aquifer)	1.452 x10 ⁵	623.4	0.0109	11.82



3E CONSTANT RATE TEST					
Data Set: C:\...Well3E Pump Test.aqt			Time: 10:07:44		
Date: 07/15/25					
PROJECT INFORMATION					
Company: WNR Group					
Client: Whitworth Water District					
Project: 097-04-00					
Location: System 3 Well Field					
Test Well: WWD Well 3E					
Test Date: 06-04-2025					
AQUIFER DATA					
Saturated Thickness: 233. ft			Anisotropy Ratio (Kz/Kr): 7.065E-5		
Aquitard Thickness (b'): 113. ft			Aquitard Thickness (b''): 1. ft		
WELL DATA					
Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Well 3E	0	0	a 3C-MW	50	72
SOLUTION					
Aquifer Model: Leaky			Solution Method: Cooley-Case		
T	= 1.454E+5 ft ² /day		S	= 0.01098	
r/B	= 0.09536		B	= 1.013E-5	

Summary- Aquifer Parameters

- Transmissivity

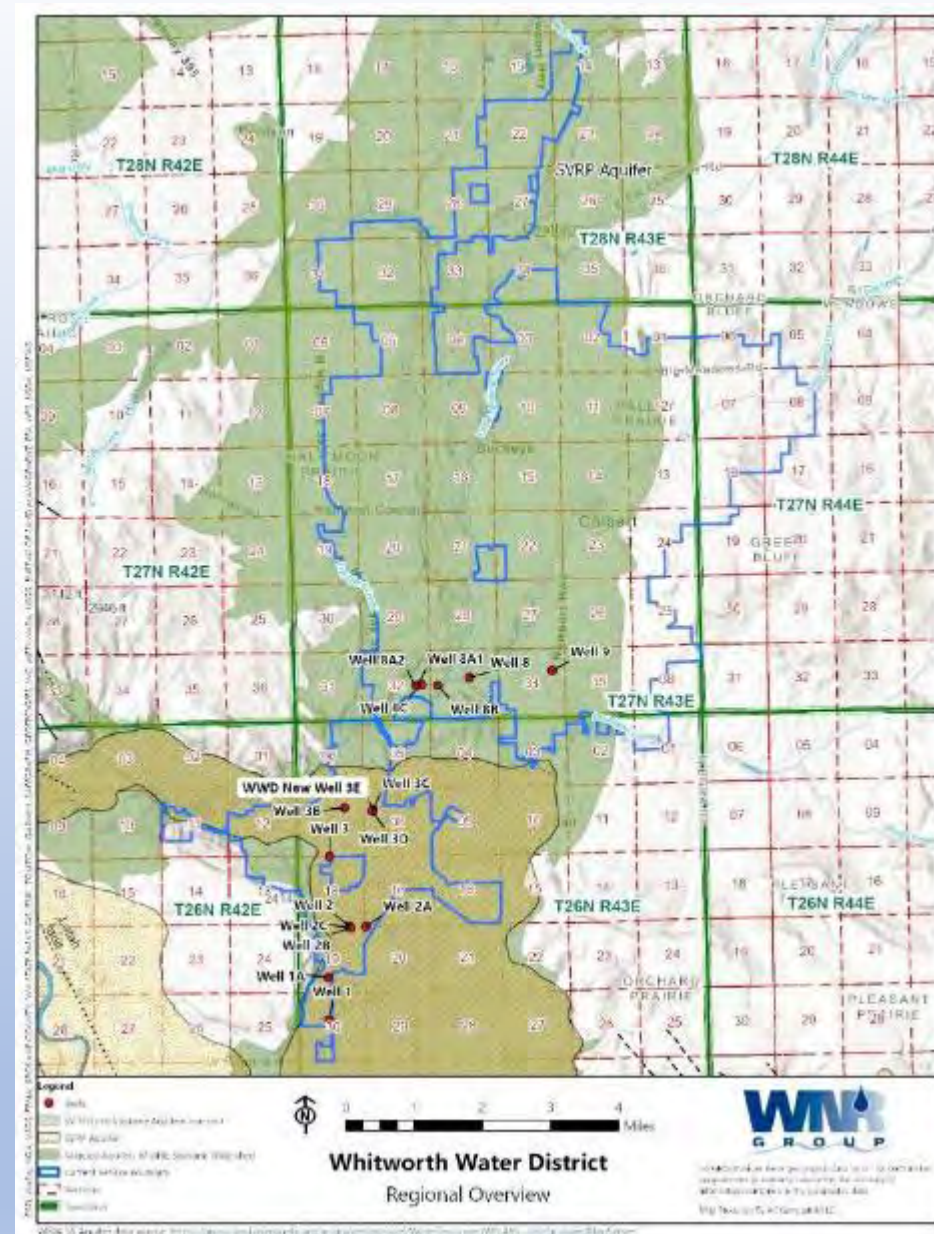
- Aquifer transmissivity was estimated at 145,200 ft²/day (Neuman-Witherspoon method) to 433,500 ft²/day (Theis-Hantusch confined method) or **1,086,169 to 3,242,798 gallons per day per foot (gpd/ft)**.
- These transmissivity values are just above the general ranges determined from the USGS reports which present an assumed aquifer transmissivity of 110,000 ft²/day (**825,000 gpd/ft**) to 130,000 ft²/day (**975,000 gpd/ft**).
- The higher transmissivity values observed at the site are a result of the coarser grained gravels observed in the WWD wells.
- The coarse gravel and cobble aquifer is under confined to semi-confined conditions in the area of the WWD wells.

- Hydraulic Conductivity

- Utilizing the T values generated from the AQTESOLV program and given an assumed aquifer thickness of **233 feet**:
- Hydraulic conductivity (K) estimate of about **623.4 ft/d** or 4,656 gpd/ft² using the Neuman-Witherspoon semi-confined two aquifer solution and about **1,860.4 ft/d** or 13,896 gpd/ft² using the Theis-Hantusch solution.
- This is within the range of hydraulic values typically found in gravel aquifers of 10⁴ to 10⁶ gpd/ft² (Freeze and Cherry, 1979 and Driscoll, 1986).
- The USGS (Kahle & Bartolino, 2007) report identifies a representative hydraulic conductivity values of **2,000 to 6,000 ft/dy** for most of the SVRP aquifer, and about **860 ft/dy** in the Hillyard Trough. (*Note – no studies from the deep gravel aquifer had been conducted at the time the USGS report was completed*).

SUMMARY

- The SVRP in the northern Hillyard Trough/North Arm area has a high yielding gravel aquifer at the bottom of the semi-confined aquifer.
- WWD Well 3E can individually sustain a pumping rate of 6700 gpm with a drawdown of 11.7 feet.
- The tests revealed that the aquifer beneath the Well Field appears to be capable of a sustained yield of 13,700 gpm from the 3 operating wells with a drawdown (potentiometric head reduction) in well 3E at 15.17 feet, in well 3D at 12.40 feet, and 3C at 7.82 feet.
- **CONCLUSION = GREAT AQUIFER FOR WATER SUPPLY!**



WWD SYSTEM 3 – SVRP AQUIFER



***THANK YOU---
QUESTIONS?***

Gene St.Godard, P.G., L.Hg., CWRE
Principal Hydrogeologist/Owner
WNR Group, Inc.
PO Box 28755
Spokane, WA 99228
wnrgroup@comcast.net
509-953-9395

