

TECHNICAL MEMORANDUM

Municipal Well Recharge Estimates Spanish Springs Valley, Nevada

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Principal Investigator

Christian A. Kropf, Washoe County Department of Water Resources

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MUNICIPAL WELL RECHARGE ESTIMATES SPANISH SPRINGS VALLEY, NEVADA

INTRODUCTION

As the population of Spanish Springs Valley (SSV) continues to increase, so too has the stress on the aquifer supplying potable water to the residents of SSV. This water quantity issue is compounded by the water quality issues posed by over 2,000 septic tanks linked to shallow groundwater contamination.

Currently, approximately 25% of the potable water demand in SSV is met by TMWA wholesale Truckee River water supplied from outside of the basin and around 75% is still supplied from ground water within the basin. Starting in 2009, base load (at approximately 2,100 AFY) will be supplied by TMWA water and peaking supply will come from SSV ground water. This will equate to approximately 60% TMWA water and 40% ground water. At build out in approximately 30 years, water demand is forecast to be 7,668 acre-ft/year (AFY) of which TMWA supply will comprise 78% and groundwater will comprise 22%.

Recharging TMWA wholesale water into the ground water during the off-peak season (November through April) may sustain the usefulness of municipal wells in terms of water quantity and quality withdrawals during peak water-use periods (May through October).

This technical memo attempts to define the maximum amount of water that could be recharged through the existing well field in SSV subject to constraints described herein. Following is a description of calculations and modeled estimates of recharge rates in SSV municipal wells (Washoe County-owned). These findings are preliminary and due to uncertainties associated with subsurface hydrogeologic parameters, can only be considered rough estimates until water is actually recharged through these wells. Wells chosen for recharge were selected by Washoe County Department of Water Resources (WCDWR) engineering and planning staff in consultation with Eco:Logic Consultants.

INITIAL ESTIMATES OF RECHARGE

A common approach to estimating recharge potential at a well is to assume a well can accept recharge water at a rate of half of the rate of extraction. Initial estimates of recharge were completed using this method and are summarized in Table 1 below. Pumping estimates were calculated based on average pumping rates during the peak pumping season.

Table 1. Initial estimates of recharge into municipal wells in SSV.

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
Pumping Rate (gpm)	380	450	740	344	474	274	344	1896
Recharge Rate (gpm)	190	225	370	172	237	137	172	948

INITIAL ESTIMATES OF RECHARGE - FIRST REVISION

The estimates above may overestimate the total amount of water to be injected. This is due to pumping rates being taken from instantaneous measurements when the pump is running. None of the wells in SSV run continuously during the peak pumping period, and could therefore overestimate recharge over this time period. Recharge of potable water, however, would occur continuously over the non-peak period.

In order to better estimate this recharge rate, it is more appropriate to use the specific capacity of the aquifer in the vicinity of each well in addition to the potential height of mounding above static water level available for recharge. To provide a factor of safety for homes in the area, mounding will be approximated to no greater than five to ten feet below the land surface. The biggest concern for high mounding heights is the presence of septic drainfield trenches that may be impacted by an elevated groundwater table and vice versa. Specific capacities were calculated from recent well testing completed during Fourth Quarter, 2008 (Widmer, 2009). If specific capacity was not available from these more recent tests, it was either estimated from pumping operations or taken from initial well construction and testing reports.

Specific capacity is "an expression of the productivity of a well, obtained by dividing the rate of discharge of water from the well by the drawdown of the water level in the well" (Fetter, 1994). Estimates of recharge potential based on specific capacities are generally lower, and hence more conservative, than estimated based solely on the pumping rate of a well. Even though the water being injected is potable and essentially free from all suspended material, recharge wells will tend to clog over time.

Recharging into unconsolidated aquifers eventually leads to clogging at the interface between the well and the aquifer (Bouwer, 1988). Clogging can occur for a number of reasons including air entrainment by aeration of water falling into the well, filtration of suspended sediment and organic matter, development of bacterial growth in the aquifer, formation of precipitates due to geochemical reactions, and swelling of clay in the aquifer among others (Fetter, 1994). Due to this clogging, the specific capacity of recharge wells into unconsolidated aquifers is only about half the specific capacity during pumping (Bouwer, 1988).

To estimate recharge in WCDWR municipal wells, $\frac{1}{2}$ of the specific capacity value (gpm/ft) is multiplied by the mounding available (ft) to determine a recharge rate (gpm) for each well. Table 2 presents estimates of recharge using this conservative method. The source of the specific capacity value is from recent well testing activities (Fourth Quarter, 2008) unless otherwise noted.

Table 2. Revised recharge estimates using specific capacity.

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
Static Water Level (ft bls)	51	70	35	61	20	20	88	30
Mounding Available (ft)	41	60	25	51	10	10	78	20
$\frac{1}{2}$ Specific Capacity (gpm/ft)	8.4	4.7	15	5.7	3.9	1.5*	1.1	7.2*
Resultant Recharge Rate (gpm)	344	282	375	288	39	15	86	144**

* Specific capacity from initial well construction and testing activities

** Recharge rate estimate increased to 475 gpm; see below for explanation

The total water necessary to recharge at these rates over a six month period from November through April is approximately 1,250 acre feet (AF). Eco:Logic believes this volume of water is available during this period of time and is available at the suggested recharge rates at each wellhead.

Since SC6 is completed in zone of "gray fractured rock", we can assume that the flow is fracture-dominated. Recharge into fractured rock aquifers can be estimated to occur at rates close to pumping rates due to the well-developed porosities of fractured aquifers (Bouwer, 1988). However, the long-term behavior of fractured-rock aquifers is more uncertain than typical alluvial aquifers. The long-term pumping rate for SC6 is ~808 gpm (230,047,000 gallons over 176 days; May 5, 2008 – Oct. 27, 2008) with a maximum pumping rate during operation of 1,900 gpm. Given this value, recharge is probably significantly greater than the 144 gpm recharge estimate from specific capacity alone.

An average of the low specific capacity-derived estimate (144 gpm) and the long-term pumping rate-derived estimate (808 gpm) is probably a safe, if not low estimate, at 475 gpm for SC6. Increasing the recharge estimate at SC6 brings the total required volume of water to approximately 1,500 AF. If the well eventually takes up to the long-term pumping rate of 808 gpm, the total required volume of water to be recharged would increase to 1,800 AF.

MODELED RECHARGE

Recharge values calculated above were modeled in AQTESOLV (Duffield, 1996) in order to estimate the impact on water levels in the vicinity of the wells above. Simulations were run in a predictive mode with initial estimates of recharge.

Model Considerations, Assumptions, and Input Parameters

AQTESOLV (Duffield, 1996) was used to model potential water level changes in each of the wells selected. The model can be used to simulate injection and pumping scenarios for numerous aquifer types under myriad well specifications and geologic constraints in a steady state or transient setting. When simulating physical parameters in a computer model, numerous considerations and assumptions are necessary. Although the AQTESOLV (Duffield, 1996) model is straightforward, some considerations have to be made in order to best-simulate real world conditions.

The most sensitive input parameter was found to be transmissivity. Values calculated from the original well construction and pumping tests were used in these simulations. Given the sensitivity of this parameter, various scenarios compared fully-penetrating vs. partially-penetrating and full aquifer depth vs. screened aquifer depth only to determine appropriate modeling. Simulated and observed draw downs were compared as a check on model input values. It was found to be more appropriate to use actual well construction and aquifer constraints instead of simulating injection with respect to the screened interval only (e.g. ignoring geology and partial penetration).

A number of assumptions were made when performing the recharge simulations. What follows is a list of assumptions used when modeling recharge at each well. Figures 1 and 2 graphically describe input parameters necessary in AQTESOLV. Table 3 lists input parameters used in our AQTESOLV simulations.

- Aquifer is unconfined at each of the municipal wells.
- Aquifer depth was obtained from the well log, if available. Where the aquifer depth is assumed to extend beyond the total depth of the well, geophysical surveys were used to estimate total depth of the aquifer (Widmer, 2007).

screened intervals?

- Wells are modeled as they occur in relation to water level surface and aquifer depth. Well specifications were obtained from well logs.
- Wells were modeled as partially-penetrating, except where well log lithology proved otherwise
- The Neuman (1974) model solution assumes no wellbore storage, no wellbore skin, allows for partial penetration of wells, and variable pumping.
- Pumping rates were modeled as long-term pumping rates (operating continuously) over the peak pumping period (May through October) by taking 2008 pumping volumes divided by the date range in question (typically around 180 days).
- Recharge was modeled as continuous over the off-peak period (November through April).
- Hydraulic conductivity anisotropy ratio (K_v/K_h) was estimated at 0.1 for all wells.
- Storativity was estimated at 0.16 from Fetter, 1994
- Specific yield of 0.1545 from the DRI flow model (Pohll, 2009)
- Transmissivity (T) = $K \cdot b$; K = horizontal hydraulic conductivity; b = aquifer thickness
- Q_p = Pumping rate; Q_r = recharge rate

Figure 1. Diagram of aquifer input parameters

General Construction Radius Rates Observations Symbols Curves Options

unit top or water table

1 2 3 4

d z zh L Lh

unit base

Measure depths d, z and zh from unit top or water table (not from land surface).

Well Configuration

Vertical, partial penetration (2)

d: 429 ft

L: 338 ft

z: 0 ft

zh: 0 ft

Lh: 1 ft

Unit: Pumped aquifer

Figure 2. Diagram of well input parameters

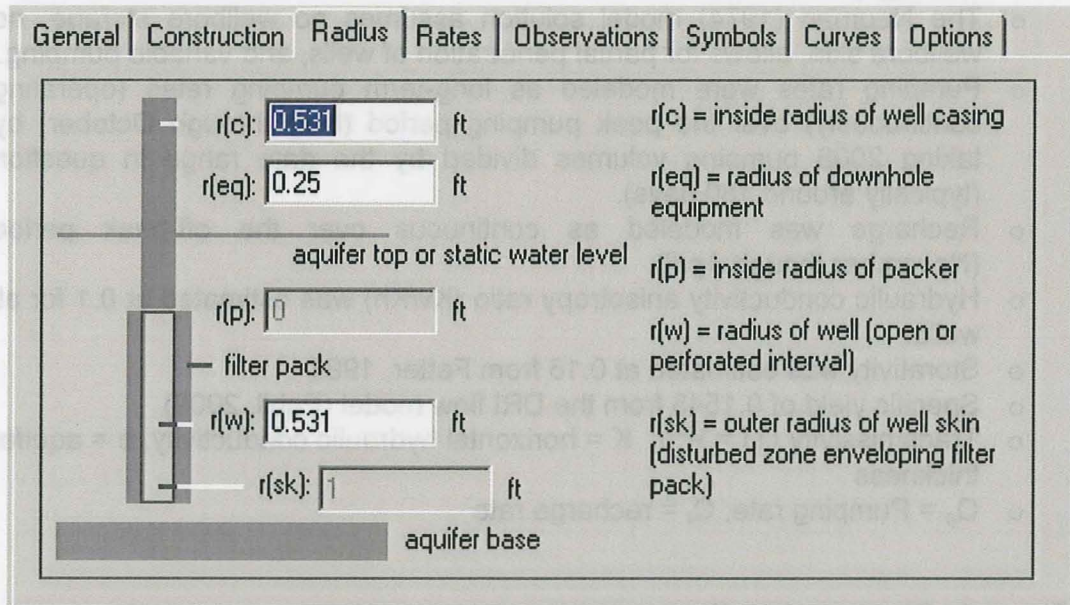


Table 3. Model input parameters used in AQTESOLV

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
b (ft)	298	743*	647	390	570	603	462*	767**
d (ft)	70	168	23	80	100	130	58	429
L (ft)	70	574	230	210	100	170	426	338
r (c) (ft)	0.502	0.666	0.415	0.502	0.583	0.583	0.583	0.531
r (eq) (ft)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
r (w) (ft)	0.502	0.666	0.415	0.502	0.583	0.583	0.583	0.531
Q_p (ft ³ /day)	23141	27810	79960	35500	21500	1510	45670	155900
Q_r (ft ³ /day)	66300	54300	72200	55500	7510	2900	16500	91440
T (ft ² /day)	8690	1600	8555	3300	1250	802	1537	13700

* From well log, bedrock encountered near TD of well at 813' for DS2 and 550' for SC4

** Well is completed in fractured bedrock with a TD of 797'

Model Output and Adjustments

Model output consists of a drawdown over time plot depicting water level elevation over time. Pumping rate has little if any impact on water level elevations resulting from recharge; increasing the pumping rate while keeping the recharge rate constant does not reduce the resultant mound elevation. Figure 3 depicts ground water elevation changes at increasing pumping rates.

Figure 3. Effect of increasing pumping rate on resultant mounding.

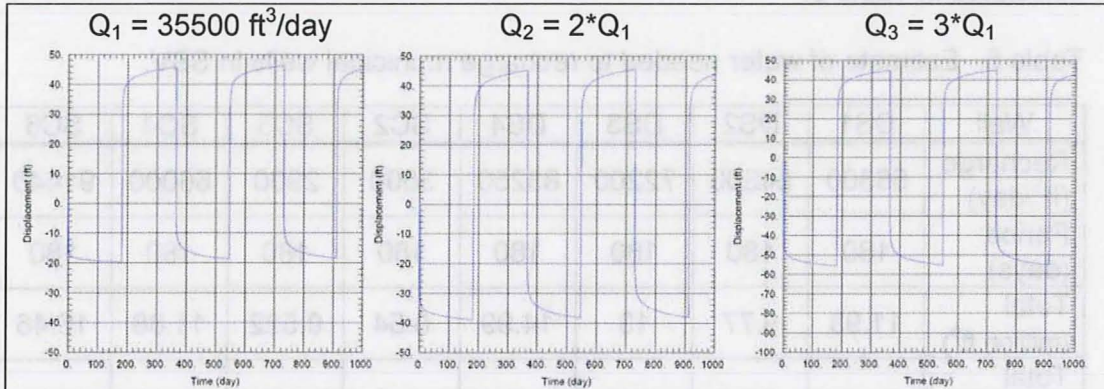


Table 4 describes mounding heights above static water level and proximity to land surface. Where mounds were estimated above land surface or were well below the available mounding potential, the simulations were re-run. These model re-runs are included in Table 4 where applicable and incorporate a new estimate of recharge. Model output plots are included in Appendix A. Well logs are included in Appendix B.

Table 4. Resultant ground water mounds from recharge operations.

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
SWL* (ft bls)	51	70	35	61	20	20	88	30
Seal (ft bls)	52	50	50	70	100	50	70	100
Mounding (ft over static)	33	52	28	31	32	13	15	19
Mound Depth (ft bls)	18	18	7	30	-12	7	73	11
Suitable R*?	X	X	X			X		X
Increase R?				X			X	
Reduce R?					X			
Previous R (ft³/day)	66300	54300	72200	55500	7510	2900	16500	91440
New Mound (ft over SWL)				46	12		59	
Mound Depth (ft bls)				15	8		29	
Revised R (ft³/day)				83250	3000		66000	

*SWL = Static Water Level; R = Recharge

The new adjusted volumes of water necessary to recharge at these rates are calculated in Table 5.

Table 5. Estimate of water needed to recharge municipal wells in SSV.

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
Recharge (ft ³ /day)	66300	54300	72200	83250	3000	2900	66000	91440
Period (days)	180	180	180	180	180	180	180	180
Total (million ft ³)	11.93	9.77	13	14.99	0.54	0.522	11.88	16.46
Total (million gallons)	89.24	73.08	97.25	112.1	4.04	3.9	88.87	123.1
Total Recharge (AF)	274	224	298	344	12	12	273	378

Total volume of water required to recharge existing municipal wells in SSV during off-peak pumping is approximately 1,815 acre-feet per year. If SC6 can be recharged at the 800 gpm level instead of the 475 gpm level, this will add approximately 250 AFY. The total water required would be closer to 2,000 AFY.

Table 6 includes approximate costs based on \$1.29 per 1,000 gallons (from September 2006 TMWA wholesale agreement).

Table 6. Approximate costs to recharge TMWA water.

Well	DS1	DS2	DS3	DS4	SC2	SC3	SC4	SC6
Cost	\$115,120	\$94,273	\$125,453	\$144,609	\$5,212	\$5,031	\$114,642	\$158,799

CONCLUSIONS & RECOMMENDATIONS

It is estimated that County-owned municipal wells in SSV may take up to 2,000 AFY in recharge water. This estimate is based on the historical pumping rates and/or well capacities, specific capacity, available mounding, and modeled simulations for each well. The analytical approach used requires more assumptions than a numerical-based model and therefore, if more descriptive results are necessary, a numerical-based model would be more appropriate. These simulations are an attempt to confirm potential estimates of recharge, and should be used as a starting point from which to begin recharge in the field. Field conditions and continual observations will provide a better feedback mechanism for adjusting recharge volumes over time.

It is recommended that if recharge is to be attempted in SSV, that it begin with a single well using the estimate provided above. A good candidate for recharge would be DS#4 given its proximity to available water, hydrogeologic characteristics near the well, and the available mounding potential above static water level.

REFERENCES

Bouwer, H. Systems for Artificial Recharge of Ground Water, in Artificial Recharge of Ground Water: proceedings of the international symposium: Anaheim, California, August 23-27, 1988. Edited by Johnson, A. I. and Finlayson, D. J.

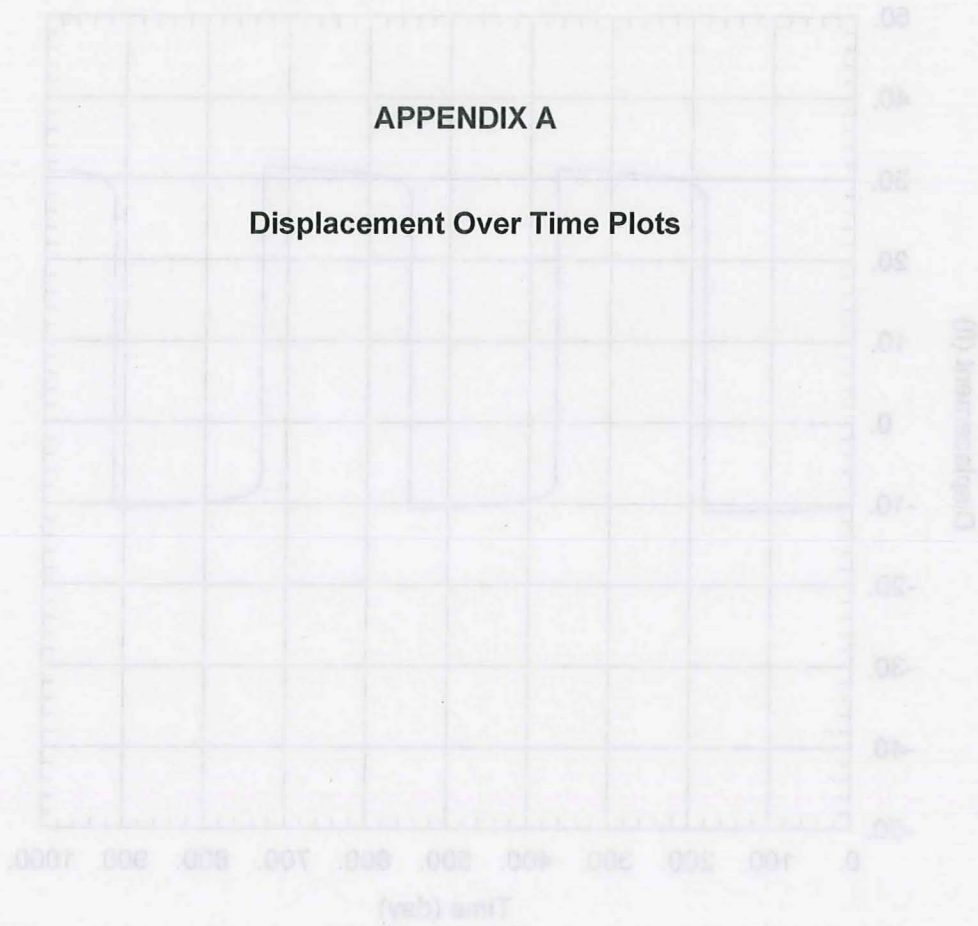
Fetter, C. W., 1994, Applied Hydrogeology, 3rd edition: New York, Macmillan College Publishing Co., 691 p.

Widmer, M. C., 2007. Letter Report: Spanish Springs Bedrock Elevation Model. Washoe County Department of Water Resources, Reno, Nevada.

Widmer, M. C., 2009. Technical Memo: Municipal Well-testing. Washoe County Department of Water Resources, Reno, Nevada.

APPENDIX A

Displacement Over Time Plots



D31 RECHARGE ESTIMATE

Date Set: 02/28/09
 Date: 02/28/09
 Time: 08:21:15
 Data Set: H1/D31 Long Term F and I - Partial Penetrating - T 9500.sst

PROJECT INFORMATION

Company: WCDWR
 Client: Facility Plan Updates
 Project: Spanish Springs
 Location: Desert Springs
 Test Well: DS 44
 Test Date: 01/28/09

AQUIFER DATA

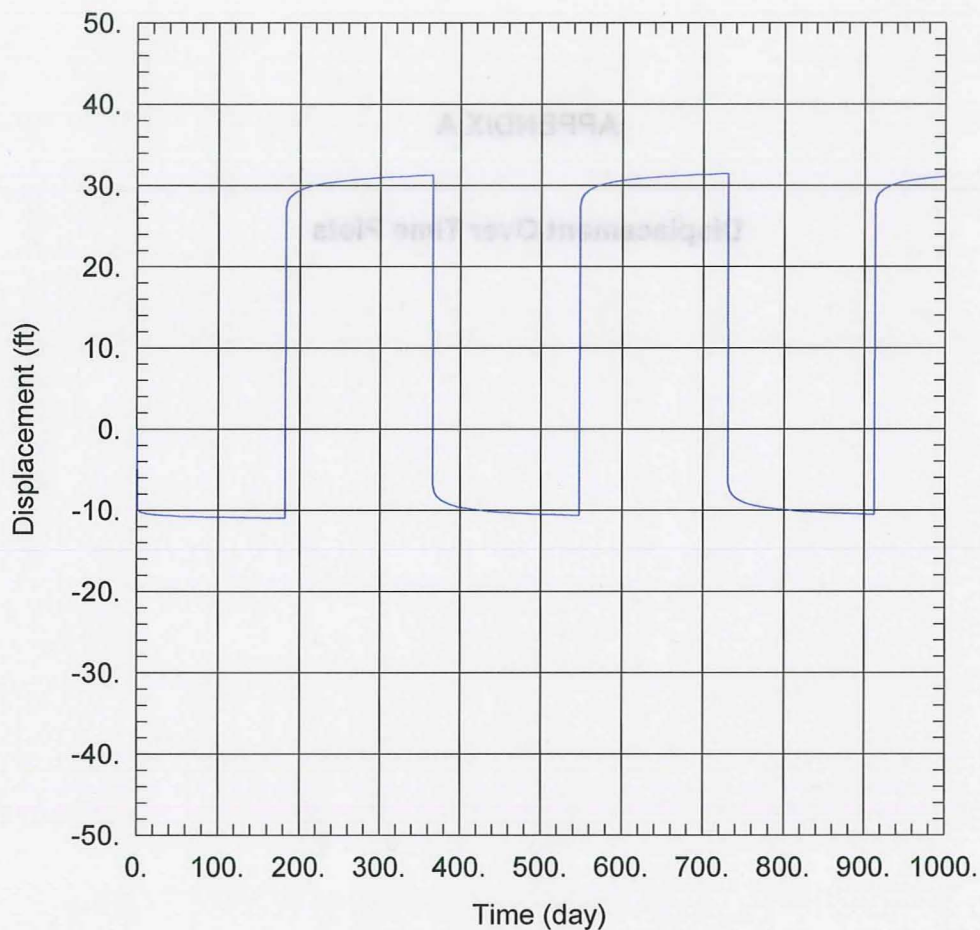
Saturated Thickness: 200 ft

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
DS 44	0	0	DS 44	0	0

SOLUTION

Appl. Model: Modified
 Solution Method: Newton
 $S = 0.155$
 $T = 9500$
 $S = 0.155$
 $T = 9500$
 $S = 0.155$
 $T = 9500$



DS1 RECHARGE ESTIMATE

Data Set: H:\...\DS1 Long Term P and I - Partial Penetrating - T 8690.aqt

Date: 02/26/09

Time: 09:57:12

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: DS #4

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 298. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DS #1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ DS #1	0	0

SOLUTION

Aquifer Model: Unconfined

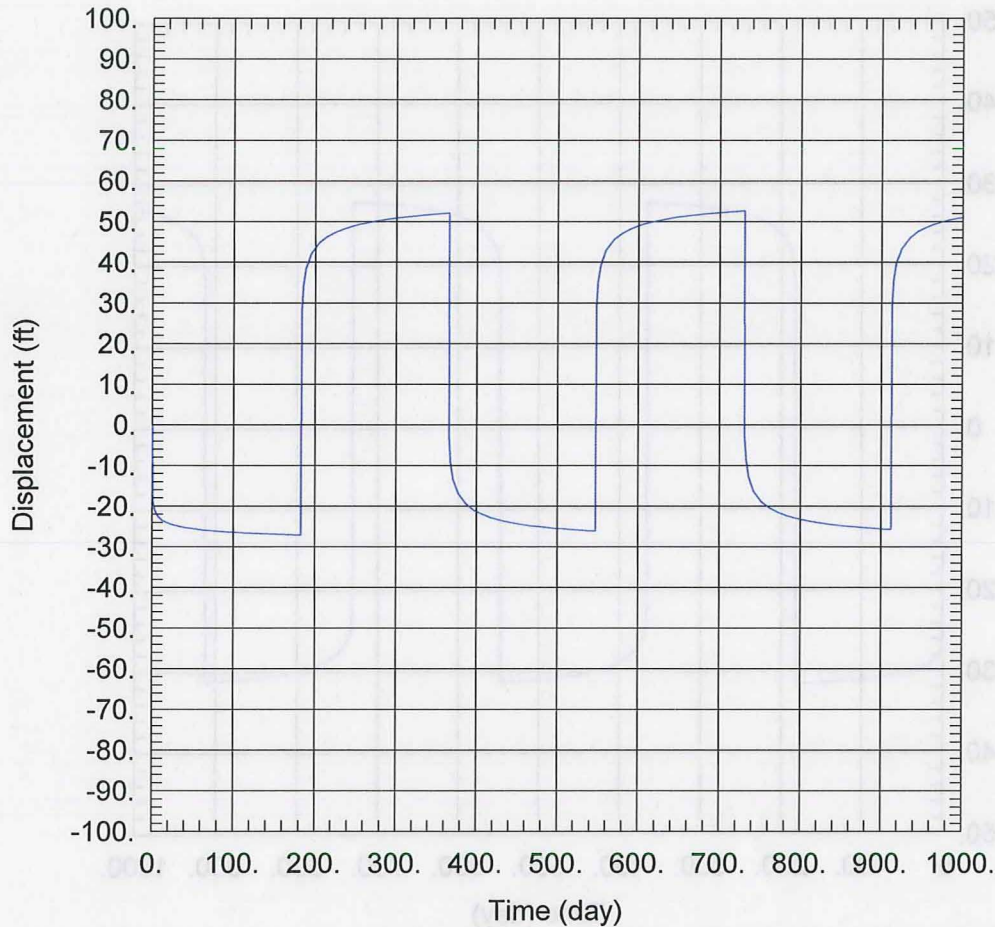
Solution Method: Neuman

T = 8690. ft²/day

S = 0.16

Sy = 0.1545

β = 2.838E-7



DS2 RECHARGE ESTIMATE

Data Set: H:\...DS2 Long Term P and I - Partial Penetrating - T 1600.aqt

Date: 02/26/09

Time: 09:57:53

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: DS #2

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 743. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DS #2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ DS #2	0	0

SOLUTION

Aquifer Model: Unconfined

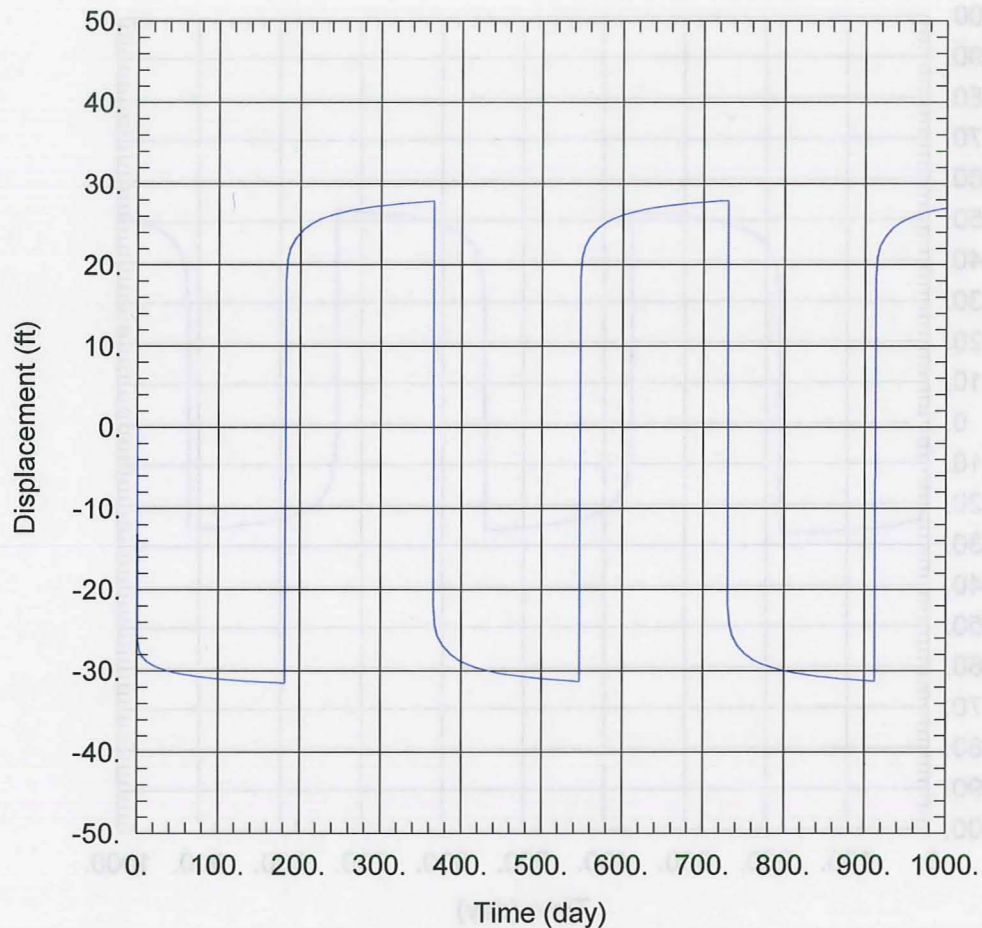
Solution Method: Neuman

T = 1600. ft²/day

S = 0.16

Sy = 0.1545

B = 8.381E-8



DS #3 RECHARGE ESTIMATE

Data Set: H:\...\DS3 Long Term P and I - Partial Penetrating - T 8555.aqt

Date: 02/26/09

Time: 09:58:49

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: DS #3

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 647. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DS #3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
DS #3	0	0

SOLUTION

Aquifer Model: Unconfined

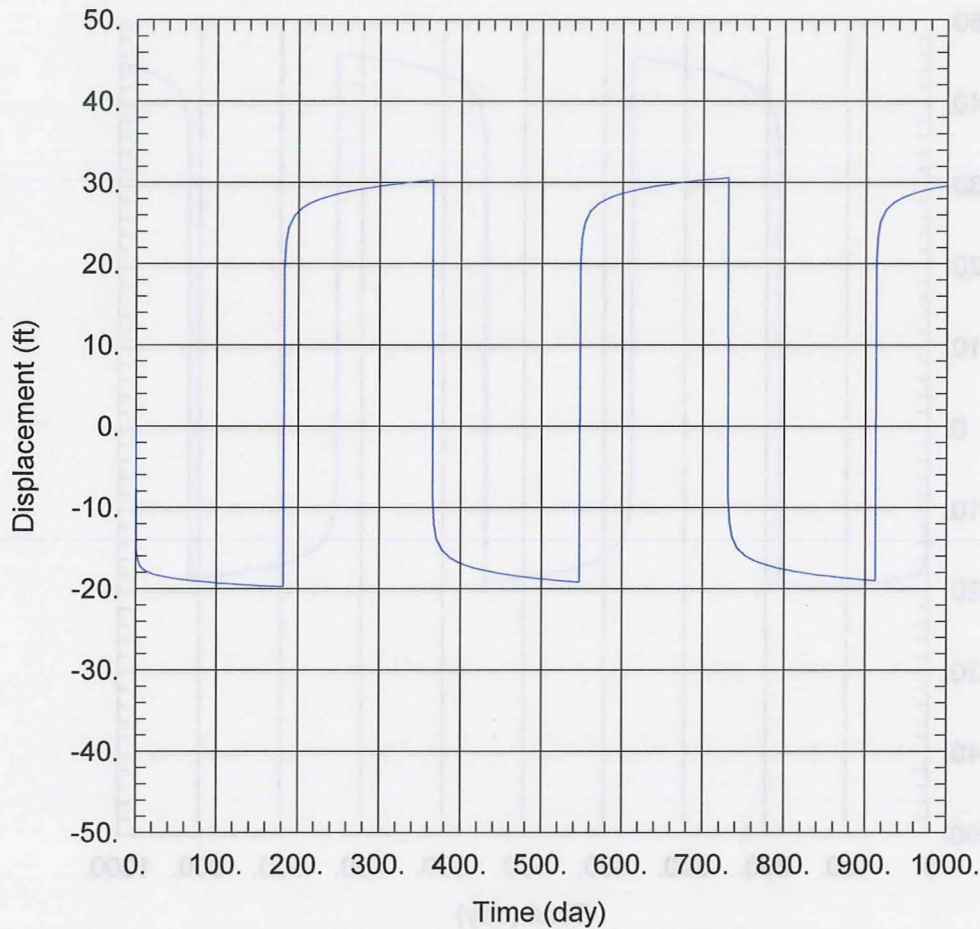
Solution Method: Neuman

$T = 8555. \text{ ft}^2/\text{day}$

$S = 0.16$

$S_y = 0.1545$

$\beta = 4.114\text{E-}8$



DS4 ORIGINAL RECHARGE ESTIMATE

Data Set: H:\...\DS4 Long Term P and I - Partial Penetrating - T 3300.aqt

Date: 02/26/09

Time: 09:59:30

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: DS #4

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 390. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DS #4	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ DS #4	0	0

SOLUTION

Aquifer Model: Unconfined

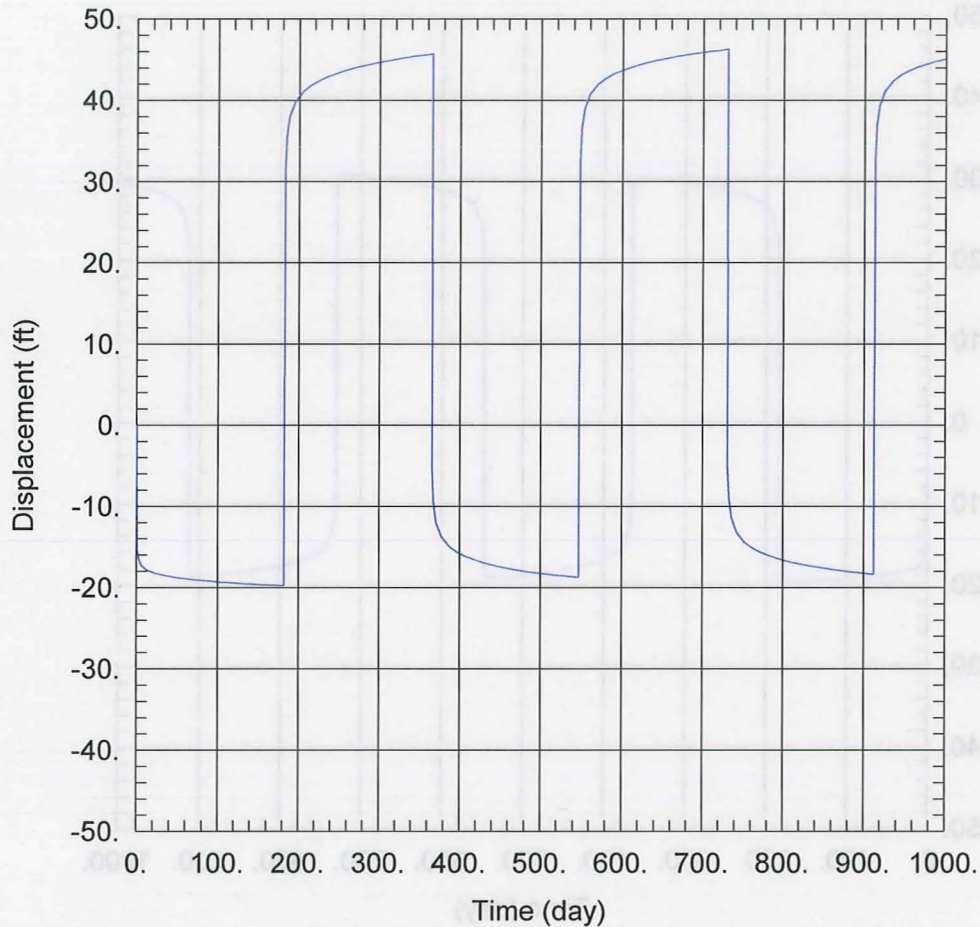
Solution Method: Neuman

T = 3300. ft²/day

S = 0.16

Sy = 0.1545

β = 1.657E-7



DS4 INCREASED RECHARGE ESTIMATE

Data Set: H:\...DS4 Long Term P and I - Partial Penetrating - T 3300 - INCREASED R.aqt

Date: 02/26/09

Time: 10:00:06

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: DS #4

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 390. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DS #4	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ DS #4	0	0

SOLUTION

Aquifer Model: Unconfined

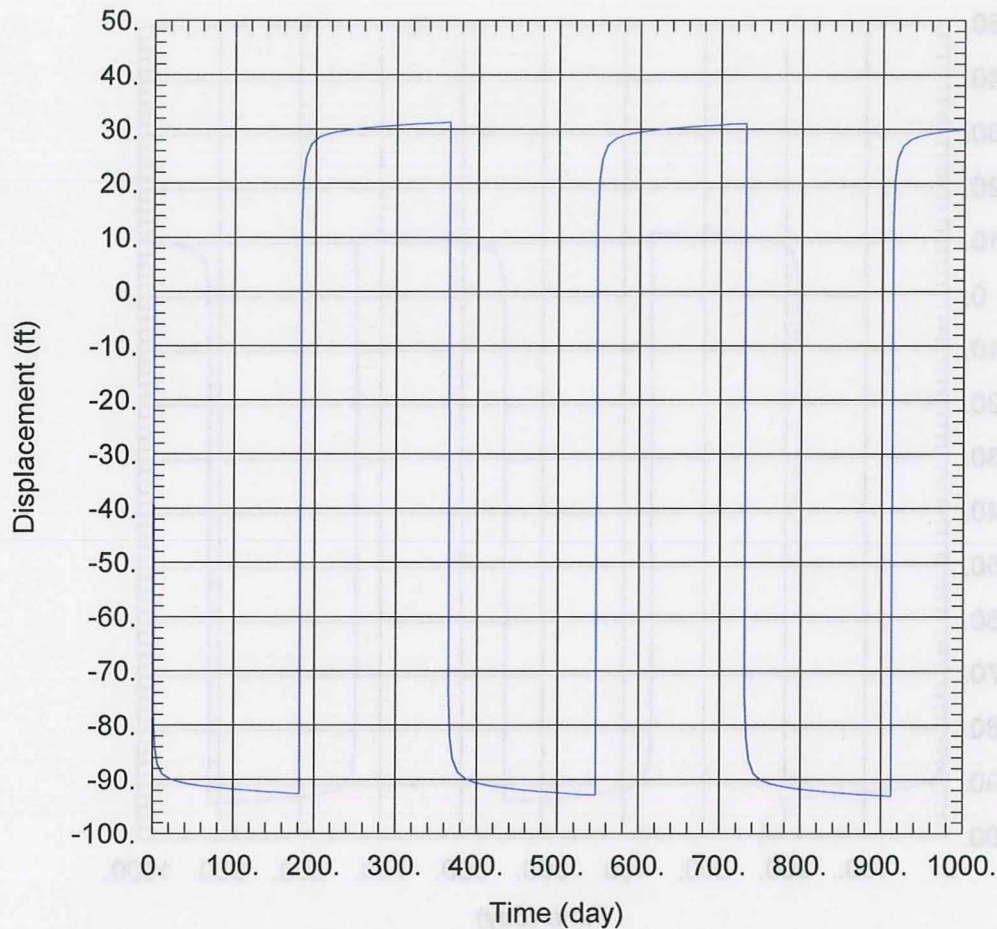
Solution Method: Neuman

T = 3300. ft²/day

S = 0.16

Sy = 0.1545

β = 1.657E-7



SC2 ORIGINAL RECHARGE ESTIMATE

Data Set: H:\...\ISC2 Long Term P and I - Partial Penetrating - T 1250.aqt

Date: 02/26/09

Time: 10:00:44

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #2

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 570. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
SC #2	0	0

SOLUTION

Aquifer Model: Unconfined

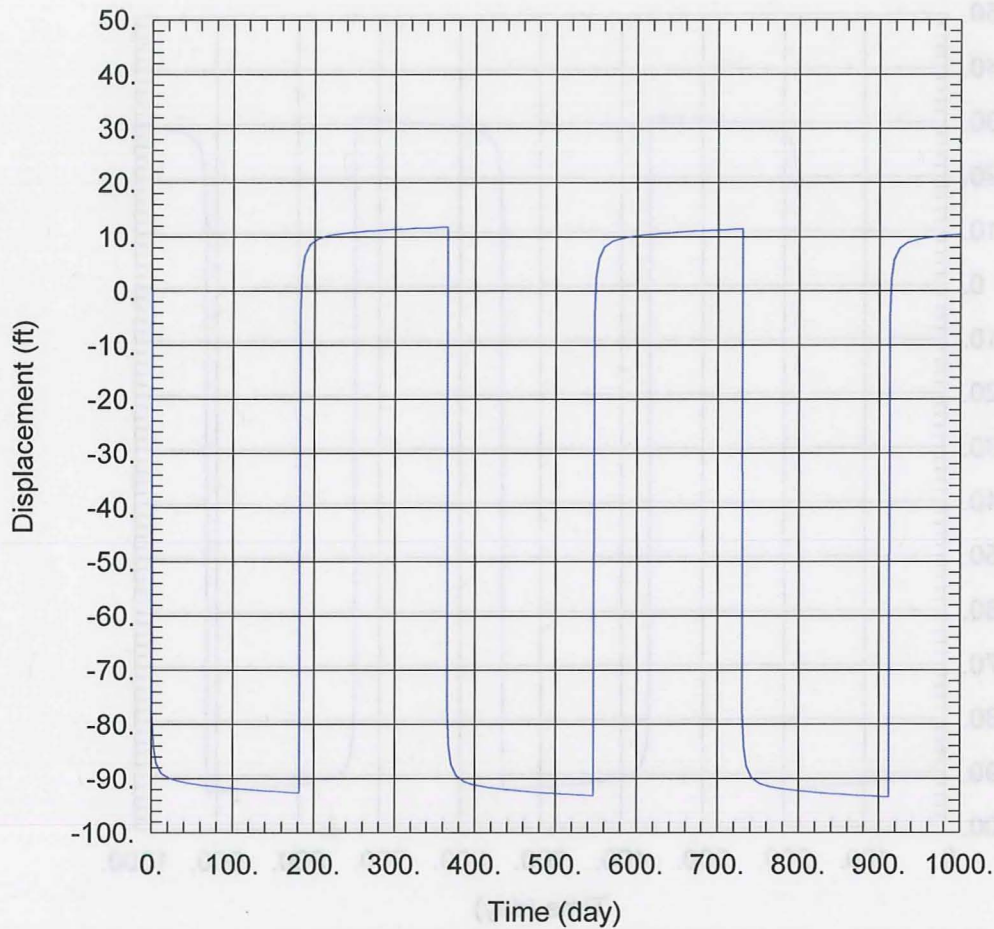
Solution Method: Neuman

T = 1250. ft²/day

S = 0.16

Sy = 0.1545

B = 1.047E-7



SC2 DECREASED RECHARGE ESTIMATE

Data Set: H:\...\SC2 Long Term P and I - Partial Penetrating - T 1250 - REDUCED R.aqt

Date: 02/26/09

Time: 10:01:18

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #2

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 570. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
SC #2	0	0

SOLUTION

Aquifer Model: Unconfined

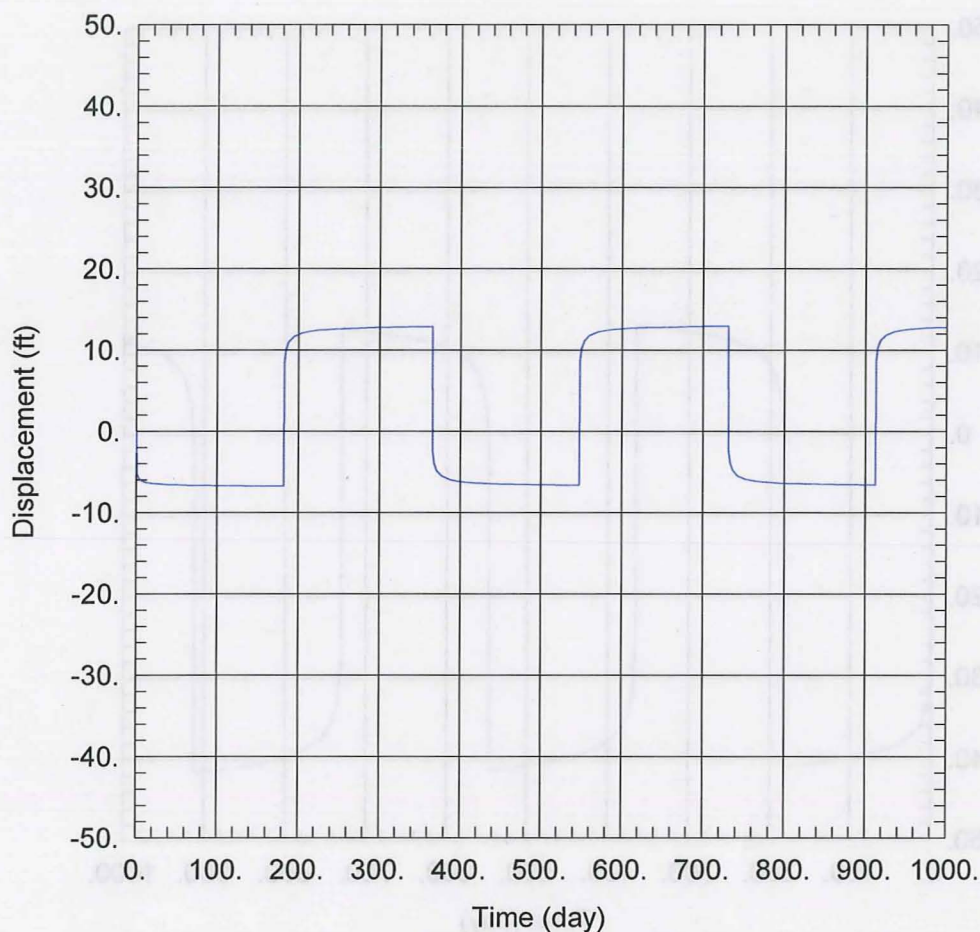
Solution Method: Neuman

T = 1250. ft²/day

S = 0.16

Sy = 0.1545

β = 1.047E-7



SC3 RECHARGE ESTIMATE

Data Set: H:\...ISC3 Long Term P and I - Partial Penetrating - T 802.aqt

Date: 02/26/09

Time: 10:01:56

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #3

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 603. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
SC #3	0	0

SOLUTION

Aquifer Model: Unconfined

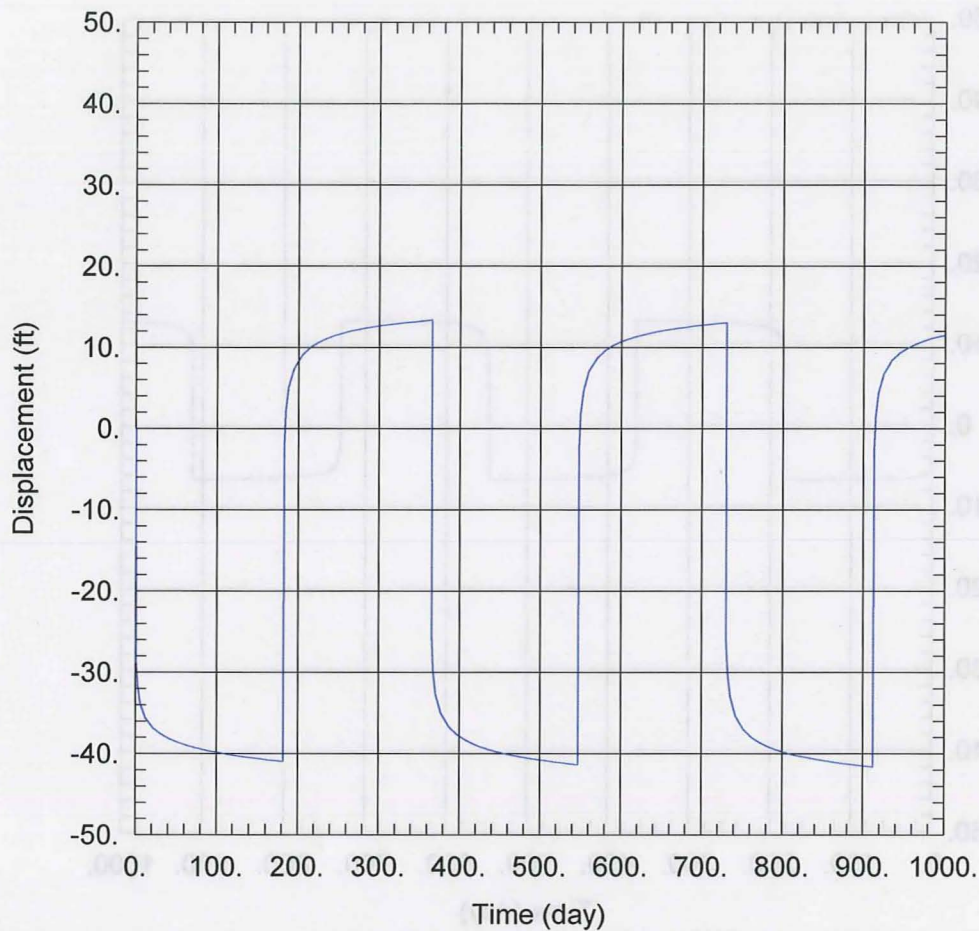
Solution Method: Neuman

T = 802. ft²/day

S = 0.16

Sy = 0.1545

B = 9.357E-8



SC4 ORIGINAL RECHARGE ESTIMATE

Data Set: H:\...SC4 Long Term P and I - Partial Penetrating - T 1537.aqt

Date: 02/26/09

Time: 10:02:30

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #3

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 484. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
SC #3	0	0

SOLUTION

Aquifer Model: Unconfined

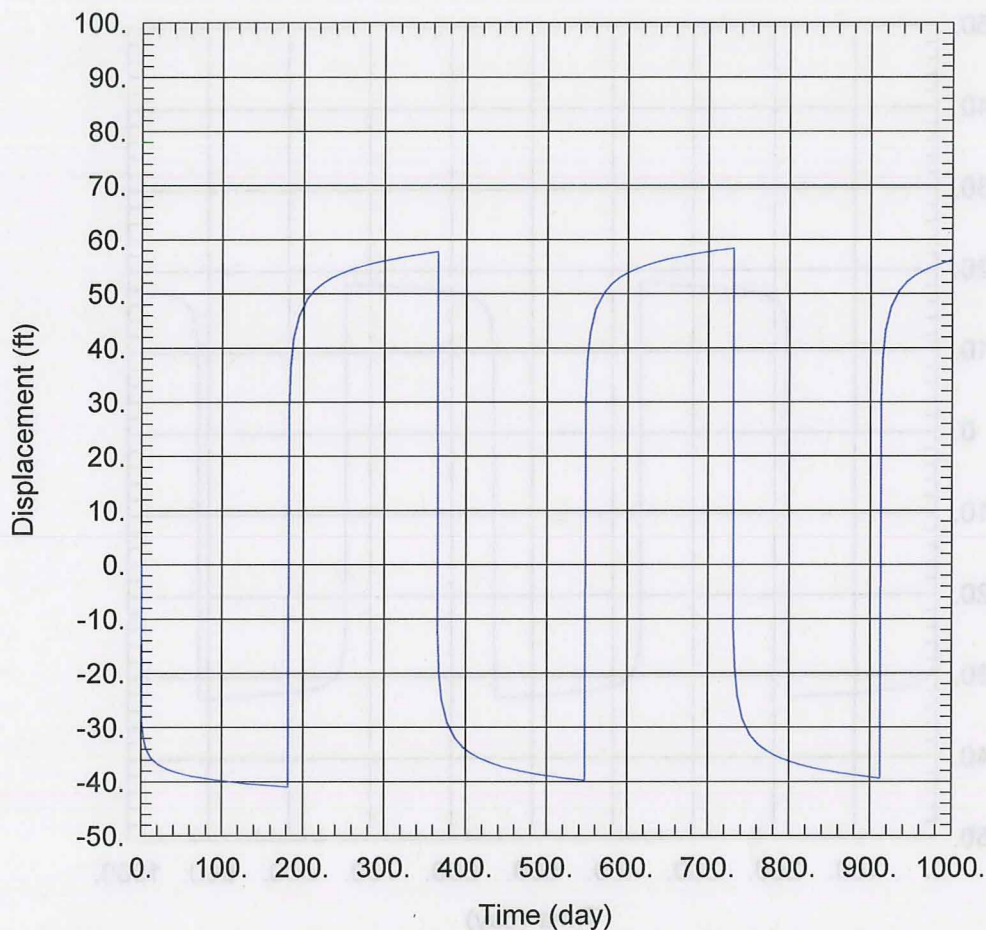
Solution Method: Neuman

T = 1537. ft²/day

S = 0.16

Sy = 0.1545

B = 1.452E-7



SC4 INCREASED RECHARGE ESTIMATE

Data Set: H:\...\SC4 Long Term P and I - Partial Penetrating - T 1537 - INCREASED R.aqt

Date: 02/26/09

Time: 10:03:04

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #3

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 484. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ SC #3	0	0

SOLUTION

Aquifer Model: Unconfined

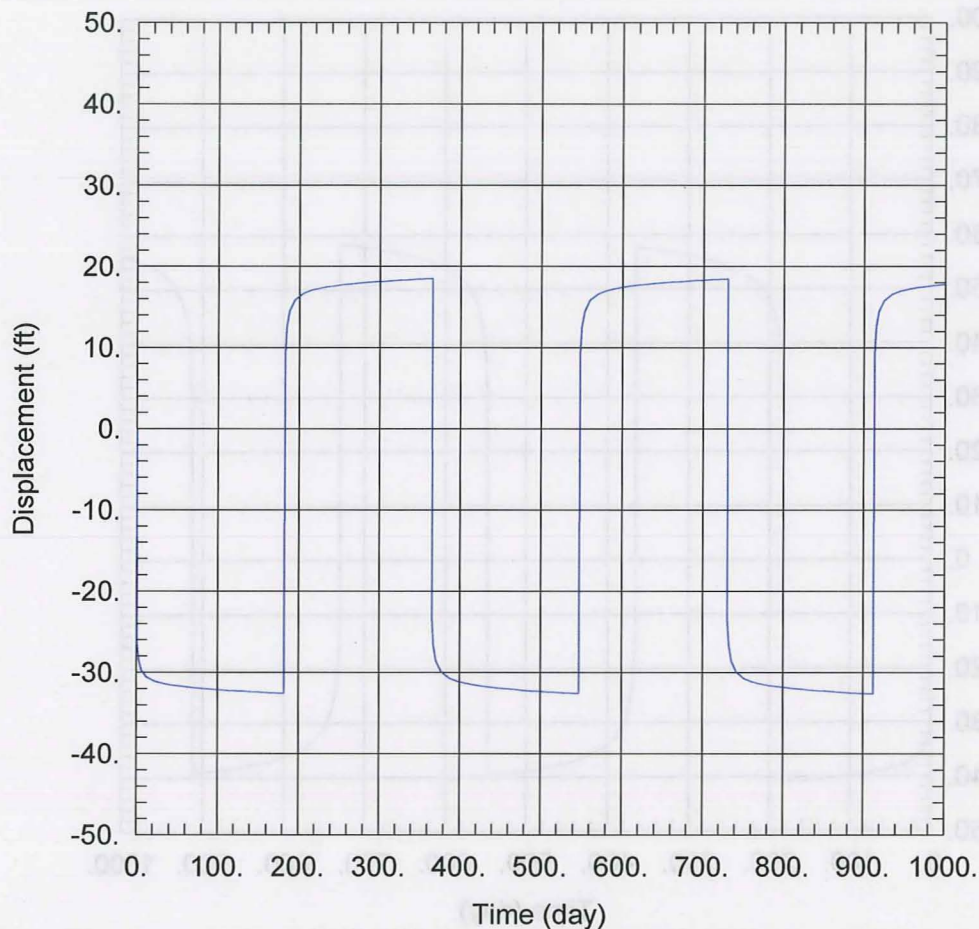
Solution Method: Neuman

T = 1537. ft²/day

S = 0.16

Sy = 0.1545

β = 1.452E-7



SC6 RECHARGE ESTIMATE

Data Set: H:\...\SC6 Long Term P and I - Partial Penetrating - T 14540.aqt

Date: 02/26/09

Time: 10:03:45

PROJECT INFORMATION

Company: WCDWR

Client: Facility Plan Updates

Project: Spanish Springs

Location: Desert Springs

Test Well: SC #6

Test Date: 01/28/09

AQUIFER DATA

Saturated Thickness: 767. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
SC #6	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ SC #6	0	0

SOLUTION

Aquifer Model: Unconfined

Solution Method: Neuman

$T = 1.37E+4 \text{ ft}^2/\text{day}$

$S = 0.16$

$Sy = 0.1545$

$\beta = 4.793E-8$

WELL DRILLER'S REPORT

PRINT OR TYPE ONLY

Please complete this form in its entirety

NOTICE OF INTENT NO. 15584

1. OWNER Springwood/ Bighorn Development ADDRESS AT WELL LOCATION Pyramid Hwy
MAILING ADDRESS 901 N Stewart St
Carson City, Nv 89701
2. LOCATION SE 1/4 SW 1/4 Sec 3 T 20 N/S R 20 E Washoe County
PERMIT NO. 52524/52588 89-150-72 Spanish Springs
Issued by Water Resources Parcel No. Subdivision Name

3. TYPE OF WORK
New Well ☒ Recondition ☐
Deepen ☐ Other ☐
4. PROPOSED USE
Domestic ☐ Irrigation ☐ Test ☐
Municipal ☒ Industrial ☐ Stock ☐
5. TYPE WELL
Cable ☐ Rotary ☒
Other ☐ Mud ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
D. G. Brown		0	17	17
Multi-colored sands w/traces brown & tan clay		17	75	58
Multi-colored sand w/ fine brown sand trace brown & tan clay		75	112	37
Multi-colored coarse sands w/trace red clay & fine sand		112	116	4
Brown clay w/some multi-colored sands		116	129	13
Course multi-colored sands some brown clay		129	170	41
Multi-colored sands w/some brown sticky clay		170	175	5
Multi-colored course sands w/ streaks brown clay		175	200	25
T. D. 200 feet				

8. WELL CONSTRUCTION

Diameter 15 inches Total depth 200 feet
Casing record 8 5/8 inch
Weight per foot 16.94 Thickness .188
Diameter From To
8 5/8 inches +1 feet 200 feet
Surface seal: Yes ☒ No ☐ Type neat cement
Depth of seal 52 feet
Gravel packed: Yes ☒ No ☐
Gravel packed from 52 feet to 200 feet
Perforations:
Type perforation screen [Roscoe Moss]
Size perforation .100
From 120 feet to 190 feet
From 120 feet to 190 feet
From 120 feet to 190 feet
From 120 feet to 190 feet
From 120 feet to 190 feet

9. WATER LEVEL

Static water level 51 feet below land surface
Flow 0 G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION

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

Name Aqua Drilling & Well Service, Inc
Contractor
Address 625 Spice Islands Dr Suite L Sparks
Contractor 89431

Nevada contractor's license number 15291
issued by the State Contractor's Board

Nevada contractor's driller's number 1132
issued by the Division of Water Resources

Nevada driller's license number issued by the 1509
Division of Water Resources, the on-site driller

Signed Roger M. Thrall
By driller performing actual drilling on site or contractor

Date Roger M. Thrall 9/21/90

7. WELL TEST DATA

Pump RPM	P.M.	Draw Down	After Hours Pump
Blew with air to clean and develop.			
Test pumped at 300 GPM for 72 hrs.			

BAILER TEST

G.P.M. Draw down feet hours
G.P.M. Draw down feet hours
G.P.M. Draw down feet hours

WELL LOG AND REPORT TO THE STATE ENGINEER OF NEVADA

PLEASE COMPLETE THIS FORM IN ITS ENTIRETY

Log No. 7343
 Rec. Aug. 22 1963
 Well No. _____
 Permit No. 21375

Do not fill in
27288

Owner E. A. Becker Driller CASCO
 Address 5017 Alta Dr., Las Vegas, Nev. Address 1790 E. Plumb Ln., Reno Lic. No. 349
 No. I
 Location of well: NE 1/4 SW 1/4 Sec. 3, T. 20N/S, R. 20E, in Washoe County
 or _____

Water will be used for Sub-Division Total depth of well 815 ft.

Size of drilled hole 26 inch Weight of casing per linear foot 42.05 lb.

Thickness of casing 0.25 inches Temp. of water 61 degrees

Diameter and length of casing 16" O.D. X 815' total length
 (Casing 12" in diameter and under give inside diameter; casing 12" in diameter give outside diameter.)

If flowing well give flow in c.f.s. or g.p.m. and pressure. _____

If nonflowing well give depth of standing water from surface 54 ft.

If flowing well describe control works. _____
 (Type and size of valve, etc.)

Date of commencement of well 5-4-63 Date of completion of well 8-25-63

Type of well rig Rotary

LOG OF FORMATIONS

From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
0	45	45	Decomposed Granite	<u>54 ft. to T.D.</u>
45	60	15	D.G./ boulders	Chief aquifer (water-bearing formation)
60	80	20	" / " & some blue clay	from _____ to _____ ft.
80	90	10	Sandy blue clay	Other aquifers _____
90	100	10	Sand, clay, rocks	
100	105	5	Sand, blue clay	
105	110	5	" " " , some boulders	
110	485	375	Sand/blue clay and gravel (thin) at intervals	
485	490	5	Very fine sand/ blue clay	
490	500	10	Blue clay	
500	665	165	Fine sand/ blue clay	
665	770	105	Blue clay/ med. sand	
770	820	50	Course sand/minor streaks of blue clay	First water at <u>54</u> feet.
820	835	15	Crse. sand, clay streaks/ Boulders	Casing perforated
835	840	5	Boulders/clay & sand-hard drilling	from <u>238.4</u> to <u>812.6</u> ft.
840	848	8	Boulders/sand-minor clay	Size of perforations
				<u>machined 1/4" X 3"</u>

[illegible]

Diam. casing	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.
I6" O.D.	G.L.	812.59	812.59	Cemented from G.L. to 50 ft. outside I6" and 26" wall of hole

Tested - 500 gpm with 140 ft. drawdown
Gravel packed- 50 ft. to T.D. with plus 1/4" minus 3/4" round

This well was drilled under my jurisdiction and the above information is true to my best information and belief.

Signed L. Hibel
Well Driller

By Max D. Pierson
Max D. Pierson
Mgr. License No. 404

Dated August 21, 1963

1953 AUG 22 AM 10 14
S. L. J. ENGINEER

36055

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

STATE OF NEVADA
DIVISION OF WATER RESOURCES

OFFICE USE ONLY
Log No. 20533
Permit No. 36059
Basin SPANISH SPRINGS

WELL DRILLERS REPORT

Please complete this form in its entirety

1. OWNER Spanish Springs Ranch ADDRESS 7255 Pyramid Rd. Reno Nev
Jim Patterson Owner
2. LOCATION $\frac{1}{4}$ Sec. 34 T. 21 N/S R. 20 E. Washoe County
PERMIT NO. 29286

3. TYPE OF WORK
New Well ☐ Recondition ☐
Deepen ☐ Re-drill ☐
4. PROPOSED USE
Domestic ☐ Irrigation ☐ Test ☐
Municipal ☒ Industrial ☐ Stock ☐
5. TYPE WELL
Cable ☐ Rotary ☒
Other ☐ Recon

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
sandy clay		6	23	
sand		23	31	
clay		31	43	
sandy clay		41	55	
clay		55	58	
sand	15	58	73	
fine gravel	7	73	77	
small boulders		77	186	
sandy clay		186	196	
sand	8	196	198	
sandy clay		198	199	
clay		199	203	
clay		203	206	
sandy clay		206	208	
coarse sand	4	208	212	
sandy clay		212	216	
coarse sand	11	216	227	
clay		227	246	
clay	7	246	253	
clay		253	259	
sandy clay		259	266	
clay		266	268	
sandy clay		268	271	
clay		271	306	

8. WELL CONSTRUCTION

Diameter hole 10 inches Total depth 306 feet
Casing record
Weight per foot 29 Thickness 250
Diameter From To
10 3/4 inches 0 feet 300 feet
inches feet feet
inches feet feet
inches feet feet
inches feet feet
inches feet feet
Surface seal: Yes ☒ No ☐ Type Cement
Depth of seal Surface 51 feet
Gravel packed: Yes ☒ No ☐ Remnant pipe 55
Gravel packed from 55 feet to 306 feet

Perforations:

Type perforation Factory run cut
Size perforation 3/8 x 25
From 58 feet to 288 feet
From 288 feet to 306 feet
From 306 feet to 306 feet
From 306 feet to 306 feet
From 306 feet to 306 feet

9. WATER LEVEL

Static water level 22 Feet below land surface
Flow G.P.M. approx 8.7
Water temperature 64 ° F. Quality Clear

10. DRILLERS CERTIFICATION

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

Name Paul Williams
Address 22 South Patterson
Nevada contractor's license number 14483
Nevada driller's license number 957
Signed Paul Williams
Date 11/26/79

Date started 11/1/79 1979
Date completed 11/23/79 1979

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump

BAILER TEST

G.P.M. Draw down feet hours
G.P.M. Draw down feet hours
G.P.M. Draw down feet hours

Page 1 of 4

WELL DRILLERS REPORT

PRINT OR TYPE ONLY

Please complete this form in its entirety

NOTICE OF INTENT NO.

1. OWNER Hawco Developers ADDRESS AT WELL LOCATION 10505 palm
sparks Ave.
 2. LOCATION SW 1/4 Sec. 20 34 21 N/S R. 20 E Washoe County
 PERMIT NO. 47793 89-150-27 spanish springs Revel.
 Issued by Water Resources Parcel No. Subdivision Name

3. TYPE OF WORK
 New Well ☒ Recondition ☐
 Deepen ☐ Other ☐
 4. PROPOSED USE
 Domestic ☐ Irrigation ☐ Test ☐
 Municipal ☒ Industrial ☐ Stock ☐ Other ☐
 5. TYPE WELL
 Cable ☐ Rotary ☒ Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
clay & sand mix		0	50	
brown clay		50	55	
coarse sandy clay layers		55	60	
coarse sand, fine gravel		60	63	
sands		63	64	
brown clay		64	65	
sands		65	70	
brown clay, sands		70	71	
sands		71	75	
brown clay & sand		75	78	
sand		78	82	
brown clay & sands		82	84	
sand		84	88	
brown clay		88	89	
sand		89	91	
sand & gravel		91	96	
brown clay		96	98	
OG		98	100	
brown clay		100	101	
sand clay		101	104	
gravel		104	106	
clay & sands		106	107	
coarse sand & fine gravel		107	127	
gravel w/ thin layers of clay		127	158	

8. WELL CONSTRUCTION

Diameter hole 3 1/4 inches Total depth 400 feet
 Casing record 26" - 12 3/4" - 10"
 Weight per foot 12 3/4" Thickness 12 3/4" 12 3/4"
 Diameter From To
26" inches 0 feet 70 feet
12 3/4" inches 0 feet 140 feet
12 3/4" inches 140 feet 260 feet
12 3/4" inches 260 feet 270 feet
10 3/4" inches 270 feet 300 feet
10 3/4" inches 300 feet 390 feet
 Surface seal: Yes ☒ No ☐ Type NEAT cement
 Depth of seal 70 feet
 Gravel packed: Yes ☒ No ☐
 Gravel packed from 0 feet to 400 feet
 Perforations:
 Type perforation 100 slot screen Factory set
 Size perforation 100 slot screen 3/32 slot
 From 12 3/4" screen 140 feet to 260 feet
 From 10 3/4" screen 300 feet to 390 feet
 From 10 3/4" screen 300 feet to 390 feet
 From 10 3/4" screen 300 feet to 390 feet

9. WATER LEVEL

Static water level 45 feet below land surface
 Flow G.P.M. P.S.I.
 Water temperature ° F. Quality unknown

10. DRILLERS CERTIFICATION

This well was drilled under my supervision and the report is true to the best of my knowledge.
 Name Paul Williams & Sons Contractor
 Address P.O. Box 8277 Truckee Calif. Contractor 95737
 Nevada contractor's license number 14483
 Nevada contractor's drillers number 957
 Nevada driller's license number 957 Actual Driller
 Signed Paul Williams Sr Contractor
 Date 7-20-88

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump
Pump test data to follow this report.			

BAILER TEST

G.P.M. Draw down feet hours
 G.P.M. Draw down feet hours
 G.P.M. Draw down feet hours

Page 2 of 4

WELL DRILLERS REPORT

Please complete this form in its entirety

PRINT OR TYPE ONLY

NOTICE OF INTENT NO. 8802

1. OWNER Hawco Developments ADDRESS AT WELL LOCATION _____
 MAILING ADDRESS 10525 palm springs dr.
sparks nev. 89431
 2. LOCATION S 16 1/4 Sec. 26 T. 21 N/S R. 20 E. Washoe County
 PERMIT NO. 47793 89-158-22 sparks springs divd.
 Issued by Water Resources Parcel No. Subdivision Name

3. TYPE OF WORK
 New Well ☒ Recondition ☐
 Deepen ☐ Other ☐
 4. PROPOSED USE
 Domestic ☐ Irrigation ☐ Test ☐
 Municipal ☒ Industrial ☐ Stock ☐
 5. TYPE WELL
 Cable ☐ Rotary ☒
 Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
Sand and gravel		158	159	
sand and clay		159	167	
Sands		167	170	
clay		170	171	
sand		171	174	
Sand & clay		174	177	
Sand & gravel		177	183	
clay & sand		183	189	
clay		189	191	
sand		191	203	
sand & gravel		203	208	
clay		208	211	
Sand & fine gravel		211	217	
clay		217	220	
clay & sand		220	233	
sand		233	239	
sandy clay		239	241	
sand & gravel		241	246	
clay		246	249	
Sand		249	252	
clay		252	253	
coarse sand		253	254	
sandy clay		254	260	
sand		260	269	
clay		269	270	
Sandy clay		270	272	
sand w/ gravel		272	285	

8. WELL CONSTRUCTION

Diameter hole _____ inches Total depth _____ feet
 Casing record _____
 Weight per foot _____ Thickness _____
 Diameter _____ inches From _____ feet To _____ feet
 _____ inches _____ feet _____ feet
 _____ inches _____ feet _____ feet
 _____ inches _____ feet _____ feet
 _____ inches _____ feet _____ feet
 _____ inches _____ feet _____ feet
 Surface seal: Yes ☐ No ☐ Type _____
 Depth of seal _____ feet
 Gravel packed: Yes ☐ No ☐
 Gravel packed from _____ feet to _____ feet
 Perforations:
 Type perforation _____
 Size perforation _____
 From _____ feet to _____ feet
 From _____ feet to _____ feet
 From _____ feet to _____ feet
 From _____ feet to _____ feet
 From _____ feet to _____ feet

9. WATER LEVEL

Static water level _____ feet below land surface
 Flow _____ G.P.M. _____ P.S.I.
 Water temperature _____ ° F. Quality _____

10. DRILLERS CERTIFICATION

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

Name _____ Contractor

Address _____ Contractor

Nevada contractor's license number _____

Nevada contractor's drillers number _____

Nevada driller's license number _____ Actual Driller

Signed _____ Contractor

Date _____

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump

BAILER TEST

G.P.M. _____ Draw down _____ feet _____ hours
 G.P.M. _____ Draw down _____ feet _____ hours
 G.P.M. _____ Draw down _____ feet _____ hours

Page 3 of 4

WELL DRILLERS REPORT

PRINT OR TYPE ONLY

Please complete this form in its entirety

NOTICE OF INTENT NO. 8802

1. OWNER Hawco Development ADDRESS AT WELL LOCATION Same
MAILING ADDRESS 10505 palm springs rd
sparks nev 89437
2. LOCATION Sec 36 T. 21 N/S R. 20 E Washoe County
PERMIT NO. 47793 89-150-27 Subdivision Name

3. TYPE OF WORK
New Well ☒ Recondition ☐
Deepen ☐ Other ☐
4. PROPOSED USE
Domestic ☐ Irrigation ☐ Test ☐
Municipal ☒ Industrial ☐ Stock ☐
5. TYPE WELL
Cable ☐ Rotary ☒
Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
Sandy clay		285	290	
clay		290	295	
Sandy clay		295	317	
sands		317	319	
clay		319	321	
sand		321	325	
clay w/ sand lens		325	329	
sand		329	330	
Sandy clay		330	331	
sand		331	334	
clay		334	335	
sand		335	337	
clay		337	340	
sand		340	342	
clay		342	355	
sand		355	357	
Sandy clay		357	360	
clay		360	361	
Sandy clay		361	363	
gleued		363	366	
sandy clay		366	372	
sand		372	375	
clay		375	379	
sand		379	380	
clay		380	382	
sandy clay		382	383	
sand		383	385	

Date started _____, 19____
Date completed _____, 19____

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump

8. BAILER TEST

G.P.M. _____ Draw down _____ feet _____ hours
G.P.M. _____ Draw down _____ feet _____ hours
G.P.M. _____ Draw down _____ feet _____ hours

8. WELL CONSTRUCTION

Diameter hole _____ inches Total depth _____ feet
Casing record _____
Weight per foot _____ Thickness _____
Diameter From To
_____ inches _____ feet _____ feet
_____ inches _____ feet _____ feet
_____ inches _____ feet _____ feet
_____ inches _____ feet _____ feet
_____ inches _____ feet _____ feet
Surface seal: Yes ☐ No ☐ Type _____
Depth of seal _____ feet
Gravel packed: Yes ☐ No ☐
Gravel packed from _____ feet to _____ feet
Perforations:
Type perforation _____
Size perforation _____
From _____ feet to _____ feet
From _____ feet to _____ feet
From _____ feet to _____ feet
From _____ feet to _____ feet
From _____ feet to _____ feet

9. WATER LEVEL

Static water level _____ feet below land surface
Flow _____ G.P.M. _____ P.S.I.
Water temperature _____ ° F. Quality _____

10. DRILLERS CERTIFICATION

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

Name _____ Contractor
Address _____ Contractor
Nevada contractor's license number _____
Nevada contractor's drillers number _____
Nevada driller's license number _____ Actual Driller

Signed _____ Contractor
Date _____

Page 4 of 4

WELL DRILLERS REPORT

OFFICE USE ONLY
Log No. 29687
Permit No.
Basin

NOTICE OF INTENT NO. 5802

1. OWNER Hawel Developers ADDRESS AT WELL LOCATION _____
MAILING ADDRESS 10505 palm springs dr. Same
sparky new
2. LOCATION S4W 1/4 S4E 1/4 Sec. 26 T 21 N/S R. 20 E Washoe County
PERMIT NO. 47793 89-150-27 Spanish Springs Development
Issued by Water Resources Parcel No. Subdivision Name

3.	TYPE OF WORK		4.	PROPOSED USE			5.	TYPE WELL	
	New Well <input checked="" type="checkbox"/>	Recondition <input type="checkbox"/>		Domestic <input type="checkbox"/>	Irrigation <input type="checkbox"/>	Test <input type="checkbox"/>		Cable <input type="checkbox"/>	Rotary <input type="checkbox"/>
	Deepen <input type="checkbox"/>	Other <input type="checkbox"/>		Municipal <input checked="" type="checkbox"/>	Industrial <input type="checkbox"/>	Stock <input type="checkbox"/>		Other <input type="checkbox"/>	

[illegible]

8. WELL CONSTRUCTION

Diameter hole.....inches Total depth.....feet

Casing record.....

Weight per foot..... Thickness.....

Diameter	From	To
.....inches	.....feet	.....feet
.....inches	.....feet	.....feet
.....inches	.....feet	.....feet
.....inches	.....feet	.....feet
.....inches	.....feet	.....feet
.....inches	.....feet	.....feet

Surface seal: Yes ☐ No ☐ Type.....

Depth of seal.....feet

Gravel packed: Yes ☐ No ☐

Gravel packed from.....feet to.....feet

Perforations:

Type perforation.....

Size perforation.....

From.....	feet to.....	feet
From.....	feet to.....	feet
From.....	feet to.....	feet
From.....	feet to.....	feet
From.....	feet to.....	feet

9. **WATER LEVEL**

Static water levelfeet below land surface

Flow.....G.P.M.....P.S.I.

Water temperature.....° F. Quality.....

Date started....., 19.....
Date completed....., 19.....

WELL TEST DATA			
Pump RPM	G.P.M.	Draw Down	After Hours Pump

BAILER TEST			
G.P.M.....	Draw down.....	feet	hours
G.P.M.....	Draw down.....	feet	hours
G.P.M.....	Draw down.....	feet	hours

10. **DRILLERS CERTIFICATION**

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

Name.....
Contractor

Address.....
Contractor

Nevada contractor's license number.....

Nevada contractor's drillers number.....

Nevada driller's license number.....
Actual Driller

Signed.....
Contractor

Date.....

WHITE-DIVISION OF WATER RESOURCES
CANARY-CLIENT'S COPY
PINK-WELL DRILLER'S COPY

STATE OF NEVADA
DIVISION OF WATER RESOURCES

OFFICE USE ONLY
Log No. 30706
Permit No. 51476
Basin 6-85 Spanish Springs

Washoe Co. - well 'A'

WELL DRILLER'S REPORT

Please complete this form in its entirety

NOTICE OF INTENT NO. 9801

PRINT OR TYPE ONLY

1. OWNER Golden West / Sunset Assoc. ADDRESS AT WELL LOCATION OLD SPANISH SPRINGS RD.
MAILING ADDRESS 255 Glenlake Ave. Suite 15
SPARKS, NV 89431
2. LOCATION S. 1/4 Sec. 35 T. 21 N. 30 R. 20 E. WASHOE County
PERMIT NO. 51476 Issued by Water Resources Parcel No. Subdivision Name

3. TYPE OF WORK
New Well ☒ Recondition ☐
Deepen ☐ Other ☐
4. PROPOSED USE
Domestic ☐ Irrigation ☐ Test ☐
Municipal ☒ Industrial ☐ Stock ☐
5. TYPE WELL
Cable ☐ Rotary ☒
Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
compact fill		0	3	3
Brown clay		3	12	9
Brown clay reddish				
Brown yellow & white				
volcanic sand		12	70	58
Brown clay with streaks of sand		70	110	40
yellow brown reddish				
Brown green & white				
volcanic sands & gravel		110	215	105
volcanic sand with brown clay layers		215	230	15

8. WELL CONSTRUCTION

Diameter 22 inches Total depth 230 feet
Casing record 14"
Weight per foot 1250 Thickness 250
Diameter From To
14 inches 1 feet 230 feet
Surface seal: Yes ☒ No ☐ Type CEMENT
Depth of seal 100 feet
Gravel packed: Yes ☒ No ☐
Gravel packed from 100 feet to 230 feet

Perforations:

Type perforation 100 slot well screen
Size perforation
From 120 feet to 220 feet
From 120 feet to 220 feet
From 120 feet to 220 feet
From 120 feet to 220 feet

9. WATER LEVEL

Static water level 20 feet below land surface
Flow 0 G.P.M. 0 P.S.I.
Water temperature 60.1 °F Quality UNKNOWN

10. DRILLER'S CERTIFICATION

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

Name OASIS DRILLING INC. Contractor
Address P.O. Box 21421 Carson City NV 89701 Contractor

Nevada contractor's license number issued by the State Contractor's Board 0023129

Nevada contractor's driller's number issued by the Division of Water Resources

Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1386

Signed T. L. Bue By driller performing actual drilling on site or contractor

Date Dec 6, 1988

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump
<u>425</u>	<u>70</u>	<u>88</u>	<u>12</u>
<u>51</u>	<u>6.6</u>	<u>72</u>	

BAILER TEST

G.P.M. 10 Draw down 10 feet 10 hours
G.P.M. 10 Draw down 10 feet 10 hours
G.P.M. 10 Draw down 10 feet 10 hours

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety

OFFICE USE ONLY

Log No. 30707

Permit No. 51477

Basin 6-85 Spanish Springs

PRINT OR TYPE ONLY

NOTICE OF INTENT NO. 9800

1. OWNER Golden West / Sunset Assoc.

ADDRESS AT WELL LOCATION

MAILING ADDRESS 255 1/2-mile Ave. Suite 15

Pyramid Lake Highway

SPRINGS NEV 89431

Parcel 1 of map # 1747

2. LOCATION SE 1/4 SW 1/4 Sec 35 T. 21

N 1/4 R. 20 E. WASHOE

County

PERMIT NO. 51477

Issued by Water Resources

Parcel No.

Subdivision Name

3. TYPE OF WORK

New Well ☒ Recondition ☐
Deepen ☐ Other ☐

4.

PROPOSED USE

Domestic ☐
Municipal ☒

Irrigation ☐
Industrial ☐

Test ☐
Stock ☐

5. TYPE WELL

Cable ☐ Rotary ☒
Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Brown clay stringers with brown yellow				
Reddish brown green and white volcanic sands (clay 2-3 sections)		235	235	
Volcanic sand		235	256	
Green clay with traces of volcanic sand		256	305	
Green clay		305	330	

8. WELL CONSTRUCTION

Diameter 22 inches Total depth 330 feet

Casing record 14"

Weight per foot Thickness 1250

Diameter	From	To
14 inches	1	330
inches	feet	feet
inches	feet	feet
inches	feet	feet
inches	feet	feet
inches	feet	feet

Surface seal: Yes ☒ No ☐ Type CEMENT

Depth of seal 50 feet

Gravel packed: Yes ☒ No ☐

Gravel packed from 50 feet to 330 feet

Perforations:

Type perforation 100 slot well screen

Size perforation 150

From 150 feet to 320 feet

From feet to feet

From feet to feet

From feet to feet

From feet to feet

9. WATER LEVEL

Static water level 20 feet below land surface

Flow G.P.M. P.S.I.

Water temperature 60.1 °F Quality UNKNOWN

10. DRILLER'S CERTIFICATION

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

Name WASH DRILLING INC.

Address P.O. Box 21421 CHASER CITY NEV 89421

Nevada contractor's license number issued by the State Contractor's Board 0023129

Nevada contractor's driller's number issued by the Division of Water Resources

Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1386

Signed T. L. Anzola

By driller performing actual drilling on site or contractor

Date DEC 6 - 1985

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump
250			12
86		10	72

BAILER TEST

G.P.M. 10412 Draw down feet hours

G.P.M. Draw down feet hours

G.P.M. Draw down feet hours

CONVERTED TO
MONITORING WELL.
OUTSIDE OF SC #4
COMPOUND.

ICES SCH Spring Creek East Well-7
STATE OF NEVADA COUNTRYSIDE
DIVISION OF WATER RESOURCES
WELL DRILLERS REPORT
Please complete this form in its entirety

NORTH WELL
OFFICE USE ONLY
Log No. 20736
Permit No. 26776
Basin

h Corp. ADDRESS 1058 Bradley
Sparks Nev.

2. LOCATION 11N 1/4 NN 1/4 Sec. 6 T. 20 N/S R. 21 E Washoe County
PERMIT NO. 26776

3. TYPE OF WORK
New Well ☒ Recondition ☐
Deepen ☐ Other ☐
4. PROPOSED USE
Domestic ☐ Irrigation ☒ Test ☐
Municipal ☐ Industrial ☐ Stock ☐
5. TYPE WELL
Cable ☐ Rotary ☒
Other ☐

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thick-ness
sand (sandy?)		0	47	✓
gravel		47	49	✓
sandy clay		49	101	✓
clay		101	115	✓
sand		115	127	✓
clay		127	190	✓
sand		190	198	✓
sandy clay		198	345	✓
sand (Coarse)	350	345	366	✓
clay		366	383	✓
sand		383	386	✓
sandy clay		386	410	✓
fine gravel	412	410	418	✓
sand		418	422	✓
clay		422	449	✓
gravel		449	452	✓
clay		452	497	✓
sand		497	549	✓
fractured Rock	555	549	561	✓
Hard Rock		561	600	✓

8. WELL CONSTRUCTION

Diameter hole 14 inches Total depth 600 feet
Casing record
Weight per foot 46 Thickness 1250
Diameter From To
14 inches 0 feet 572 feet
Surface seal: Yes ☒ No ☐ Type Cement
Depth of seal 53 feet
Gravel packed: Yes ☒ No ☐
Gravel packed from 53 feet to 572 feet
Perforations:
Type perforation factory sawed
Size perforation 176 feet to 572 feet
From 176 feet to 572 feet
From 176 feet to 572 feet
From 176 feet to 572 feet
From 176 feet to 572 feet

9. WATER LEVEL

Static water level 56 Feet below land surface
Flow G.P.M. 500 to 600
Water temperature 59 F. Quality clear

Date started 1-12 1980
Date completed 1-29 1980

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump

BAILER TEST

G.P.M. Draw down feet hours
G.P.M. Draw down feet hours
G.P.M. Draw down feet hours

10. DRILLERS CERTIFICATION

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

Name Paul Williams
Address 22 South Patterson
Sparks
Nevada contractor's license number 14483
Nevada driller's license number 957
Signed Paul Williams
Date 2/2/80

