

# Water Availability Analysis

## APN 025-380-017

Three Twins Vineyards  
704 Greenfield Rd  
St. Helena, California 94558

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Three Twins

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December 3, 2018

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## Introduction

Three Twins is seeking to plant an additional 2.5 gross acres of vineyard at the Three Twins Ranch located at 704 Greenfield Road (APN 025-380-017, 23 acres +/-) which is located near the northeast shore of Lake Hennessey (Figure 1). Existing vineyard acreage is 4.76 (+/-) acres. Irrigation of existing and proposed vineyards uses groundwater from an existing on-site well. This Water Availability Analysis (WAA) was developed based on the guidance provided in the Napa County Department of Planning, Building, & Environmental Services' Water Availability Analysis Guidance Document formally adopted by the Napa County Board of Supervisors in May 2015.

The WAA includes the following elements: estimates of existing and proposed water uses within the project recharge area, compilation of drillers' logs from the area and characterization of local hydrogeologic conditions, and performance of analyses to estimate groundwater recharge relative to proposed uses (Tier 1 of the WAA) and a screening analysis of the potential for well interference at neighboring wells located within 500-ft of the project wells (Tier 2 of the WAA).

## Limitations

Groundwater systems of Napa County and the Coast Range are typically complex, and available data rarely allows for more than general assessment of groundwater conditions and delineation of aquifers. Hydrogeologic interpretations are based on the drillers' reports made available to us through the California Department of Water Resources, available geologic maps and hydrogeologic studies, and professional judgment. This analysis is based on limited available data and relies significantly on interpretation of data from disparate sources of disparate quality.

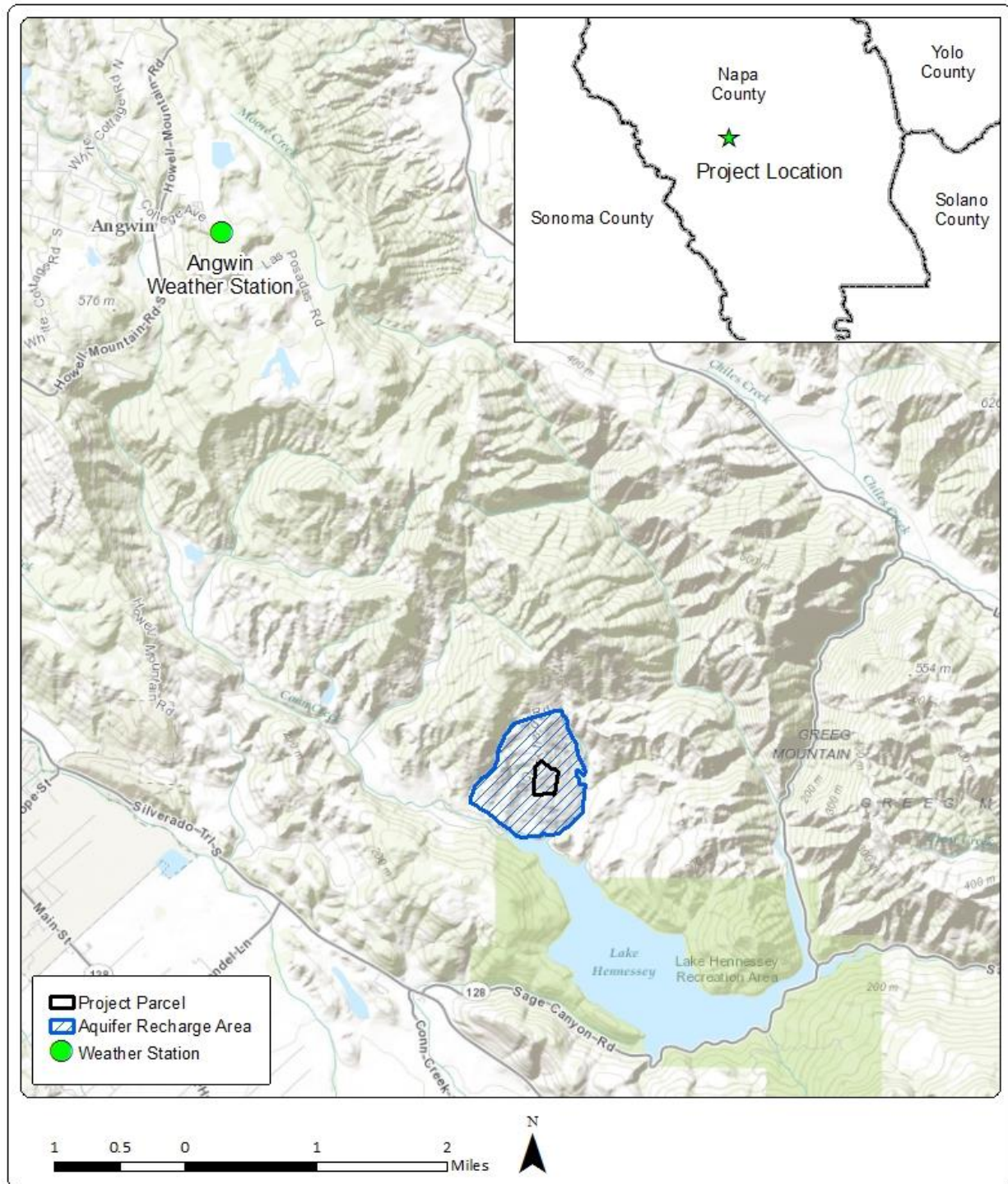


Figure 1: Project location map.

## Hydrogeologic Conditions

The project parcel is set in the mountains east of the Napa Valley. The local bedrock is volcanic sand and gravel of the Tertiary aged Sonoma Volcanics Formation (Figure 2; map unit Tss). The Tss unit is part of a one-square mile block bounded on its north edge by a fault contact with the Rhyolite Flows of the Sonoma Volcanics (map unit Tsr) and to the east and west by parallel northwest to southeast trending faults which run about 5 miles to the northwest beginning near Lake Hennessey (Figure 2). All faults are approximately located. An eight-acre area capping a subtle ridgeline within the Tss block is mapped as the Pumiceous Ash Flow Tuff (map unit Tst) and is in the western third of the project parcel. To the east of the project area is a contact between the Tss and a large block of the metagraywacke of the Cretaceous-age Franciscan Complex (map unit Kfm).

Wells 1 - 3 and 6 - 8 have been located within the ridgetop Tst. Based on map interpretation the Tst unit has a maximum thickness of 240 ft. All wells penetrating the Tst unit are 350 ft or deeper and are assumed to penetrate the Tss. The Tss unit is intersected by both wells on the project parcel (Well 1 and Well 2, Figures 2 and 3) and is assumed to be the primary project aquifer. It is described as “crossbedded, coarse-grained volcanic sandstone, and cobble conglomerate with well-rounded to angular andesite and basalt clasts. [It] also includes tuffaceous silt, bedded tuff, clay and diatomite” (Graymer et al., 2007). Wells drilled in the Sonoma Volcanics typically yield between 16 gpm to less than 50 gpm, however, of the subunits within the Sonoma Volcanics the Tss has a slightly higher well yield potential than the tuffs (Tst) (LSCE, 2013).

The Tsr unit primarily consists of rhyolite lava flows with intercalated rhyolite tuff in places (Graymer et al., 2007). This unit has a very low primary porosity and groundwater occurs primarily in fractures resulting in great variability in production in wells intersecting this unit. Due to this and the presence of the fault contact between the Tss and Tsr, the units are not considered to be hydrologically connected and the project aquifer and associated recharge area (Figure 2) do not include the Tsr unit.

The Kfm unit is described as gray, foliated, jadeite-bearing metagraywacke with brown weathering (Graymer et al., 2007). Primary porosity in the Kfm and other rocks of the Franciscan Complex is very low and groundwater occurs primarily in fractures. Similar to the Tsr unit, well yields are variable depending on the degree of fracturing however yields are generally quite low and on the order of a few gallons per minute; dry test holes are also common within these rocks (LCSE, 2013). Kfm and Tss are considered hydrologically separate, therefore the contact between Kfm and Tss is defined as the eastern project recharge area boundary (Figure 2).

Driller's logs (Well Completion Reports) for wells on and around the project parcel were obtained from the California Department of Water Resources. A subset of these logs for wells that could be located with reasonable accuracy was compiled and georeferenced based on parcel and location sketch information (Figure 2). Appendix A contains copies of these well logs.



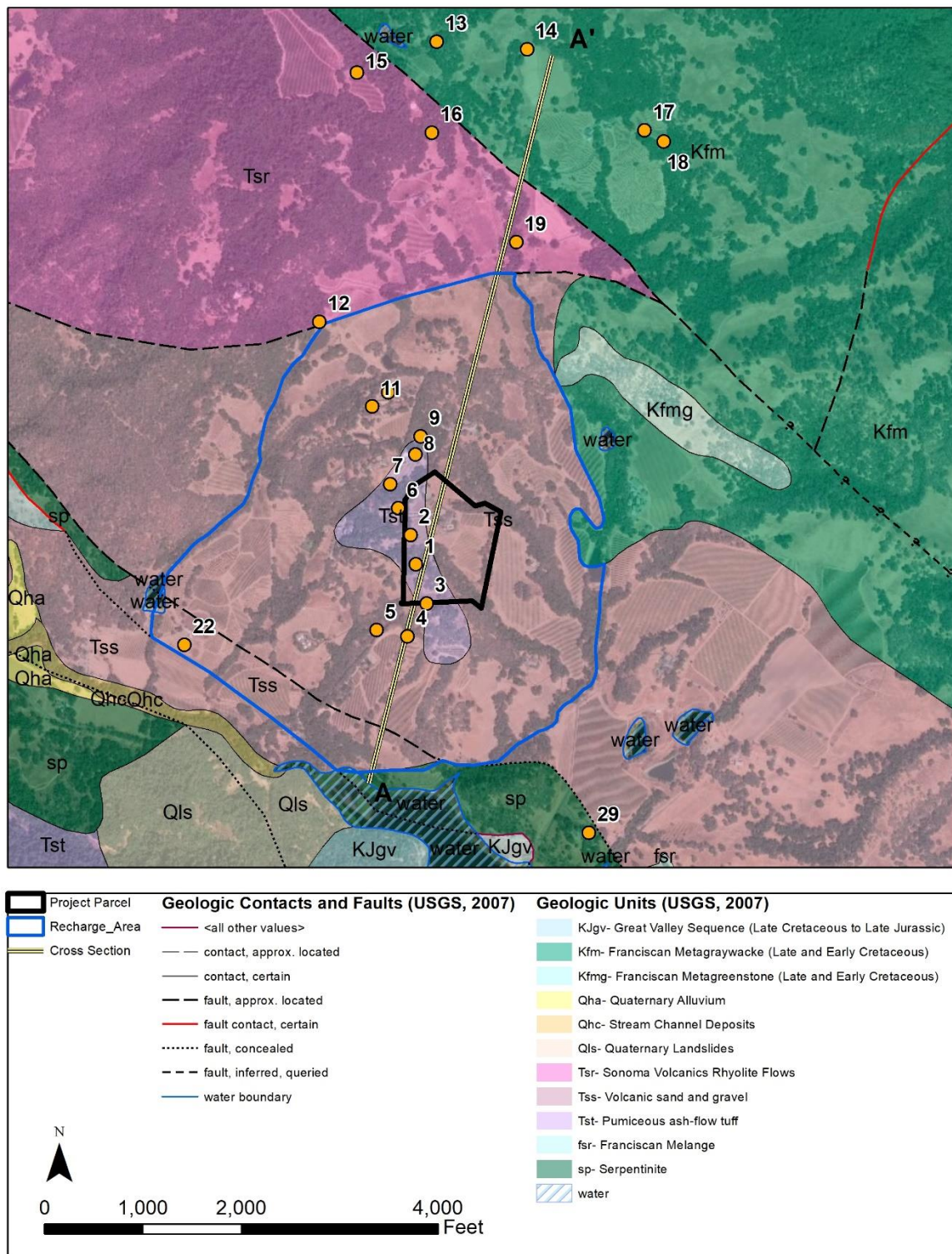


Figure 2: Surficial geology and locations of wells in the vicinity of the project parcel (Graymer et al., 2007).

There are two wells located on the project parcel. The project well, Well 1, serves as the source for irrigation and is in the southeastern quadrant of the project parcel (Figure 2). The older of the two wells, Well 2, serves the residence and is located immediately south of the driveway at the western edge of the parcel.

Well 1 was completed in 2016 to a depth of 510 feet. At the time of completion, this well had a static water level of 130 feet and an estimated yield of 120 gpm. Based on a 4-hour air lift pump test at estimated pumping rate of 120 gpm with 170 feet of drawdown, Well 1 has an estimated specific capacity of 0.71 gpm/ft of drawdown. The geologic log on the available Well Completion Report (Appendix A) indicates upper layers of clay and changing with increasing depth to river gravel, then shale and shale clay down to 225 ft where volcanic gravel and more consolidated volcanic rocks were logged down to 500 ft. Shale was encountered at a depth of 500 feet.

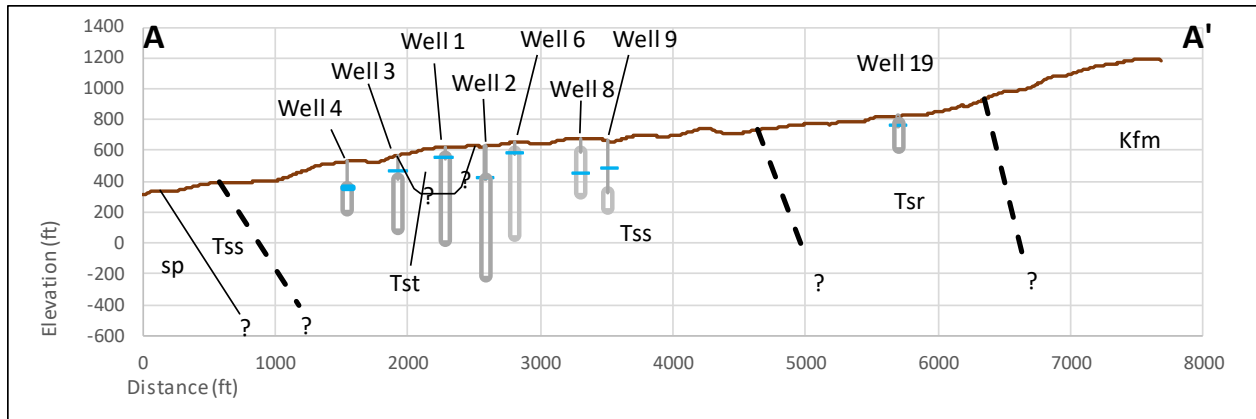
Well 2 is located approximately 350 ft to the northwest of Well 1. A well completion report is not available for Well 2, but a well inspection and pump test conducted on September 16, 2015 by Ray's Well Testing Service provides some details about its construction and performance. The 2015 report states that the depth probe reached a depth of 272 feet before hitting an obstruction; the observed static water level was 243 ft. Based on a 5-hour pump test at 12.9 gpm with 2 feet of drawdown, Well 2 has an estimated specific capacity ( $S_c$ ) of 6.45 gpm/ft drawdown.

The wells in the surrounding area have depths ranging from 198 to 840 feet and static water levels vary widely from 25 to 230 feet (Table 1, Figures 2 and 3). Pump test information obtained at the time of development was available for several of these wells and indicate a wide variety of specific capacities from 0.004 to 0.53 gpm/ft of drawdown. The driller's reports include a wide variety of rock descriptions, but the most common are brown clay, gray clay, gray sand and gravel, sandy clay and gravels with occasional mention of boulders. These descriptions are consistent with the volcanic sedimentary deposits described by Graymer et al. (2007).

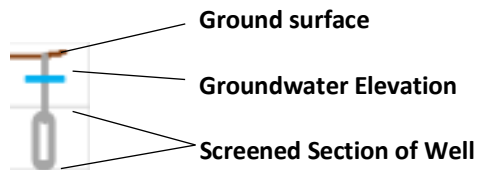
Some of these neighboring wells are located near the project wells. Well 6 on an adjacent parcel (APN 025-380-008) is located approximately 260 feet west-northwest of Well 2 and 660 ft from Well 1. Well 3, located on the parcel to the south (APN 025-380-012) is 376 ft from Well 1 and 419 ft away from project Well 2. All other neighboring wells are located more than 500 feet away from either of the two project wells.

**Table 1: Well completion details for the project well and wells on nearby parcels.**

Well ID	1	2	3	4	5	6	7	8	9	10	12	14	19	29
Year Completed	2016	Unk.	2006	Unk.	1981	2010	2003	1978	1986	1990	1998	1995	1993	1996
Depth (ft)	510	272	470	318	265	600	840	350	440	340	325	350	198	200
Static Water Level (ft)	130	243	105	174	40	70	205	230	175	80	70	21	61	25
Top of Screen (ft)	210	Unk.	155	Unk.	45	60	218	90	340	60	125	50	52	40
Bottom of Screen (ft)	510	Unk.	470	Unk.	220	600	798	350	440	250	325	350	198	200
Pumping Rate (gpm)	120	12.9	100	20	10	20	20	10	1	1	1	50	2	50
Drawdown (ft)	170	2	Unk.	201	110	590	Unk.	Unk.	440	240	325	Unk.	195	120
Test Length (hrs)	4	5	5	1.66	Unk.	15	1	Unk.	1	3	4	3	2	4
Specific Capacity (gpm/ft)	0.76	6.45	Unk.	0.74	0.14	0.04	Unk.	Unk.	0.004	0.01	0.004	Unk.	0.01	0.53
Map Unit	Tst	Tst	Tst	Tss	Tss	Tst	Tst	Tst	Tss	Tss	Tsr	Kfm	Tsr	sp



### Well



Geologic Contact (Uncertain where queried) ———

Fault approximately located (Uncertain where queried) - - - -

Figure 3: Hydrogeologic cross section A-A' through the vicinity of the project parcel (see Figure 2 for location).

## Water Demand

### Existing Use

Existing condition water use in the project recharge area consists of residential use, irrigation use for vineyards, and winery use. Existing uses were determined using satellite photo interpretation to determine the number and size of residences and publicly available vineyard and winery data from the County of Napa to determine vineyard acreage and winery production. Annual rates for the various uses have been estimated primarily based on Napa County's Water Availability Analysis Guidance Document, dated May 2015 (Napa County, 2015). Within the project recharge area, the existing residential use is estimated to total 24.98 acre-ft/yr, the existing irrigation use is estimated to total 51.45 acre-ft/yr, and the existing winery use including duties for employees and guests is estimated to total 0.40 acre-ft/yr. The total estimated existing use is 76.82 acre-ft/yr (Tables 2 through 7). Approximately 6.9 acre-ft/yr or 8.9% of the existing water use occurs on the project parcel. The project parcel is approximately 23 acres which represents 6.2% of the approximately 370-acre project recharge area.

Within the project recharge area, there are seven oversized main residences, fifteen main residences, six secondary residences, and nine uncovered pools. Many of these residences contain more than 1,000 ft<sup>2</sup> of lawn. In total there is an estimated 28,200 ft<sup>2</sup> of lawns above and beyond the 1,000 ft<sup>2</sup> per residence assumed by the residential water uses. The project parcel contains one main residence, one secondary residence, an uncovered pool, and approximately



6,900 ft<sup>2</sup> of lawn. The project parcel also contains approximately 18,000 ft<sup>2</sup> of drought-tolerant landscaping. Because 1,000 ft<sup>2</sup> of the parcel's lawn has already been excluded from the residential water use calculations, all 18,000 ft<sup>2</sup> of drought tolerant landscaping are included in the residential water use calculations.

There are several vineyards within the project recharge area. Based on publicly available vineyard data from the County of Napa, there are approximately 99.29 acres of vines within the project recharge area. Of this, 4.76 acres are located on the project parcel.

A winery, the MJA Winery (APN 025-3800-021), is also located within the project recharge area. Based on publicly available winery data from the County of Napa, this winery has an annual production of 15,000 gallons and has three full-time employees. The winery also hosts tastings for up to 3,900 guests per year and hosts marketing events for up to 420 guests per year. There are no other publicly registered wineries within the project recharge area.

**Table 2: Existing and proposed groundwater uses within the project recharge area.**

	<b>Residential Use (acre-ft/yr)</b>	<b>Irrigation Use (acre-ft/yr)</b>	<b>Winery Use (acre-ft/yr)</b>	<b>Total Use (acre-ft/yr)</b>
<b>Existing Use</b>	24.98	51.45	0.40	<b>76.82</b>
<b>Proposed Use</b>	24.98	52.30	0.40	<b>77.67</b>

**Table 3: Calculation of estimated existing and proposed residential use within the project recharge area.**

<b>Use Category</b>	<b># of Units</b>	<b>Use per Unit (ac-ft/yr)</b>	<b>Use per 1,000 square feet above first 1,000 (ac-ft/yr)</b>	<b>Annual Water Use (ac-ft/yr)</b>
Oversized Main Residence	7	1.00		7.00
Main Residence	15	0.75		11.25
Secondary Residences	6	0.35		2.10
Pools	9	0.10		0.90
Lawns (ft <sup>2</sup> )	28,200		0.10	2.82
Drought-Tollerant Landscaping (ft <sup>2</sup> )	18,172		0.05	0.91
<b>TOTAL</b>				<b>24.98</b>

**Table 4: Calculation of estimated existing irrigation use within the project recharge area.**

Use Category	Number of Acres	Use per Acre (ac-ft/yr)	Annual Water Use (ac-ft/yr)
Vineyard Irrigation	99.29	0.50	49.65
Orchard Irrigation	0.45	4.00	1.80
<b>TOTAL</b>			<b>51.45</b>

**Table 5: Calculation of estimated existing and proposed winery use within the project recharge area.**

Use Category	Annual Production (gal/yr)	Use per 100,000 gal of production	Annual Water Use (ac-ft/yr)
Winery Process Use	15,000	2.15	0.32
Winery Domestic Use	15,000	0.50	0.08
Winery Employee Use (see Table 6)			0.04
Winery Guest Use (see Table 7)			0.06
<b>TOTAL</b>			<b>0.40</b>

**Table 6: Calculations of estimated existing and proposed employee use within the project recharge area.**

Work Category	# of Employees	# Work Days per Year	Use per Employee (gal/day)	Annual Water Use (ac-ft/yr)
Full-time	3	260	15	0.036
<b>TOTAL</b>				<b>0.036</b>

**Table 7: Calculations of estimated existing and proposed guest use within the project recharge area.**

Visitor Category	Annual # of Visitors	Use per Visitor (gallons)	Annual Water Use (acre-ft/day)
Tasting/Tours	3,900	3	0.036
Marketing Events	420	15	0.019
<b>TOTAL</b>			<b>0.055</b>

## Proposed Use

In the proposed condition, an additional 1.7 acres (2.5 acres gross) of grape vines will be added on the project parcel, increasing the vineyard area on the project parcel to 6.46 acres and vineyard area within the project recharge area to 101 acres. On-site residential water use is unchanged and no winery is proposed for the project parcel.

On the project parcel, the proposed vineyard expansion will increase the irrigation demand from 4.18 acre-ft/yr to 5.03 acre-ft/yr (Table 8). Within the project recharge area, the proposed vineyard expansion will increase the irrigation water use from 51.45 acre-ft/yr to 52.3 acre-ft/yr (Table 9) and will increase the total water use from 76.82 acre-ft/yr to 77.67 acre-ft/yr (Table 2). Approximately 7.72 acre-ft/yr or 9.9% of the proposed water use occurs on the project parcel which represents 6.2% of the recharge area.

**Table 8: Calculation of estimated proposed irrigation use on the project parcel.**

Use Category	Number of Acres	Use per Acre (ac-ft/yr)	Annual Water Use (ac-ft/yr)
Vineyard Irrigation	6.46	0.50	3.23
Orchard Irrigation	0.45	4.00	1.80
<b>TOTAL</b>			<b>5.03</b>

**Table 9: Calculation of estimated proposed irrigation use within the project recharge area.**

Use Category	Number of Acres	Use per Acre (ac-ft/yr)	Annual Water Use (ac-ft/yr)
Vineyard Irrigation	101.0	0.50	50.50
Orchard Irrigation	0.45	4.00	1.80
<b>TOTAL</b>			<b>52.30</b>

## Groundwater Recharge Analysis

The Soil Water Balance (SWB) model developed by the U.S. Geological Survey (Westenbroek et al., 2010) was used to produce a spatially distributed estimate of annual recharge in the vicinity of the project parcel defined by the project recharge area. This model operates on a daily timestep and calculates runoff based on the Natural Resources Conservation Service (NRCS)

curve number approach and Actual Evapotranspiration (AET) and recharge based on a modified Thornthwaite-Mather soil-water-balance approach (Westenbroek et al., 2010).

This approach simulates potential recharge from infiltration of precipitation and does not account for the capacity of the project aquifer materials to accept recharge. As discussed above under Limitations, groundwater occurring at significant depths may not be directly related to the recharge generated on the overlying landscape. Significant additional recharge may occur through streambed infiltration, and/or groundwater inflows from outside the defined project recharge area, however quantifying these recharge components is beyond the scope of this analysis.

Estimated recharge rate for the project parcel is reported as an area-weighted proportion of estimated recharge rate for the approximately 370-acre project recharge area. Although it is possible to calculate the model estimate of recharge specifically on the project parcel, the differences in recharge rate estimates should not be considered accurate at the parcel scale. The factors controlling spatial variation in the rate of groundwater infiltration to the underlying geologic materials comprising the aquifer are not known with certainty; therefore, we consider the estimated groundwater recharge rate to be valid only as a spatial average for the project recharge area.

## Model Development

The eastern boundary of the project aquifer recharge area was defined by the locations of the contact between Tss and Kfm and along a tributary to Lake Hennessey. The northern boundary was defined by the fault contact between Tss and Tsr, the western boundary was defined by an unnamed tributary to Conn Creek, and the southern boundary was defined by a fault mapped along the main stem of Conn Creek (Figures 2 and 3). This area is underlain by the Tss units of the Sonoma Volcanics Formation with a small area mapped as Tst and is approximately 370 acres in size.

The model was developed using a 10-meter resolution rectangular grid and water budget calculations were made on a daily time step. Key spatial inputs included a flow direction map developed from the USGS 10-meter resolution Digital Elevation Model (DEM), a land cover dataset developed from the National Land Cover Dataset and modified based on the Napa County shapefile of agricultural areas and interpretation of 2016 aerial photography (Figure 4), a distribution of Hydrologic Soil Groups (A through D classification from lowest to highest runoff potential; Figure 5), and Available Water Capacity (AWC) developed from the NRCS Soil Survey Geographic Database (SSURGO).

A series of model parameters were assigned for each land cover type/soil group combination including a curve number, dormant and growing season interception storage values, and a rooting depth (Table 10). Curve numbers were assigned based on standard NRCS methods. Interception storage values and rooting depths were assigned based on literature values and previous modeling experience. Infiltration rates for hydrologic soil groups A through D were applied based on Cronshey et al. (1986) (Table 11) along with default soil-moisture-retention relationships based on Thornthwaite and Mather (1957) (Figure 6).

Daily precipitation and daily minimum and maximum air temperature data were compiled for the Angwin weather station which is located approximately 4.8 miles northwest of the project parcel (Figure 7). This station was selected because it represents the best available climate station in proximity to the project site with a long and continuous period of record. Based on the PRISM dataset which describes the spatial variations in long-term precipitation for the continental U.S., the 1980 to 2010 mean annual precipitation at the Angwin weather station location was 42.5 inches versus 35.7 inches for the project recharge area (PRISM, 2010). The precipitation data was scaled down by a factor of 0.84 to account for the difference in precipitation between the station location and the project recharge area. Water Year 2010 was selected to represent average water year conditions for the analysis because it represents a recent year with near long-term average precipitation conditions (37.3 inches at the scaled Angwin weather station). The model was also evaluated for water year 2014 to represent drought conditions. Water year 2014 precipitation was 21 inches or approximately 56% of long-term average conditions.



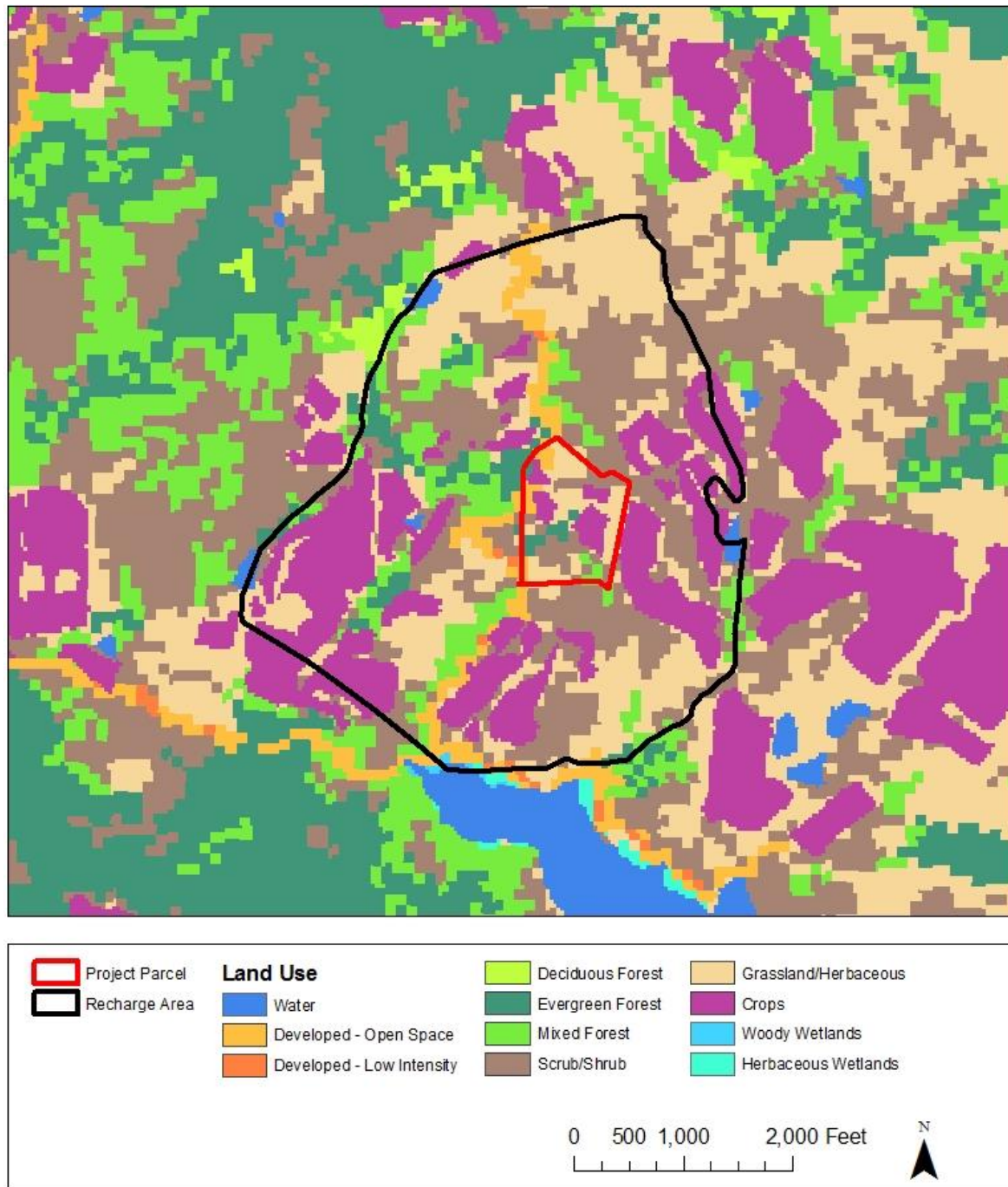


Figure 4: Land cover map used in the SWB model.



Figure 5: Soil map used in the SWB model.

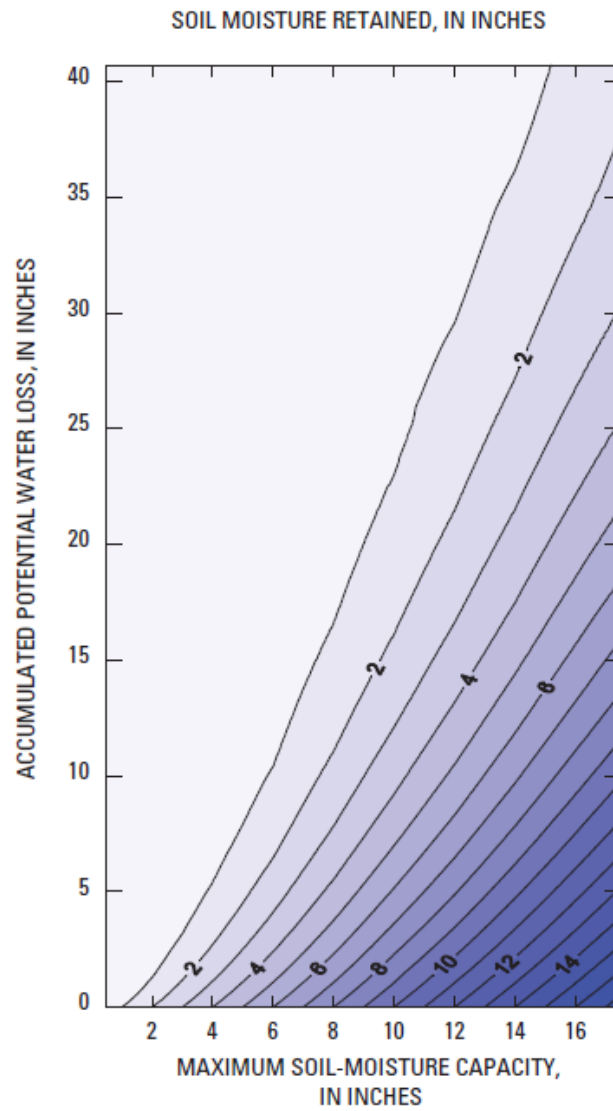


Figure 6: Soil-moisture-retention table (Thorntwaite and Mather, 1957).

Table 10: Soil and land cover properties used in the SWB model.

Land Cover	Curve Number	Interception Storage Values		Rooting Depths (ft)
		Growing Season	Dormant Season	
water developed open space developed - low intensity developed - high intensity evergreen forest mixed forest shrub/scrub grassland/herbaceous woody wetlands herbaceous wetland vineyard	C Soils			C Soils
	100	0.000	0.000	0.00
	82	0.010	0.005	2.00
	82	0.010	0.005	2.00
	90	0.005	0.002	2.00
	70	0.050	0.050	4.00
	70	0.050	0.035	4.50
	65	0.080	0.015	2.70
	71	0.005	0.004	1.00
	90	0.050	0.035	4.50
	91	0.000	0.000	1.00
	75	0.080	0.015	2.00

Table 11: Infiltration rates for NRCS hydrologic soil groups (Cronshey et al., 1986).

Soil Group	Infiltration Rate (in/hr)
A	> 0.3
B	0.15 - 0.3
C	0.05 - 0.15
D	<0.05

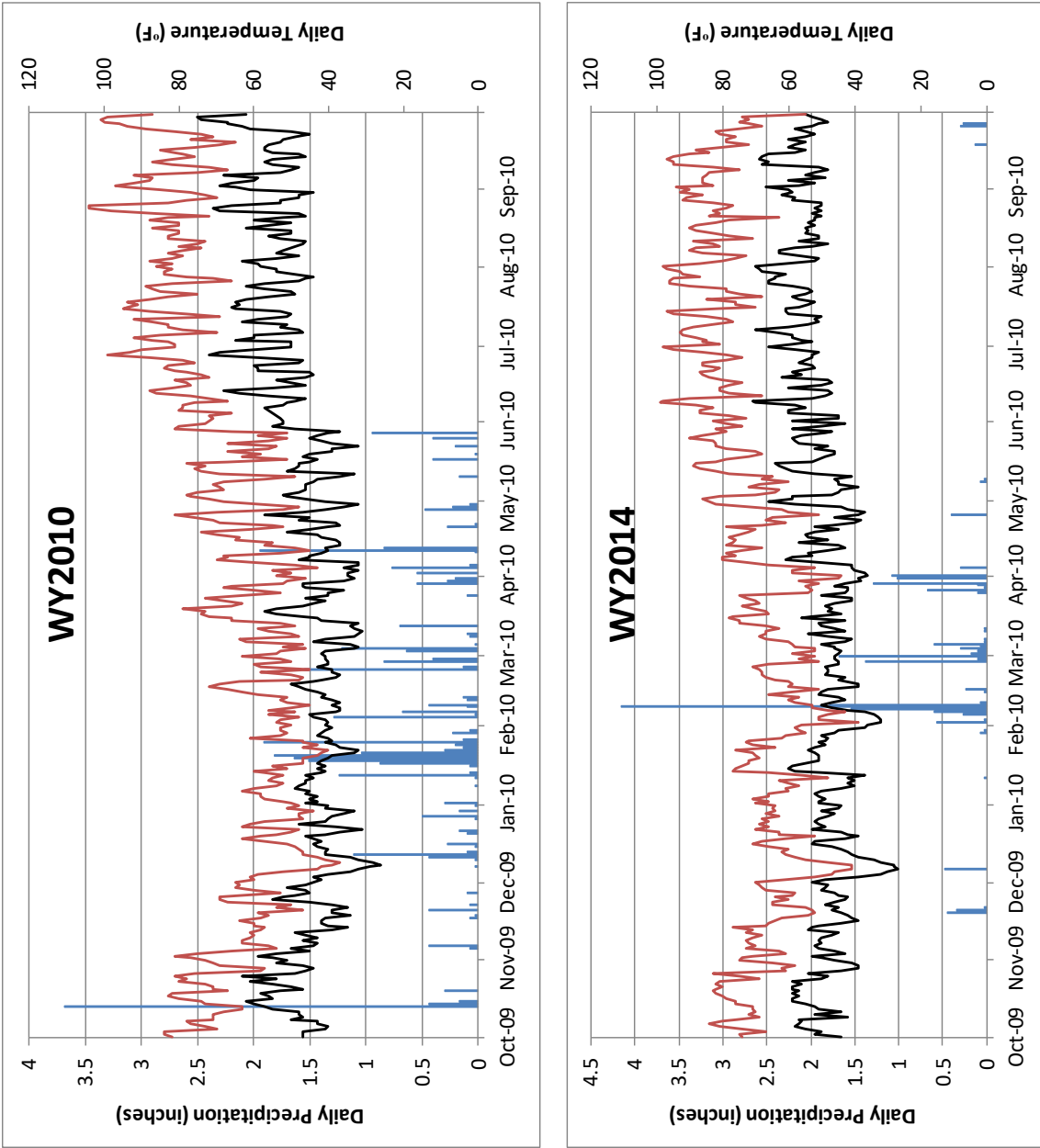


Figure 7: Daily precipitation (blue bars) and minimum (black lines) and maximum (red lines) air temperature used in the SWB model.

Results

The simulated Water Year 2010 (average water year) recharge results indicate that recharge varied across the project recharge area from 1.24 to 19.9 inches, excluding areas classified as water where the model assumed zero recharge (Figure 8 and Table 12). Spatially averaged over the project recharge area, the 37.3 inches of precipitation was partitioned as follows: Actual Evapotranspiration (AET) = 20.5 inches, Runoff = 9.3 inches, and Recharge = 7.6 inches (Table 12).

The simulated water year 2014 (dry water year) recharge results indicate that recharge varied across the project recharge area from 0.016 to 13.1 inches (Figure 9 and Table 10). Spatially averaged over the project recharge area, only 3.3 of the 21 inches of precipitation was recharged (Table 12).



Recharge as a percentage of annual precipitation ranged from 20% in the average water year to 16% in the dry water year. Runoff as a percentage of annual precipitation was lower in the dry water year (16%) compared to the average water year (25%).

Groundwater recharge estimates can also be expressed as a total volume by multiplying the calculated recharge by the project aquifer recharge area of 370 acres. This calculation yields an estimate of total recharge of 101.8 ac-ft during the drought conditions of water year 2014 and of 234.3 ac-ft for the average water year of 2010. Representative estimates of recharge rates on the project parcel are 6.3 ac-ft/yr for dry water years and 14.6 ac-ft/yr for average water years in proportion to the size of the project parcel (23 acres) relative to the simulated recharge area (Table 13).

The project recharge area lies within the lower reaches of the Conn Creek watershed, and a water budget estimate is available for this watershed from LSCE (2013). The simulated Water Year 2010 average AET for the project recharge area represents approximately 55% of the precipitation which is similar to the results for the Conn Creek watershed (53%). The simulated Water Year 2010 runoff for the project recharge area represents approximately 25% of the precipitation which agrees very well with the results for the Conn Creek watershed (25%). The simulated Water Year 2010 groundwater recharge for the watershed represents approximately 20% of the precipitation which is also similar to the results for the Conn Creek watershed (21%).

**Table 12: Summary of water balance results from the SWB model.**

	2010 Normal Year		2014 Dry Year	
	inches	% of precip	inches	% of precip
Precipitation	37.3		21.0	
AET	20.5	55%	14.4	69%
Runoff	9.3	25%	3.3	16%
Recharge	7.6	20%	3.3	16%

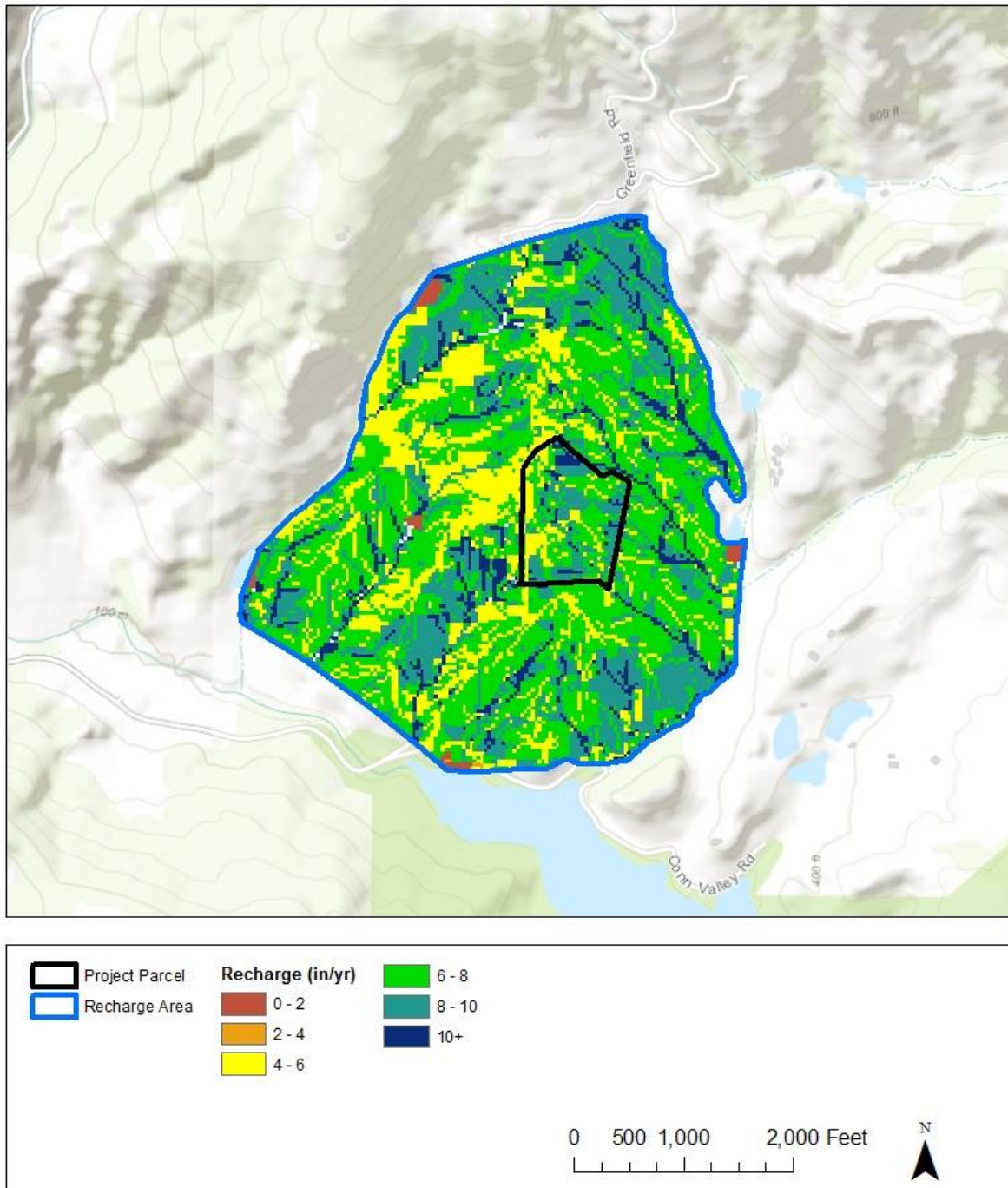


Figure 8: WY 2010 recharge simulated with the SWB model.

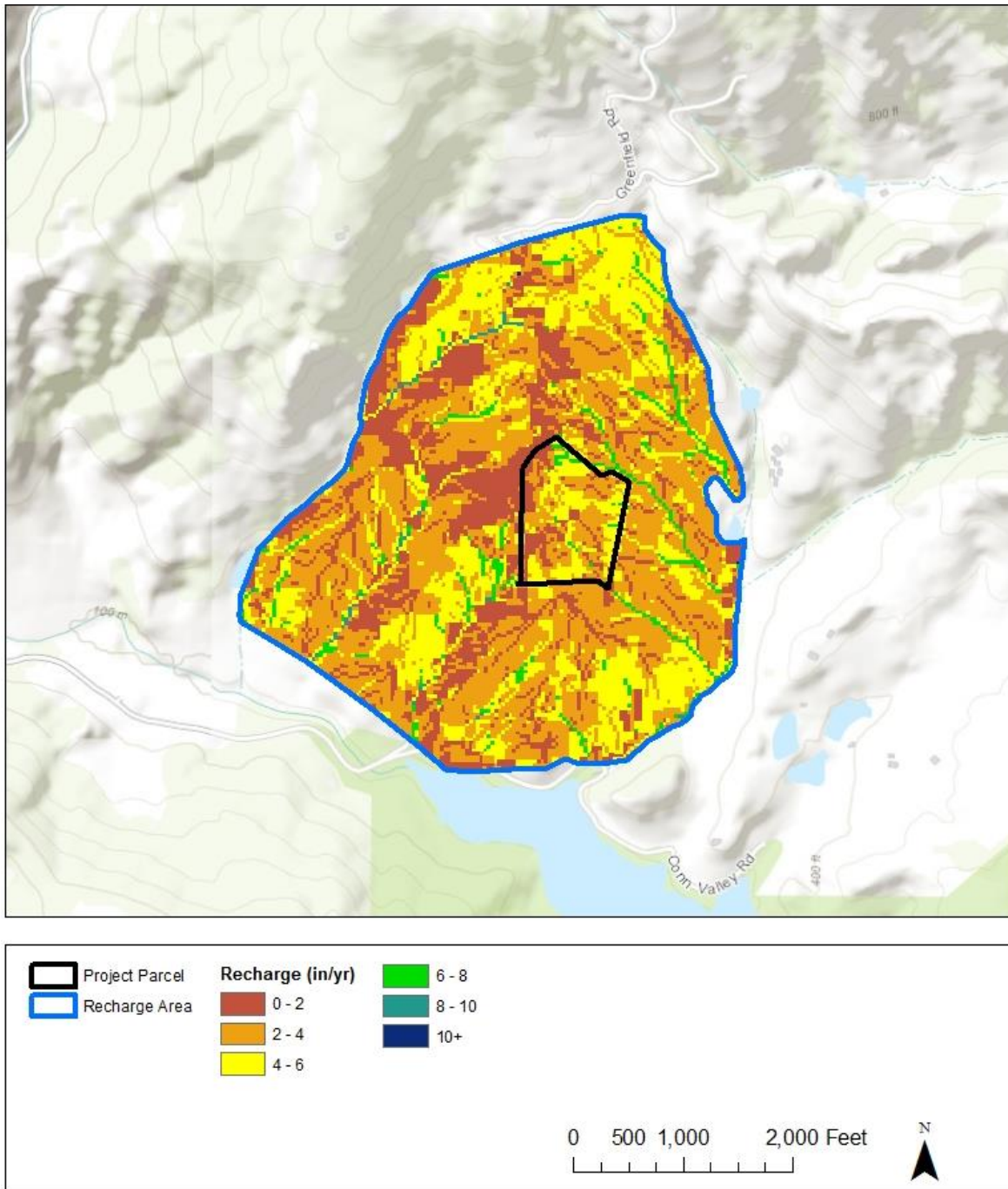


Figure 9: WY 2014 recharge simulated with the SWB model.

## Comparison of Water Demand and Groundwater Recharge

The total proposed groundwater use for the project recharge area is estimated to be 77.7 acre-ft/yr; total proposed groundwater use on the project parcel is about 7.7 acre-ft/yr. Proposed groundwater use in the project recharge area is equivalent to 33% of the estimated mean annual groundwater recharge of 234.3 ac-ft/yr and 76% of the estimated dry water year recharge of 101.8 ac-ft/yr (Table 13). This comparison indicates that there is a substantial surplus of groundwater resources in terms of estimated annual groundwater recharge. Given the magnitude of this surplus, the increase in water use associated with the proposed vineyard expansion (approximately 0.85 acre-ft/yr) is highly unlikely to result in reductions in groundwater levels or depletion of groundwater resources over time.

**Table 13: Comparison of proposed water use to average and dry year groundwater recharge in the project area and on the project parcel.**

	Total Proposed Demand (ac-ft/yr)	Average Water Year (2010)			Dry Water Year (2014)		
		Recharge (ac-ft/yr)	Recharge Surplus (ac-ft/yr)	Demand as % of Recharge	Recharge (ac-ft/yr)	Recharge Surplus (ac-ft/yr)	Demand as % of Recharge
Project Recharge Area	77.7	234.3	156.7	33%	101.8	24.1	76%
Project Parcel	7.7	14.6	6.8	53%	6.3	-1.4	122%

## Well Interference Analysis

The WAA guidance document indicates that a well interference analysis (Tier 2 WAA) is required if neighboring wells lie within 500-feet of the project well. The closest neighboring well to the project well (Well 1) on the project parcel is Well 3, which is located about 376 feet south of the project well on the adjacent parcel APN 025-380-012. A driller's report was obtained from the DWR for both the project well and the neighboring well. The second well on the project parcel (Well 2) is located 360 ft north of Well 1 and provides water for domestic use. Exhaustive efforts to obtain the Well Completion Report for Well 2 from the State Department of Water Resources and from the property owner's representative have been unsuccessful; the Well Completion Report cannot be obtained.

### Approach

To evaluate potential well interference, we used a procedure demonstrated by Weight and Sonderegger (2000, pp. 426-7) to estimate the radius of influence of the project well (Well 1) using available data to estimate key aquifer hydraulic parameters and distance-drawdown well function equations (Driscoll 1986, p. 237 and Bedient, Huber and Vieux, 2013). The radius of influence ( $r_o$ ) can be described as the horizontal distance from the well to the edge of the "cone of depression" in the aquifer formed by pumping from a well. If the radius of influence is less than the distance between Well 1 and the nearest adjacent well (Well 3), then it is unlikely that there will be significant well interference caused by operation of Well 1. The 2015 Napa County

guidance document pertaining to WAA's allows for 10 to 15 feet of water level drawdown attributable to well interference, but this criterion is only valid if the radius of influence of the project well extends beyond a potentially-impacted neighboring well. For wells with casing diameter of six inches or less, drawdown of 10 feet is recommended as a threshold of concern; for wells with casing diameter greater than six inches, drawdown of 15 feet is recommended as a threshold of concern.

The Napa WAA guidance recommends applying the Theis equation to wells located within 500 ft of the project well to estimate drawdown. The Theis equation (from Bedient, Huber and Vieux, 2013) is as follows:

$$s' = (Q/4\pi T) W(u)$$

with  $W(u)$  being the well function where

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

and the well function integral expanded as a series as:

$$W(u) = -0.5772 - \ln(u) + u - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) \dots$$

where:

$s'$  = drawdown (units in ft)

$r$  = radial distance (units in ft)

$S$  = storativity (dimensionless)

$T$  = transmissivity (units in  $\text{ft}^2/\text{day}$ )

$Q$  = discharge at the well (in gpm)

$t$  = time (days)

Several assumptions are made when using the Theis equation:

1. The aquifer is homogeneous, isotropic, uniformly thick and of infinite areal extent.
2. Prior to pumping, the piezometric surface is horizontal
3. The fully penetrating well is pumped at a constant rate.
4. Flow is horizontal within the aquifer.
5. Storage within the well can be neglected.
6. Water removed from storage responds instantaneously with a declining head.

The well function equation above can be algebraically transformed to solve for  $r_o$  after the method of Weight and Sonderegger (2000):

$$r_o = [0.3 T t S^{-1}]^{0.5}$$



To estimate the likely radius of influence ( $r_o$ ) of the project well (Well 1) and the potential drawdown ( $s$ ) within that radius, estimates of the parameters  $T$ ,  $t$  and  $S$  defined above are required.

### Estimated Aquifer Parameters

Typically, a time-drawdown pump test would be performed on the project well to determine aquifer parameters to be used in a well interference analysis; however, no pump test data is available for the project well. Well 2 was the subject of a five hour pump test in September 2015. Given the relatively close proximity (360 ft) of Well 2 to the project well (Well 1) and the fact that the two are located in the same geologic unit (including the neighboring Well 3), this test has been used to estimate aquifer properties that can be used in the well interference analysis. Consequently, the potential drawdown of groundwater elevation caused by operation of the project well was evaluated using data gathered from the interpretation of the pump test performed on Well 2 along with the evaluation of a range of hydraulic aquifer properties listed in the Napa WAA document.

Transmissivity ( $T$ ) of the aquifer at the well can be estimated by two methods. First,  $T$  can be roughly approximated using single well pump test data and well theory, limited by a set of assumptions (Driscoll 1986, p. 1021). In this method, an empirical equation for confined and unconfined aquifers relates specific capacity ( $S_c$ , gallons per minute per foot of drawdown determined from a pump test) to transmissivity as:

$$2,000 S_c = T \text{ (confined aquifers)} \quad 1,500 S_c = T \text{ (unconfined aquifers)}$$

where  $S_c$  is in units of gallons per minute per foot (gpm/ft) and  $T$  is in units of gallons per day per foot (gpd/ft). This method of estimating  $T$  is very generalized and should not be relied upon if time-drawdown pump test data are available.

The extent and depth of clay-rich strata overlying the water-bearing strata observed in Well Completion Reports indicates confined aquifer conditions. Consequently, one estimate of  $T$  is given by  $2,000 S_c$ . The pump test of Well 2 in September 2015 (Appendix B) gave  $S_c = 6.45$  gpm/ft; estimated  $T$  from this method is 12,900 gpd/ft, equivalent to about 1,725 ft<sup>2</sup>/day.

$T$  was also estimated by analyzing available time-drawdown pump test data (Appendix B) using specialized software (AQTESOLV) capable of evaluating the data with alternative analytical methods and assumptions regarding the aquifer. This approach may provide both a more site-specific estimate of  $T$  along with perspective regarding uncertainty of the estimate of  $T$ . Pump test data from a production well alone does not provide an estimate of  $S$  (although AQTESOLV reports a value of  $S$ ).

Values of  $T$  were estimated using two solution methods in AQTESOLV, one using the Theis confined aquifer solution and another using the Hantush-Jacob leaky (confined) aquifer solution (Appendix C). The pump test reported some information about well construction and static and pumping water levels. Because a well completion report was not available for Well 2, construction details of the well including the total depth and screened casing intervals were estimated based on knowledge of the construction of surrounding wells. Both the Theis solution and the Hantush-Jacob solution methods resulted in an estimate of 10,772 gpd/ft (1,440 ft<sup>2</sup>/day)

for T and an estimate of 0.001 for S. The T estimate fits well with our empirical estimate of 12,900 gpd/ft falling within the same order of magnitude.

T can also be estimated using reference hydraulic conductivity (K) values for aquifer materials and multiplying by the saturated aquifer thickness (b) based on the definition  $T = Kb$ . Napa County Guidance suggests a range of K values between  $10^{-2}$  to  $10^2$  for Fractured Basalt (e.g. Sonoma Volcanics; Appendix G Table F3 in Napa 2015). A saturated aquifer thickness can be estimated by assuming conservatively that it only includes the static water level in the well down to the bottom of the screened interval of the well. Well 1 is screened to a depth of 510 ft and the well completion report for Well 1 reports the static water level to be at 130 ft therefore the estimated saturated aquifer thickness at the project site would be 380 ft. Applying this to the range of K values gives a range of T values from 284 gpd/ft to 2,842,588 gpd/ft.

Storativity (S) can be determined by an analytical pump test utilizing a pumping well and at least one observation well. No such pump test data are available for this site. Consequently, S must be estimated for purposes of evaluating likely values of  $r_o$ . In an unconfined aquifer, S ranges from 0.01 to 0.3, and for confined aquifers they range from about 0.001 to 0.00001 (Lohman 1972). AQTESOLV estimates of S are at the upper end of the range stated for confined aquifers. Given the uncertain value of S due to the lack of observation well data, a range of likely values of S are considered in efforts to estimate the radius of influence of the well and the drawdown of water elevation that might be experienced in neighboring wells.

S can also be calculated using known Specific Storage values for certain aquifer materials and multiplying by the saturated aquifer thickness. Napa County Guidance suggests a range of Specific Storage values between  $10^{-6}$  to  $2.1 \times 10^{-5}$  for Rock, fissured (Appendix G Table F3 in Napa 2015). Applying the estimated saturated thickness of 380 ft to the range of Specific Storage values gives a range of storativity from 0.00038 to 0.00798. Given that typical storativity value range from Lohman (1972) the Napa guidance seems to over estimate the upper end of the storativity.

In addition to the data available for the wells located on the project parcel, T and S were estimated for a separate nearby WAA study (APN 025-380-011) authored by OEI in 2016. In that study, estimated T values ranged from 1205 gpd/ft to 1480 gpd/ft ( $161.1 \text{ ft}^2/\text{day}$  to  $197.8 \text{ ft}^2/\text{day}$ ) and S values range between  $10^{-4}$  to  $10^{-5}$ . These estimates were derived from a pump test and located relatively close to the project parcel (to the south) and within similar geology; consequently, these values were considered representative of the project aquifer. The estimates are much smaller than those calculated for the project irrigation well but fall within the range of values suggested by Napa County Guidance and so were used as the lower end of the range of values evaluated.

Time since pumping began (t) was determined using the estimated annual irrigation demand (Table 8) and applying that to typical irrigation season length to determine an estimated daily demand. Assuming a 6-month (or 180 day) irrigation season, the proposed irrigation demand of 5.03 acre-ft becomes a daily demand of 9,105 gallons. Irrigation practices are typically limited by

well pumping capacity and storage tank capacity so assuming storage is not an issue, and the irrigation well pumps at a rate similar to the sustained rate of the domestic well (12.9 gpm) recorded in the 2015 pump test, it would take 11.8 hours to meet the daily demand. The value of  $t$  used for this analysis is 0.49 days (11.8 hours/24 hours per day).

### Estimated Radius of Influence

Based on the equation presented above ( $r_o = [0.3 T t S^{-1}]^{0.5}$ ), the estimated radius of influence of Well 1 extends beyond Well 3, located about 376 feet from Well 1. The validity of the equation used to estimate the radius of influence is constrained by the requirement that the well function  $w(u)$  for a given set of parameters ( $r$ ,  $S$ ,  $T$  and  $t$ ) remain relatively small ( $< 0.05$ , Driscoll, p. 219-220). For the set of parameters applicable to this scenario ( $t = 0.49$  days,  $T = 10,772$  gpd/ft and  $S = 0.001$ )  $w(u) = 0.048$  and the Hantush-Jacob equation estimates a radius of influence of 1258 ft.

### Estimated Drawdown

Potential drawdown of water elevation in Well 3 resulting from pumping of Well 1 was estimated using the standard Theis equation (from Bedient, Huber and Vieux, 2013):

$$s' = (Q/4\pi T) W(u)$$

where the variables are the same as previously defined.

Since specific pump test data was not available for the project well (Well 1), aquifer properties were estimated from pump test data for Well 2 located 360 ft to the north. Estimated  $T$  values range from 10,772 gpd/ft from the AQTESOLV analysis as described above up to 12,900 gpd/ft from the empirical relationship described by Driscoll (1986). A storativity value of 0.001 was derived from the AQTESOLV analysis and pumping for 11.8 hours at 12.9 gpm. Applying these parameters, estimated drawdown at Well 3 ranges from 0.37 ft to 0.73 ft.

If we use the minimum values derived from the nearby Tier 2 WAA analysis by OEI in 2016,  $T$  of 1,205 gpd/ft (161.1 ft<sup>2</sup>/day) and  $S$  of  $10^{-5}$ , and assume the same pumping scheme of 12.9 gpm for 11.8 hours, drawdown at Well 3 is estimated to be 6.2 ft.

The WAA Tier 2 guidelines suggest a threshold of concern for drawdown of 10 ft. Consequently, operation of the project well (Well 1) does not appear to cause significant drawdown in the nearest neighboring well.

### Well Interference Analysis Conclusion

This analysis suggests that pumping at the project irrigation well (Well 1) is unlikely to result in significant drawdown at neighboring wells. In order to perform a more robust analysis of well interference potential, a pump test would need to be performed on the project irrigation well with one or more nearby wells serving as monitoring wells. Such a pump test would be expected to provide more directly applicable estimates of the aquifer parameters  $T$  and  $S$  used to estimate

the lateral extent of drawdown caused by operation of the project irrigation well and the depth of drawdown of the water surface in any neighboring wells

## Summary

Application of the Soil Water Balance (SWB) model to the project recharge area revealed that average water year recharge was ~7.6 inches/yr or 234.3 ac-ft/yr. During drought conditions, recharge was significantly lower at ~3.3 inches/yr or 101.8 ac-ft/yr. The total proposed Water Use for the project aquifer recharge area is estimated to be 77.7 ac-ft/yr reflecting an increment of additional groundwater use to irrigate an additional 1.7 acres of vineyards. This represents only 33% of the mean annual recharge. The proposed use for the project parcel is 7.7 ac-ft/yr and represents 53% of the mean annual recharge on the parcel indicating that the project is unlikely to result in declines in groundwater elevations or depletion of the groundwater resources over time.

The neighboring well (Well 3) nearest to the project well (Well 1) is located about 367 feet south of the project well. The estimated radius of influence of the project well extends approximately 1258 ft from Well 1 including Well 3. Estimated drawdown caused by operation of the project well is most likely in the range of < 1 ft based on estimated aquifer hydraulics from Well 2; based on aquifer hydraulic parameters estimated for a different well in the aquifer, estimated drawdown could be about 6.2 feet. Since the WAA Tier 2 guidance suggests that up to 10 feet of drawdown in a neighboring well caused by operation of a project well is acceptable, this analysis indicates that there are no significant adverse effects on groundwater elevation on neighboring parcels.

## References

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**APPENDIX A**  
**WELL COMPLETION REPORTS**



State of California  
**Well Completion Report**  
WCR Form Submitted 07/05/2016  
WCR2016-004586

WELL 1

Owner's Well Number 025-380-017-000 Date Work Began 05/30/2016 Date Work Ended 06/10/2016  
Local Permit Agency Napa County Planning Building and Environmental Services  
Secondary Permit Agency Permit Number E15-00983 Permit Date 12/31/2015

**Well Owner (must remain confidential pursuant to Water Code 13752)**

Name RICHARD TALMADGE THREE TWINS LLC  
Mailing Address 22 BISBEE LANE  
City BEDFORD HILLS State NY Zip 10507

**Planned Use and Activity**

Activity New Well  
Planned Use Water Supply Domestic

**Well Location**

Address 704 GREENFIELD RD APN 025-380-017-000  
City ST HELENA Zip 94574 County Napa Township 08 N  
Latitude N Longitude W Range 05 W  
Dec. Lat. 38.5114548 Deg. Min. Sec. Dec. Long. -122.3873110 Deg. Min. Sec. Section 26  
Vertical Datum Horizontal Datum WGS84 Baseline Meridian Mount Diablo  
Location Accuracy Elevation Accuracy Ground Surface Elevation Elevation Determination Method

**Borehole Information**

Orientation Vertical Specify   
Drilling Method Direct Rotary Drilling Fluid Bentonite  
Total Depth of Boring 510 Feet  
Total Depth of Completed Well 510 Feet

**Water Level and Yield of Completed Well**

Depth to first water 150 (Feet below surface)  
Depth to Static   
Water Level 130 (Feet) Date Measured 06/10/2016  
Estimated Yield\* 120 Test Type Air Lift  
Test Length 4 Total Drawdown 170 (Feet)  
\*May not be representative of a well's long term yield.

**Geologic Log - Free Form**

Depth from Surface Feet to Feet	Description
0 65	BROWN CLAY
65 145	RIVER GRAVEL
145 225	SHALE & SHALE CLAY
225 265	GREY VOLCANICS
265 345	GREY CLAY AND GRAVEL
345 500	GREY VOLCANICS
500 510	GREY SHALE CLAY

**Casings**

Casing #	Depth from Surface Feet to Feet	Casing Type	Material	Casings Specifications	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if any (Inches)	Description
1	0 10	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	10 110	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	110 150	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			



1	150	190	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	190	210	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	210	230	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	230	250	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	250	270	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	270	290	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	290	310	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	310	330	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	330	350	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	350	370	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	370	390	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	390	410	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	410	430	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	430	450	Conductor or Fill Pipe	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	450	470	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	470	490	Blank	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563			
1	490	510	Screen	PVC	OD: 5.563 in.   SDR: 21   Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	

#### Annular Material

Depth from Surface Feet to Feet	Fill	Fill Type Details	Filter Pack Size	Description
0	54	Cement	10.3 Sack Mix	
54	510	Filter Pack	Other Gravel Pack	6
				Bird's Eye Gravel Well Pack

#### Other Observations:

#### Borehole Specifications

Depth from Surface Feet to Feet	Borehole Diameter (inches)
0	510
	11

#### Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name PULLIAM WELL EXPLORATION INC  
 Person, Firm or Corporation  
1663 Howell Mtn Road ANGWIN CA 94508  
 Address City State Zip  
 Signed *Caron Pulliam* 07/05/2016 808508  
 C-57 Licensed Water Well Contractor Date Signed C-57 License Number

**DWR Use Only**

--	--

Site Number / State Well Number

						N
--	--	--	--	--	--	---

Latitude Deg/Min/Sec

								W
--	--	--	--	--	--	--	--	---

Longitude Deg/Min/Sec

TRS:

APN:



 OSP 03 78836

ORIGINAL

File with DWR

025 380 010

STATE OF CALIFORNIA

THE RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

Well5

Do not fill in

No. 103484

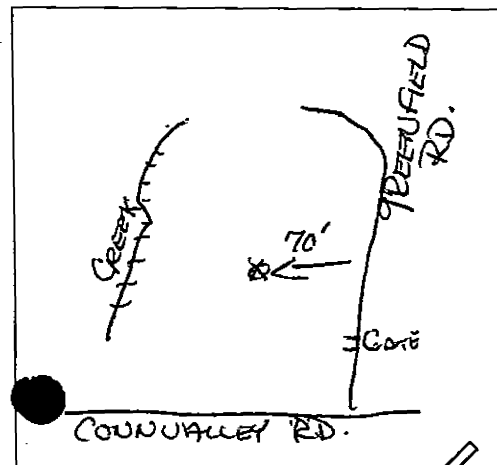
Permit No. or Date \_\_\_\_\_

State Well No. \_\_\_\_\_  
Other Well No. 08N05W35

## (2) LOCATION OF WELL (See instructions):

County Napa Owner's Well Number 25-380-10Well address if different from above Greenfield RdTownship St. Helena Range 05W Section \_\_\_\_\_

Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_



WELL LOCATION SKETCH

## (3) TYPE OF WORK:

New Well ☒ Deepening ☐Reconstruction ☐Reconditioning ☐Horizontal Well ☐Destruction ☐ (Describe destruction materials and procedures in Item 12)

## (4) PROPOSED USE:

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

## (5) EQUIPMENT:

Rotary ☒ Reverse ☐Cable ☐ Air ☐Other ☐ Bucket ☐

## (6) GRAVEL PACK:

Yes ☒ No ☐ Size 3/4"Diameter of bore 15 1/2"Packed from 22 to 265 ft

## (7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

## (8) PERFORATIONS:

Type of perforation or size of screen power saw

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	45	6	160	45	220	1/8x3

## (9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 22 ft.Were strata sealed against pollution? Yes ☐ No ☒ Interval \_\_\_\_\_ ft.Method of sealing cement

## (10) WATER LEVELS:

Depth of first water, if known 100 ft.Standing level after well completion 40 ft.

## (11) WELL TESTS:

Was well test made? Yes ☒ No ☐ If yes, by whom? drillerType of test Pump ☐ Bailor ☒ Air lift ☐Depth to water at start of test 40 ft. At end of test 110 ft.Discharge 10 gal/min after \_\_\_\_\_ hours Water temperature \_\_\_\_\_Chemical analysis made? Yes ☐ No ☒ If yes, by whom? \_\_\_\_\_Was electric log made? Yes ☐ No ☒ If yes, attach copy to this report(12) WELL LOG: Total depth 265 ft. Depth of completed well 265 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)

0	15	sandy clay
15	60	multi color gravel
60	80	blue sandy clay
80	95	hard & soft multi color rock
95	120	multi color gravel
120	190	gravel & gray rock
190	220	gravel w white ash
220	260	gray clay green & brown rock
-	-	hard & soft
260	265	gray clay w str of rock

WATER CODE SEC. 13752

Work started 9/15 1981 Completed 9/18 1981

## WELL DRILLER'S STATEMENT:

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

SIGNED J. S. Doshier (Well Driller)NAME Doshier & Gregson Drilling, Inc  
(Person, firm, or corporation) (Typed or printed)Address 5365 Napa-Vallejo HwyCity Vallejo, Ca Zip 94589-9679License No. 294001 Date of this report 9/21/81

ORIGINAL  
File with DWR

Page

Owner's Well No.

Date Work Began 11/29/10, Ended 1/19/11

Local Permit Agency Napa

Permit No. E10-00536

Permit Date 11/30/10

# STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 0949241

DWR USE ONLY

Well 6

STATE WELL NO./STATION NO.

LATITUDE

LONGITUDE

APN/TRS/OTHER

## GEOLOGIC LOG

ORIENTATION ( )		<input checked="" type="checkbox"/> VERTICAL	<input type="checkbox"/> HORIZONTAL	<input type="checkbox"/> ANGLE	(SPECIFY)
DEPTH FROM SURFACE		DRILLING METHOD		FLUID	
		mud		cetco s/g	
		DESCRIPTION			
		Describe material, grain size, color, etc.			
Ft.	to	Ft.			
0	20		topsoil brown clay		
20	60		brown clay		
60	80		brown sand, rock imbedded		
80	140		sand, multicolor rock		
140	160		gray clay rock		
160	200		gray clay black gray rock		
200	220		brown gray clay		
220	280		gray black rock		
280	300		gray yellow white rock		
300	340		gray sand gray clay		
340	380		gray clay		
380	400		brown gray clay		
400	420		gray black rock		
420	440		gray black white rock		
440	480		gray shale black sand		
480	500		gray clay black sand		
500	520		gray medium shale		
520	580		gray shale		
580	600		gray shale black sand		

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 600 (Feet)

## WELL OWNER

Name

Mailing Address

CITY

WELL LOCATION

Address 691 Greenfield Road

City St. Helena

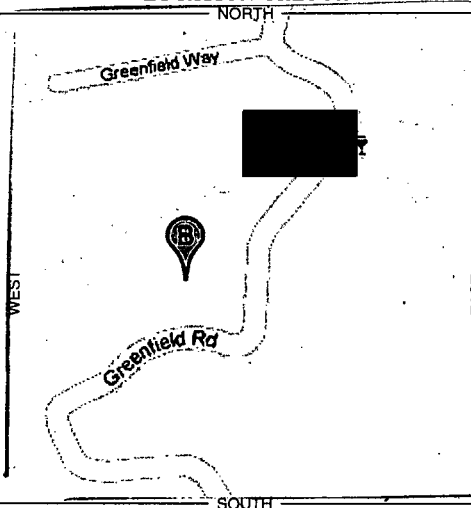
County Napa

APN Book 025 Page 380 Parcel 008

Township Range Section

Lat. DEG. MIN. SEC. N Long. DEG. MIN. SEC. W

## LOCATION SKETCH



## ACTIVITY ( )

☒ NEW WELL  
☐ MODIFICATION/REPAIR  
    ☐ Deepen  
    ☐ Other (Specify)

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

## USES ( )

☒ WATER SUPPLY  
    ☒ Domestic ☐ Public  
    ☐ Irrigation ☐ Industrial

☐ MONITORING  
☐ TEST WELL  
☐ CATHODIC PROTECTION  
☐ HEAT EXCHANGE  
☐ DIRECT PUSH  
☐ INJECTION  
☐ VAPOR EXTRACTION  
☐ SPARGING  
☐ REMEDIATION  
☐ OTHER (SPECIFY)

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

## WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER (Feet) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 70 (Feet) & DATE MEASURED 1/19/11

ESTIMATED YIELD 20 (GPM) & TEST TYPE air

TEST LENGTH 15 (Hrs.) TOTAL DRAWDOWN 590 (Feet)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING (S)							
			TYPE ( < )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
			BLANK	SCREEN	CON-DUCTOR	FILL PIPE				
Ft.	to Ft.									
0	60	123/4	X				F480	6	200	
60	140	97/8		X			F480	6	200	factory
140	200	97/8	X				F480	6	200	
200	220	97/8		X			F480	6	200	factory
220	240	97/8	X				F480	6	200	
240	260	97/8		X			F480	6	200	factory

DEPTH FROM SURFACE		ANNULAR MATERIAL			
Ft. to Ft.		TYPE			
		CE- MENT ( )	BEN- TONITE ( )	FILL ( )	FILTER PACK (TYPE/SIZE)
0	63	X			
63	600				pea gravel

## ATTACHMENTS ( )

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☒ Other casing

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

## CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME McLean & Williams, INC.

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

878 El Centro Ave., Napa, CA 94558

ADDRESS

CITY

STATE

ZIP

Signed

C-57 LICENSED WATER WELL CONTRACTOR

1/27/11

DATE SIGNED

396352

C-57 LICENSE NUMBER



A.P.#025-380-008

## Continue casing list:

260 - 280	9 7/8	Blank	F480	6"	200	
280 - 300	9 7/8	Perf	F480	6"	200	factory
300 - 320	9 7/8	Blank	F480	6"	200	
320 - 340	9 7/8	Perf	F480	6"	200	factory
340 - 360	9 7/8	Blank	F480	6"	200	
360 - 500	9 7/8	Perf	F480	6"	200	factory
500 - 520	9 7/8	Blank	F480	6"	200	
520 - 540	9 7/8	Perf	F480	6"	200	factory
540 - 560	9 7/8	Blank	F480	6"	200	
560 - 600	9 7/8	Perf	F480	6"	200	factory

STATE OF CALIFORNIA  
WELL COMPLETION REPORT

Refer to Instruction Pamphlet

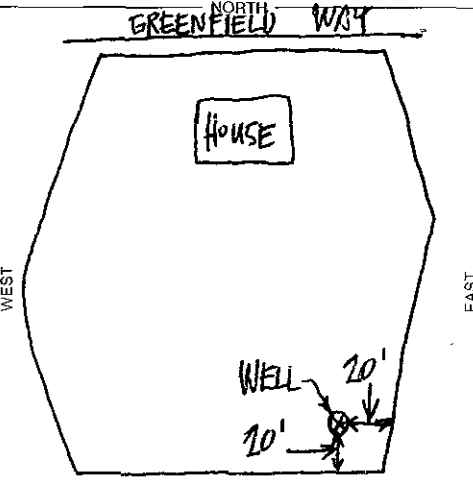
No. **804476**

DWR USE ONLY		Well 7	
08N10S02W210			
STATE WELL NO./STATION NO			
LATITUDE		LONGITUDE	
APN/TRS/OTHER			

## GEOLOGIC LOG

## WELL OWNER

ORIENTATION ( )		X VERTICAL		HORIZONTAL		ANGLE		(SPECIFY)	
DEPTH FROM SURFACE		DRILLING METHOD		FLUID		DESCRIPTION			
Ft. to Ft.		rotary		bentonite		Describe material, grain size, color, etc.			
0	30					brown clay			
30	140					mixed volcanics			
140	580					serpentine			
580	595					shale			
595	840					80% sandstone/ 20% shale			
LOST PIPE DOWN WELL FROM 550' TO 818', OPEN CASING DEPTH 550'.									
398	538	blank	PVC	5"					
538	678	screen	PVC	5"	.032 slot				
678	698	blank	PVC	5"					
698	798	screen	PVC	5"	.032 slot				
798	818	blank	PVC	5"					
TOTAL DEPTH OF BORING <u>840</u> Feet									
TOTAL DEPTH OF COMPLETED WELL <u>818</u> Feet									

Name _____		Mailing Address _____	
CITY _____		WELL LOCATION	
Address <u>3 Greenfield Way</u>		City <u>St. Helena</u>	
County <u>Napa</u>		APN Book <u>25</u> Page <u>380</u> Parcel <u>20</u>	
Township _____ Range _____ Section _____		Latitude _____ North _____ Longitude _____ West _____	
DEG. MIN. SEC.		DEG. MIN. SEC.	
LOCATION SKETCH		ACTIVITY ( )	
		X NEW WELL	
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.		MODIFICATION/REPAIR ____ Deepen ____ Other (Specify) _____	
		DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")	
		PLANNED USES ( )	
		WATER SUPPLY	
		X Domestic _____ Public _____	
		Irrigation _____ Industrial _____	
		MONITORING _____	
		TEST WELL _____	
		CATHODIC PROTECTION _____	
		HEAT EXCHANGE _____	
		DIRECT PUSH _____	
		INJECTION _____	
		VAPOR EXTRACTION _____	
		SPARGING _____	
		REMEDIATION _____	
		OTHER (SPECIFY) _____	

## WATER LEVEL &amp; YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER	<u>580</u>	(FL.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL	<u>205</u>	(FL.) & DATE MEASURED <u>6-19-03</u>
ESTIMATED YIELD	<u>20</u>	(GPM) & TEST TYPE <u>air lift</u>
TEST LENGTH	<u>1</u>	(Hrs.) TOTAL DRAWDOWN <u>N/A</u> (FL.)
* May not be representative of a well's long-term yield.		

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING (S)				INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	ANNULAR MATERIAL					
Ft.	to Ft.		TYPE ( )							TYPE					
Ft.	to Ft.		BLANK	SCREEN	CON- DUCTOR	FILL PIPE	MATERIAL / GRADE			Ft.	to Ft.	CE- MENT ( )	BEN- TONITE ( )	FILL ( )	FILTER PACK (TYPE/SIZE)
0	25	10								0	22	X			concrete
25	840	9								22	818			X	gravel
0	218		X				PVC F480	5	SDR-21						
218	238			X			PVC F480	5	SDR-21	.032					
238	378		X				PVC F480	5	SDR-21						
378	398			X			PVC F480	5	SDR-21	.032					

## ATTACHMENTS ( )

- \_\_\_\_ Geologic Log
- \_\_\_\_ Well Construction Diagram
- \_\_\_\_ Geophysical Log(s)
- \_\_\_\_ Soil/Water Chemical Analyses
- \_\_\_\_ Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

## CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME HUCKFELDT WELL DRILLING  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)ADDRESS 2110 Penny LaneCITY Napa STATE CA ZIP 94559SIGNED [Signature]DATE SIGNED 7-7-03

WELL DRILLER/AUTHORIZED REPRESENTATIVE

C-57 LICENSE NUMBER 439-746

ORIGINAL

File with DWR

of Intent No. \_\_\_\_\_

Permit No. or Date \_\_\_\_\_

STATE OF CALIFORNIA

THE RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

225 380 06

Well 8

Do not fill in

No. 103317

State Well No. \_\_\_\_\_

Other Well No. 08N050 261

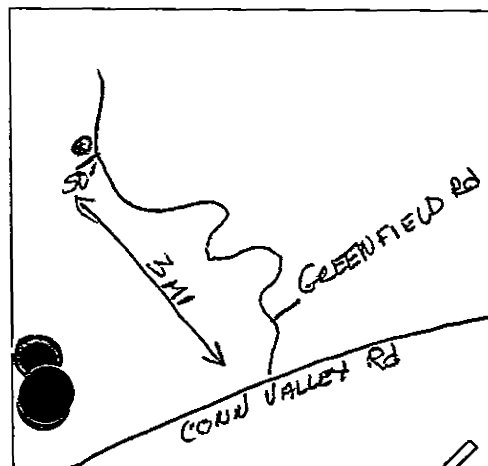


## (2) LOCATION OF WELL (See instructions):

County Napa Owner's Well Number 25-380-06Well address if different from above same

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_

Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_



WELL LOCATION SKETCH

## (3) TYPE OF WORK:

New Well ☒ Deepening ☐Reconstruction ☐Reconditioning ☐Horizontal Well ☐Destruction ☐ (Describe destruction materials and procedures in Item 12)

## (4) PROPOSED USE:

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

## (5) EQUIPMENT:

Rotary ☐ Reverse ☐Cable ☐ Air ☒Other ☐ Bucket ☐

## (6) GRAVEL PACK:

Yes ☐ No ☒ Size \_\_\_\_\_

Diameter of bore \_\_\_\_\_

Packed from \_\_\_\_\_ to \_\_\_\_\_

## (7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

## (8) PERFORATIONS:

Type of perforation or size of screen \_\_\_\_\_

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	90	6	160	90	350	1/8x3

## (9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 22 ft.Were strata sealed against pollution? Yes ☐ No ☒ Interval \_\_\_\_\_ ft.Method of sealing Grout

## (10) WATER LEVELS:

Depth of first water, if known 240 ft.Standing level after well completion 230 ft.

## (11) WELL TESTS:

Was well test made? Yes ☒ No ☐ If yes, by whom? DrillersType of test Pump ☐ Bailer ☐ Air lift ☒

From \_\_\_\_\_ to water at start of test \_\_\_\_\_ ft. At end of test \_\_\_\_\_ ft.

Flow rate 10 gal/min after \_\_\_\_\_ hours Water temperature \_\_\_\_\_Laboratory analysis made? Yes ☐ No ☐ If yes, by whom? \_\_\_\_\_Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report(12) WELL LOG: Total depth 350 ft. Depth of completed well 350 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)

0	-	40	Brown clay sandy
40	-	76	Multi color d rock
76	-	92	Brown clay sticky
92	-	118	Multi colored rock
118	-	135	Brown clay with some rock
135	-	162	Gray clay sandy
162	-	206	Gray sandstone soft
206	-	240	Multi colored rock
240	-	252	Gray rock med hard
252	-	350	Gray rock soft

Work started 8/13 1978 Completed 8/14 1978

## WELL DRILLER'S STATEMENT:

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

SIGNED J. A. Washburn (Well Driller)NAME Doshier-Gregson Drilling, Inc.

(Person, firm, or corporation) (Typed or printed)

Address 5365 Napa-Vallejo HwyCity Vallejo, CaZip 94590License No. 2940C1Date of this report 8/16/78

25-380-16

Well 10

ORIGINAL  
File with DWRSTATE OF CALIFORNIA  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

Do not fill in

No. 371058

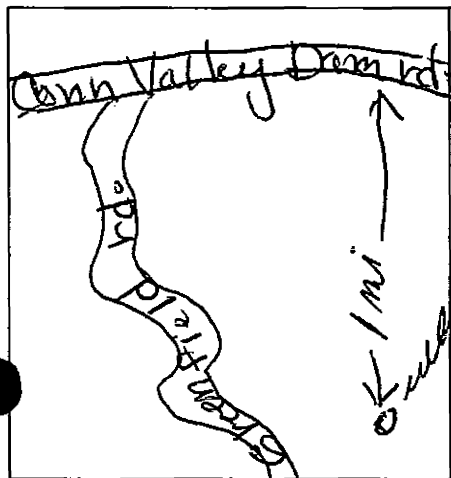
Notice of Intent No. \_\_\_\_\_

Local Permit No. or Date \_\_\_\_\_

Well # 1

State Well No. \_\_\_\_\_  
Other Well No. 08N05W26M

## (2) LOCATION OF WELL (See instructions):

County 28 Owner's Well Number \_\_\_\_\_  
Well address if different from above Same  
Township 23 Range 380 Section 16  
Distance from cities, roads, railroads, fences, etc. 1 mi. North of Conn. Dam rd. on Greenfield rd. in St. Helena

WELL LOCATION SKETCH

## (3) TYPE OF WORK:

New Well ☒ Deepening ☐  
Reconstruction ☐  
Reconditioning ☐  
Horizontal Well ☐  
Destruction ☐ (Describe destruction materials and procedures in Item 12)

## (4) PROPOSED USE:

Domestic ☒  
Irrigation ☐  
Industrial ☐  
Test Well ☐  
Municipal ☐  
Other ☐ (Describe)(12) WELL LOG: Total depth 340 ft. Completed depth 250 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)0 - 40' brown clay  
40 - 90' blue clay  
90 - 120' sandy clay, gravel & boulders  
120 - 210' clay  
210 - 240' sandy clay, gravel & boulders  
240 - 300' clay  
300 - 340' shale

## (5) EQUIPMENT:

Rotary ☒ Reverse ☐  
Cable ☐ Air ☐  
Other ☐ Bucket ☐

## (6) GRAVEL PACK:

Yes ☒ No ☐ Size 20-40  
Diameter of bore \_\_\_\_\_  
Packed from 22 to 250 ft.

## (7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

## (8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	250	5	160	60	250	4x3

## (9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 22 ft.Were strata sealed against pollution? Yes ☐ No ☒ Interval \_\_\_\_\_ ft.Method of sealing cement

## (10) WATER LEVELS:

Depth of first water, if known 90 ft.Standing level after well completion 80 ft.

## (11) WELL TESTS:

Was well test made? Yes ☒ No ☐ If yes, by whom? DrillerType of test Pump ☐ Bailor ☐ Air lift ☒Depth to water at start of test 80 ft. At end of test 240 ft.Discharge 1 gal/min after 3 hours Water temperature \_\_\_\_\_Chemical analysis made? Yes ☐ No ☒ If yes, by whom? \_\_\_\_\_Was electric log made? Yes ☐ No ☒ If yes, attach copy to this reportWork started 9-1-90 Completed 9-8-90

## WELL DRILLER'S STATEMENT:

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

Signed Bill Pulliam (Well Driller)NAME Pulliam Well DrillingAddress 5871 Piedmont AveCity Napa ZIP 94558License No. 2048677 Date of this report 9-29-90

parcel 25-380-16

Well 11

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

Do not fill in

No. 371056

Notice of Intent No. \_\_\_\_\_  
Local Permit No. or Date 27126

Well # 2

State Well No. \_\_\_\_\_  
Other Well No. 08N05W26M

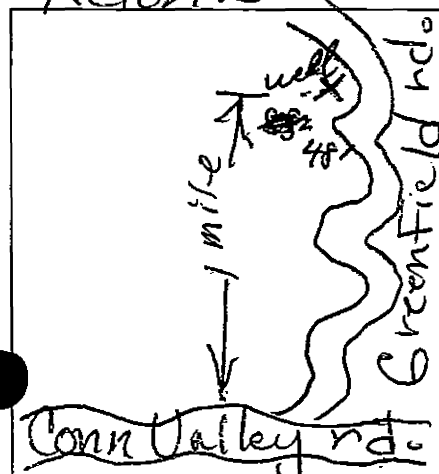


(12) WELL LOG: Total depth 325 ft Completed depth 317 ft  
from ft to ft Formation (Describe by color, character, size or material)

0 - 130' brown clay  
130 - 140' sand  
140 - 160' river sand & gravel  
160 - 170' brown clay  
170 - 185' blue sticky clay  
185 - 260' blue clay & gravel  
260 - 317' blue clay

(2) LOCATION OF WELL (See instructions):

County 28 Owner's Well Number \_\_\_\_\_  
Well address if different from above Same  
Township 25 Range 380 Section 16  
Distance from cities, roads, railroads, fences, etc. 1 mi. N. of Conn Dam rd. on Greenfield rd. in St. Helena



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐  
Reconstruction ☐  
Reconditioning ☐  
Horizontal Well ☐  
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☐  
Irrigation ☐  
Industrial ☐  
Test Well ☐  
Municipal ☐  
Other ☒ (Describe)

(5) EQUIPMENT:

Rotary ☒ Reverse ☐  
Cable ☐ Air ☐  
Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size 20  
Diameter of bore 10  
Packed from 25 to 317 ft

(7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

(8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	317	8	160	100	317	Factory

(9) WELL SEAL:

Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth \_\_\_\_\_ ft.  
Were strata sealed against pollution? Yes ☐ No ☒ Interval \_\_\_\_\_ ft.  
Method of sealing Cement

(10) WATER LEVELS:

Depth of first water, if known 120 ft.  
Standing level after well completion \_\_\_\_\_ ft.

(11) WELL TESTS:

Was well test made? Yes ☒ No ☐ If yes, by whom? Driller  
Type of test Pump ☐ Bailor ☐ Air lift ☒  
Depth to water at start of test 5 ft. At end of test 300 ft.  
Discharge 15 gal/min after 4 hours Water temperature \_\_\_\_\_  
Chemical analysis made? Yes ☐ No ☒ If yes, by whom? \_\_\_\_\_  
Was electric log made Yes ☐ No ☒ If yes, attach copy to this report

Work started 9-11-90 Completed 9-24-90

WELL DRILLER'S STATEMENT:

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

Signed Tom Pulliam (Well Driller)  
NAME Pulliam Well Drilling  
Address 2871 Piedmont Ave  
City Napa ZIP 94558  
License No. 248677 Date of this report 9-24-90

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

Page \_\_\_\_ of \_\_\_\_

Owner's Well No. \_\_\_\_\_

Date Work Began 10-06-99, Ended 10-14-99 No. 813841

Local Permit Agency Napa

Permit No. 96-10696 Permit Date 11-24-98

DWR USE ONLY **Well 12**

08N105W20

STATE WELL NO./STATION NO.

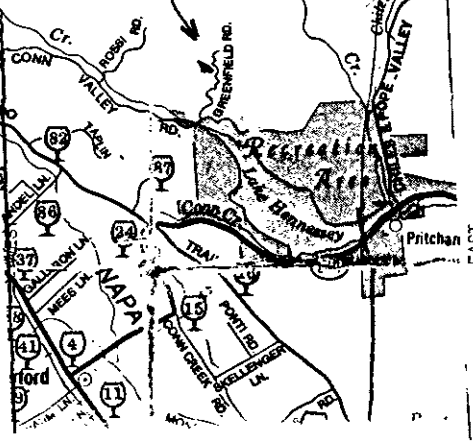
LATITUDE LONGITUDE

APN/TRS/OTHER

ORIENTATION ( )			<input checked="" type="checkbox"/> VERTICAL	HORIZONTAL	ANGLE	(SPECIFY)
DEPTH FROM SURFACE			DRILLING METHOD	FLUID		
FL.	to	FL.	DESCRIPTION			
Describe material, grain size, color, etc.						
0	3		topsoil			
3	20		brown clay			
20	30		brown sandstone			
30	50		brown sandstone stringers gray shale			
50	70		hard & soft gray shale			
70	110		gray shale			
110	130		coarse sand & gravel			
130	150		soft shale stringers hard gray shale			
150	170		gray & brown rock			
170	210		red gray white brown rock stringers green			
210	230		gray white brown red rock			
230	245		brown tan gray green & white rock			
245	270		soft gray shale stringers rock			
270	290		soft gray shale stringers gray & brown rock			
290	310		soft gray shale stringers hard gray shale			
310	330		soft gray shale			

TOTAL DEPTH OF BORING 330 (Feet)

TOTAL DEPTH OF COMPLETED WELL 325 (Feet)

WELL OWNER	
Name	
Address	
City	
County	
APN Book	Page Parcel
Township	Range Section
Latitude	Longitude
WELL LOCATION	
Address <u>1025 Greenfield Road</u>	
City <u>St. Helena</u>	
County <u>Napa</u>	
APN Book <u>025</u> Page <u>390</u> Parcel <u>009</u>	
Township _____ Range _____ Section _____	
Latitude _____ Longitude _____	
LOCATION SKETCH	
	
ACTIVITY ( )	
<input checked="" type="checkbox"/> NEW WELL	
MODIFICATION/REPAIR	
Deepen _____	
Other (Specify) _____	
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")	
PLANNED USES ( )	
<input checked="" type="checkbox"/> WATER SUPPLY	
Domestic _____ Public _____	
Irrigation _____ Industrial _____	
MONITORING _____	
TEST WELL _____	
CATHODIC PROTECTION _____	
HEAT EXCHANGE _____	
DIRECT PUSH _____	
INJECTION _____	
VAPOR EXTRACTION _____	
SPARGING _____	
REMEDIATION _____	
OTHER (SPECIFY) _____	
WATER LEVEL & YIELD OF COMPLETED WELL	
DEPTH TO FIRST WATER _____ (FL.) BELOW SURFACE	
DEPTH OF STATIC WATER LEVEL <u>70</u> (FL.) & DATE MEASURED <u>10-14-99</u>	
ESTIMATED YIELD <u>1</u> (GPM) & TEST TYPE <u>air</u>	
TEST LENGTH <u>4</u> (Hrs.) TOTAL DRAWDOWN <u>325</u> (FL.)	
* May not be representative of a well's long-term yield.	

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING (S)							DEPTH FROM SURFACE			ANNULAR MATERIAL			
				TYPE ( <input type="checkbox"/> )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS				SLOT SIZE IF ANY (Inches)	TYPE		
Fl.	to	Fl.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE									Fl.	to	Fl.
0	125	9 7/8	X					F480	6"	200		0	20	X			
125	165	9 7/8		X				F480	6"	200	factory	20	325			X	pea gravel
165	205	9 7/8	X					F480	6"	200							
205	265	9 7/8		X				F480	6"	200	factory						
265	285	9 7/8	X					F480	6"	200							
285	305	9 7/8		X				F480	6"	200	factory						
305	325	9 7/8	X					F480	6"	200							

CERTIFICATION STATEMENT

ATTACHMENTS ( )

Geologic Log \_\_\_\_\_

Well Construction Diagram \_\_\_\_\_

Geophysical Log(s) \_\_\_\_\_

Soil/Water Chemical Analyses \_\_\_\_\_

Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME McLean & Williams, Inc.

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 878 El Centro Ave. CITY Napa CA 94558

Signed Sherry Salinas DATE SIGNED 11-23-99 C-57 LICENSE NUMBER 396352

WELL DRILLER/AUTHORIZED REPRESENTATIVE



STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

DWR USE ONLY

**Well 13**

0.8 N 0.5 W 1

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Page \_\_\_\_ of \_\_\_\_

Owner's Well No. 5-31-00 No. 774365

Date Work Began 6-5-00 Ended 6-5-00

Local Permit Agency Napa County

Permit No. 96-17428 Permit Date 6-19-00

**GEOLOGIC LOG**

ORIENTATION ( ) VERTICAL ☒ HORIZONTAL ☐ ANGLE (SPECIFY) \_\_\_\_\_

DRILLING METHOD rotary FLUID mud

DEPTH FROM SURFACE (Feet) DESCRIPTION

0 to 35 brown clay & rock

35 90 blue clay

90 120 broken up sandstone

120 190 blue clay

190 195 sandstone broken up

195 285 blue clay & shale

285 320 hard sandstone

320 400 blue clay & shale

400 435 hard sandstone

435 530 blue oil shale

TOTAL DEPTH OF BORING 550 Feet

TOTAL DEPTH OF COMPLETED WELL 530 Feet

**WELL LOCATION**

Address Same

City St Helena

County Napa

APN Book \_\_\_\_\_ Page \_\_\_\_\_ Parcel 25-390-03

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**LOCATION SKETCH**

WEST EAST

0 well

Comm Valley rd

**ACTIVITY ( )**

☒ NEW WELL

MODIFICATION/REPAIR

\_\_\_\_ Deepen

\_\_\_\_ Other (Specify) \_\_\_\_\_

\_\_\_\_ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

**PLANNED USES ( )**

WATER SUPPLY

\_\_\_\_ Domestic \_\_\_\_\_ Public

☒ Irrigation \_\_\_\_\_ Industrial

MONITORING \_\_\_\_\_

TEST WELL \_\_\_\_\_

CATHODIC PROTECTION \_\_\_\_\_

HEAT EXCHANGE \_\_\_\_\_

DIRECT PUSH \_\_\_\_\_

INJECTION \_\_\_\_\_

VAPOR EXTRACTION \_\_\_\_\_

SPARGING \_\_\_\_\_

REMEDIATION \_\_\_\_\_

OTHER (SPECIFY) \_\_\_\_\_

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH TO FIRST WATER 90 (Feet) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 70 (Feet) & DATE MEASURED 6-8-00

ESTIMATED YIELD 10 (GPM) & TEST TYPE AIR LIFT

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 440 (Feet)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Feet	BORE-HOLE DIA. (Inches)	CASING (S)					
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)
Fl.	to	Fl.	Blank	Screen	Conductor		
0	23	10.5	X			PLASTIC	5"
0	70	8.0	X			"	"
70	530	8"				FACT PERF	"

DEPTH FROM SURFACE Feet	BORE-HOLE DIA. (Inches)	ANNULAR MATERIAL			
		TYPE			
Fl.	to	Fl.	CE-MENT ( )	BEN-TONITE ( )	FILL ( )
0	23	10.5	X		
23	530	8"			PEA GRAVEL

**ATTACHMENTS ( )**

- \_\_\_\_ Geologic Log
- \_\_\_\_ Well Construction Diagram
- \_\_\_\_ Geophysical Log(s)
- \_\_\_\_ Soil/Water Chemical Analyses
- \_\_\_\_ Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Pulliam Well Drilling

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2877 Piedmont CITY Napa STATE Ca. ZIP 94558

Signed B. Pulliam DATE SIGNED 6-12-00 C-57 LICENSE NUMBER 248677

WELL DRILLER/AUTHORIZED REPRESENTATIVE

## WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. **550975**

DWR USE ONLY - Well 14

08MD5W

STATE WELL NO./STATION NO.

LATITUDE

LONGITUDE

APN/TRS/OTHER

## GEOLOGIC LOG

ORIENTATION ( ) ☒ VERTICAL \_\_\_\_\_ HORIZONTAL \_\_\_\_\_ ANGLE \_\_\_\_\_ (SPECIFY)DEPTH TO FIRST WATER 90 (Ft.) BELOW SURFACE

Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

CITY \_\_\_\_\_

WELL LOCATION

Address same

City \_\_\_\_\_

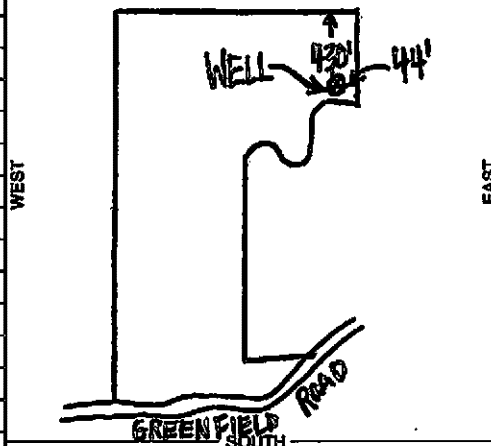
County NapaAPN Book 025 Page 390 Parcel 003

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_

Latitude \_\_\_\_\_ NORTH Longitude \_\_\_\_\_ WEST

LOCATION SKETCH

WELL #1 (Test Hole #3)



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE &amp; COMPLETE.

ACTIVITY ( )

☒ NEW WELL

MODIFICATION/REPAIR

\_\_\_\_ Deepen

\_\_\_\_ Other (Specify) \_\_\_\_\_

\_\_\_\_ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) ( )

\_\_\_\_ MONITORING

WATER SUPPLY

☒ Domestic

\_\_\_\_ Public

\_\_\_\_ Irrigation

\_\_\_\_ Industrial

\_\_\_\_ "TEST WELL"

\_\_\_\_ CATHODIC PROTECTION

\_\_\_\_ OTHER (Specify) \_\_\_\_\_

DRILLING METHOD Rotary air FLUID \_\_\_\_\_

WATER LEVEL &amp; YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 21 (Ft.) & DATE MEASURED 10-9-95ESTIMATED YIELD\* 5 (GPM) & TEST TYPE air liftTEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)

\* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 400 (Feet)TOTAL DEPTH OF COMPLETED WELL 350 (Feet)

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING(S)					DEPTH FROM SURFACE			ANNULAR MATERIAL			
				TYPE (✓)				MATERIAL / GRADE				INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE
Ft.	to	Ft.		BLANK	SCREEN	CON- DUCTOR	FILL PIPE		CE- MENT (✓)	BEN- TONITE (✓)	FILL (✓)				FILTER PACK (TYPE/SIZE)
0	25	10										X			concrete
25	400	8											X		chips
														X	pea gravel
0	50		X				plastic	5	SDR-21						
50	350			X			plastic	5	SDR-21	1/8"					

## ATTACHMENTS ( )

- \_\_\_\_ Geologic Log
- \_\_\_\_ Well Construction Diagram
- \_\_\_\_ Geophysical Log(s)
- \_\_\_\_ Soil/Water Chemical Analyses
- \_\_\_\_ Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

## CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME HUCKFELDT WELL DRILLING **1487**

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2110 Penny Lane Napa CA 94559

CITY STATE ZIP

Signed Lloyd Huckfeldt  
WELL DRILLER/AUTHORIZED REPRESENTATIVE10-19-95 439-746

DATE SIGNED C-57 LICENSE NUMBER

ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. # 2

Date Work Began 12-6-97, Ended 12-10-97

Local Permit Agency Co of Napa Environmental Management

Permit No. 96-10159 Permit Date 12-4-97

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**

Refer to Instruction Pamphlet

No. **535601**

DWR USE ONLY

Well 15

08N05W

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

**GEOLOGIC LOG**

ORIENTATION (✓) VERTICAL HORIZONTAL ANGLE (SPECIFY)

DEPTH TO FIRST WATER (FL) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	4	Top Soil
4	15	Hard Black Vol Rock
15	28	Hard White Vol Ash
28	41	Soft Tan Ash
41	88	Hard white Ash
88	190	Grey Ash
190	204	Brown Ash & Clay mix
204	227	White Ash
227	262	Brown Ash
262	391	Soft White Ash
391	406	Small Alluvial Rock mixed with Ash or laying on clay
406	445	Soft Clay sandstone mix
445	597	Shale - Blue Clay "Gumbo" mixed soft!

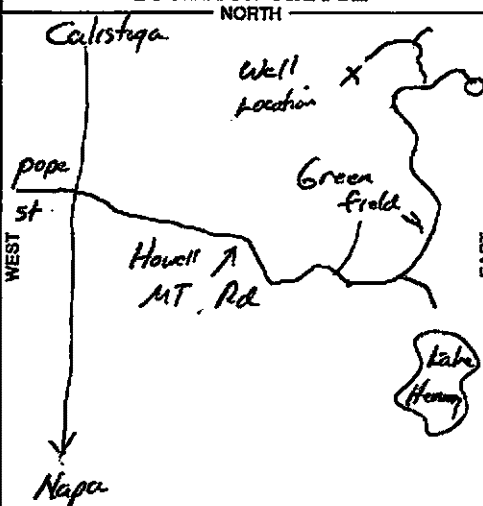
TOTAL DEPTH OF BORING 597 (Feet)

TOTAL DEPTH OF COMPLETED WELL 500 (Feet)

**WELL LOCATION**

Address 1075 Greenfield Rd  
City St Helena  
County Napa  
APN Book 25 Page 650 Parcel 34  
Township Range Section Section  
Latitude DEG. MIN. SEC. NORTH Longitude DEG. MIN. SEC. WEST

**LOCATION SKETCH**



**ACTIVITY (✓)**

- ☒ NEW WELL
- MODIFICATION/REPAIR**
- ☐ Deepen
- ☐ Other (Specify)
- DESTROY** (Describe Procedures and Materials Under "GEOLOGIC LOG")
- PLANNED USE(S)** (✓)
- ☐ MONITORING
- WATER SUPPLY**
- ☐ Domestic
- ☐ Public
- ☐ Irrigation
- ☐ Industrial
- ☐ "TEST WELL"
- ☐ CATHODIC PROTECTION
- ☐ OTHER (Specify)

DRILLING METHOD Air Rotary FLUID

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH OF STATIC WATER LEVEL 244 (FL) & DATE MEASURED 12-20-97

ESTIMATED YIELD 25 (GPM) & TEST TYPE Air Lift

TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN 500 (FL)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING(S)					DEPTH FROM SURFACE			ANNULAR MATERIAL					
				TYPE (✓)				MATERIAL/ GRADE				INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Ft.	to	Ft.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE									Ft.	to	Ft.
0	23	10 3/4	X				PVC F480	6	200		0	23		✓			
23	200	9	X				PVC F480	6	200		23	597				✓	3/8" Red Gravel
200	220	9		X			PVC F480	6	200	.032							
220	350	9	X				PVC F480	6	200								
350	500	9		X			PVC F480	6	200	.032							

**ATTACHMENTS (✓)**

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME D. Bess Pump & Well

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1115 MT George Ave CITY Napa STATE Ca ZIP 94558

Signed D. Bess  
WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 12-21-97 C-57 LICENSE NUMBER 487027

# WELL COMPLETION REPORT

Refer to Instruction Pamphlet

018 N 95

STATE Well 15

Page 1 of 1

Owner's Well No. # 2

No. 535601

Date Work Began 12-6-97, Ended 12-10-97

Local Permit Agency Co of Napa Environmental Management

Permit No. 96-10159 Permit Date 12-4-97

## GEOLOGIC LOG

## WELL OWNER

ORIENTATION ( ) ☒ VERTICAL ☐ HORIZONTAL ☐ ANGLE (SPECIFY)

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE

DEPTH FROM SURFACE  
Ft. to Ft.

### DESCRIPTION

Describe material, grain size, color, etc.

0	4	Top Soil
4	15	Hard Black Vol Rock
15	28	Hard White Vol Ash
28	41	Soft Tan Ash
41	88	Hard white Ash
88	190	Grey Ash
190	204	Brown Ash & Clay mix
204	227	White Ash
227	262	Brown Ash
262	391	Soft White Ash
391	406	Small Aluvial Rock mixed with Ash or laying on clay
406	445	Soft Clay sand stone mix
445	597	Shale - Blue Clay "Gumbo" mixed soft!

TOTAL DEPTH OF BORING 597 (Feet)

TOTAL DEPTH OF COMPLETED WELL 500 (Feet)

## WELL LOCATION

Address 1075 Greenfield Rd

City St Helena

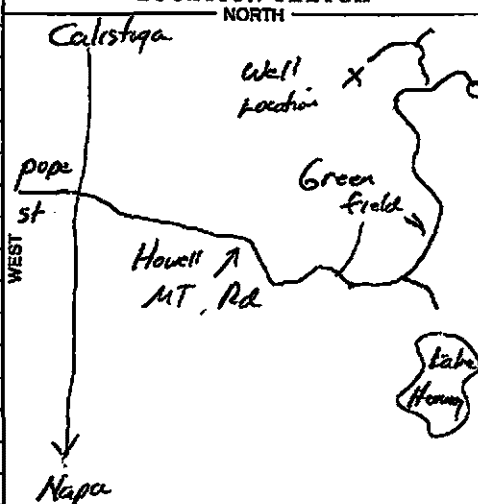
County Napa

APN Book 25 Page 060 Parcel 34

Township Range Section

Latitude DEG. MIN. SEC. NORTH Longitude DEG. MIN. SEC. WEST

## LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

## ACTIVITY ( )

- ☒ NEW WELL
- ☐ MODIFICATION/REPAIR
  - ☐ Deepen
  - ☐ Other (Specify)
- ☐ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")
- ☐ PLANNED USE(S) ( )
  - ☐ MONITORING
- ☐ WATER SUPPLY
  - ☐ Domestic
  - ☐ Public
  - ☐ Irrigation
  - ☐ Industrial
- ☐ "TEST WELL"
- ☐ CATHODIC PROTECTION
- ☐ OTHER (Specify)

DRILLING METHOD Air Rotary FLUID

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 244 (Ft.) & DATE MEASURED 12-20-97

ESTIMATED YIELD 25 (GPM) & TEST TYPE Air Lift

TEST LENGTH 2 (Ft.) TOTAL DRAWDOWN 500 (Ft.)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	CASING(S)					
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)
		BLANK	SCREEN	CHURN-DRILLER	FULL PIPE		
0	23	10 3/4	X			PVC F480	6
23	200	9	X			PVC F480	6
200	220	9	X			PVC F480	6
220	350	9	X			PVC F480	6
350	500	9	X			PVC F480	6

DEPTH FROM SURFACE Ft. to Ft.	ANNULAR MATERIAL			
	TYPE			
	CE-MENT ( )	BEN-TO-NITE ( )	FILL ( )	FILTER PACK (TYPE / SIZE)
0	23	✓		
23	597		✓	3/4" Pea Gravel

## ATTACHMENTS ( )

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil / Water Chemical Analyses
- ☐ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

## CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME D. Bess Pump & Well

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1115 MT George Ave Napa Ca 94558

Signed [Signature] DATE SIGNED 12-21-97 487027

WELL DRILLER / AUTHORIZED REPRESENTATIVE C-57 LICENSE NUMBER

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

DWR USE ONLY **Well 16**  
**08N05W**  
STATE WELL NO./STATION NO  
LATITUDE LONGITUDE  
APN/TRS/OTHER

Page \_\_\_\_ of \_\_\_\_  
Owner's Well No. \_\_\_\_  
Date Work Began 5-1-90 Ended 5-8-00  
Local Permit Agency Napa County  
Permit No. 96-11427 Permit Date 1-19-00  
No. **774364**

**GEOLOGIC LOG**

ORIENTATION ( )		VERTICAL	HORIZONTAL	ANGLE	(SPECIFY)
DEPTH FROM SURFACE		DRILLING METHOD	FLUID		
		DESCRIPTION			
0	32	rotary	mud	Describe material, grain size, color, etc.	
32	90			brown clay & rock	
90	140			blue clay	
140	195			broken up sandstone	
195	240			blue clay	
240	290	rotary	mud	broken up sandstone and rock	
290				blue shale	

TOTAL DEPTH OF BORING 300 Feet  
TOTAL DEPTH OF COMPLETED WELL 290 Feet

**WELL LOCATION**  
Address same  
City Helena  
County Napa  
APN Book \_\_\_\_ Page \_\_\_\_ Parcel 25-390-03  
Township \_\_\_\_ Range \_\_\_\_ Section \_\_\_\_  
Latitude \_\_\_\_ Longitude \_\_\_\_  
DEG. MIN. SEC. NORTH WEST  
DEG. MIN. SEC. SOUTH EAST

**LOCATION SKETCH**  
NORTH  
WEST EAST SOUTH  
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc., and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

**ACTIVITY ( )**  
☒ NEW WELL  
MODIFICATION/REPAIR  
\_\_\_\_ Deepen  
\_\_\_\_ Other (Specify) \_\_\_\_  
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")  
**PLANNED USES ( )**  
WATER SUPPLY  
Domestic: \_\_\_\_ Public \_\_\_\_  
☒ Irrigation \_\_\_\_ Industrial \_\_\_\_  
MONITORING \_\_\_\_  
TEST WELL \_\_\_\_  
CATHODIC PROTECTION \_\_\_\_  
HEAT EXCHANGE \_\_\_\_  
DIRECT PUSH \_\_\_\_  
INJECTION \_\_\_\_  
VAPOR EXTRACTION \_\_\_\_  
SPARGING \_\_\_\_  
REMEDICATION \_\_\_\_  
OTHER (SPECIFY) \_\_\_\_

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH TO FIRST WATER 90 (Ft.) BELOW SURFACE  
DEPTH OF STATIC WATER LEVEL 60 (Ft.) & DATE MEASURED 5-5-00  
ESTIMATED YIELD 12 (GPM) & TEST TYPE 4 hr LEFT  
TEST LENGTH 4 (Hrs) TOTAL DRAWDOWN 240 (Ft.)  
\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING (S)					ANNULAR MATERIAL						
Ft.	to	Ft.		TYPE ( )	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	DEPTH FROM SURFACE	TYPE					
			BLANK	SCREEN	CON-DUCTOR	FILL PIPE			Ft.	to	Ft.	CE-MENT	BEN-TONITE	FILL	FILTER PACK (TYPE/SIZE)
0	23	10 5/8	X				PLASTIC	5	200	0	23	X			
23	70	8	X				"	"	"						
70	290	8"					FACT PERE	"	"	23	290				PEA GRAVEL

**ATTACHMENTS ( )**

- \_\_\_\_ Geologic Log
- \_\_\_\_ Well Construction Diagram
- \_\_\_\_ Geophysical Log(s)
- \_\_\_\_ Soil/Water Chemical Analyses
- \_\_\_\_ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

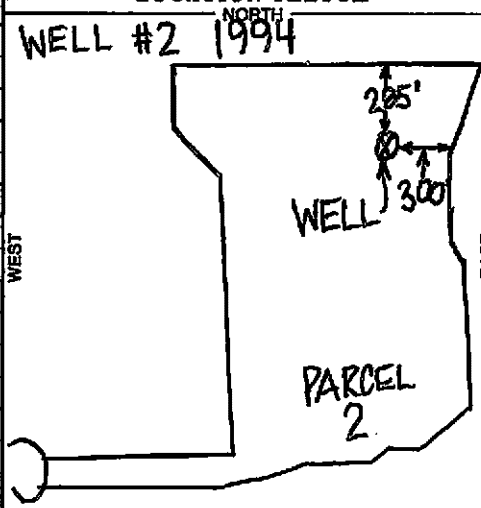
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Pulliam Well Drilling  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
ADDRESS 5877 Piedmont Ave. Napa Ca. 94558  
CITY Napa STATE Ca.  
Signed Bill Beckman DATE SIGNED 6-12-00 C-57 LICENSE NUMBER 248677  
WELL DRILLER/AUTHORIZED REPRESENTATIVE

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

Owner's Well No. \_\_\_\_\_ No. **546360**  
Date Work Began **11-14-94**, Ended **11-18-94**  
Local Permit Agency **Napa County Environmental Mgmt.**  
Permit No. **37780** Permit Date **11-4-94**

DWR USE ONLY - Well 17  
**081005W20**  
STATE WELL NO./STATION NO.  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
APN/TRS/OTHER \_\_\_\_\_

GEOLOGIC LOG				WELL OWNER	
ORIENTATION (°)		X VERTICAL _____ HORIZONTAL _____ ANGLE _____ (SPECIFY)		Name	
DEPTH TO FIRST WATER <b>40</b> (Ft.) BELOW SURFACE				Mailing Address	
DESCRIPTION				CITY	
Ft. to Ft.		Describe material, grain size, color, etc.		WELL LOCATION	
0	18	brown clay with embedded rock		Address	same
18	38	clay		City	
38	53	fractured sandstone		County	Napa
53	70	gray shale & clay		APN Book	25 Page 390 Parcel 011
70	115	hard sandstone		Township	Range Section
115	140	soft sandstone		Latitude	DEG. MIN. SEC. NORTH Longitude DEG. MIN. SEC. WEST
140	155	shale		LOCATION SKETCH	
155	200	50% sandstone/50% shale		WELL #2 1994	
200	220	sandstone			
220	250	shale		ACTIVITY (°)	
250	300	soft sandstone		X NEW WELL	
				MODIFICATION/REPAIR	
				_____ Deepen	
				_____ Other (Specify)	
				DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")	
				PLANNED USE(S) (°)	
				_____ MONITORING	
				WATER SUPPLY	
				_____ Domestic	
				_____ Public	
				X Irrigation	
				_____ Industrial	
				"TEST WELL"	
				_____ CATHODIC PROTECTION	
				_____ OTHER (Specify)	

DRILLING METHOD **Rotary (air)** FLUID \_\_\_\_\_  
WATER LEVEL & YIELD OF COMPLETED WELL  
DEPTH OF STATIC WATER LEVEL **36** (Ft.) & DATE MEASURED **11-18-94**  
ESTIMATED YIELD\* **50** (GPM) & TEST TYPE **air lift**  
TEST LENGTH **2** (Hrs.) TOTAL DRAWDOWN **N/A** (Ft.)  
\* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING **300** (Feet)  
TOTAL DEPTH OF COMPLETED WELL **270** (Feet)

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE		ANNULAR MATERIAL				
			TYPE (✓)				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)			GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Ft.	to Ft.		BLANK	SCREEN	CON- DUCTOR	FILL PIPE			CE- MENT (✓)	BEN- TONITE (✓)			FILL (✓)	FILTER PACK (TYPE/SIZE)	
0	25	10								0	3	X			concrete
25	300	8								3	20		X		grout
										20	270			X	pea gravel
0	50		X				plastic	5	SDR-21						
50	270			X			plastic	5	SDR-21	1/8"					

ATTACHMENTS (°)		CERTIFICATION STATEMENT	
____ Geologic Log ____ Well Construction Diagram ____ Geophysical Log(s) ____ Soil/Water Chemical Analyses ____ Other _____		I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.	
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.		NAME <b>HUCKFELDT WELL DRILLING</b> 1487 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)	
		ADDRESS <b>2110 Penny Lane</b> Napa CA 94559 CITY STATE ZIP	
		Signed <b>Lloyd Huckfeldt</b> 11-28-94 439-746 WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER	



STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

No. **546359**

DWR USE ONLY - Well 18

08W05W2E

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

**GEOLOGIC LOG**

ORIENTATION (°) ☒ VERTICAL \_\_\_\_\_ HORIZONTAL \_\_\_\_\_ ANGLE \_\_\_\_\_ (SPECIFY)

DEPTH TO FIRST WATER 80 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Ft.	to Ft.	
0	20	brown clay with embedded rock
20	45	brown sandstone & clay
45	80	gray shale & clay
80	130	hard gray sandstone
130	140	gray clay
140	190	soft sandstone
190	320	60% clay with sandstone stringers

TOTAL DEPTH OF BORING 320 (Feet)

TOTAL DEPTH OF COMPLETED WELL 160 (Feet)

**WELL OWNER**

Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

City \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

County Napa

APN Book 25 Page 390 Parcel 011

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**WELL LOCATION**

DEG. MIN. SEC. NORTH Longitude DEG. MIN. SEC. WEST

**LOCATION SKETCH**

WELL #1 (1994)

**ACTIVITY (°)**

☒ NEW WELL

MODIFICATION/REPAIR

\_\_\_\_\_ Deepen

\_\_\_\_\_ Other (Specify) \_\_\_\_\_

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

**PLANNED USE(S)**

(°)

\_\_\_\_\_ MONITORING

**WATER SUPPLY**

\_\_\_\_\_ Domestic

\_\_\_\_\_ Public

☒ Irrigation

\_\_\_\_\_ Industrial

\_\_\_\_\_ "TEST WELL"

\_\_\_\_\_ CATHODIC PROTECTION

\_\_\_\_\_ OTHER (Specify) \_\_\_\_\_

**DRILLING METHOD** Rotary (air) FLUID \_\_\_\_\_

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH OF STATIC WATER LEVEL 65 (Ft.) & DATE MEASURED 11-18-94

ESTIMATED YIELD\* 1 (GPM) & TEST TYPE air lift

TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE		ANNULAR MATERIAL				
			TYPE (✓)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)			GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Fl.	to Ft.		BLANK	SCREEN	COR- DUCTOR	FILL PIPE			CE- MENT (✓)	BEN- TONITE (✓)			FILL (✓)	FILTER PACK (TYPE/SIZE)	
0	25	10								0	3	X			concrete
25	320	8								3	20		X		grout
										20	300			X	pea gravel
0	40		X				plastic	5	SDR-21						
40	160			X			plastic	5	SDR-21						.062

**ATTACHMENTS (°)**

\_\_\_\_\_ Geologic Log

\_\_\_\_\_ Well Construction Diagram

\_\_\_\_\_ Geophysical Log(s)

\_\_\_\_\_ Soil/Water Chemical Analyses

\_\_\_\_\_ Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME HUCKFELDT WELL DRILLING 1487

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2110 Penny Lane Napa CITY CA 94559

Signed Lloyd Huckfeldt 11-28-94 439-746

WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. \_\_\_\_\_

Date Work Began 11-9-1993, Ended 11-17-1993

Local Permit Agency Napa County Environmental Mgmt.

Permit No. 34245 Permit Date 10-28-93

STATE OF CALIFORNIA

# WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. **462850**

DWR USE ONLY - Well 19

0.8 N 0.5 W 1/4	
STATE WELL NO./STATION NO.	
LATITUDE	LONGITUDE
APN/TRS/OTHER	

## GEOLOGIC LOG

ORIENTATION (°) X VERTICAL \_\_\_\_\_ HORIZONTAL \_\_\_\_\_ ANGLE \_\_\_\_\_ (SPECIFY)

DEPTH TO FIRST WATER 58 (Ft.) BELOW SURFACE

### DESCRIPTION

Describe material, grain size, color, etc.

DEPTH FROM SURFACE	
Ft.	to Ft.

Ft.	to Ft.	DESCRIPTION
0	33	brown clay
33	42	grey clay with grey sands
42	140	grey clay, shale & sandstone stringers
140	142	sandstone
142	320	grey clay with embedded alluvium

Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

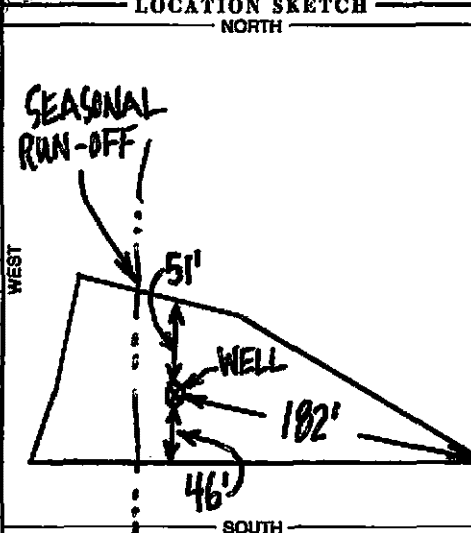
CITY \_\_\_\_\_

## WELL OWNER

### WELL LOCATION

Address Greenfield Road  
City Napa  
County Napa  
APN Book 025 Page 390 Parcel 006  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

### LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

### ACTIVITY (°)

X NEW WELL  
MODIFICATION/REPAIR  
\_\_\_\_\_ Deepen  
\_\_\_\_\_ Other (Specify)

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (°)  
\_\_\_\_\_ MONITORING

WATER SUPPLY  
X Domestic  
\_\_\_\_\_ Public  
\_\_\_\_\_ Irrigation  
\_\_\_\_\_ Industrial  
\_\_\_\_\_ "TEST WELL"  
\_\_\_\_\_ CATHODIC PROTECTION  
\_\_\_\_\_ OTHER (Specify)

DRILLING METHOD Rotary (air) FLUID \_\_\_\_\_

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 61 (Ft.) & DATE MEASURED 11-17-93

ESTIMATED YIELD\* 2 (GPM) & TEST TYPE air lift

TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN 195 (Ft.)

\* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 320 (Feet)

TOTAL DEPTH OF COMPLETED WELL 198 (Feet)

DEPTH FROM SURFACE		BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE		ANNULAR MATERIAL				
			TYPE (✓)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)			GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Ft.	to Ft.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE									Ft.	to Ft.
0	60	10								0	14	X			concrete
60	320	8								14	50		X		bentonite
										50	320			X	pea gravel
+1	2			X		steel	8								
0	52		X			plastic	5	SDR-21							
52	198			X		plastic	5	SDR-21	1/8"						

## ATTACHMENTS (°)

- \_\_\_\_\_ Geologic Log
- \_\_\_\_\_ Well Construction Diagram
- \_\_\_\_\_ Geophysical Log(s)
- \_\_\_\_\_ Soil/Water Chemical Analyses
- \_\_\_\_\_ Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

## CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME HUCKFELDT WELL DRILLING  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2110 Penny Lane

CITY Napa

STATE CA ZIP 94559

Signed Lloyd Huckfeldt  
WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 11-18-1993 C-57 LICENSE NUMBER 439-746

ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. 1-2010

Date Work Began 6/22/2010, Ended 7/7/2010

Local Permit Agency Napa County Environmental Mgmt

Permit No. E10-00251 Permit Date 6/17/2010

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

No. **E0112798**

Well 21

DWR USE ONLY  
**08N05W27**  
STATE WELL NO./STATION NO.  
LATITUDE  
LONGITUDE  
APN/TRS/OTHER

**GEOLOGIC LOG**

**WELL OWNER**

ORIENTATION (✓) ☒ VERTICAL ☐ HORIZONTAL ☐ ANGLE (SPECIFY)  
DRILLING METHOD **ROTARY** FLUID **AIR**

DEPTH FROM SURFACE  
Ft. to Ft.  
DESCRIPTION  
Describe material, grain, size, color, etc.

0	3	BOULDER
3	12	BROWN ASH W/EMBEDDED SANDS
12	14	BOULDER
14	50	BROWN ASH W/EMBEDDED SANDS
50	70	GREEN CLAY
70	100	BROWN CLAY
100	130	BROWN SANDY ASH
130	255	SHALE & CLAY
255	290	SHALE & CLAY / 10% SANDSTONE
290	300	BROWN SANDSTONE
300	378	SHALE & CLAY
378	520	40% SANDSTONE / 60% SHALE & CLAY
520	620	90% SANDSTONE / 10% SHALE
620	622	HARD SANDSTONE
622	635	SANDSTONE
635	790	SHALE & CLAY
790	1000	80% SHALE / 20% CLAY

**CONTINUED CASING LAYOUT**

488	508	BLANK PVC 5"
508	638	SCREEN PVC 5" .032 SLOT
638	658	BLANK PVC 5"

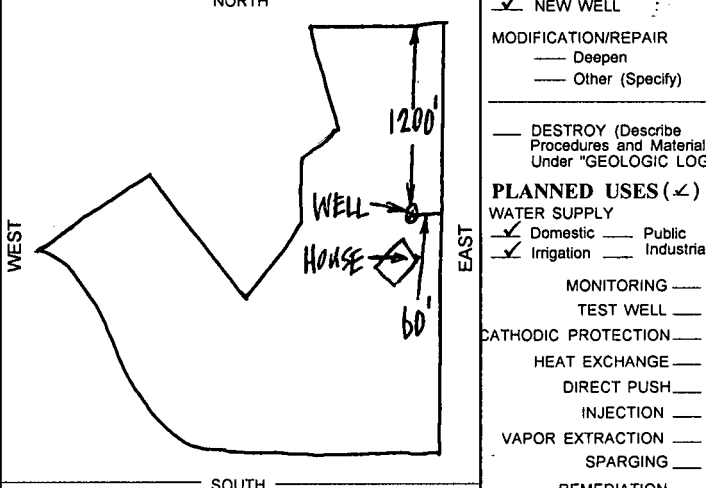
TOTAL DEPTH OF BORING **1000** (Feet)

TOTAL DEPTH OF COMPLETED WELL **658** (Feet)

**WELL LOCATION**

Address **1200 Conn Valley Road**  
City **St. Helena CA**  
County **Napa**  
APN Book **025** Page **180** Parcel **046**  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Latitude \_\_\_\_\_

DEG. MIN. SEC. LOCATION SKETCH NORTH  
DEG. MIN. SEC. ACTIVITY (✓)



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH TO FIRST WATER **290** (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL **138** (Ft.) & DATE MEASURED **7/7/2010**

ESTIMATED YIELD **3** (GPM) & TEST TYPE **AIR LIFT**

TEST LENGTH **4** (Hrs.) TOTAL DRAWDOWN **N/A** (Ft.)

May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	CASING (S)					
		TYPE (✓)	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	
0	30	12					
30	1000	9					
0	268	✓	PVC F480	5	SDR-21		
268	308	✓	PVC F480	5	SDR-21	.032	
308	348	✓	PVC F480	5	SDR-21		
348	488	✓	PVC F480	5	SDR-21	.032	

DEPTH FROM SURFACE Ft. to Ft.	ANNULAR MATERIAL TYPE			
	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	3	✓		CONCRETE
3	26	✓		CHIPS
26	1000		✓	PEA GRAVEL

**ATTACHMENTS (✓)**

- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analysis
- Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME **HUCKFELDT WELL DRILLING, INC.**  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane  
ADDRESS

Napa  
CITY

CA  
STATE

94559  
ZIP

Signed \_\_\_\_\_  
WELL DRILLER/AUTHORIZED REPRESENTATIVE

07/07/10  
DATE SIGNED

439-746  
C-57 LICENSE NUMBER



**ORIGINAL  
File with DWR**

Page 1 of 1

Owner's Well No. \_\_\_\_\_

Date Work Began 3-20-96

Ended 3-25-96

No. **547469**

Local Permit Agency Napa Co. Dept. of Environmental Mgmt

Permit No. 41603

Permit Date 3-18-96

**STATE OF CALIFORNIA  
WELL COMPLETION REPORT**

Refer to Instruction Pamphlet

DWR USE ONLY - Well 29

081N 051W 521  
STATE WELL NO./STATION NO.  
LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_  
APN/TRS/OTHER \_\_\_\_\_

**GEOLOGIC LOG**

ORIENTATION (✓) ☒ VERTICAL \_\_\_\_\_ HORIZONTAL \_\_\_\_\_ ANGLE \_\_\_\_\_ (SPECIFY)

DEPTH TO FIRST WATER 60 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Ft.	to Ft.	
0	1	Topsoil
1	20	Brown clay
20	40	Blue shale
40	57	Grey shale with stringers of grey rock
57	165	Fract. rock, grey, green, brown tan
165	200	Fract. rock, grey, brown & white
		Con't from below
		Blank Screen Slot size
140	160	X
160	200	X .030
TOTAL DEPTH OF BORING <u>200</u> (Feet)		
TOTAL DEPTH OF COMPLETED WELL <u>200</u> (Feet)		

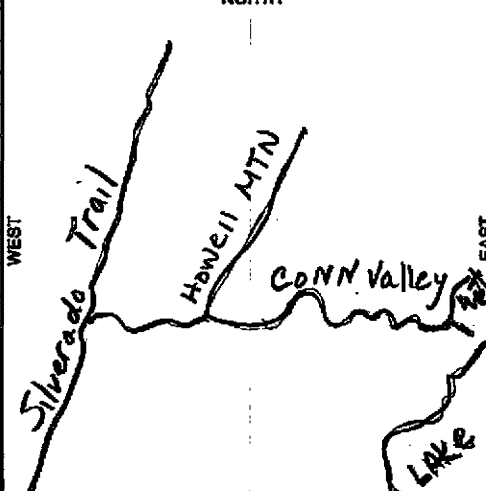
**WELL OWNER**

Address \_\_\_\_\_  
City \_\_\_\_\_  
County \_\_\_\_\_  
APN Book 25 Page 020 Parcel 043  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**WELL LOCATION**

Address 1740 Conn Valley Rd  
City St. Helena  
County Napa  
APN Book 25 Page 020 Parcel 043  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**LOCATION SKETCH**



**ACTIVITY (✓)**

☒ NEW WELL  
MODIFICATION/REPAIR  
\_\_\_\_\_ Deepen  
\_\_\_\_\_ Other (Specify) \_\_\_\_\_

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")  
\_\_\_\_\_

**PLANNED USE(S) (✓)**

MONITORING  
WATER SUPPLY  
☒ Domestic  
\_\_\_\_\_ Public  
\_\_\_\_\_ Irrigation  
\_\_\_\_\_ Industrial  
"TEST WELL"  
CATHODIC PROTECTION  
OTHER (Specify) \_\_\_\_\_

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.  
PLEASE BE ACCURATE & COMPLETE.

DRILLING METHOD Rotary FLUID Mud  
WATER LEVEL & YIELD OF COMPLETED WELL  
DEPTH OF STATIC WATER LEVEL 25 (Ft.) & DATE MEASURED 3-25-96  
ESTIMATED YIELD\* 50 (GPM) & TEST TYPE Air lift  
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 120 (Ft.)  
\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING(S)					DEPTH FROM SURFACE			ANNULAR MATERIAL						
				TYPE (✓)				MATERIAL/ GRADE				INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE			
Ft.	to	Ft.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE									Ft.	to	Ft.	CE- MENT (✓)
0		40	12 1/4"	X				F 480	6"	c1200		0		21	X			
40		60			X						.030	21		22		X		
60		80		X								22		200			X	pea gravel
80		100			X						.030							
100		120		X														
120		140			X						.030							

**ATTACHMENTS (✓)**

- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analyses
- Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME D. Doshier-Gregson Inc. 220  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
ADDRESS 5365 Napa-Vallejo Hwy American Canyon, Ca 94589  
SIGNED Raymond Shebster CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
WELL BUILDER/AUTHORIZED REPRESENTATIVE DATE SIGNED 3/26/96 258826  
C-57 LICENSE NUMBER

**APPENDIX B**  
**PUMP TEST, WELL 2**  
**2 pages following**





**Phone:** 707 823 3191 **Fax:** 707 317 0057 **Email:** rayswelltesting@gmail.com **Lic#:** 903708

**Address:** 4853 Vine Hill Rd, Sebastopol Ca 95472

**Date:** 09/16/15

**Report #:** 7608

**Report By:** Cody Monday

**Subject Property Address:** 704 Greenfield Rd, Saint Helena CA 94574

**Customer Name:** Josh Clark – Clark Vineyard Management

#### WELL DATA:

<b>Location/Description of well:</b>	To the right of the driveway
<b>Type of Well:</b>	Drilled
<b>Depth of Well:</b>	Probe stopped in casing at 272 feet
<b>Diameter of Well Casing:</b>	8" O.D. Steel
<b>Sanitary Seal (plate seal at top of well):</b>	Yes
<b>Annular Well Seal (in ground seal of bore hole):</b>	Unknown – please refer to well log

#### PUMP DATA:

<b>Pump HP and Type:</b>	2 HP 230V Submersible
<b>Depth of Pump Suction:</b>	Unknown – probe stopped in drop pipe at 113'
<b>Size of Tee at Well Head:</b>	1.25"
<b>Submersible Cable Size:</b>	#10-4
<b>Water Level Control:</b>	PumpSaver 77C
<b>Backpressure Test:</b>	*3.5 GPM @ 70 PSI @ 243.1' @ 8.5 amps

#### WELL PRODUCTION SUMMARY (see next page for pumping log):

<b>Length of Test:</b>	5 Hours		
<b>Type of Test:</b>	Drawdown and constant pumping level		
<b>Static Water Level:</b>	243.1 Feet	<b>Starting Flow</b>	9.3 GPM
<b>Water Level Drawdown:</b>	2 Feet		
<b>Final Pumping Level:</b>	245.1 Feet	<b>Final Flow</b>	12.9 GPM

#### WATER LEVEL RECOVERY SUMMARY:

<b>Pre Test Static Water Level:</b>	243.1 Feet
<b>Post Test Static Water Level:</b>	243.1 Feet
<b>Water Level Drawdown:</b>	2 Feet
<b>Water Level Recovery:</b>	2 Feet
<b>Water Level Recovery as % of Drawdown:</b>	100.00%
<b>Length Between End of Test and Recovery:</b>	10 Minutes



**WELL PRODUCTION DATA & PUMPING LOG:**

Date	Time	Interval	Water Level	Appearance	Sulfur Odor	Sand	GPM
09/16/15	10:20 AM	15 Minutes	243.1	Yellow	No	No	9.3
09/16/15	10:35 AM	15 Minutes	244.3	Orange	No	½ Pinch Casing	13.7
09/16/15	10:50 AM	15 Minutes	245	Orange	No	½ Pinch Casing	13.1
09/16/15	11:05 AM	15 Minutes	245.1	Orange	No	No	12.9
09/16/15	11:20 AM	15 Minutes	245.1	Orange	No	No	12.9
09/16/15	11:35 AM	15 Minutes	245.1	Orange	No	No	12.9
09/16/15	11:50 AM	15 Minutes	245.1	Orange	No	No	12.9
09/16/15	12:05 PM	15 Minutes	245.1	Orange	No	No	12.9
09/16/15	12:20 PM	30 Minutes	245.1	Orange	No	No	12.9
09/16/15	12:50 PM	30 Minutes	245.1	Yellow	No	No	12.9
09/16/15	01:20 PM	30 Minutes	245.1	Yellow	No	No	12.9
09/16/15	01:50 PM	30 Minutes	245.1	Yellow	No	No	12.9
09/16/15	02:20 PM	30 Minutes	245.1	Yellow	No	No	12.9
09/16/15	02:50 PM	30 Minutes	245.1	Yellow	No	No	12.9
09/16/15	03:20 PM	30 Minutes	245.1	Yellow	No	No	12.9

**Final Pumping Level:** 245.1 Feet  
**Final Flow Rate:** 12.9 GPM

**WATER LEVEL RECOVERY DATA:**

Date	Time	Interval	Water Level	Recovery %
09/16/15	03:25 PM	5 Minutes	243.5	80.00%
09/17/15	03:30 PM	5 Minutes	243.1	100.00%

**Final post test static level measurement:** 243.1 Feet  
**Final Water Level Recovery as % of Drawdown:** 100.00%  
**Length of time between end of test and recovery:** 10 Minutes

\*NOTE: the pump output pressure test indicates plugging, wear or a hole in pipe.

Water levels and well depth are measured as feet below top of well casing unless otherwise noted.

**DISCLAIMER:**

Results of well production are accurate only at time of test. We cannot predict future production or water yield.

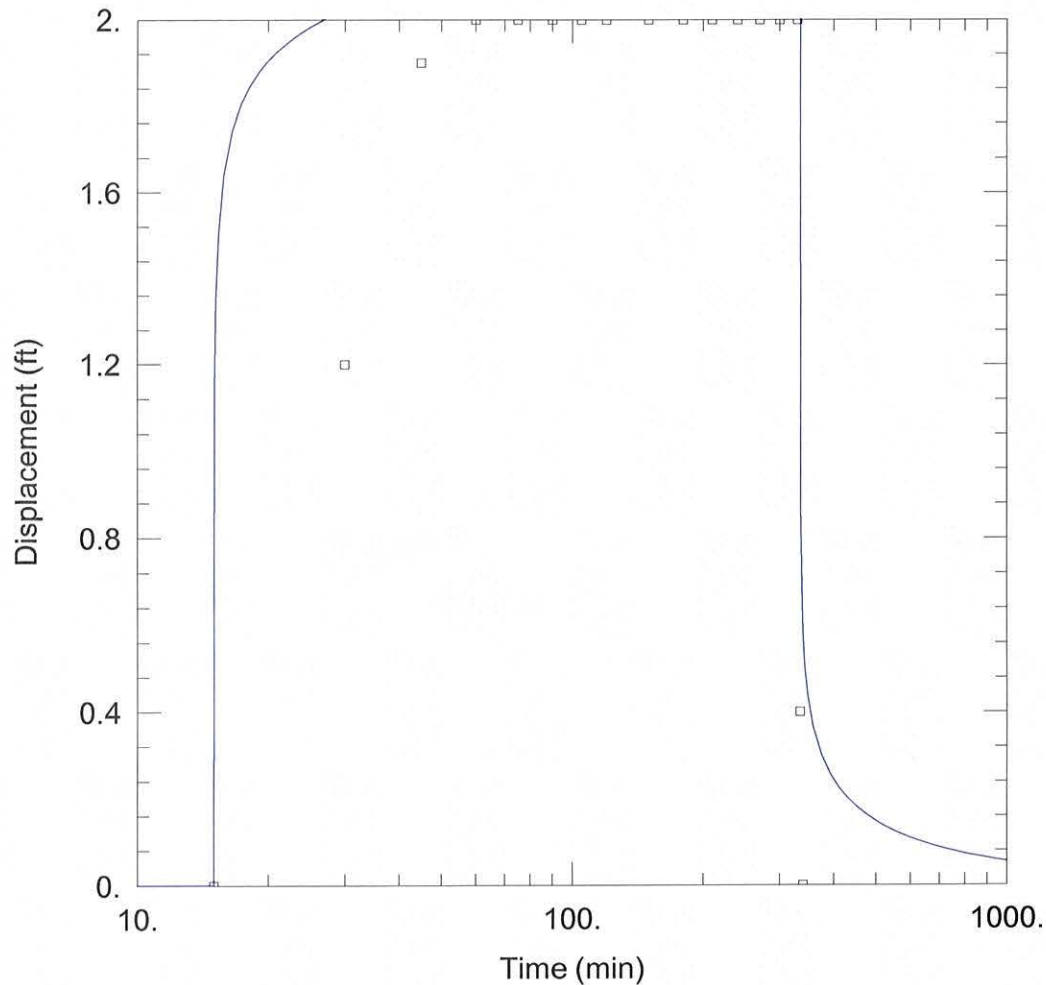
**WATER QUALITY: (The following samples are being analyzed, please refer to follow up report)**

**Analysis Choice:** Irrigation + arsenic      **Turnaround:** Standard

## **APPENDIX C**

### **PUMP TEST ANALYSIS SUMMARIES FOR AQUIFER HYDRAULIC PARAMETERS**

**3 PAGES FOLLOWING**



### WELL TEST ANALYSIS

Data Set: N:\Projects\ActiveProjects\THR 1-17 Napa WAA\Data\Working\THRPUMPTTEST.aqt

Date: 11/20/18

Time: 11:30:32

### PROJECT INFORMATION

Company: OEI

Client: THR 1-18

Project: 1

Location: Greenfield Rd

Test Well: Domestic Well #2

Test Date: 9/16/15

### WELL DATA

#### Pumping Wells

Well Name	X (ft)	Y (ft)
Domestic	0	0

#### Observation Wells

Well Name	X (ft)	Y (ft)
□ Domestic	0	0

### SOLUTION

Aquifer Model: Confined

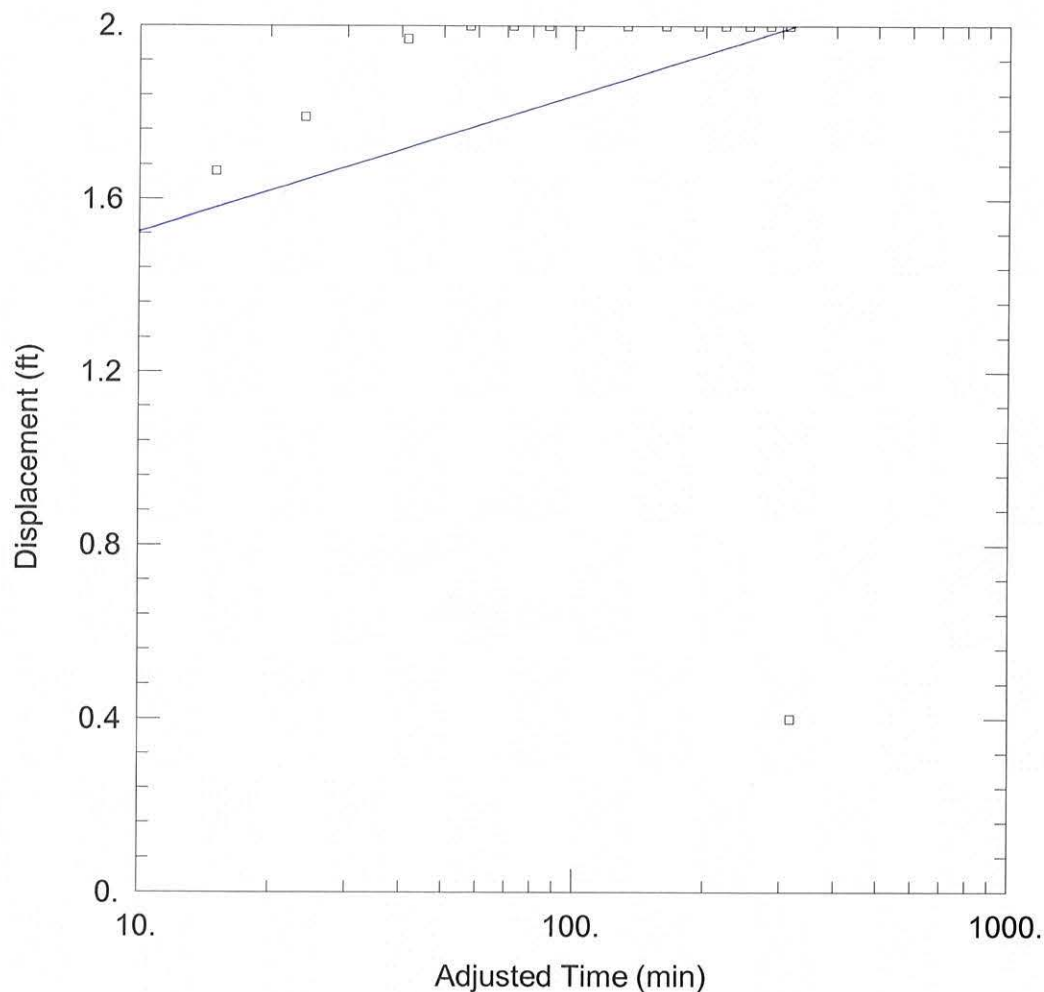
Solution Method: Theis

T = 1440. ft<sup>2</sup>/day

S = 0.001

Kz/Kr = 1.

b = 200. ft



### WELL TEST ANALYSIS

Data Set: N:\Projects\ActiveProjects\THR 1-17 Napa WAA\Data\Working\THRPUMPTTEST.aqt  
 Date: 11/20/18 Time: 11:29:39

### PROJECT INFORMATION

Company: OEI  
 Client: THR 1-18  
 Project: 1  
 Location: Greenfield Rd  
 Test Well: Domestic Well #2  
 Test Date: 9/16/15

### AQUIFER DATA

Saturated Thickness: 200. ft Anisotropy Ratio (Kz/Kr): 1.

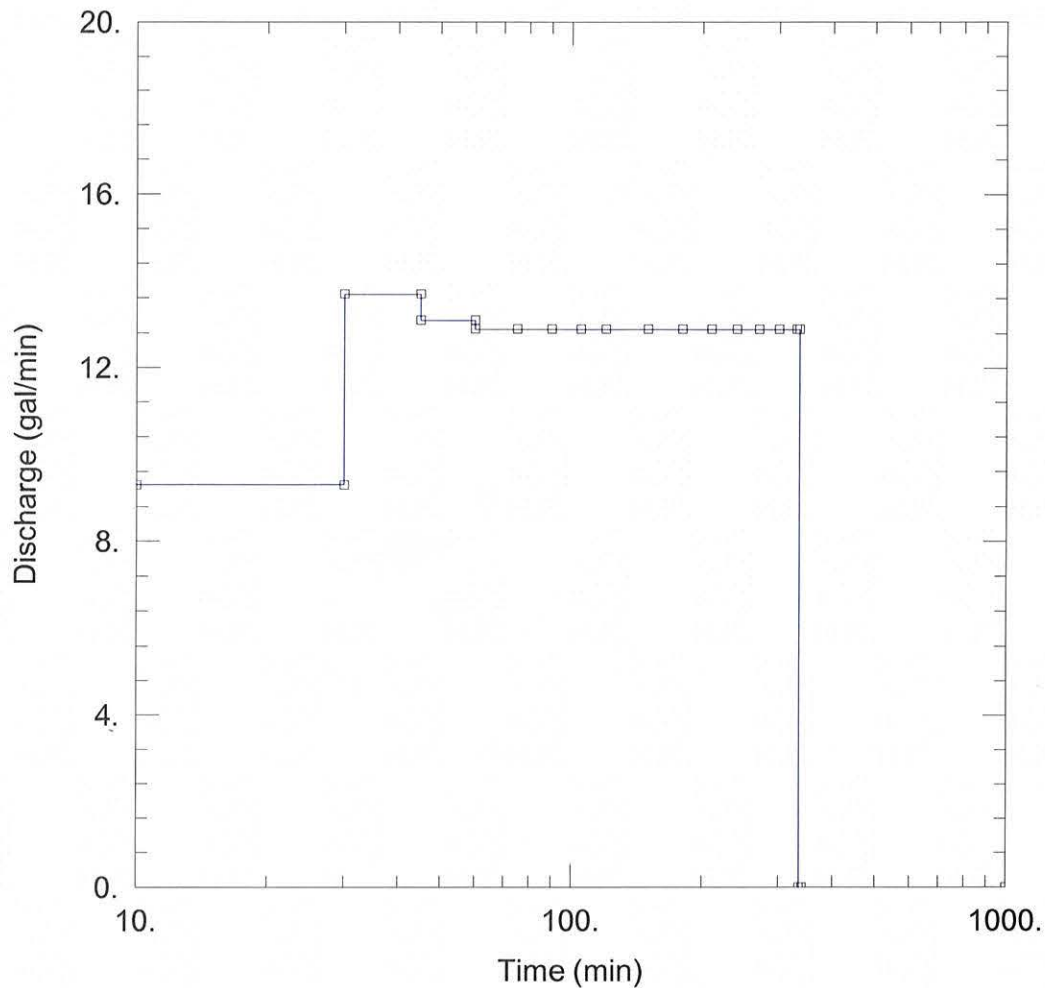
### WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Domestic	0	0	□ Domestic	0	0

### SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob  
 $T = 1440. \text{ ft}^2/\text{day}$   $S = 0.001$





### WELL TEST ANALYSIS

Data Set: N:\Projects\ActiveProjects\THR 1-17 Napa WAA\Data\Working\THRPUMPTTEST.aqt

Date: 11/20/18

Time: 11:34:43

### PROJECT INFORMATION

Company: OEI

Client: THR 1-18

Project: 1

Location: Greenfield Rd

Test Well: Domestic Well #2

Test Date: 9/16/15

### WELL DATA

#### Pumping Wells

#### Observation Wells

Well Name	X (ft)	Y (ft)
□ Domestic	0	0

Well Name	X (ft)	Y (ft)
Domestic	0	0

### SOLUTION

Aquifer Model: Leaky (confined)

Solution Method: Hantush-Jacob

T = 1440. ft<sup>2</sup>/day

S = 0.001

r/B = 0.1

Kz/Kr = 1.

b = 200. ft