



MEMORANDUM

May 31, 2014

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Job No. 533-NPA01

Re: Summary of Key Groundwater Conditions and
Results of Constant Rate Pumping Test
Proposed Yountville Hills Winery
Yountville Area, Napa County

Introduction and Project Location

Provided herein is a summary of key groundwater conditions in the vicinity of the proposed Yountville Hills Winery in the Yountville area of Napa County. Specifically, and as illustrated on Figure 1, "Location Map," the subject property is located at 7400 St. Helena Hwy just southeast of the intersection of Yount Mill Rd with the Highway and approximately 1.75 miles north of the Town of Yountville. Two APNs currently comprise the property: the smaller APN 031-130-028 (± 2.7 acres) on the northwest; and the somewhat larger APN 031-130-029 (± 8.2 acres) on the southeast. Reportedly, these two parcels will be merged as part of the overall winery construction project in order to comply with Napa County Code section 18.104.240, which requires a 10-acre minimum parcel size for new wineries.

Figure 2, "Aerial Photo View," provides the subject property boundaries on an aerial photograph basemap. Notable on Figure 2 for the subject property are: the current existence of a small, 2.6-acre vineyard in the west corner of the smaller parcel along/near Highway 29; the existing single-family residence just east of that small vineyard; and the hillsides of the adjoining Yountville Hills, which comprise much of the steeper portions of the property. Most of the entire property is seen to be undeveloped on Figure 2.



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Also shown on Figures 1 and 2 are the approximate locations of three existing water wells on the property; one, known as the Vineyard Well (aka, Well No. 1), near the northernmost corner of the smaller parcel; the second, known as the Domestic Well (aka, Well No. 2), in the southern portion of the larger parcel; and the recently constructed Well No. 3, located in the higher-elevation, northeastern corner of the property. This latter (and new) well is to be used to meet all of the water demands of the proposed winery.

Proposed Development and Water Demand for Project

We understand the property owner is planning to construct a new onsite winery, to be known as the Yountville Hills Winery. As reported in a “Wastewater Feasibility Report” prepared by Riechers Spence Associates (RSA) and dated August 28, 2013, the owner is applying for a County of Napa Winery Use Permit to allow the construction and operation of this new winery, which is to have a capacity of 100,000 gallons per year (approximately 42,000 cases of wine per year). According to that wastewater feasibility report, RSA expects that all wastewater disposal would be to the existing vineyard in the topographically-flatter portions of the two existing parcels. This existing vineyard lies in the vicinity of the Vineyard well (Well No. 1).

The project water demands described below will be met in the future by using groundwater pumped from the onsite wells. A majority of the groundwater for the project will be pumped from the recently-constructed Well No. 3. Well No. 3 will supply the potable water for the project. A small portion of the project groundwater demand will be pumped from existing Well No. 1 for irrigation-supply purposes (0.72 AF/yr, as stated in the RSA “Water Feasibility Study”). The remainder of irrigation water for the project will come from wastewater that is treated onsite, and used for vineyard irrigation. However, for the purposes of this report, and because the demand required from Well No. 1 is very small (only 0.72 AF/yr), we will assume that all groundwater demands for the project will be pumped from new Well No. 3.

In its August 2013 “Water Feasibility Study”, RSA calculated the annual water demand for the project to be approximately 1,586,895 gallons (a volume of approximately 4.87 acre feet each year, AF/yr); again, this estimate assumes that a portion of the vineyard irrigation demand will be met using treated wastewater that is processed onsite. Using this annual water demand, RSA also determined the daily average demand and the peak daily demand (defined therein to



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be 200% of the average daily demand); i.e., 4,350 gallons per day (gpd) and 8,700 gpd, respectively.

To pump this annual demand volume for the project of 4.87AF, and assuming only one onsite well (Well No. 3) were to be pumped continuously on a 100% operational basis in the future, then this well would need to pump at a constant rate of approximately 3.0 gallons per minute (gpm), 24 hours per day, 365 days per year (a 100% operational pumping basis). To strictly meet the peak daily demand of 8,700 gpd that would occur only in certain months, Well No. 3 would need to be pumped continuously on a similar 100% operational basis, but at a rate of approximately 6.0 gpm during these months.

However, in our long-term experience, a water well should not be pumped on a continuous, 100% operational basis (24 hrs/day, 365 days per year) over extended periods of time. Instead, it is more advantageous for the longevity of a well to be pumped on an operational basis of 12 hrs/day to 18 hrs/day (i.e., operational bases of 50% to 75%, respectively). At such more-realistic operational pumping scenarios, a new onsite well would need to be pumped at the following rates to meet the stated demands listed below:

- Average Daily Demand of 4,350 gpd
 - Pumped at a constant rate of approximately 6.0 gpm, while pumping at a 50% operational pumping basis (12 hrs/day, every day)
 - Pumped at a constant rate of about 4.0 gpm, while pumping at a 75% operational pumping basis (18 hrs/day, every day)
- Peak Daily Demand of 8,700 gpd
 - Pumped at a constant rate of approximately 12.1 gpm, while pumping at a 50% operational pumping basis (12 hrs/day, every day)
 - Pumped at a constant rate of approximately 8.1 gpm, while pumping at a 75% operational pumping basis (18 hrs/day, every day)
 - Note: these flow estimates for meeting peak daily demand assume there are no onsite water storage tanks.

Existing Onsite Water Wells

There is one historic existing water well on each of the two parcels which currently comprise the subject property. Figure 1 shows the locations and respective names/numbers assigned by RSA to these existing historic wells; both wells are located in the flatter portions of each current parcel. Well No. 3, the most recently-constructed onsite well is located in the higher elevations of the property, as also shown on Figure 1. Available information for the two



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historic wells was provided to RCS by either RSA, or by each of the contractors that drilled and constructed those two wells, or by Oakville Pump Service, Inc; this latter company has occasionally serviced the pumps in these historic onsite wells over time.

From the August 22, 2013-dated report by RSA titled “Water Feasibility Study,” the two onsite wells include:

Well No. 1 (aka, the Vineyard Well)

This well was reportedly constructed in 1984, although an official State Well Completion Report (i.e., a driller’s log) was not available in Napa County files, according to RSA. Reportedly, the available application to the County to drill and construct the well stated that this well would be provided with a 23-foot deep cement annular seal in the upper portion of the borehole; such a seal depth would allow the pumped groundwater to be used for irrigation-supply, and for single-family domestic use only. As seen on Figures 1 and 2, this well is located in the northern corner of the smaller parcel, near the existing small vineyard in that area. Well No. 1 is currently used to meet the irrigation demands of the existing onsite vineyard.

RCS acquired a copy, from RSA, of the “Application and Permit to Construct a Water Well” in Napa County for Well No. 1; RSA had mentioned in its August 22, 2013 report that this was the only information available to them for this well. This permit application, which is dated May 16, 1984, reveals that it was signed by Bill Pulliam of Pulliam Well Drilling Co (Pulliam) of Napa. The only items revealed on the permit application for this well were the following:

- a. The well would be used for domestic supply
- b. The well would be provided with a 23-foot deep annular seal. Note, the drilling depth, casing type, drilling method, casing diameter, and a description of the drill cuttings from the borehole were not listed on this permit application; no information on water levels or pumping rates were provided, either.

Well No. 2 (aka, the Domestic Well)

The available driller’s log according to the RSA report noted that this well was drilled and constructed in 1974 to a cased depth of 300 ft. This well, as shown on Figures 1 and 2, lies in the topographically-flatter portions of the larger of the two subject parcels, and the RSA report notes that this well is slated for permanent destruction as part of the proposed project.

RCS also acquired a copy, from RSA, of the “Application and Permit to Construct a Water Well” in Napa County for Well No. 2; once again, RSA had mentioned in its August 22, 2013 report that this was the only information available to them for this well. This permit application, which is dated April 11, 1974, reveals that it was signed by Ms. Ruby Gregson of Doshier & Gregson Inc (Doshier-Gregson), a former drilling



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company in Vallejo, CA. Also revealed on the permit application for this well are the following:

- a. Drilling and reaming of the borehole for this well were performed to a depth of 302 ft, using the direct mud rotary (bentonite clay) method of drilling.
- b. The well has 6-inch diameter casing.
- c. A cement surface seal was set to a depth of 23 ft.
- d. Based on the driller's terminology for the drill cuttings he encountered while drilling the pilot borehole, it is clear that all but the upper few feet of this borehole was drilled into various types of volcanic rocks of the Sonoma Volcanics; the driller used words like "pumice", "fractured dark rock", "fractured black rock", and "soft gray rock and hard gray volcanic rock" to describe these earth materials.

A geophysical electric log was not conducted in the open pilot hole upon completion of drilling.

The official "Water Well Driller's Report" for Well No. 2 (Log No. 94411, a copy of which is appended hereto), as prepared by Doshier-Gregson, was acquired by RCS directly from Doshier-Gregson. The log reveals the following for this well:

- a. The borehole for the well was drilled in April 1974 to a depth of 302 ft, using the direct mud rotary (bentonite) drilling method.
- b. The entire drilled borehole was uncased, except for the upper 23 ft, into which 6-inch diameter steel casing was emplaced and cemented into place; this formed the sanitary seal for the well.
- c. Because the well is uncased, it is an "open hole" below a depth of 23 ft and, hence, there are no perforations or gravel pack.
- d. After drilling the borehole, the driller reported a static water level at a depth of 18 ft in April 1974.
- e. Based on 6 hours of bailing following drilling of the borehole, the driller reported a "yield" of 20 gpm.

Neither an electric log survey of the drilled borehole nor a laboratory water quality test of the bailed groundwater was performed.

Information for Historic Wells from "Well Reports" by Oakville Pump

The Oakville Pump "Well Report" of 9/20/12 for Well No. 1 (Vineyard Well) indicated the following:

- The casing depth was not known



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- The static water level was “not tested”
- The well casing is 5-inch diameter PVC
- The pump size is 3Hp
- The pump depth setting, the water level drawdown, and the water level recovery were “not tested”.

An Oakville Pump “Well Report” is available for two separate dates for Well No. 2 (Domestic Well), these dates being 7/8/97 and 9/20/12. In its 1997 report, Oakville Pump noted:

- Total casing depth = 300 ft
- Static water level = 60 ft
- Pump depth setting = 273 ft
- A well yield of 20 gpm and a water level drawdown of 85 ft [likely, to a depth of ±145 ft]
- The well is cased with 6-inch diameter steel casing

For its 2012 report, Oakville Pump noted:

- 300 foot deep well
- Static water level was “not tested”
- Casing is steel and it has a 5-inch diameter
- The pump has a 5 Hp motor and a rated capacity of 20 gpm
- The pump is set at a depth of 273 ft
- Water level drawdown and water level recovery were “not tested”

Well No. 3 (The Recently-Constructed Well)

Drilling and construction of this new water well occurred between April 11 and 22, 2014; drilling and well construction operations were performed by Pulliam Well Exploration Inc. (PWE) of Vacaville, California. RCS geologists did not have any direct contact with PWE during the well construction, and were not present in the field during any part of the drilling, construction, or development of new YHW Well No. 3. The direct air rotary drilling method was used to drill and ream the pilot borehole for this new well.

A State of California Department of Water Resources (DWR) Well Completion Report (i.e., the driller’s log) was provided to us for Well No. 3, as prepared by PWE; a copy of this driller’s log is provided in the Appendix. Details of the as-built well construction, according to the PWE driller’s log, include:

1. The pilot hole was drilled to a depth of 705 ft below ground surface (bgs).
2. The pilot hole was reamed to a diameter of 12 inches from ground surface to a depth of 70 ft bgs, and to a diameter of 10 inches from 70 ft to a final depth of 665 ft bgs.

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3. The reamed borehole was then cased with 6-inch diameter Schedule 40 PVC SDR21 well casing to 665 ft bgs.
4. Casing perforations consist of machine-cut horizontal slots (0.032-inch slot size) and were reportedly placed at the following depths: 385 to 425 ft; 465 to 505 ft; 525 to 545 ft; 565 to 605 ft; and 645 to 665 ft bgs.
5. The annular space (annulus) between the reamed borehole walls and the outside of the well casing was filled with a gravel pack comprised by “pea” gravel from a depth of 70 ft to 200 ft bgs and by a No. 6 gradation gravel pack from 200 ft bgs to the total reamed depth of 665 ft bgs.
6. The cement used for the sanitary seal for the new well was placed in the upper portion of the annulus from ground surface to a depth of 70 ft bgs.

Following installation of the well casing, gravel pack and cement seal, and based on the information available on the driller’s log, PWE performed well development operations via airlifting methods on April 19, 2014 for a period of 4 hours at an estimated airlift rate of 50 gpm. Prior to this short-term airlifting, the static water level in the well was measured by PWE to be 340 ft.

In early-May 2014, and following the mechanical development work (via airlifting), Imboden Pump of Napa, California (Imboden) was selected by the owner to install a test pump and conduct pumping development in Well No. 3. Imboden reportedly installed a temporary test pump to a depth of approximately 610 ft bgs and then developed the new well by pumping and surging methods. Limited pumping and surging was performed at pumping rates as high as 27 gpm for a period of 3 hours on May 1, 2014. At the end of that three-hour period, the water discharged from the well was reported by Imboden to be clear and relatively free of fine-grained sediment.

Rainfall Conditions

To assess rainfall in the region, RCS obtained annual rainfall totals via the Western Regional Climate Center (www.wrcc.dir.edu) for the Napa State Hospital raingage (No. 046074), which represents the gage nearest the subject property with available long-term precipitation data. As shown on Figure 3A, “Annual Rainfall Totals,” useable annual rainfall data for this gage range from 1918 only through 2010; data for this gage for 2011, 2012 and 2013 are reportedly incomplete, inaccurate, or not available. During the period of useable record, minimum and maximum rainfall totals have ranged approximately from a high of 51.3 inches in 1983 to a low of 9.7 inches in 1946. The long-term average annual rainfall for the period of record is



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calculated to be 24.8 inches. Such a relatively high average annual rainfall is beneficial for groundwater recharge.

To help assess possible trends in annual rainfall over time recorded by the Napa State Hospital raingage, RCS then created Figure 3B, "Accumulated Rainfall Departure Curve." By the standard manner in which the data points for this curve have been calculated and plotted, rainfall trends over time are discernible as follows:

- a. Whenever the curve ascends to the right, a wet period has occurred; examples of wet periods are 1940-1943, 1978-1984 and 1995-2007. In such wet periods, the annual rainfall during every year in the period has generally been at or above the long-term average annual rainfall total for this gage.
- b. Whenever the curve descends to the right (e.g., from 1918-1940, 1943-1978 and 1984-1995), a dry period or drought has occurred. That is, annual rainfall totals in each year of this period has generally tended to be at or below the long-term average annual rainfall for the gage.

Local Geologic Conditions

Figure 4, "Geology Map," illustrates the types, lateral extents, and boundaries between the various earth materials mapped at ground surface in the region by others. Specifically, geologic data on Figure 5 have been adapted from the results of regional geologic field mapping of the Rutherford and Yountville quadrangles, as published by the California Geological Survey (CGS) in 2005 (Clahan, K.; Wagner, D., et al). From geologically youngest to oldest, the local earth materials exposed at ground surface in the mapped area include:

- a. Alluvial deposits (map symbols, Qhf, Qhl, Qf, Qhty). These materials, which are of Holocene and late Pleistocene in geologic age, consist of unconsolidated layers and lenses of clay, silt, sand and gravel and include alluvial fans, stream terraces, fan levees, and even landslide materials in the nearby hills. On Figure 4, these alluvial materials are shown in pale yellow to dark yellow colors. As seen, these alluvial deposits occur at ground surface across most of the floor of Napa Valley, and also along the topographically-flatter portions of the property along Highway 29. These alluvial materials may extend to a maximum depth of only 20 ft to 30 ft beneath any portion of the subject property.
- b. Sonoma Volcanics (map symbols, Tsvasl, Tsvatsl, Tsvr). Rocks of the Sonoma Volcanics are exposed at ground surface throughout the hillsides comprising the Yountville Hills and, thus, these rocks occur at ground surface on the topographically-elevated portions of the subject property. On Figure 4, these volcanic materials directly on the subject property are shown in a wine color (Tsvasl). Typical rock types of the Sonoma Volcanics include dacite, andesitic and basaltic lava flows, and volcanic



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tuffs. These hard volcanic rocks tend to produce more groundwater wherever and whenever they are highly fractured and/or deeply weathered. However, fine-grained ash flows and deeply weathered volcanic tuffs (Tsvatsl) tend to have limited permeability and these materials are capable of providing groundwater at only low production rates to new wells.

- c. Bedrock (not exposed at ground surface in the area shown on Figure 4) Underlying the volcanic rocks at depth below the property are various rocks of the Franciscan assemblage. Principal rock types in this geologically older formation are thick-bedded sandstone and siltstone with minor interbedded shale, and even serpentinite. These rocks are of Cretaceous to Jurassic in geologic age. Because of their high degree of consolidation and/or cementation, their overall fine-grained nature, and their great geologic age, these diverse rocks are considered to be nonwater-bearing; only a small and variable amount of water may occur in the limited number of fractures and/or fissures in these rocks. Hence, these older rocks represent the bedrock of the area.

A northwest-southeast oriented fault has been mapped by others in the region, as shown by the dark black dashed/solid line on Figure 4. This fault does not traverse the subject property. The possible impacts of this fault on groundwater availability are unknown. However, this fault could serve to increase the amount and frequency of fracturing in the local volcanic rocks. If the latter has occurred, it would tend to increase the open area in the rocks which, in turn, could increase the ability of the local volcanic rocks to store groundwater.

Local Hydrogeologic Conditions

Earth materials exposed in the hillsides and in the topographically-flat portions of the property along Highway 29 can generally be classified into two basic categories, based on their relative ability to store and transmit groundwater to wells. These two basic categories include:

Potentially Water-Bearing Materials

These materials include the various alluvial sediments that mantle the low-lying portion of the subject property along Highway 29. However, these sediments do not have a sufficient thickness beneath the property to allow them to be a potential source of groundwater for the proposed winery project.

The principal water-bearing materials at and beneath the subject property and its environs are represented by the hard and fractured volcanic rocks of the Sonoma Volcanics on the subject property. The occurrence and flow of groundwater in these rocks tend to be primarily controlled by the secondary porosity within the rock mass, that is, by the fractures and joints that have been created in these harder volcanic flow-type rocks over time by various volcanic and tectonic processes. Specifically, these fractures and joints have been created as a result of the cooling of these originally molten flow rocks following their deposition, and also from

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mountain building or tectonic processes (faulting and folding) that have occurred over time after the rocks have hardened. Some groundwater can also occur in zones of deep weathering between the periods of volcanic events that yielded the various flow rocks. The amount of groundwater available at a particular drill site for a new well in such hard volcanic flow rocks would depend on such factors as:

- the number, frequency, size and degree of openness of the fractures/joints
- the degree of interconnection of the various fracture/joint systems in the subsurface
- the amount of recharge from local rainfall that becomes available for deep percolation to the fracture systems
- the extent to which the fractures may have been filled over time by chemical deposits and/or weathering products (clay, etc.)

Due to the highly variable nature of rock fractures, it is not possible to predict, without drilling a pilot borehole, the actual amounts or depths to the open fractures and the associated occurrence of groundwater. From our considerable amount of prior experience with these harder flow rocks at other water well construction projects in Napa County, pumping capacities in individual wells have ranged widely, from rates of 5 or 10 gpm, to rates of 200 gpm, or more. As stated above, the principal rock types exposed at ground surface on the property and also expected in the subsurface beneath the property are the hard, potentially well-fractured volcanic flow rocks of andesitic composition (Figure 5 symbol, Tsvasl).

Potentially Nonwater-Bearing Rocks

This category includes all rocks that underlie and are geologically older than the Sonoma Volcanics. This includes all rocks assigned to the Franciscan assemblage. In essence, these rocks are old, well-cemented and well-lithified, and have an overall fine-grained nature and low permeability. Even in areas of abundant fractures, successful well yields are often only a few gpm in these rocks, and the water quality can be marginal to poor in terms of total dissolved solids concentrations, etc. Hence, whereas a well constructed into these rocks may produce sufficient groundwater for domestic supply to a residence, a new well would very likely not be capable of producing water in useable quantities for the proposed winery project.

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Site Visit and Data for Offsite Water Wells in the Area

Based on our recent field visit, on our review of readily available aerial photographs, and on the results of our prior hydrogeologic work for other clients in the area, RCS is aware that water wells do exist at various properties along the valley floor in this portion of Napa County. Figure 5, "Locations of Nearby Water Wells," illustrates the very approximate locations of offsite water wells either known or suspected to occur on these offsite properties. It is to be understood that the locations of the offsite wells shown on Figure 5 may not be a complete documentation of all existing wells in the area.

Each of the offsite homes and vineyard areas can be assumed to have its own onsite water well(s) because there is no public water supply in the area. Because California Water Code Section 13752 requires that well completion reports (driller's logs) be kept confidential, RCS was unable to obtain and/or describe any of these logs and, hence, RCS cannot discuss actual water levels, pumping rates, or water quality for any of these offsite wells in this report. Each of these offsite wells can reasonably be assumed to be operationally pumped to provide groundwater for domestic use, for landscape irrigation, an/or for irrigation of vineyards (if any) on these offsite parcels.

One notable well for which RCS provided previous hydrogeologic services (for well siting, well design, and final well testing) lies within ± 2000 ft of the subject property. This offsite well was cased with 8-inch diameter casing to a depth in the range of 550 to 600 ft. All but the upper portion of the borehole was drilled into various types of volcanic rocks. Due to the known perforated interval(s) in this offsite well, RCS recognizes that its groundwater supply is derived solely from rocks of the Sonoma Volcanics. During the final pumping tests of this offsite well, the RCS geologist tested it at rates in excess of 100 gpm.

Groundwater Level Data

No long-term accumulations of data on the depths to the static (non-pumping) water levels and/or pumping water levels exist for either of the two historic onsite wells. At the date of its 1974 construction, the driller for Doshier-Gregson reported that the original static water level in Well No. 2 was at a depth of 18 ft; no similar information on the original static water level depth in Well No. 1 is available.

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During the March 2, 2014 field visit to the property by a Senior Geologist from RCS, the static water level in Well No. 1 was measured at a depth of 24.7 ft below ground surface. This “current” depth is only about 6.7 ft below the one reported by the driller when this well was constructed in early-1974. During this same site visit, the RCS geologist also measured the then-current static water level in the Domestic well (Well No. 2) to be at a depth of 53.5 ft.

As noted in the “Well Reports” by Oakville Pump (Oakville), discussed above, they did not measure or record a static water level depth in Well No. 1 during their field visit on September 20, 2012. However, in their July 8, 1997 field visit, Oakville reported the static water level in Well No. 2 to be at a depth of 60 ft; that company did not monitor a static water level depth during its September 20, 2012 for this Domestic well. Thus, in mid-1997, the static water level in Well No. 2 was about 6.5 ft deeper than it was based from the measurement by the RCS geologist on March 2, 2014.

Groundwater Levels in Napa Valley

To help assess the general status of groundwater levels in wells along the floor of Napa Valley, RCS obtained available water level records for 4 wells in Napa Valley that have both long-term and current data records. Water levels in numerous water level observation wells have been monitored for many years by Napa County; these data have been provided by the County to the California Department of Water Resources (DWR). Unfortunately, over time, some of the observation wells once monitored by the County were removed from service or destroyed, or were otherwise no longer monitored by the County.

Thus, water levels in the 4 wells selected by RCS for review are ones still measured by the County (i.e., their data are current). The approximate locations of these 4 wells, relative to the subject property, are shown on Figure 6, “Wells with Hydrographs”. As seen thereon, these wells include State Well Nos. 7N/5W-9Q2 (located about 3.5 miles northwest of the subject property); 7N/5W-16L1 (located about 3.2 miles northwest of the property); 7N/5W-16N2 (located 3.2 miles to the northwest); and 6N/4W-6L2 (located about 2.6 miles southeast of the property). Data used to prepare the resulting graphs of water levels vs time (known as hydrographs) for these 4 wells were obtained in electronic format from the DWR website.

Figures 7A through 7D represent the respective hydrographs for the 4 wells shown on Figure 6. The specific data points, for the most part, represent the results of monitoring events performed

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by County personnel twice each year, once in the spring and once in the fall. Most of the spring water level data appear to be for static (non-pumping) water levels; most of the water levels obtained in the fall months are likely pumping levels. Note that the names of the well owners, along with the use, activity, total pumpage rates and volumes, well depths and perforation intervals are not reported for the 4 County-monitored wells shown on Figure 6.

Notable on all graphs are the following:

- a. Each well has a relatively long period of available water level data, but the duration of available data for each well is different.
- b. Water levels tend to be at their annual high during the spring months of each year following rainfall/recharge events and reduced groundwater extractions.
- c. The annual water level low tends to occur in the fall months following a period of a lack of rainfall/recharge events and increased groundwater extractions.
- d. The amplitude of water level change on each hydrograph from the spring reading to the fall reading is somewhat different for each well. For example, the typical annual water level fluctuations for wells 7N/5W-9Q2 (Figure 7A) and 6N/4W-6L2 (Figure 7D) are on the order of 5 to 15 ft each year between the spring and fall readings. In contrast, the hydrographs seen on Figures 7B and 7C display seasonal water fluctuations as large as 60 ft to nearly 120 ft (as stated above, it is likely that many of these fall readings in these two wells represent pumping water levels and not true static levels).
- e. These hydrographs do not reveal a progressive, continuous or increasing trend in the decline of groundwater levels over time; instead, the water levels respond to changes and trends in rainfall over time, based on a comparison to the rainfall cumulative departure curve on Figure 3B.

Pumping Tests of New Well No. 3

Pumping tests were performed in Well No.3 shortly following both the limited airlift development by the well driller (PWE), and the limited pumping development by the pump installer (Imboden). For these recent pumping tests in Well No. 3, pressure transducers were installed by an RCS geologist on May 5, 2014 into the three onsite wells, Well Nos. 1, 2, and 3. These pressure transducers were installed to automatically collect water level data in each well before, during, and after the step drawdown and constant rate pumping tests conducted in Well No. 3. In addition, a barometric pressure transducer was installed at the Well No. 3 site to measure changes in atmospheric pressure in the area that may have occurred during the testing period. Water level data collected by these electronic devices were supplemented by occasional manual water level measurements collected by the onsite pumper from Ray's Well Testing

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Service Inc. (RWTS), who also operated the test pump and collected field data during the pumping tests.

During these pumping tests (i.e., the step drawdown test and the constant rate pumping test), only Well No. 3 (the pumping well) was allowed to pump during the entire water level monitoring period. Well Nos. 1 and 2 were completely disabled to preclude any unplanned pumping in those wells.

For the following discussion, all water levels reported below reflect the depths to groundwater below the wellhead reference point (brp) at each well. For this pumping work, a sounding tube was installed into each of the three onsite wells to safely house each transducer and to facilitate the collection of water level measurements. Note, the reference point at each well is actually above ground surface, at the top of the sounding tube in each well.

Background Water Level Monitoring

The purpose of this background water level monitoring period was to identify possible groundwater fluctuations that may have been occurring in the area prior to the start of the pumping portion of the subject pumping tests. Background water level monitoring was performed as follows: for a period of roughly 1 day prior to the start of the step drawdown test in Well No. 3; for a period of 2½ days between the end of the step drawdown test and the constant rate pumping test; and for a period of 3 days following the end of the constant rate pumping test. Figure 8A, “Water Levels During Entire Monitoring Period, Well No. 3,” and Figure 8B, “Water Levels During Entire Monitoring Period, Well Nos. 1 and 2,” have been prepared to illustrate the automatically-recorded transducer data collected in all three onsite wells during the entire monitoring period.

Water level data for all three monitored wells showed that little to no fluctuation occurred during the entire background water level monitoring period (the period when no onsite wells were pumping). In Well No. 3 (Figure 8A), water levels appear to remain stable and level for all background water level monitoring periods, with the exception of the final 10 hours of the water level monitoring period, during which water levels appear to decline by roughly 0.3 ft (see Figure 8A).

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Water levels monitored in the two observation wells, Nos. 1 and 2, also showed very minimal water level fluctuation or decline (see Figure 8B) during the background monitoring period. Water levels in these two wells showed a general decline on the order of 0.5 ft over the course of the entire water level monitoring period (including the periods of non-pumping before and after the constant rate pumping test). This is typical of volcanic rock aquifers in the Napa Valley region. During the irrigation season, water levels in the aquifers tend to decline as irrigation water is extracted, and thereafter tend to rise during periods of recharge following rainfall events.

Step Drawdown Test

A 9-hour (540-minute) step drawdown test was performed in new Well No. 3 on May 6, 2014. For this test, this well was pumped at the approximate pumping rates of 10 gpm, 15 gpm, and 25 gpm; the well was pumped continuously at each of these three step rates for three hours. Figure 9, "Water Levels During Step Drawdown Test, Well No. 3," shows the water levels as recorded by the pressure transducer during the step drawdown test. Table 2, "Step Drawdown Test Data," provides a summary of the data collected during this step test. As shown on Figure 9, and as summarized on Table 2, the results of the step test were as follows:

- The pre-test static water level (SWL) was measured and recorded by the pressure transducer to be at a depth of 285.9 ft below reference point (brp).
- During the test, maximum pumping water levels (PWLs) were measured at the following depths: 293.3 ft brp while pumping at an average rate of 10 gpm for Step No. 1; 300.2 ft brp while pumping at an average rate of 18 gpm for Step No. 2; and 308.4 ft brp while pumping at an average rate of 25 gpm for Step No. 3.
- Specific capacity values for each of the short-term step test rates were: 1.4 gpm/ft drawdown (ddn) for Step No. 1; 1.3 gpm/ft ddn for Step No. 2; and 1.1 gpm/ft ddn for step rate No. 3.
- During step drawdown testing, it was reported by the RWTS pumper at the beginning of the test that the discharge water had a light yellow to gray color. Clear water was reportedly not observed by the pumper until near the middle of Step No. 2. At the beginning of Step No. 3, the water was noted to display a light yellow "haze" and the water did not appear to clear up until the last hour of continuous pumping. No additional water quality field observations were noted by the pumper during the step drawdown test.

MEMORANDUM

Constant Rate Pumping Test

Following the step drawdown test, a 24-hour (1440-minute) constant rate pumping test was then performed in Well No. 3 (the pumping well) on May 9, 2014, at an overall average pumping rate of 15 gpm. (Note that this pumping rate is higher than the pumping rate necessary for the entire project.) Figure 10A, "Water Levels During Constant Rate Pumping Test, Well No. 3," illustrates the water level changes as recorded by the pressure transducer and by the occasional manual water level measurements recorded by the pumper during the constant rate testing period. A summary of key test data is as follows:

- An initial SWL of 286.2 ft brp was measured prior to startup of this test.
- After 24 hours of continuous pumping at an average pumping rate of 15 gpm (based on totalizer dial readings collected by the pumper), a maximum pumping water level (PWL) depth of 298.0 ft brp was recorded. This results in a total water level drawdown of 11.8 ft.
- The current specific capacity of the well for this 24-hour constant rate test is calculated to be 1.3 gpm/ft ddn.
- Pumping water levels appeared to be stable after roughly 6 hours of continuous pumping.
- The water reportedly had a light yellow color and was hazy in the first 2 hours of the pumping test; after this period, the water was noted by the pumper to be clear.
- After the cessation of pumping for the constant rate pumping test, recovery water level measurements were recorded by the pump operator for a period of 2 hours. At the end of this recovery period, water levels had recovered to a depth of 286.8 ft brp; this depth is only 0.6 ft below the pre-test SWL of 286.2 ft brp.

Figure 10B, "Water Levels During Constant Rate Pumping Test, Well Nos. 1 and 2," graphically illustrates water levels recorded in these onsite water level observation wells (each was monitored by a separate pressure transducer) during the constant rate pumping test of Well No. 3. Neither of these onsite water level observation wells was pumped during the pumping test of Well No. 3. The curves presented of Figure 10B show that while continuously pumping new Well No. 3 for 24 hours at an average rate of 15 gpm, water level declines of approximately 0.05 ft and 0.15 ft occurred in Well Nos. 1 and 2, respectively. Therefore, each of these onsite wells showed only negligible water level declines, and these measured declines are within the error range of the pressure transducers used for this test. Hence, the pumping of Well No. 3 for the constant rate pumping test is considered to have little to no effect on the onsite wells. From

MEMORANDUM

Figure 1, these two historic wells are located 920 ft to the west-northwest (Well No. 1), and 720 ft to the west-southwest (Well No. 2) from new Well No. 3.

Groundwater Quality

Samples for water quality analysis were collected at the end of the constant rate pumping test on May 10, 2014 and were submitted to CalTest Laboratory in Napa, CA (CalTest). Key data from those laboratory analyses include:

- The local groundwater has a calcium bicarbonate to a sodium bicarbonate water character;
- A very low total dissolved solids (TDS) concentration of 190 milligrams per liter (mg/L);
- Total hardness of the water is considered to be low, reported to be 53 mg/L;
- A pH of 6.5;
- Dissolved iron was not detected in the sample;
- Arsenic was not detected in the groundwater sample;
- Boron was not detected;
- Nitrate as NO₃ was only at 3.1 mg/L;
- Fluoride was not detected;
- Silica was reported at a concentration of 100 mg/L. Although there is no health standard for dissolved silica, it can clog emitters, valves and other water distribution mechanisms, and it can stain plumbing fixtures. Further, CalTest labs reports that concentrations in excess of 70 mg/L “etch various household materials such as leaded crystal, marble, tile, windows, and porcelain”.

Laboratory results from prior testing of groundwater samples collected from each of the 2 historic onsite wells are not available; limited data for a few analytes, however, do exist for the limited field water quality parameters recorded by Oakville Pump during their prior assessments of the pumps for the two wells. Specific field water quality data by Oakville Pump include:

Well No. 1

From a field visit on 9/20/12: pH = 6.49; total hardness (TH) = 205 mg/L; iron = 0.07 mg/L; manganese = 0.029 mg/L; silica = 49.4 mg/L; hydrogen sulfide (an odor) = not detected (ND); nitrate/nitrite = not tested (NT); total dissolved solids (TDS) = 400.8 mg/L; turbidity = 1.54 NTUs

MEMORANDUM

Well No. 2

From a field visit on 9/20/12: pH = 6.52; TH = 68.4 mg/L; iron = 4.94 mg/L [this value exceeds the State Secondary Maximum Contaminant Level (MCL) of 0.30 mg/L for this constituent for domestic supply]; manganese = 0.111 [this value exceeds the Secondary MCL of 0.05 mg/L) for manganese for domestic supply]; silica = 88.8 mg/L; hydrogen sulfide = ND; nitrate/nitrite = NT; TDS = 120.4 mg/L; and turbidity = 80 NTUs ([his turbidity value is very high; it indicates the tested water contained abundant fine-grained sediments (silt and clay) and as a result, this high value very likely resulted in the “false positives” for the excessive detections of iron and manganese]).

Conclusions

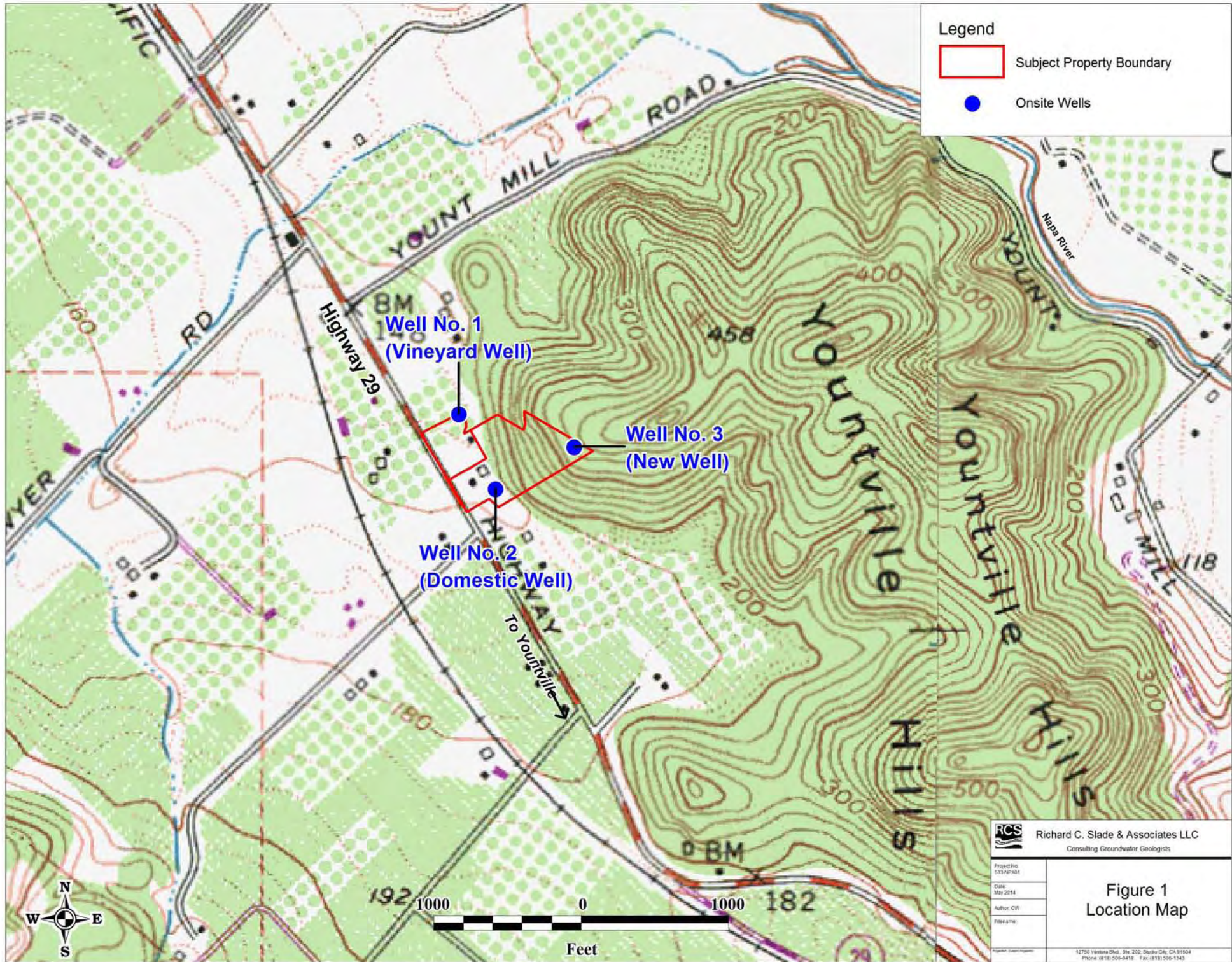
Based on the data presented herein for this project, our key conclusions are as follows:

- The average annual groundwater demand for the project is 4.87 AF/yr, as reported in documents prepared by RSA. In order to produce this volume of water, an onsite well (or wells) would need to pump at a combined rate of approximately 6.0 gpm, while pumping at a 50% operational pumping basis (12 hrs/day, every day).
- Peak day demands for the project are estimated by RSA to be about 8,700 gpd. This equates to an onsite well (or wells) pumping at a rate of approximately 12.1 gpm, while pumping at a 50% operational pumping basis (12 hrs/day, every day).
- Water demands for the proposed project will be met by pumping onsite groundwater. Well No. 3 will be the primary well, and will provide all of the groundwater needed for the project, including all potable water supplies. A small portion of the groundwater demand for the project will come from treated wastewater that will be generated onsite. Well No. 1 will provide a small portion of the annual irrigation demand for the onsite vineyards (reported by RSA to be 0.72 AF/yr).
- A constant rate pumping test was performed in Well No. 3 at a rate of 15 gpm. This rate of 15 gpm was chosen by RCS for the pumping test because it is higher than the pumping rate at which onsite wells would need to pump in the future on a 50% operational basis to meet the peak day demand (12.1 gpm) for the project. Further, this rate is much higher than the rate at which onsite wells would need to pump to meet the average daily demand for the project (6.0 gpm, assuming a 50% operational pumping basis (12 hrs/day, every day)).
- Water level drawdown in the pumping well at the end of the 24-hour pumping test was only 11.2 ft when pumping at a rate of 15 gpm. Further water levels became relatively stable after 6 hours of pumping, and thereafter remained stable throughout the pumping period. Recall that the pumping rate necessary to meet the peak day demand pumping rate for the project is only 12.1 gpm (assuming the well pumps only 12 hours per day during the peak demand period). Within

MEMORANDUM

24 hours of the cessation of the pumping test, the water levels in the well had fully recovered to the pre-test static water level.

- While pumping Well No. 3 at a rate of 15 gpm for a period of 24 hours, very little to no water level drawdown was observed in onsite Well Nos. 1 and 2, which lie 900 ft and 720 ft from Well No. 3, respectively. The nearest known offsite well, as shown on Figure 5, is located roughly 1000 ft west-northwest of Well No. 3. Because this distance is greater than are the distances from Well No. 3 (the pumping well) to Well Nos. 1 and 2 (the observation wells), and because essentially no water level drawdown was observed in Well No. 1 and 2 while pumping Well No. 3, then water level drawdown impacts while pumping Well No. 3 on that more distant offsite well would be considered to be not detectable. This would also be the same for all offsite wells that are at similar distances, or greater distances, from Well No. 3 than are Well Nos. 1 and 2.
- Results of the water quality analyses for groundwater pumped from Well No. 3 reveal that the groundwater meets the requirements for potable use for a public supply well.
- Onsite Well No. 1 will be used to meet a very small portion (only 0.72 AF/yr) of the project demand. This equates to a well pumping at a rate of roughly 1.5 gpm on 50% operational schedule (pumping 12 hours per day) every day during a typical 16-week irrigation season. Because Well No. 1 has historically been used to meet the irrigation water demand for the existing onsite vineyard, then Well No. 1 will be capable of meeting the small portion of the future demand (0.72 AF/yr) proposed for the project.
- Based on the data presented herein, it is the opinion of RCS that Well No. 3 is capable of meeting the groundwater demands of the proposed project. Further, impacts to neighboring offsite wells owned by others are considered to be less than significant, if any.



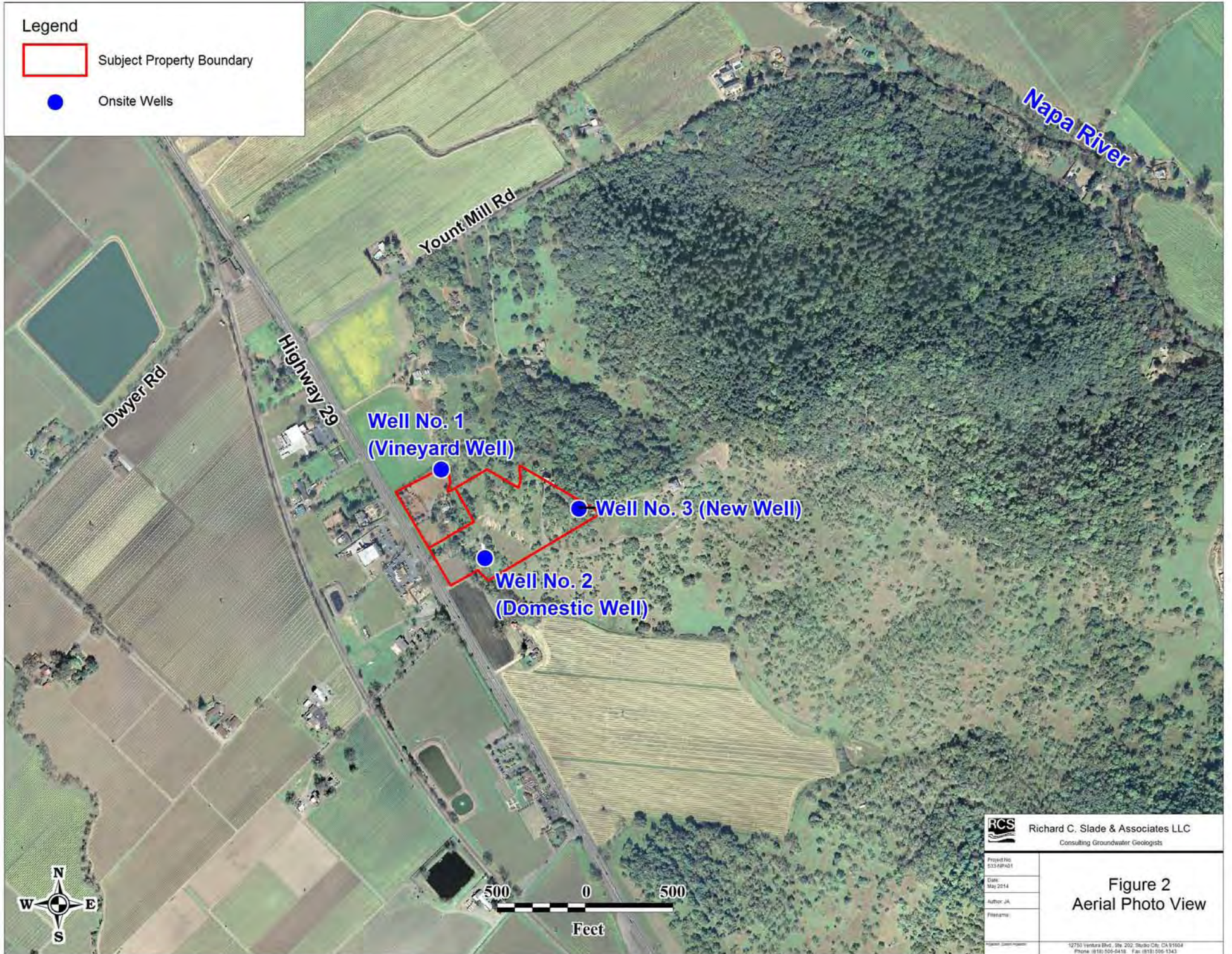
Legend



Subject Property Boundary



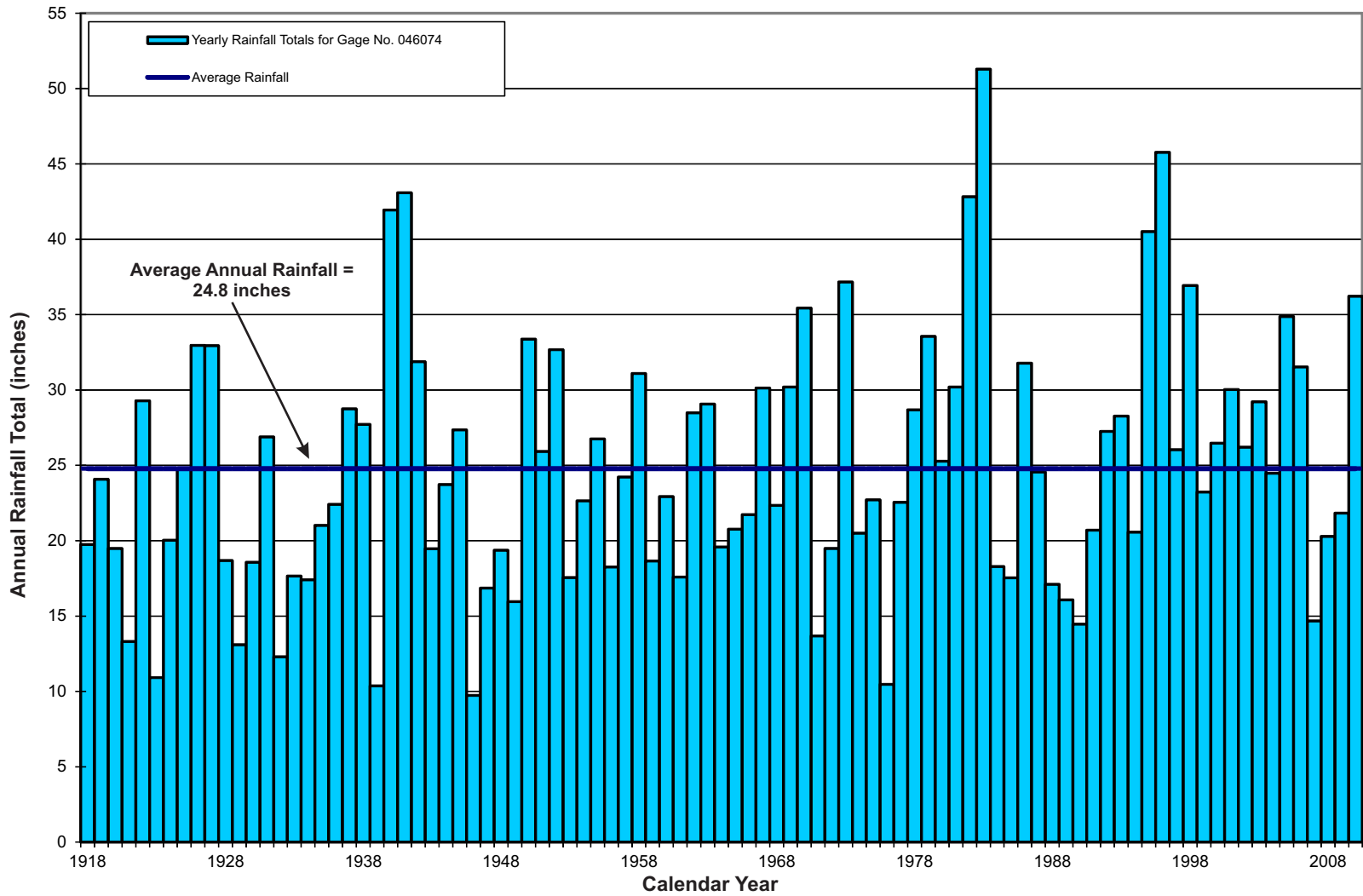
Onsite Wells



RCS Richard C. Slade & Associates LLC
Consulting Groundwater Geologists

Project No:
533-RPAB1
Date:
May 2014
Author: JA
Filename:

Figure 2
Aerial Photo View

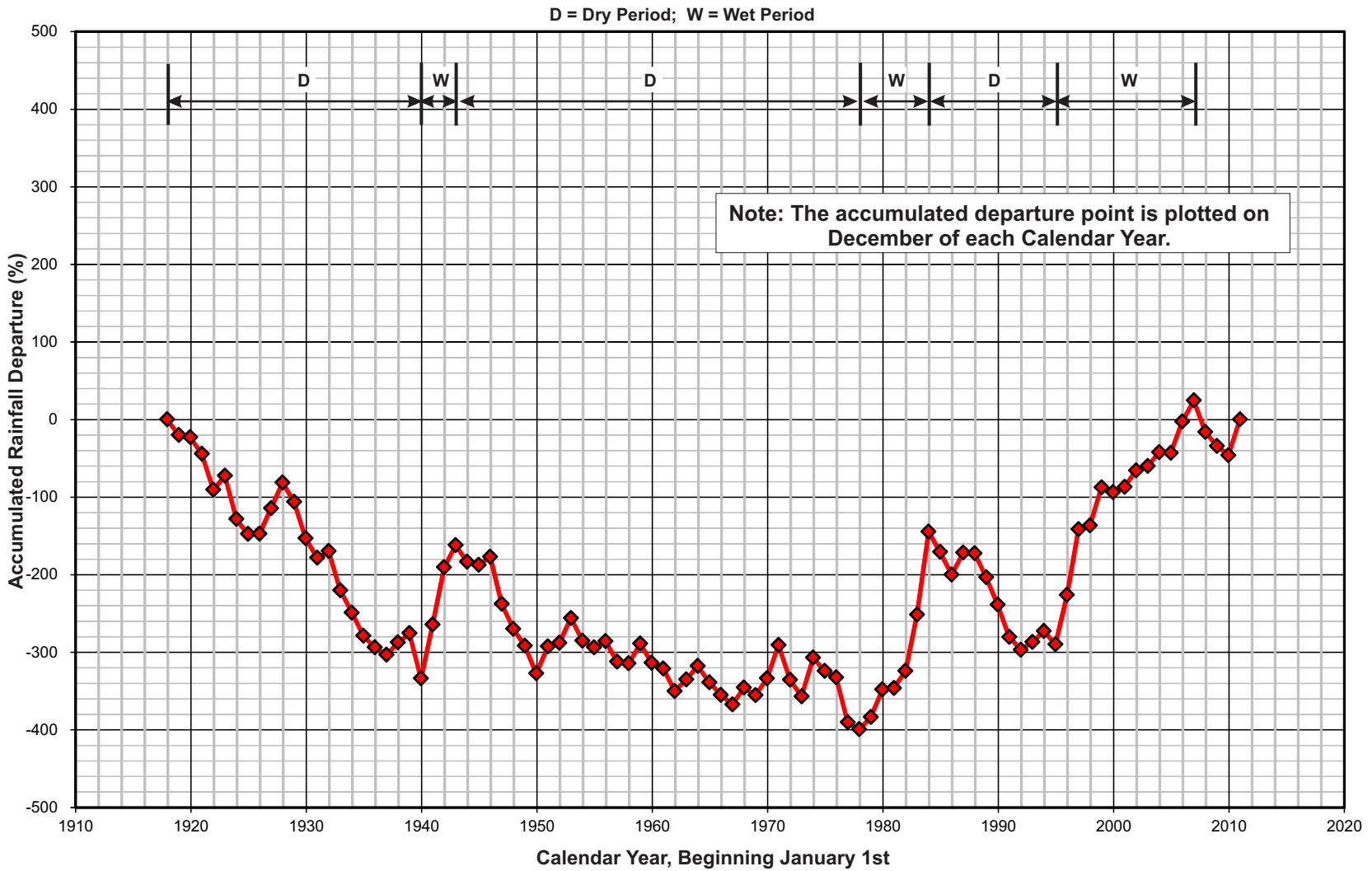


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Figure 3A
Annual Rainfall Totals
Napa State Hospital (Gage No. 046074)

Job No. 533-NPA01

May 2014



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Figure 3B
Accumulated Rainfall Departure Curve
Napa State Hospital (Gage No. 046074)

Job No. 533-NPA01

May 2014

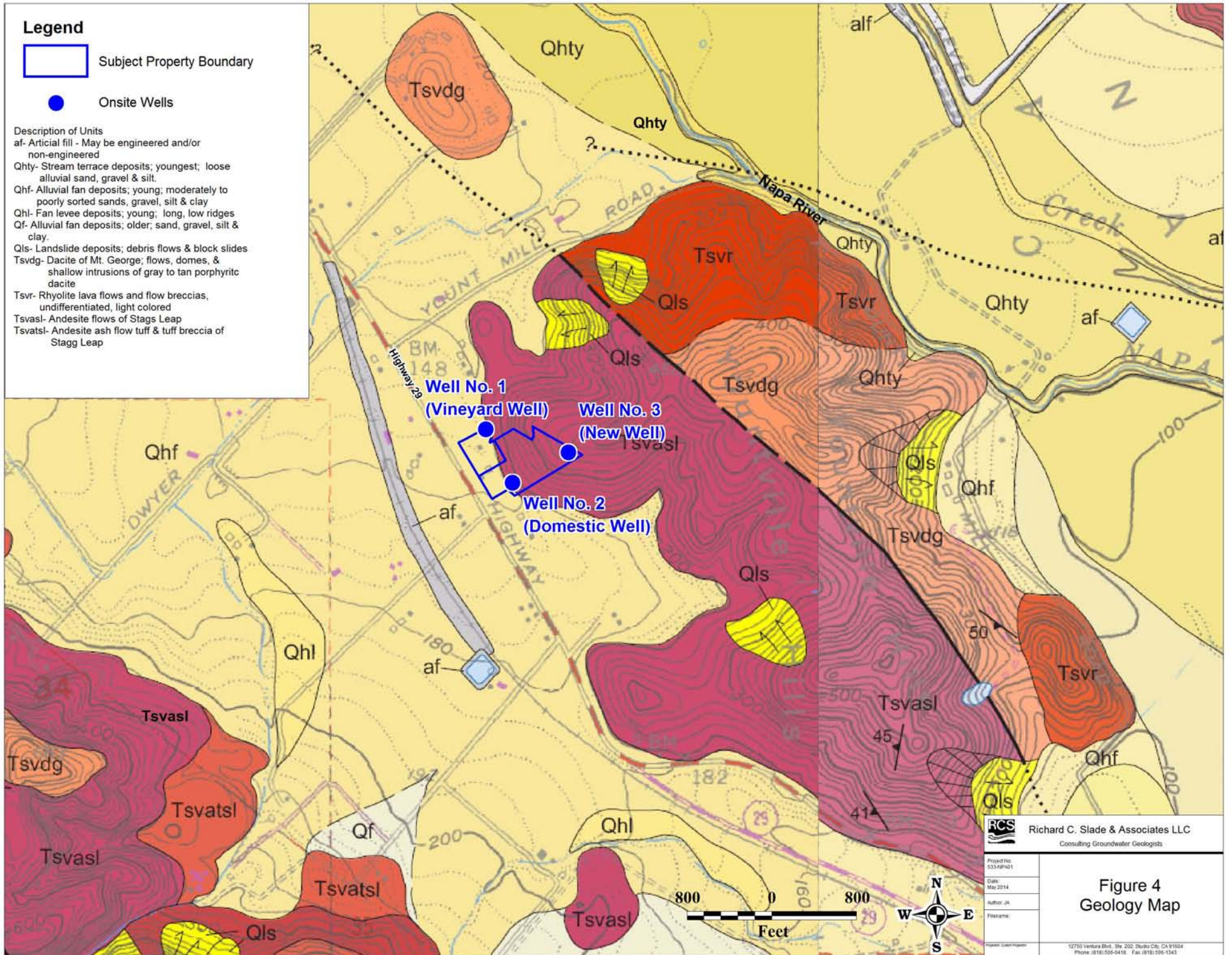
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 Subject Property Boundary

 Onsite Wells

Description of Units

- af- Artificial fill - May be engineered and/or non-engineered
- Qhty- Stream terrace deposits; youngest; loose alluvial sand, gravel & silt.
- Qhf- Alluvial fan deposits; young; moderately to poorly sorted sands, gravel, silt & clay
- Qhl- Fan levee deposits; young; long, low ridges
- Qf- Alluvial fan deposits; older; sand, gravel, silt & clay.
- Qls- Landslide deposits; debris flows & block slides
- Tsvdg- Dacite of Mt. George; flows, domes, & shallow intrusions of gray to tan porphyritic dacite
- Tsvr- Rhyolite lava flows and flow breccias, undifferentiated, light colored
- Tsvasl- Andesite flows of Stags Leap
- Tsvatsl- Andesite ash flow tuff & tuff breccia of Stags Leap

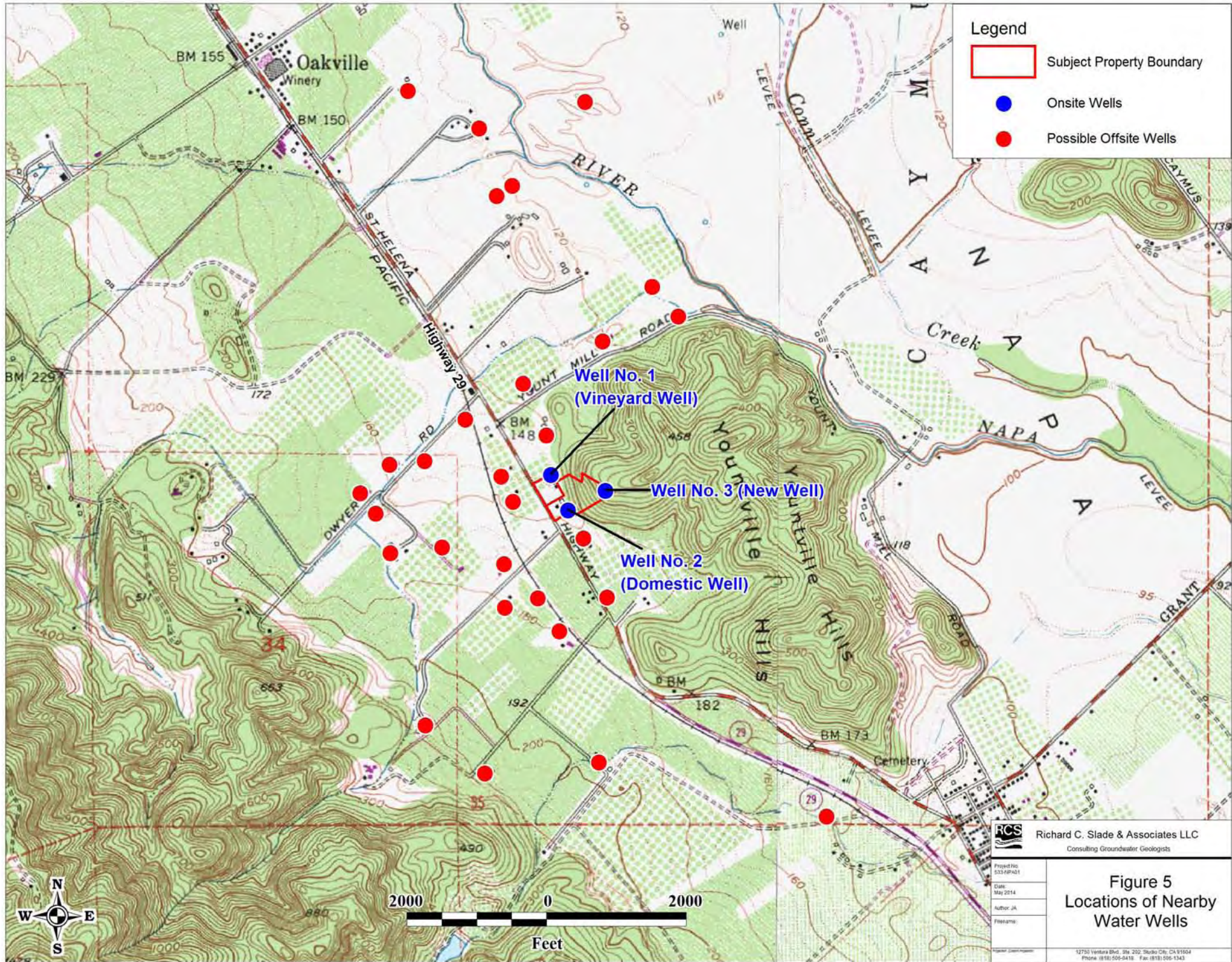


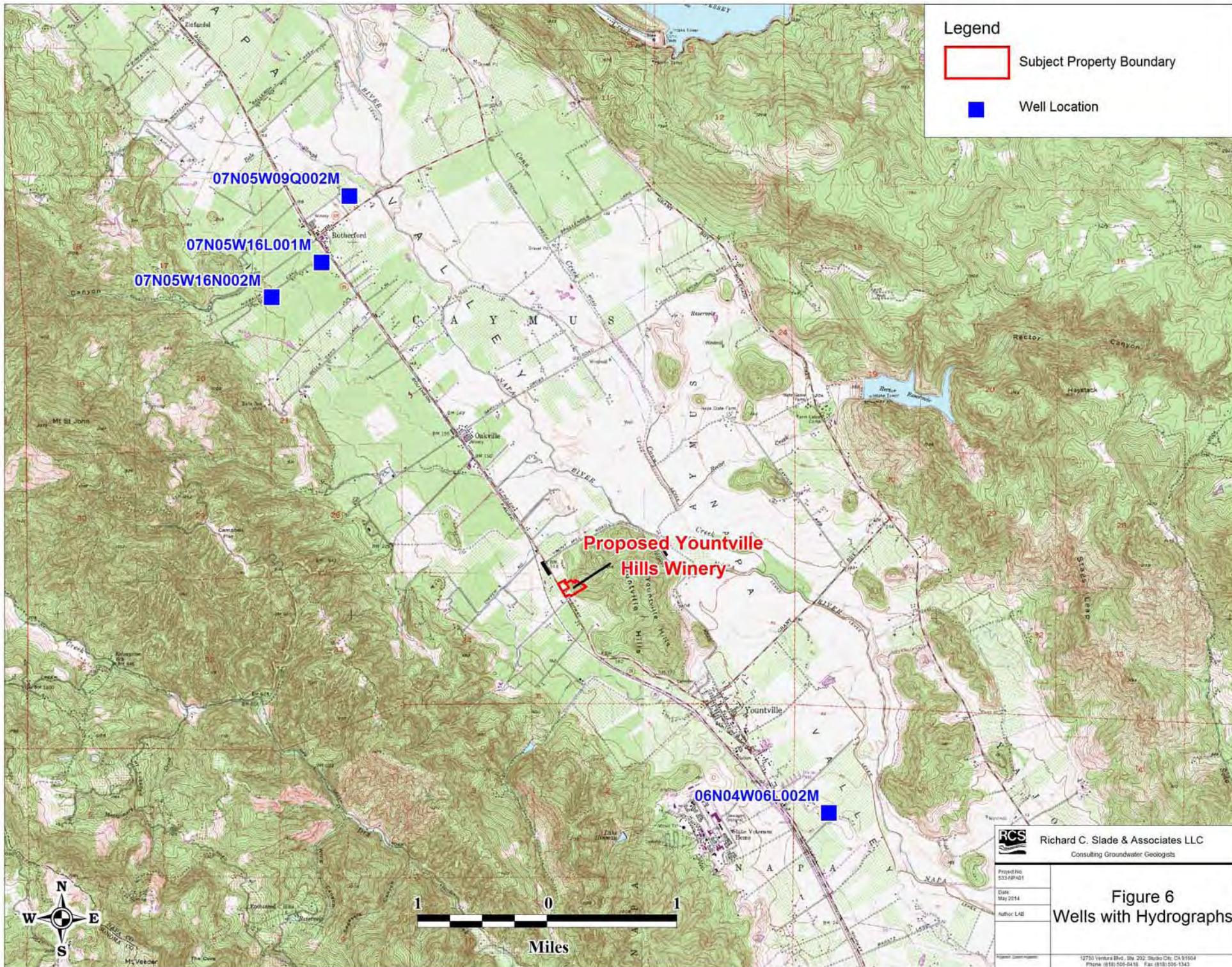
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Consulting Groundwater Geologists

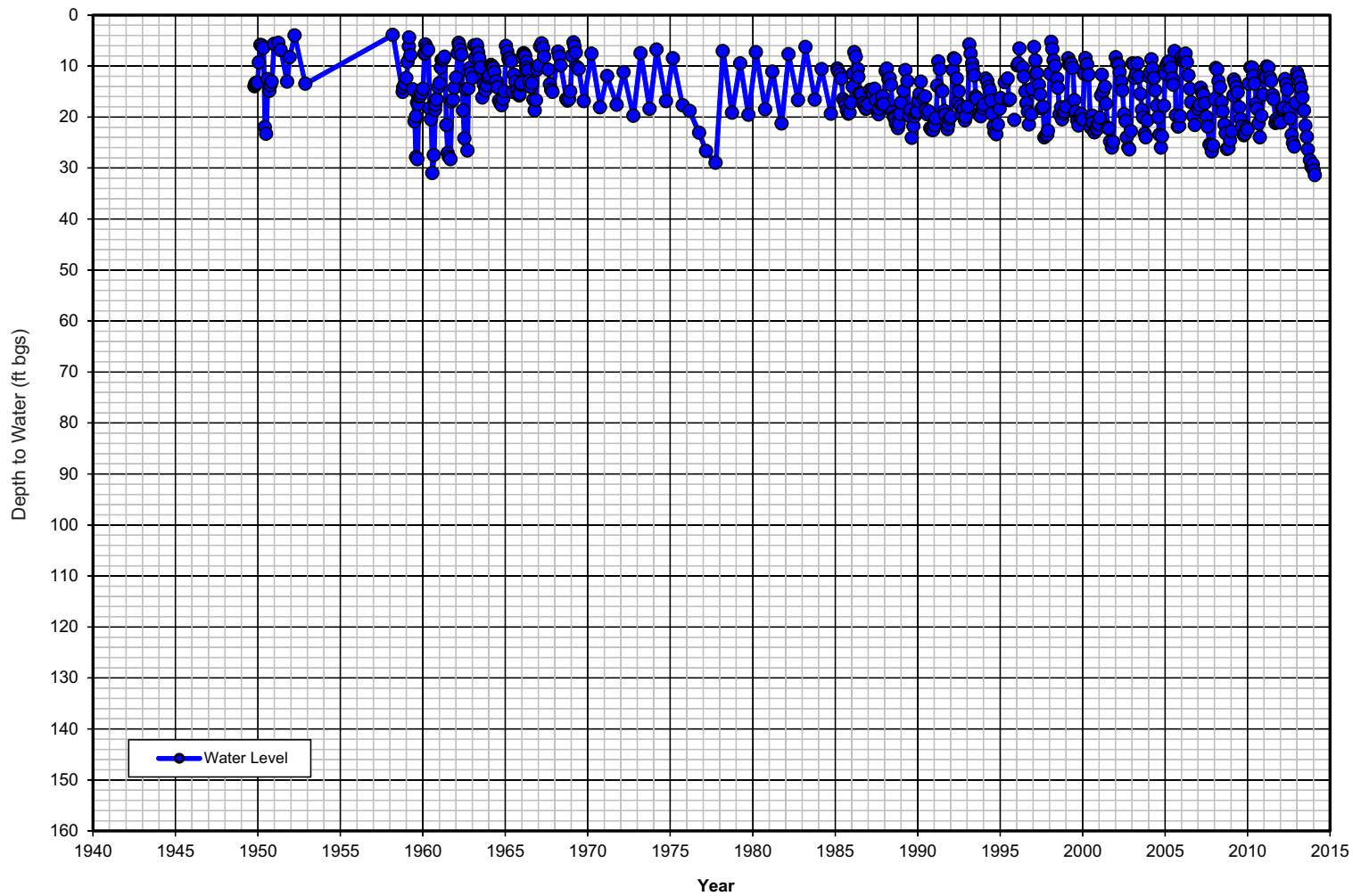
Project No:
533APAD1
Date:
May 2014
Author: JA
Filename:

Figure 4
Geology Map

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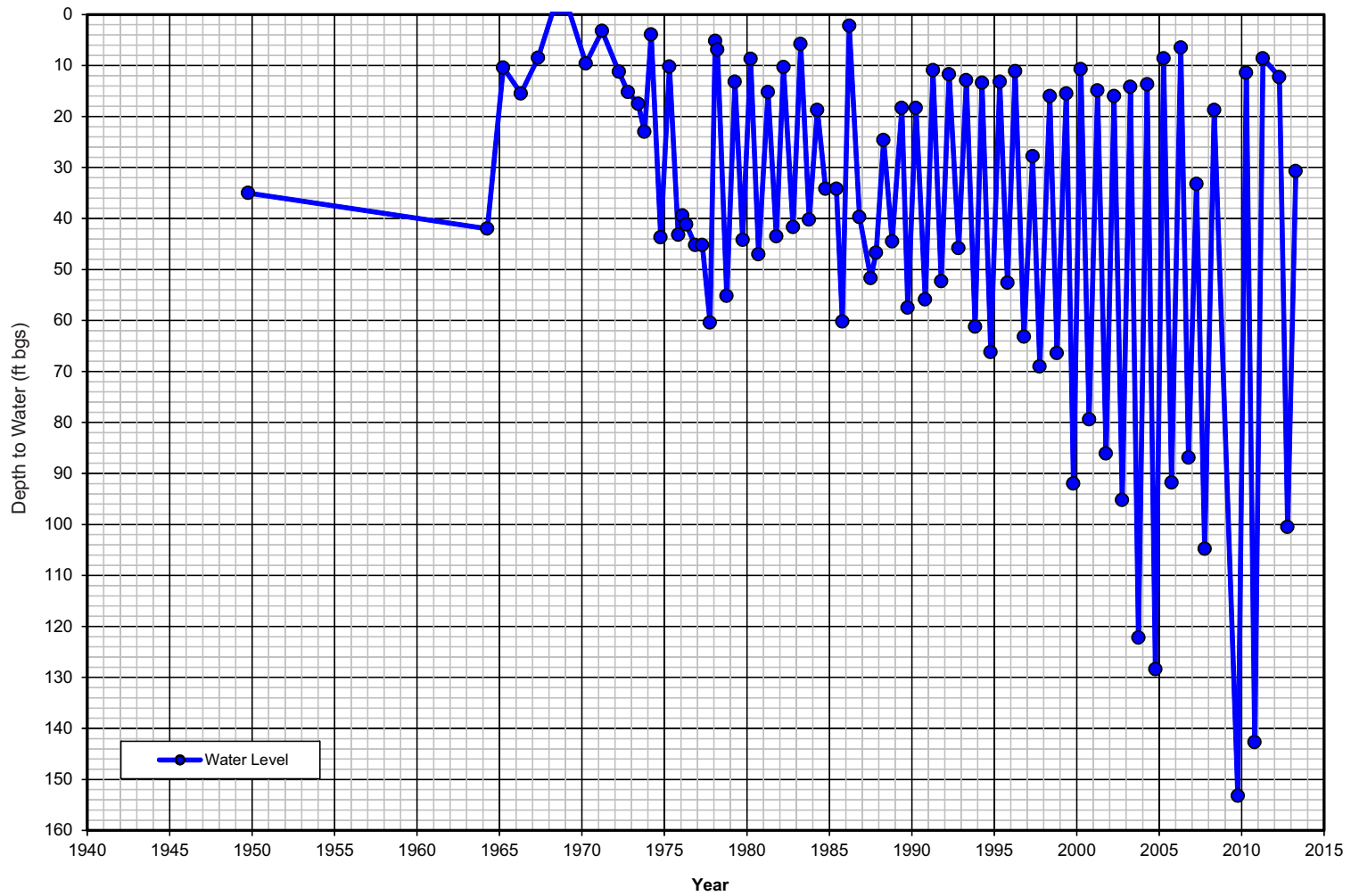


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FIGURE 7A
HYDROGRAPH FOR WELL 07N05W09Q02M

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May 2014

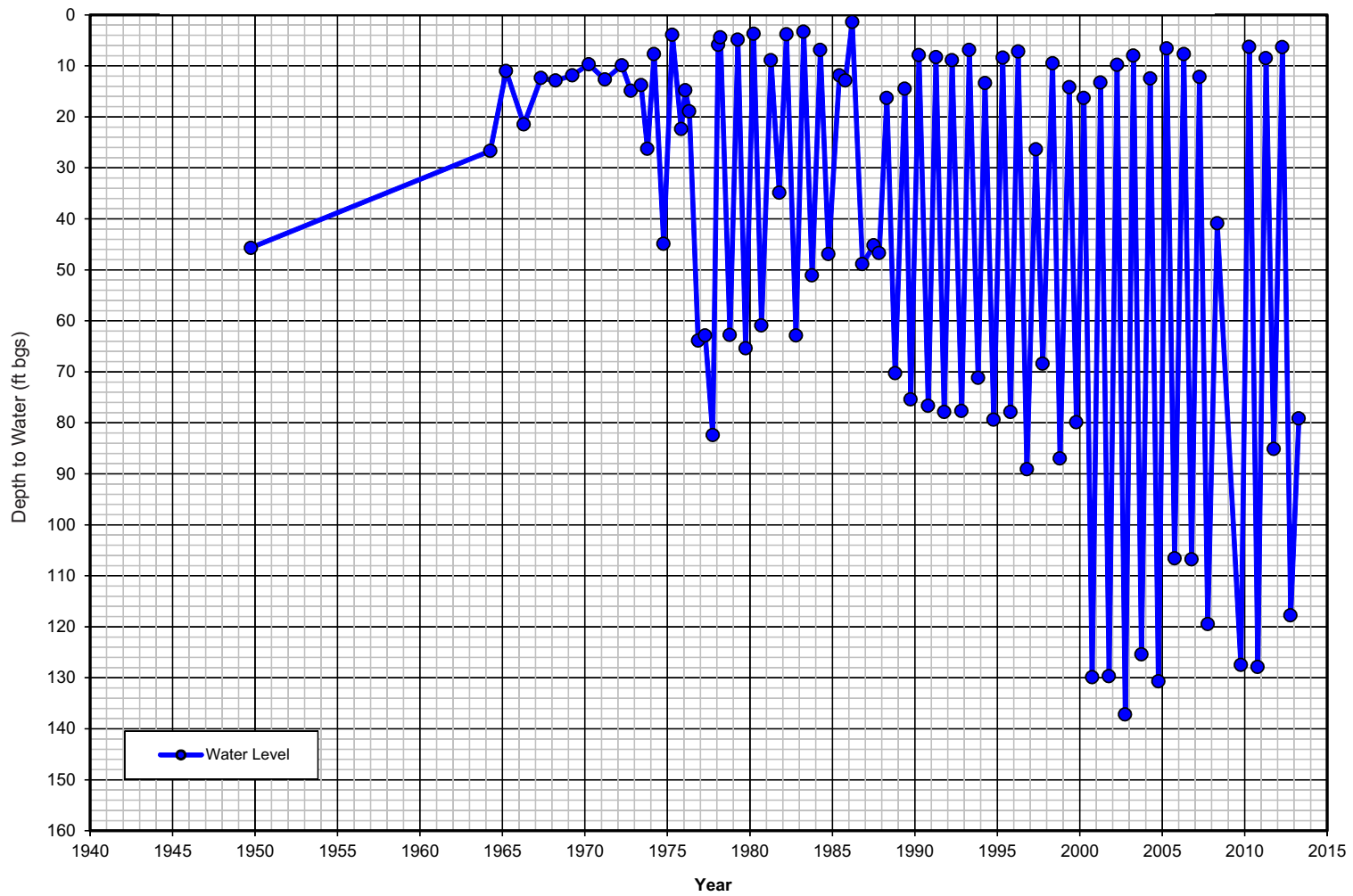


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FIGURE 7B
HYDROGRAPH FOR WELL 07N05W16L001M

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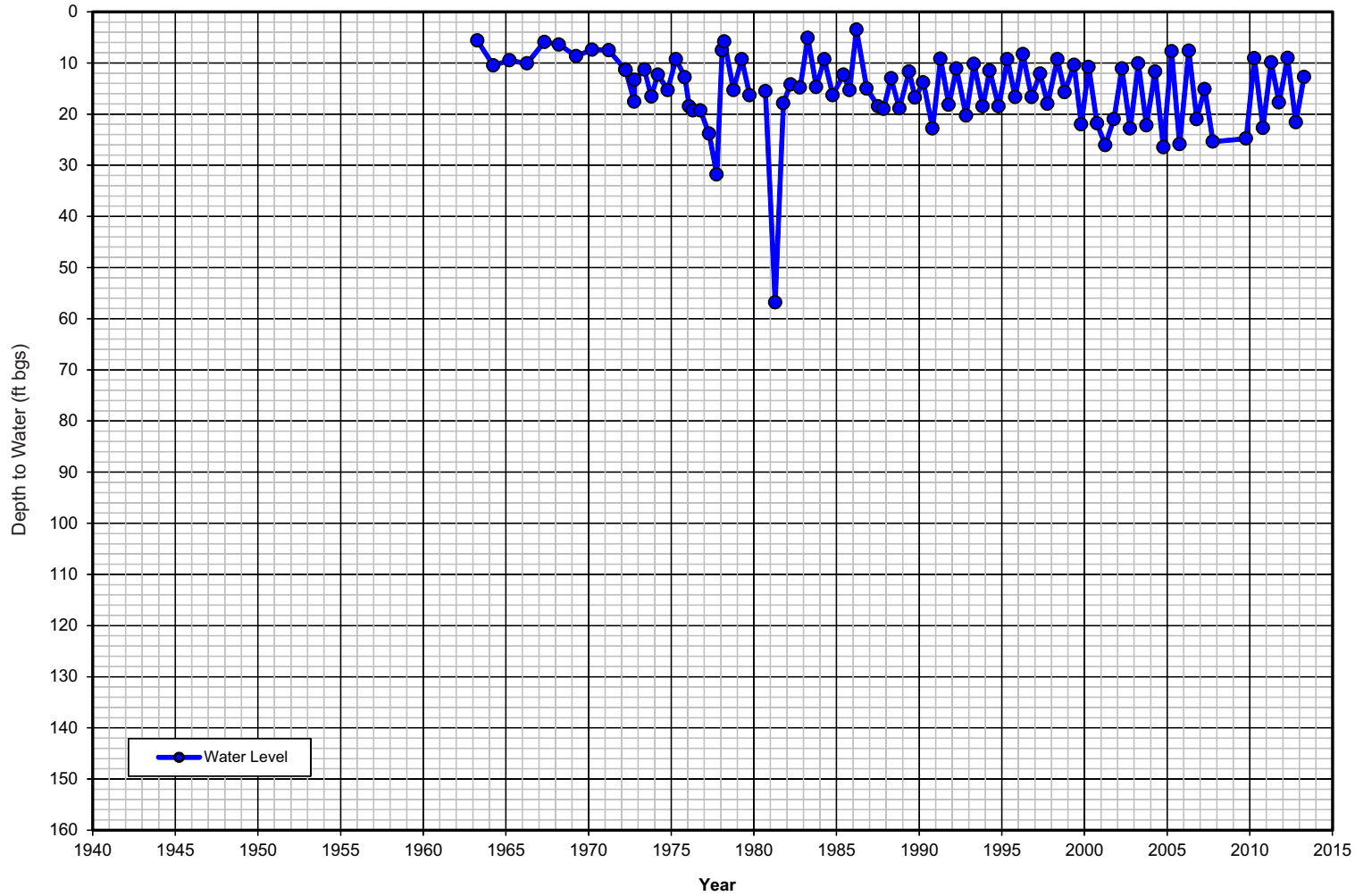


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FIGURE 7C
HYDROGRAPH FOR WELL 07N05W16N002M

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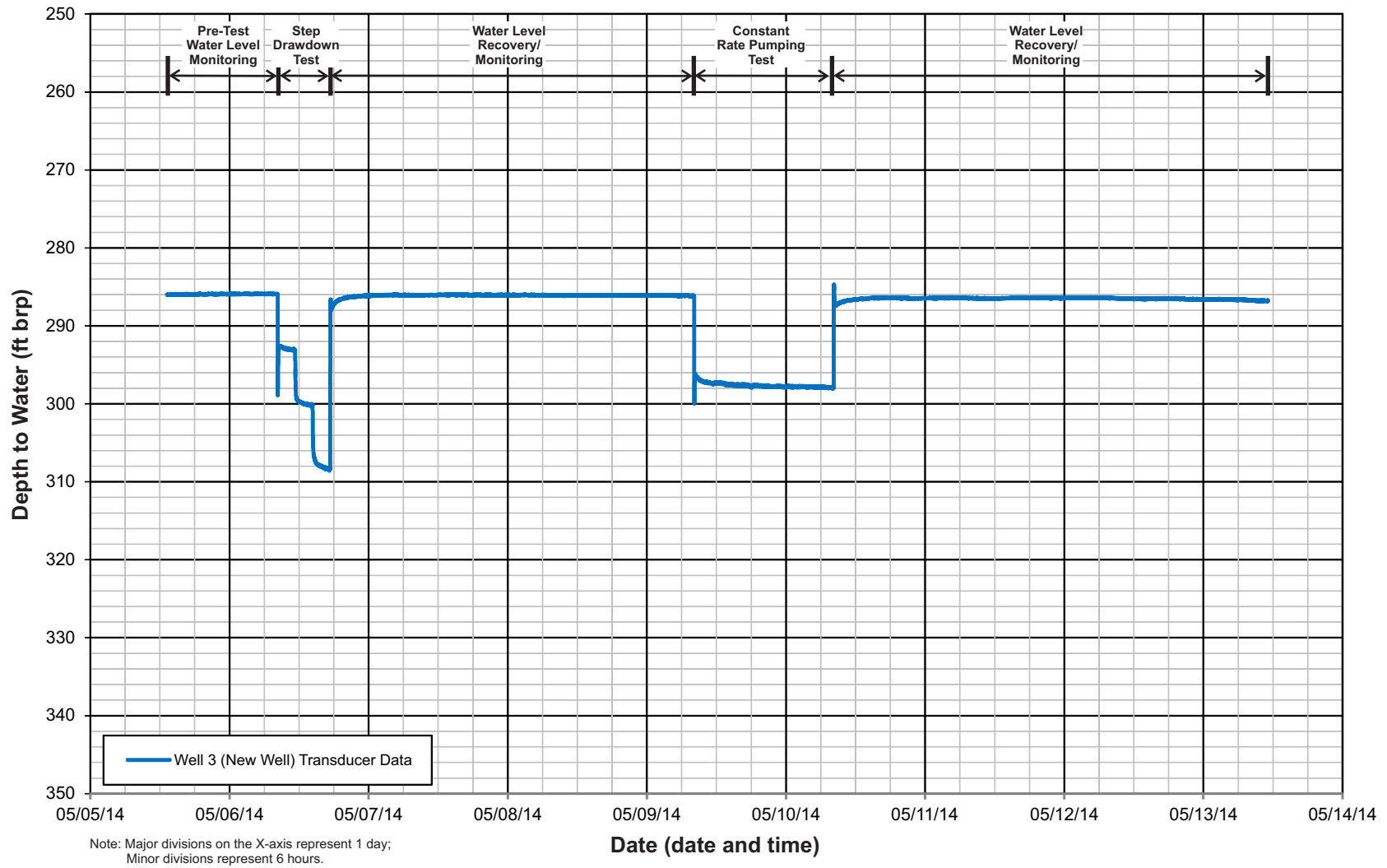


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FIGURE 7D
HYDROGRAPH FOR WELL 06N04W06L002M

Job No. 533-NPA01

May 2014

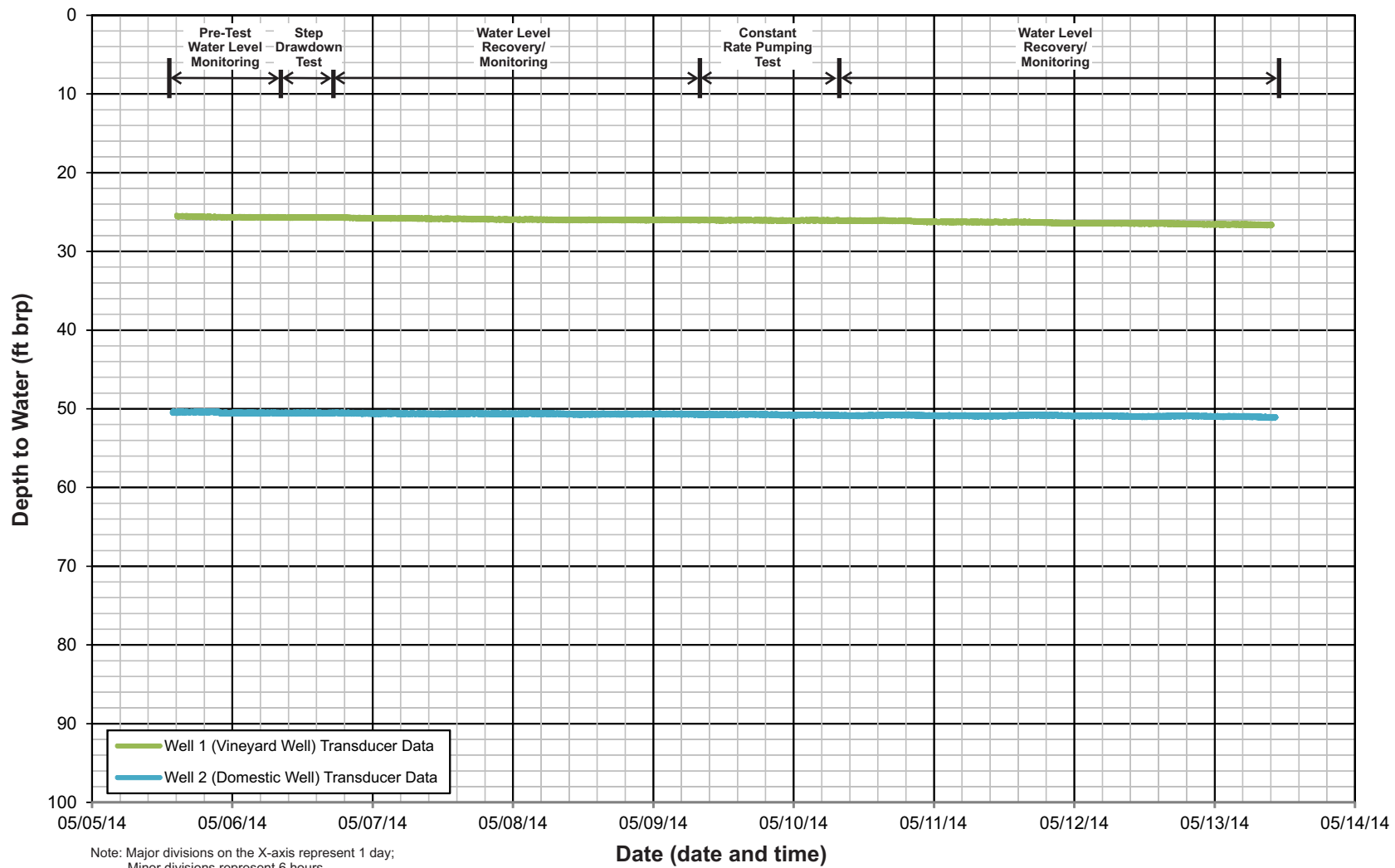


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FIGURE 8A
WATER LEVELS DURING ENTIRE MONITORING PERIOD
WELL NO. 3

Job No. 533-NPA01

May 2014

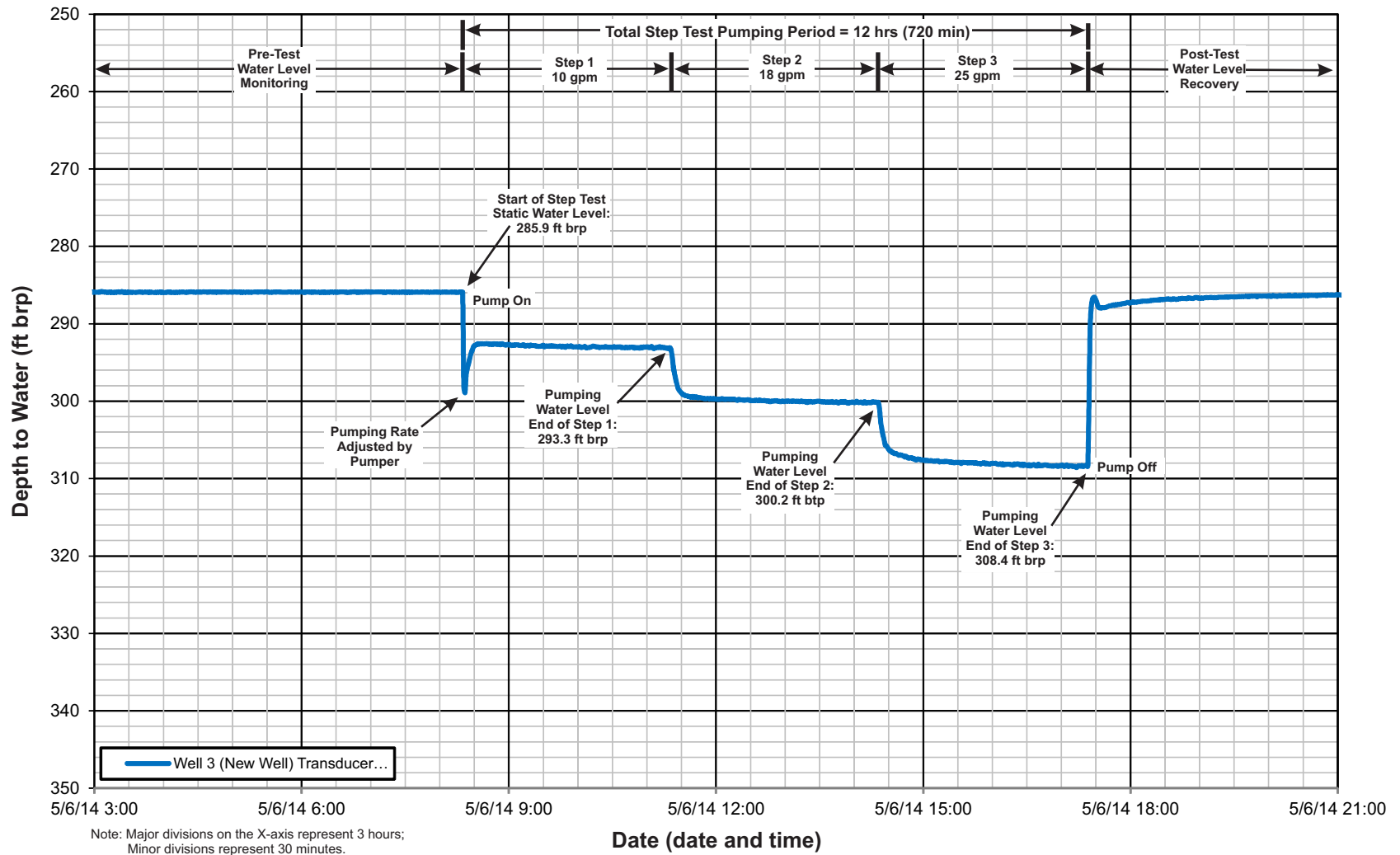


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FIGURE 8B
WATER LEVELS DURING ENTIRE MONITORING PERIOD
WELL NOS. 1 AND 2

Job No. 533-NPA01

May 2014

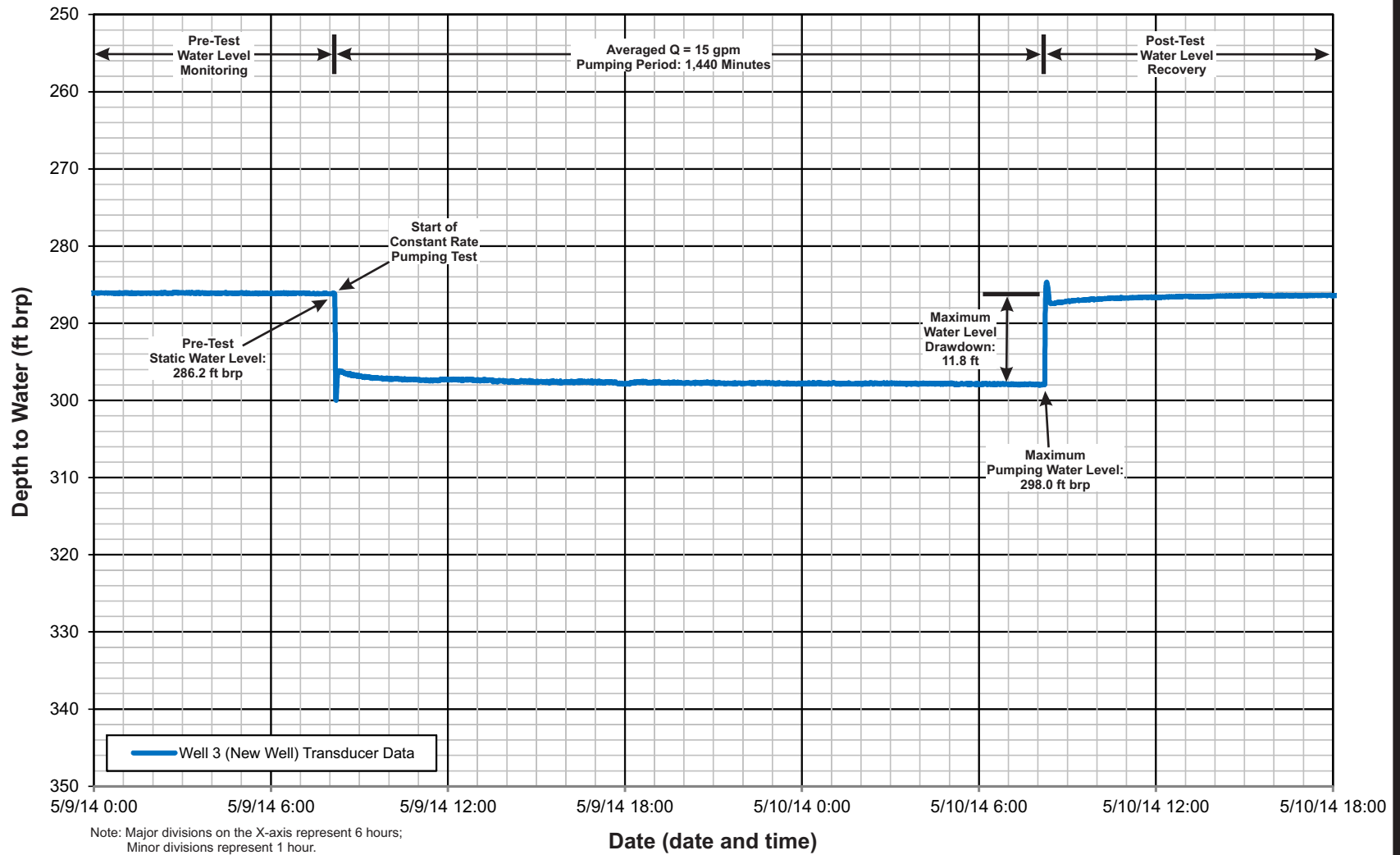


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FIGURE 9
WATER LEVELS DURING STEP DRAWDOWN TEST
WELL NO. 3

Job No. 533-NPA01

May 2014



Note: Major divisions on the X-axis represent 6 hours;
Minor divisions represent 1 hour.

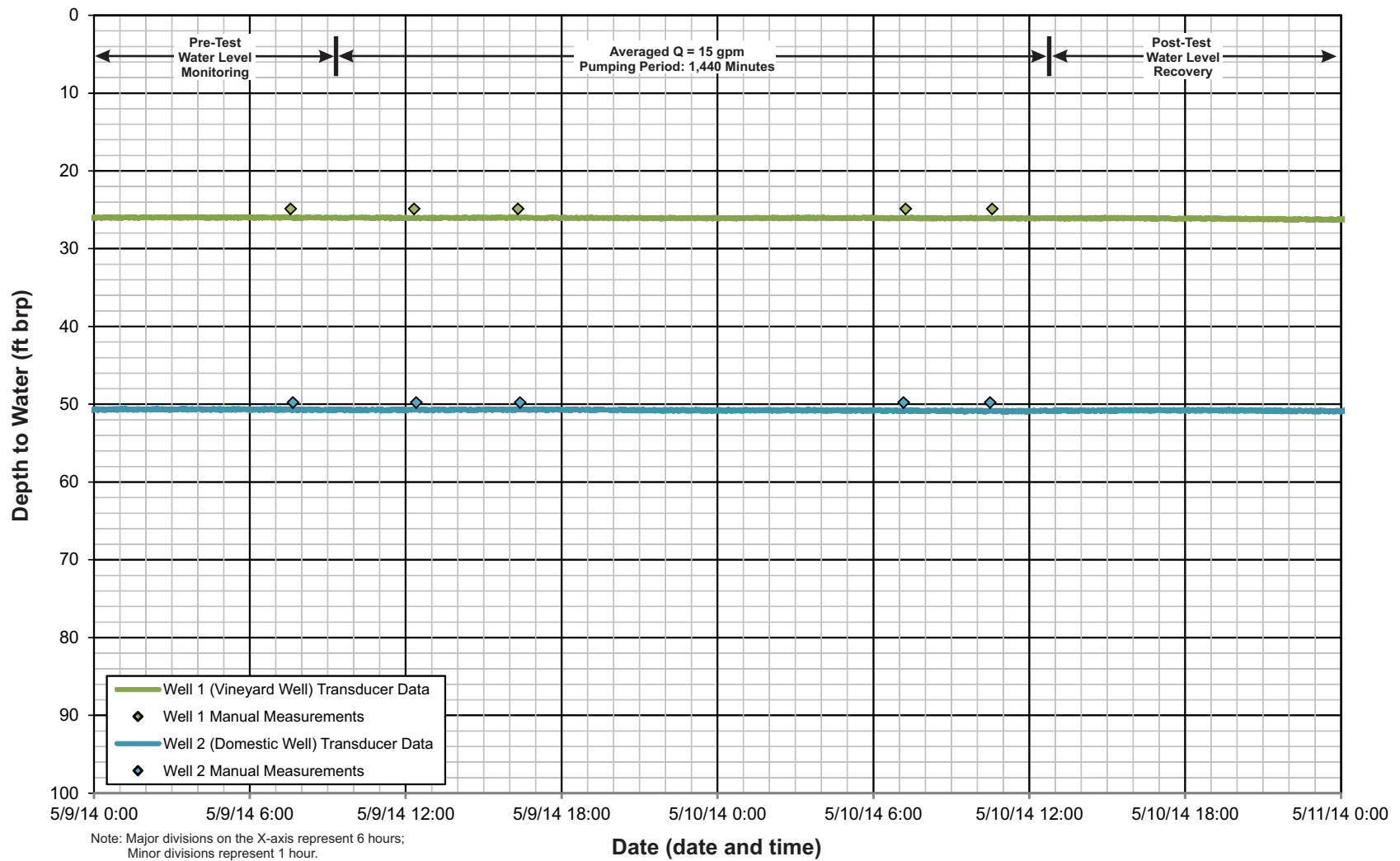


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FIGURE 10A
WATER LEVELS DURING CONSTANT RATE TEST
WELL NO. 3

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FIGURE 10B
WATER LEVELS DURING CONSTANT RATE TEST
WELL NOS. 1 AND 2

Job No. 533-NPA01

May 2014

MEMORANDUM

APPENDIX

- Well Completion Report for Well No. 2
- “Well Reports” by Oakville Pump Service Inc.
- Well Completion Report for Well No. 3
- Water Quality Data from CalTest Laboratory

STATE OF CALIFORNIA
THE RESOURCES AGENCY

Do Not Fill In

TRIPPLICATE
Retain this copy

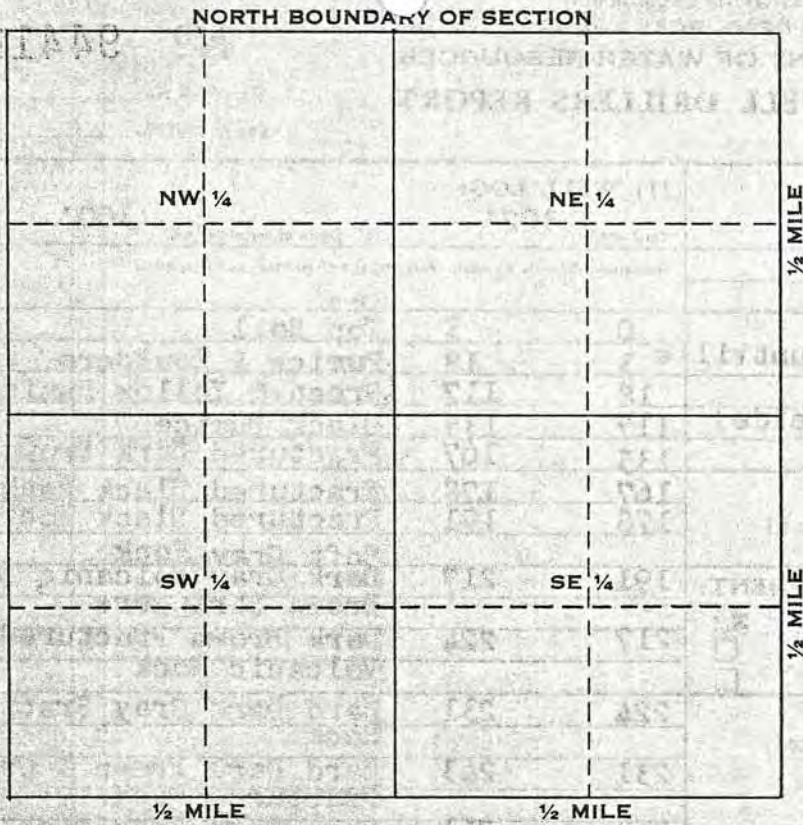
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

No 94411

State Well No. _____
Other Well No. _____

<p>(1) OWNER: Name R.B. Maddox, M.D. Address 2462 Willis Drive Napa, Ca. 94558</p>				<p>(11) WELL LOG: Total depth 302' ft. Depth of completed well 300' ft. Formation: Describe by color, character, size of material, and structure</p>																																																																																													
<p>(2) LOCATION OF WELL: County Napa Owner's number, if any N. Yountville Township, Range, and Section P31-130-08 (See diagram, reverse side) Distance from cities, roads, railroads, etc.</p>				<table border="1" style="width:100%; border-collapse: collapse;"> <tr><td style="width:10%;"></td><td style="width:10%; text-align: center;">0</td><td style="width:10%; text-align: center;">3</td><td colspan="3">Top Soil</td></tr> <tr><td></td><td style="text-align: center;">3</td><td style="text-align: center;">18</td><td colspan="3">Pumice & Boulders</td></tr> <tr><td></td><td style="text-align: center;">18</td><td style="text-align: center;">117</td><td colspan="3">Green & Yellow Pumice</td></tr> <tr><td></td><td style="text-align: center;">117</td><td style="text-align: center;">135</td><td colspan="3">Black Pumice</td></tr> <tr><td></td><td style="text-align: center;">135</td><td style="text-align: center;">167</td><td colspan="3">Fractured Dark Brown Rock</td></tr> <tr><td></td><td style="text-align: center;">167</td><td style="text-align: center;">178</td><td colspan="3">Fractured Black Rock</td></tr> <tr><td></td><td style="text-align: center;">178</td><td style="text-align: center;">191</td><td colspan="3">Fractured Black Rock w/ Soft Gray Rock</td></tr> <tr><td></td><td style="text-align: center;">191</td><td style="text-align: center;">217</td><td colspan="3">Dark Gray Volcanic Soft Brown Stringers</td></tr> <tr><td></td><td style="text-align: center;">217</td><td style="text-align: center;">224</td><td colspan="3">Dark Brown Fractured Volcanic Rock</td></tr> <tr><td></td><td style="text-align: center;">224</td><td style="text-align: center;">231</td><td colspan="3">Hard Dark Gray Fractured Rock</td></tr> <tr><td></td><td style="text-align: center;">231</td><td style="text-align: center;">243</td><td colspan="3">Hard Dark Brown & Gray Fractured Rock</td></tr> <tr><td></td><td style="text-align: center;">243</td><td style="text-align: center;">251</td><td colspan="3">Hard Dark Gray Rock w/ White Stringers</td></tr> <tr><td></td><td style="text-align: center;">251</td><td style="text-align: center;">262</td><td colspan="3">Dark Gray Granular w/ Yellow Stringers</td></tr> <tr><td></td><td style="text-align: center;">262</td><td style="text-align: center;">271</td><td colspan="3">Brown Gray & Fractured Yellow Sandrock</td></tr> <tr><td></td><td style="text-align: center;">271</td><td style="text-align: center;">302</td><td colspan="3">Hard Black Rock</td></tr> </table>					0	3	Top Soil				3	18	Pumice & Boulders				18	117	Green & Yellow Pumice				117	135	Black Pumice				135	167	Fractured Dark Brown Rock				167	178	Fractured Black Rock				178	191	Fractured Black Rock w/ Soft Gray Rock				191	217	Dark Gray Volcanic Soft Brown Stringers				217	224	Dark Brown Fractured Volcanic Rock				224	231	Hard Dark Gray Fractured Rock				231	243	Hard Dark Brown & Gray Fractured Rock				243	251	Hard Dark Gray Rock w/ White Stringers				251	262	Dark Gray Granular w/ Yellow Stringers				262	271	Brown Gray & Fractured Yellow Sandrock				271	302	Hard Black Rock		
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	262	271	Brown Gray & Fractured Yellow Sandrock																																																																																														
	271	302	Hard Black Rock																																																																																														
<p>(3) TYPE OF WORK (check): New Well <input checked="" type="checkbox"/> Deepening <input type="checkbox"/> Reconditioning <input type="checkbox"/> Destroying <input type="checkbox"/> If destruction, describe material and procedure in Item 11.</p>				<p>(5) EQUIPMENT: Rotary <input checked="" type="checkbox"/> Cable <input type="checkbox"/> Other <input type="checkbox"/></p>																																																																																													
<p>(4) PROPOSED USE (check): Domestic <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Municipal <input type="checkbox"/> Irrigation <input type="checkbox"/> Test Well <input type="checkbox"/> Other <input type="checkbox"/></p>				<p>(6) CASING INSTALLED: STEEL: OTHER: SINGLE <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> If gravel packed Diameter of Bore From ft. To ft. Gage or Wall From ft. To ft.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td style="width:10%;"></td><td style="width:10%; text-align: center;">0</td><td style="width:10%; text-align: center;">23'</td><td style="width:10%; text-align: center;">6"</td><td style="width:10%; text-align: center;">.156</td><td style="width:10%;"></td><td style="width:10%;"></td><td style="width:10%;"></td></tr> </table> <p>Size of shoe or well ring: None Size of gravel: None Describe joint: None</p>					0	23'	6"	.156																																																																																					
	0	23'	6"	.156																																																																																													
<p>(7) PERFORATIONS OR SCREEN: Type of perforation or name of screen None</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:10%;">From ft.</th> <th style="width:10%;">To ft.</th> <th style="width:10%;">Perf. per row</th> <th style="width:10%;">Rows per ft.</th> <th style="width:20%;">Size in. x in.</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.																																				<p>(8) CONSTRUCTION: Was a surface sanitary seal provided? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> To what depth 23' ft. Were any strata sealed against pollution? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, note depth of strata From ft. to ft. From ft. to ft. Method of sealing Neat Cement</p>																																																					
From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.																																																																																													
<p>(9) WATER LEVELS: Depth at which water was first found, if known 167' ft. Standing level before perforating, if known 18' ft. Standing level after perforating and developing _____ ft.</p>				<p>Work started Apr. 20 19 74, Completed Apr. 24 19 74 WELL DRILLER'S STATEMENT: <i>This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.</i> NAME Doshier And Gregson Drilling, Inc. (Person, firm, or corporation) (Typed or printed) Address 5365 Napa-Vallejo Highway Vallejo, Ca. 94590 [SIGNED] _____ (Well Driller) License No. 258826 Dated April 24, 1974</p>																																																																																													
<p>(10) WELL TESTS: Tested by bailing. Was pump test made? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, by whom? Drillers Yield: 20' gal./min. with 172' ft. drawdown after 6 hrs. Temperature of water _____ Was a chemical analysis made? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Was electric log made of well? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, attach copy</p>				<p>SKETCH LOCATION OF WELL ON REVERSE SIDE</p>																																																																																													

WELL LOCATION SKETCH

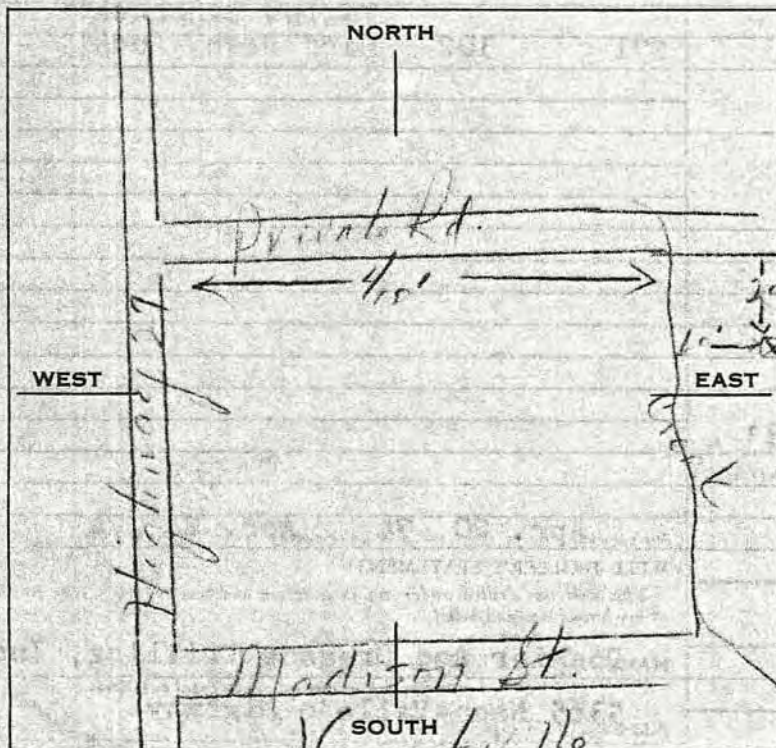


Township _____ N/S

Range _____ E/W

Section No. _____

A. Location of well in sectionized areas.
 Sketch roads, railroads, streams, or other features as necessary.



B. Location of well in areas not sectionized.
 Sketch roads, railroads, streams, or other features as necessary.
 Indicate distances.



Oakville Pump Service, Inc.

P.O. Box 435

Oakville, Ca 94562

Phone (707) 944-2471 Fax (707) 944-5636

Lic.# 744958

Well Report For:

September 20, 2012

CSZ Wines, LLC.

Eric Sklar

P.O. Box 607

Rutherford, Ca 94573

Job Number: 121-4637

Well Address: 7400 St. Helena Hwy, Yountville, Ca - Domestic Well System

Well No. 2

The well inspection and it's report are completed and the results are below:

I. Well information (approx.)

Well Depth:	300'	Pump Size:	5 hp 20 gpm
Static Water Level:	Not Tested	Pump Setting:	273'
Casing Size:	5"	Draw down:	Not Tested
Casing Type:	Steel	Recovery:	Not Tested

II. System Inspection

Well Pump Op:	Functional	Storage Tank(s):	See Below
Electrical Equip:	See Below	Pressure Tank(s):	See Below
Plumbing:	See Below	Booster Pump Op:	HSC20 - See Below
Well Seal:	Functional	Filter System:	None
Low Water Protection:	None	Pressure Relief Valve:	None

III. Water Quality & Potability testing:

If any water samples were taken, the results will be available within the specified time that was requested and will be sent at that time

IV. Comments & Observations:

> Storage Tank(s): There are 2 storage tanks: A 10,500 gallon tank on top of the property that gravity feeds to the house for domestic and irrigation water with a 4" fire hydrant. At the bottom of the hill is a 5,000 gallon tank that is used for irrigation water at the bottom of the hill (the overflow pipe connection to the tank is broken and needs a new tank adaptor). The Redwood tank above the pump shed is not functional and is falling in on itself. This tank should be removed.

> Booster Pump System: For the irrigation system at the bottom of the hill there is a 2 hp booster pump with 3 pressure tanks. The 3 pressure tanks are dated and water logged needing replacement. The 2 hp booster pump is functional, however the volume and pressure that the pump was pumping was very little. This pump may have run dry, requiring new impellers.

> Plumbing: The plumbing across the creek for the irrigation at that site has been dismantled and only leaks water when the valve at the pump house is turned on. The 5K tank only fills when the upper 10.5K tank is calling for water.

< Electrical: There is a 'temporary' cable going from the electrical sub-panel to the vineyard system. The low water off control float in the 5K Storage tank should be replaced due to cracking in the plastic. There is a wireless system from the 10.5K tank to the lower system to turn on the well pump - this system is not working, possible due to a bad battery.

Thank you for letting us be of service. If there are any questions or comments please call.

Nicholaus Lutz



OAKVILLE PUMP SERVICE, INC.

#1 Walnut Drive / P.O. Box 435
Oakville, CA 94562
Phone (707) 944-2471 Fax (707) 944-5636
License # 744958

Water Quality Report

For: CSZ Wines, LLC.
Address: P.O. Box 607
City: Rutherford, Ca 94573
Phone:
Fax:

Lab Number: **1360**
Date: 9/20/2012
Job Number: 121-4637
Sample Site: 7400 St Helena Hwy
Source: Domestic Well

well No. 2

	<u>Value</u>	<u>Recommended Limit</u>
pH:	6.52	7.0 - 8.0
Hardness: 4 gpg	68.4 ppm	< 50 ppm
Iron:	4.94 ppm	< .30 ppm
Manganese:	0.111 ppm	< .05 ppm
Silica:	88.8 ppm	< 30 ppm
Hydrogen Sulfide:	ND	None
Nitrate / Nitrite:	NT	
Total Dissolved Solids:	<u>120.4</u> ppm	< 500 ppm
Turbidity:	80 NTU	< 1.0 ppm

N/A Not Applicable
ND None Detected
NT Not Tested



OAKVILLE PUMP SERVICE

P.O. Box 435
 Oakville, CA 94562
 Phone (707) 944-2471 Fax (707) 944-5636

Domestic
~~LOW W~~

Well No. 2

Name: Mrs Moxley
 Company:
 Project:
 Date: 7/8/97

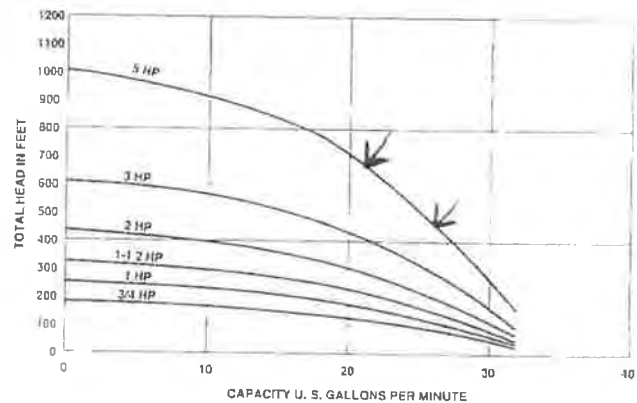
Well Information	
Well Depth:	300'
Static Water Level:	60'
Pump Depth:	273'
Well Yield & Drawdown:	85' at 20 GPM
Estimated Water Needs:	AMAP
Casing Size & Type:	6" Steel -

Pump Sizing	Best	Worst
Elevation Differential:	280	300
Well (Static/Pump Set):	60	200
Friction Loss for Pipe:	20	20
Pressure (Low/Hi):	92	140
Other:	20	20
TDH Requirements:	472	680

Note: Drop Pipe 1.5' Galv - appears as it will go again
 Wine - H6 - needs fuel

700 TDH = 206 GPM. 5/2 - 20 GPM

20 GPM





Oakville Pump Service, Inc.

P.O. Box 435

Oakville, Ca 94562

Phone (707) 944-2471 Fax (707) 944-5636

Lic.# 744958

Well Report For:

September 20, 2012

CSZ Wines, LLC.

Eric Sklar

P.O. Box 607

Rutherford, Ca 94573

Job Number: 12I-4637

Well Address: 7400 St. Helena Hwy, Yountville, Ca - Vineyard Well System

= well No. 1

The well inspection is complete and the following is the report:

I. Well information (approx.)

Well Depth:	Not Available	Pump Size:	3 hp
Static Water Level:	Not Tested	Pump Setting:	Not Available
Casing Size:	5"	Draw down:	Not Tested
Casing Type:	PVC	Recovery:	Not Tested

II. System Inspection

Well Pump Op:	Functional	Storage Tank(s):	See Below
Electrical Equip:	See Below	Pressure Tank(s):	See Below
Plumbing:	See Below	Booster Pump Op:	HSC20 - Functional
Well Seal:	Functional	Filter System:	Sand Separator
Low Water Protection:	None	Pressure Relief Valve:	Yes

III. Water Quality & Potability testing:

If any water samples were taken, the results will be available within the specified time that was requested and will be sent at that time.

IV. Comments & Observations:

- > Electrical: The onsite electrical looks to be in good condition and functions properly. However, the power cable supplying power to this system is sub cable run over the ground from the domestic system.
- > Plumbing: There is a cracked check valve after the booster pump
- > Storage Tank: There is a 10,000 gallon poly tank. This tank has a slight lean to it.
- > Filter: On the well is a sand separating filter that requires manual flushing to evacuate the build of sand in the separator.
- > Pressure Tank: Needs to be re-pressurized, however is dated and will need replacement soon. The pad that the pressure tank and the booster pump is not on flat ground and this tank / pad is also leaning.
- > This system was originally a temporary system for this vineyard. Due to the condition of the gravel base under the 10K tank, the pressure system pad, and the wire run. Improvements need to be made for long term functionality.

Thank you for letting us be of service. If there are any questions or comments please call

Nicholaus Lutz



OAKVILLE PUMP SERVICE, INC.

#1 Walnut Drive / P.O. Box 435
Oakville, CA 94562
Phone (707) 944-2471 Fax (707) 944-5636
License # 744958

Water Quality Report

For: CSZ Wines, LLC.
Address: P O. Box 607
City: Rutherford, Ca 94573
Phone:
Fax:

Lab Number: **1359**
Date: 9/20/2012
Job Number: 121-4637
Sample Site: 7400 St. Helena Hwy
Source: Vineyard Well

≡ Well No. 1

	<u>Value</u>	<u>Recommended Limit</u>
pH:	6.49	7.0 - 8.0
Hardness: 12 gpg	205.2 ppm	< 50 ppm
Iron:	0.07 ppm	< .30 ppm
Manganese:	0.029 ppm	< 05 ppm
Silica:	49.4 ppm	< 30 ppm
Hydrogen Sulfide:	ND	None
Nitrate / Nitrite:	NT	
Total Dissolved Solids:	<u>400.8</u> ppm	< 500 ppm
Turbidity:	1.54 NTU	< 1.0 ppm

N/A Not Applicable
ND None Detected
NT Not Tested

File Original with DWR

State of California
Well Completion Report

Refer to Instruction Pamphlet
No. **e0210024**

Page _____ of _____

Owner's Well Number _____

Date Work Began 04/11/2014 Date Work Ended 4/22/2014

Local Permit Agency Napa County

Permit Number E14-00244 Permit Date 4/3/14

DWR Use Only - Do Not Fill In

State Well Number/Site Number			
Latitude		Longitude	
APN/TRS/Other			

Geologic Log		
Orientation <input checked="" type="radio"/> Vertical <input type="radio"/> Horizontal <input type="radio"/> Angle Specify _____		
Drilling Method <input type="radio"/> Direct <input type="radio"/> Rotary <input type="radio"/> Air _____		
Depth from Surface	Description	
Feet to Feet	Describe material, grain size, color, etc	
0	60	Yellow Clay & hard Gray Rock
60	460	Dark Gray Volcanic Rock
460	500	Dark Gray Green Volcanic Rock
500	510	Red & Gray Volcanic Rock
510	520	Gray Green Volcanic Rock
520	590	Gray, Red, & Green Volcanic Rock
590	640	Gray, Green Volcanic Rock
640	680	Red, Gray, & Green Volcanic Rock
680	705	Hard Gray Green Rock
Perforation Lay out		
P = Perforation		
B = Blank		
0 to 385 Blank		
P 405 ft		
B		
B		
P		
P		
B 505 ft		
P		
B		
P		
P 605 ft		
B		
P		
P 665 ft		
Total Depth of Boring <u>705</u> Feet		
Total Depth of Completed Well <u>665</u> Feet		

Well Owner

Name CS2 Wines LLC

Mailing Address P.O. Box 47

City Oakville State CA Zip 94562

Well Location

Address 7400 Highway 29

City Yountville County Napa

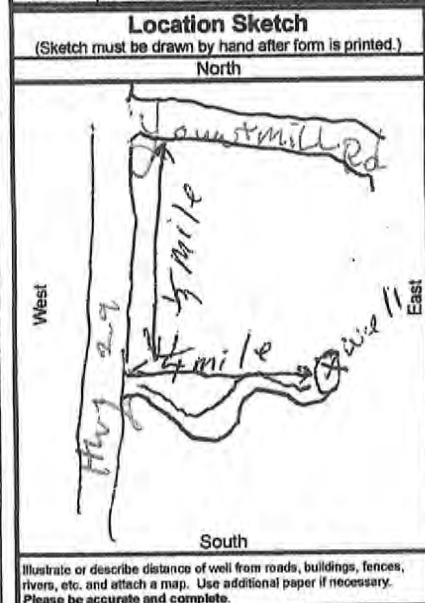
Latitude _____ N Longitude _____ W

Dec. Min. Sec. Dec. Min. Sec.

Datum _____ Dec. Lat. _____ Dec. Long. _____

APN Book 031 Page 130 Parcel 029-000

Township _____ Range _____ Section _____



Activity

New Well

Modification/Repair

Deepen

Other _____

Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

Water Supply

Domestic Public

Irrigation Industrial

Cathodic Protection

Dewatering

Heat Exchange

Injection

Monitoring

Remediation

Sparging

Test Well

Vapor Extraction

Other _____

Water Level and Yield of Completed Well

Depth to first water 420 (Feet below surface)

Depth to Static _____

Water Level 340 (Feet) Date Measured 04/19/2014

Estimated Yield * 50 (GPM) Test Type Air Lift

Test Length 4.0 (Hours) Total Drawdown 300 (Feet)

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

Casings						
Depth from Surface	Borehole Diameter	Type	Material	Wall Thickness	Outside Diameter	Screen Type
Feet to Feet	(Inches)			(Inches)	(Inches)	
0	70	12	Blank	PVC Sch. 40	R21	6
70	385	10	Blank	PVC Sch. 40	R21	6
385	665	10	Screen	PVC Sch. 40	R21	6

Annular Material			
Depth from Surface	Fill	Description	
Feet to Feet			
0	70	Cement	
70	200	Filter Pack	pea gravel
200	665	Filter Pack	#6 well pack

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 Exploration Inc

Person, Firm or Corporation

4371 Cantelow Rd Vacaville CA 95688

Address City State zip

Signed [Signature] 04/20/2014 808-508

C-57 Licensed Water Well Contractor Date Signed C-57 License Number



Wednesday, May 28, 2014

Eric Sklar

7400 Hwy 29
Yountville, CA 94599

Re Lab Order: P050505
Project ID: YOUNTVILLE HILL

Collected By: PADRIAS MCGINNIS
PO/Contract #: C.O.D.

Dear Eric Sklar:

Enclosed are the analytical results for sample(s) received by the laboratory on Friday, May 09, 2014. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Enclosures

Project Manager: Eli N. Greenwald



ENVIRONMENTAL ANALYSES

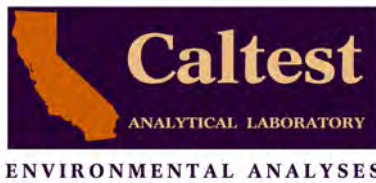
SAMPLE SUMMARY

Lab Order: P050505
 Project ID: YOUNTVILLE HILL

Lab ID	Sample ID	Matrix	Date Collected	Date Received
P050505001	NEW WELL	Water	05/09/2014 15:00	05/09/2014 15:49

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NARRATIVE

Lab Order: P050505
Project ID: YOUNTVILLE HILL

General Qualifiers and Notes

Caltest authorizes this report to be reproduced only in its entirety. Results are specific to the sample(s) as submitted and only to the parameter(s) reported.

Caltest certifies that all test results for wastewater and hazardous waste analyses meet all applicable NELAC requirements; all microbiology and drinking water testing meet applicable ELAP requirements, unless stated otherwise.

All analyses performed by EPA Methods or Standard Methods (SM) 20th Edition except where noted (SMOL=online edition).

Caltest collects samples in compliance with 40 CFR, EPA Methods, Cal. Title 22, and Standard Methods.

Dilution Factors (DF) reported greater than '1' have been used to adjust the result, Reporting Limit (RL), and Method Detection Limit (MDL).

All Solid, sludge, and/or biosolids data is reported in Wet Weight, unless otherwise specified.

Filtrations performed at Caltest for dissolved metals (excluding mercury) and/or pH analysis were not performed within the 15 minute holding time as specified by 40CFR 136.3 table II.

Results Qualifiers: Report fields may contain codes and non-numeric data correlating to one or more of the following definitions:

ND - Non Detect - indicates analytical result has not been detected.

RL - Reporting Limit is the quantitation limit at which the laboratory is able to detect an analyte. An analyte not detected at or above the RL is reported as ND unless otherwise noted or qualified. For analyses pertaining to the State Implementation Plan of the California Toxics Rule, the Caltest Reporting Limit (RL) is equivalent to the Minimum Level (ML). A standard is always run at or below the ML. Where Reporting Limits are elevated due to dilution, the ML calibration criteria has been met.

J - reflects estimated analytical result value detected below the Reporting Limit (RL) and above the Method Detection Limit (MDL). The 'J' flag is equivalent to the DNQ Estimated Concentration flag.

E - indicates an estimated analytical result value.

B - indicates the analyte has been detected in the blank associated with the sample.

NC - means not able to be calculated for RPD or Spike Recoveries.

SS - compound is a Surrogate Spike used per laboratory quality assurance manual.

NOTE: This document represents a complete Analytical Report for the samples referenced herein and should be retained as a permanent record thereof.



ENVIRONMENTAL ANALYSES

ANALYTICAL RESULTS

Lab Order: P050505
Project ID: YOUNTVILLE HILL

Lab ID	P050505001	Date Collected	5/9/2014 15:00	Matrix	Water			
Sample ID	NEW WELL	Date Received	5/9/2014 15:49					
Parameters	Result Units	R. L.	DF	Prepared	Batch	Analyzed	Batch	Qual
pH, Electrometric Analysis	Analytical Method:	SM20-4500-H B				Analyzed by:	CFG	
pH	6.5 pH Units		1			05/09/14 16:08	BIO 13818	
Calculation, Adjusted SAR	Analytical Method:	Calculation				Analyzed by:	PJB	
Adj. Sodium Adsorption Ratio	0.48 units		1			05/28/14 13:33	CALC	
Calculation, Hardness	Analytical Method:	Calculation				Analyzed by:	LM	
Hardness Calculation	53 mg/L	0.5	1			05/14/14 21:33	CALC	
Calculation, Total Anions	Analytical Method:	Calculation				Analyzed by:	CLM	
Total Anions	1.4 meq/L		1			05/15/14 14:25	CALC	
Calculation, Total Cations	Analytical Method:	Calculation				Analyzed by:	LM	
Total Cations	1.5 meq/L		1			05/14/14 22:35	CALC	
Metals by ICPMS, Collision Mode, Total	Prep Method:	EPA 200.8		Prep by:	UK			
	Analytical Method:	EPA 200.8				Analyzed by:	LM	
Calcium	12 mg/L	0.50	10	05/12/14 00:00	MPR 12770	05/14/14 22:35	MMS 7209	
Magnesium	6.4 mg/L	0.50	10	05/12/14 00:00	MPR 12770	05/14/14 22:35	MMS 7209	
Sodium	9.8 mg/L	1.0	10	05/12/14 00:00	MPR 12770	05/14/14 22:35	MMS 7209	
Metals by ICPMS, Collision Mode, Diss	Prep Method:	EPA 200.8 (filtrate)		Prep by:	UK			
	Analytical Method:	EPA 200.8 (filtrate)				Analyzed by:	LM	
Arsenic	ND mg/L	0.0020	1	05/12/14 00:00	MPR 12771	05/14/14 21:33	MMS 7208	
Boron	ND mg/L	0.10	1	05/12/14 00:00	MPR 12771	05/15/14 18:56	MMS 7208	
Iron	ND mg/L	0.050	1	05/12/14 00:00	MPR 12771	05/14/14 21:33	MMS 7208	
Magnesium	5.9 mg/L	0.50	1	05/12/14 00:00	MPR 12771	05/14/14 21:33	MMS 7208	
Manganese	0.011 mg/L	0.0050	1	05/12/14 00:00	MPR 12771	05/14/14 21:33	MMS 7208	
Silica (as SiO ₂)	100 mg/L	1.0	2	05/12/14 00:00	MPR 12771	05/15/14 18:39	MMS 7208	
Zinc	0.55 mg/L	0.020	4	05/12/14 00:00	MPR 12771	05/15/14 18:22	MMS 7208	
Turbidity Analysis	Analytical Method:	EPA 180.1				Analyzed by:	BCP	
Turbidity	1.5 NTU	0.05	1			05/09/14 17:30	WET 7598	
Electrical Conductance Analysis	Analytical Method:	EPA 120.1 / SM2510B				Analyzed by:	CLM	
Conductivity	150 umhos/cm	10	1			05/15/14 10:47	WET 7597	
Total Dissolved Solids Analysis	Analytical Method:	SM20-2540 C				Analyzed by:	ATA	
Total Dissolved Solids	190 mg/L	10	1			05/13/14 15:03	WGR 5462	
Anions by Ion Chromatography	Analytical Method:	EPA 300.0				Analyzed by:	MYS	
Chloride	5.8 mg/L	1	1			05/10/14 01:43	WIC 4517	
Fluoride	ND mg/L	0.1	1			05/10/14 01:43	WIC 4517	
Nitrate, as NO ₃	3.1 mg/L	0.5	1			05/10/14 01:43	WIC 4517	
Sulfate (as SO ₄)	0.79 mg/L	0.5	1			05/10/14 01:43	WIC 4517	
Alkalinity, Total by Standard Methods	Analytical Method:	SM20-2320 B				Analyzed by:	CLM	
Alkalinity, Total (as CaCO ₃)	58 mg/L	10	1			05/15/14 14:25	WTI 2496	

5/28/2014 14:34

REPORT OF LABORATORY ANALYSIS

Page 4 of 5

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ENVIRONMENTAL ANALYSES

ANALYTICAL RESULTS

Lab Order: P050505
 Project ID: YOUNTVILLE HILL

Lab ID	P050505001	Date Collected	5/9/2014 15:00	Matrix	Water		
Sample ID	NEW WELL	Date Received	5/9/2014 15:49				
Parameters	Result Units	R. L.	DF Prepared	Batch	Analyzed	Batch	Qual
Carbonate (as CO ₃)	ND mg/L	6.0	1		05/15/14 14:25	WTI 2496	
Bicarbonate (as HCO ₃)	71 mg/L	12	1		05/15/14 14:25	WTI 2496	
Hydroxide (as OH)	ND mg/L	1.7	1		05/15/14 14:25	WTI 2496	



