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Water Availability Analysis

Regusci Winery, Major Modification to Use Permit P16-00307
& Request for Exception to Road and Street Standards
Planning Commission Hearing Date, November 15, 2017

RICHARD C. SLADE & ASSOCIATES LLC
CONSULTING GROUNDWATER GEOLOGISTS

DRAFT
MEMORANDUM

June 9, 2016

To: Mr. Jim Regusci
Regusci Winery
5584 Silverado Trail
c/o George Monteverdi
Monteverdi Consulting, LLC
Sent via email (George@monteverdiconsulting.com)

Job No. 593-NPA01

From: Chris Wick, Anthony Hicke and Richard C. Slade
Richard C. Slade & Associates LLC

Re: Results of Napa County Tier 1 Water Availability Analysis
For Existing Regusci Winery
Vicinity Stags Leap
Yountville Area, Napa County, California

Introduction

Provided herein are the key findings, conclusions, and preliminary recommendations regarding our Water Availability Analysis, in conformance with Napa County Tier 1 requirements, for the Regusci Winery property in Napa County (County), California. The property, known herein as the "subject property," is located on the east side of Silverado Trail, roughly 2 miles east of the Town of Yountville. According to the Napa County Assessor Records, the subject property is comprised by a single parcel which contains approximately 162.6 acres. Figure 1, "Well Location Map," shows the boundary of the subject property superimposed on the local USGS topographic map for the Yountville quadrangle, along with the locations of the four existing onsite water wells. Property boundaries shown on Figure 1 were adapted from assessor's parcel data that are freely available from the Napa County GIS website. Figure 2, "Aerial Photograph of the Subject Property," shows the locations of these onsite wells on an aerial photograph of the subject property; this aerial photograph was also obtained directly from the Napa County GIS website (the date of the imagery is August 2007).

Currently, the subject property is occupied by vineyards and several structures including: a winery and tasting room; vineyard management offices; and residences. We understand that the proposed project includes a permit modification to the existing winery that will increase the permitted winery production volume, and also increase the number of winery employees and visitors at the site. Groundwater pumped from the active onsite wells is currently used to meet all of the existing water demands of the subject property and will continue to be used to meet all future water demands of the proposed project.

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As part of the permit submittal for the proposed vineyard expansion, a Water Availability Analysis (WAA) is required by the County. Hence, the purpose of this Memorandum is to comply with Napa County's WAA guidelines, which were promulgated by the County in May 2015. Specifically, this Memorandum reflects a "Tier 1" WAA, because there are no offsite wells located within 500 ft of any of the active onsite wells; hence, a "Tier 2" WAA has been presumptively met.

Scope of Services

Based on our revised proposal to you dated September 30, 2015, our scope of services for this County Tier 1 Water Availability Analysis included the following tasks:

Task 1A.1 – Collect and Review Available Data

Task 1A.2 – Site Meeting and Field Reconnaissance

Task 1A.3 – Data Analysis and Prepare Memorandum

This current Memorandum represents the culmination of our Task 1A.3 work. Wholly excluded from our work on this project is any and/or all geotechnical and engineering geology work related to such site development as: grading and earthwork; slope stability; building foundations; road construction; fault hazards and related ground shaking issues; landslide activity; site drainage; and all work related to the feasibility, design, construction, operation, maintenance, and/or impacts to the subsurface resulting from any/all of your existing and/or future subsurface sewage disposal operations.

Site Conditions

From our field reconnaissance visit at the subject property on December 16, 2015, the following key items were noted and/or observed (refer to Figures 1 and 2):

a. The subject property is comprised of a single parcel located in the hills east of the Town of Yountville in Napa County and has a County Assessor's Parcel Number (APN) of 039-030-023. The subject property is located along the east side of Silverado Trail, roughly 2 miles north of its intersection with Oak Knoll Ave.

b. The subject property includes several acres of existing vineyards which are primarily located along the southwestern side of the property. Also, an existing winery, tasting room, residences, vineyard management offices and associated landscaping also exist in the west-central portion of the property. The eastern and northern portions of the property were observed to be generally undeveloped areas covered by native brush and trees.

c. Topographically, the subject property generally slopes to the southwest towards the Silverado Trail. The less-developed eastern and northern portions of the property are relatively steep, whereas the more developed western portion of the property, which lies along the Napa Valley floor, is relatively flat.

d. Four water wells were observed on the subject property, as shown on Figures 1 and 2. The "Driveway Well" is located in the topographically lower and flatter western portion of the property, along the driveway that enters the property from Silverado Trail; the "Main Well" is located in the south-central portion of the property along the base of the nearby hillside; the "Clos Du Val Well" lies near the southeastern corner of the property; and the "Backup Well" is located in the topographically higher, north-central portion of the property. The Main, Clos Du Val and Backup wells are reportedly the only active wells on the property; the Driveway Well is reportedly "abandoned." Of the three onsite active wells, only groundwater from the Main Well and Backup Well is currently used to meet the existing water demands of the property; the Clos Du Val Well is active but is essentially unused because it is reportedly a low producing well. Thus, this latter well is considered to be an emergency backup well only.

e. The offsite areas surrounding the subject property consist primarily of existing vineyards and/or wineries and residences in the lower elevations, and naturally vegetated and wooded hillsides in the higher elevation areas.

f. The property owner showed the RCS Geologist the locations of a few historically known seeps/springs during the December 2015 site visit. However, these historic seeps/spring locations were observed to be dry at the time of our site visit, and have reportedly not been observed by the property owner to flow for many years.

g. No nearby offsite wells owned by others were directly observed by the Geologist, and no wells owned by others are known to exist within 500 ft of any of the existing onsite wells.

Key Construction Data for Existing Onsite Wells

Of the four existing onsite wells, California Department of Water Resources (DWR) Well Completion Reports (also known as driller's logs) were available only for the Main Well and the Backup Well (driller's log Nos. 0939902 and 384856, respectively). These driller's logs were provided to RCS Geologists by the property owner.

Table 1, "Summary of Well Construction Data," provides a tabulation of key well construction and pumping data, respectively, for those onsite wells for which the requisite data were available.

Key data for the existing onsite wells include:

a. The Main Well was drilled and constructed in May 2009 by McLean & Williams, Inc. (M&W), of Napa, California using the direct air rotary drilling method; drilling foams were listed on the driller's log as a drilling additive.

b. The Backup Well was drilled and constructed in September 1991 by Doshier-Gregson, Inc. (Doshier-Gregson), of American Canyon, California using the direct air rotary drilling method.

c. Pilot hole depths (the borehole drilled before the well casing was placed downhole) were reported to be 340 feet below ground surface (ft bgs) for the Main Well, and 485 ft bgs for the Backup Well.

d. The Main Well and the Backup Wells were each cased with PVC well casing having a nominal diameter of 8 inches. The Main Well and the Backup Well were cased to the total depths of 340 ft and 480 ft bgs, respectively.

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e. Casing perforations in the Main Well and the Backup Well are machine-cut slots and have slot opening widths of 0.032 inches (32-slot). Casing perforations in the Backup Well were placed continuously between the depths of 200 and 480 ft bgs. Perforations in the Main Well were reportedly placed between the following depths: 65 ft to 110 ft bgs; 120 ft to 160 ft bgs; and 180 ft to 220 ft bgs. No perforations are shown to exist below a depth of 220 ft bgs in the Main Well. However, based on the reported total casing depth of 340 ft bgs, it is possible that additional "un-reported" perforations may exist below a depth of 220 ft bgs in this well. If no additional perforations exist, then the well has 120 ft of blank cellar casing in the well, or the total casing is 240 ft, not 340 ft.

f. The gravel pack material listed on the driller's log for the Main Well is described as "#6 Sand" and was emplaced from 65 ft to 340 ft bgs; the Backup Well lists the gravel pack as "pea gravel", which was emplaced in the annulus between the depths of 31 ft and 480 ft bgs.

g. Both the Main Well and the Backup Well were reportedly constructed with sanitary seals consisting of cement (grout) for the Main Well, and bentonite clay (a type of clay with low permeability) and concrete for the Backup Well. The depth of the sanitary cement seal in the main Well is listed on the log to extend to a depth of 65 ft. The depth of the sanitary seal for the Backup Well is not listed on the log. However, because the gravel pack in the well is reported to have been emplaced no shallower than 31 ft, and a sealing material is listed, then RCS assumes the sanitary seal in the well extends from ground surface to a depth of 31 ft.

h. Due to the lack of driller's logs for the Driveway and Clos Du Val wells, their casing depths, perforated intervals, and sanitary seal depths are unknown. During our December 2015 field visit, the RCS Geologist noted that the Driveway Well had a 17-inch diameter steel upper (outer) casing, and the Clos Du Val Well was constructed of PVC casing having a nominal diameter of 6 to 8 inches.

Summary of Key Well "Test" Data for Onsite Wells

Table 1 also provides a brief summary of the original, post-construction "testing" data for the Main Well and the Backup Well, as described on the driller's logs for those wells. These "test" data include:

- Initial static water levels (SWLs) following completion of well construction for the Main Well and Backup Well were 80 ft to 165 ft bgs, respectively, depending on date of construction.
- Reported yield rates during initial post-construction airlifting ranged from 200 gallons per minute (gpm) to 250 gpm for the Backup Well and the Main Well, respectively. As a rule of thumb, RCS Geologists estimate normal operational pumping rates for a new well are typically on the order of only about one-half the airlifting rate reported on the driller's log.
- Water level drawdown amounts were not listed on the log, because water level drawdown cannot be measured during airlifting operations; thus the original post-construction specific capacity (SC) value for these two wells cannot be calculated.

Specific capacity, in gallons per minute per foot of water level drawdown (gpm/ft ddn), represents the ratio of the pumping rate in a well (in gpm) divided by the amount of water level drawdown (in ft ddn) created in the well while at that rate.

In February 2016, Oakville Pump Service, Inc. (OPS), of Oakville, California was contracted by the property owner to perform pumping tests in the Main and Backup Wells. Data collected by the OPS pumper were provided to RCS for review. In their reports, OPS referred to the Main and Backup Wells as the "Lower Well" and "Upper Well", respectively. This testing reportedly included two 8-hour constant drawdown tests that were performed in both of the two wells. The following provides a short summary of the data collected by the OPS pumper during these two tests:

Main Well (or "Lower Well" according to OPS)

- The 8-hour (480-minute) constant drawdown pumping test was performed on February 2, 2016. As reported by the pumper, the pump was set at a depth of approximately 315 ft bgs in the well.
- An initial (pre-test) SWL of 129.1 ft was measured by the OPS pump operator prior to the commencement of the pumping test.
- The initial pumping rate at the start of the test was reported to be 172 gpm, but after 15 minutes of pumping, the pumping rate was systematically reduced to 170 gpm for the remaining portion of the pumping test.
- Pumping water levels (PWLs) appeared to be relatively stable and were decreasing at a rate of only 0.7 ft/hour in the final 4 hours of testing.
- Just prior to the end of the pumping test, a final PWL of 152.6 ft was recorded. This represents a maximum pumping water level of 23.5 ft below the initial SWL. Based on a pumping rate of 170 gpm, the specific capacity of the Main Well on the date of the OPS test was approximately 7.2 gpm/ft ddn.
- After period of roughly 8 hours following cessation of pumping in this well, water levels had recovered to a depth of 131.1 ft. This recovery represents approximately 91% recovery from the maximum drawdown observed during the pumping test.

Backup Well (aka, Upper Well)

- This 8-hour (480-minute) constant drawdown pumping test was performed on February 1, 2016; the pump was reportedly set at a depth of approximately 441 ft bgs in the well.
- A pre-test SWL of 160.5 ft was measured by OPS prior to the start of the pumping test.
- The initial pumping rate was reported to be 45 gpm. Pumping rates were then systematically reduced during the initial testing period. After 105 minutes of pumping, the pumping rate was reduced to the final pumping rate of 37 gpm, presumably because pumping water levels were still declining at higher rates.
- Water levels appeared to be very stable in the final five hours of pumping, and were recorded to be at a depth of 323 ft during that five-hour period.

- A final PWL of 323 ft was recorded at the end of the testing period. This represents a maximum water level drawdown of 162.5 ft from the initial SWL. Based on a pumping rate of 37 gpm, the specific capacity of this well on the date of the OPS test was approximately 0.22 gpm/ft ddn.
- After a period of roughly 30 minutes following cessation of pumping in this well, water levels had recovered to a depth of 160 ft. This recovery represents greater than 100% recovery from the maximum pumping water level observed during the pumping test.

Well Data from Site Visit

As discussed above, a field reconnaissance of the Regusci Winery property was performed by an RCS Geologist on December 16, 2015. The following information for the four onsite wells was gleaned from this site visit:

- Driveway Well – This well was observed to be "abandoned" (i.e., no electrical and/or discharge piping connected to the well) at the time of our December 2015 site visit. A SWL depth of 10.6 ft below the wellhead reference point (brp) was measured during the visit; the reference point for this measurement was estimated to be ±1-foot above ground surface (ags) by the RCS Geologist.
- Main Well – At the time of our visit, the Main Well was observed to be equipped with a permanent pump, but was not actively pumping. A SWL depth of 172.2 ft brp was measured during the visit; the reference point for the measurement is approximately 1.9 ft ags. It is unknown if water levels in the Main Well were recovering from a recent pumping period at the time of the site visit.
- Backup Well – Based on our initial site visit, this well is equipped with a permanent pump, but was not actively pumping. A SWL depth of 178.4 ft brp was measured during the December 16, 2015 site visit; the reference point for this measurement is approximately 1.0 ft ags. Similar to the Main Well, it is unknown if or how recently the well was pumped prior to the RCS site visit.
- Clos Du Val Well – This well was observed to be equipped with a permanent pump, but was not actively pumping at the time of our site visit. A SWL depth of 175.2 ft brp was measured during the visit; the reference point for the measurement is approximately 1.6 ft ags. This well reportedly pumps only at a rate of ±3 gpm, and is used as an emergency backup well.

Local Geologic Conditions

Figure 3, "Geologic Map," illustrates the types, lateral extents, and boundaries between the various earth materials mapped at ground surface in the region by others. Specifically, Figure 3 has been adapted from the results of regional geologic field mapping of the Yountville quadrangle, as published by the California Geological Survey (CGS) in 2005 (Bezore, S.; Clahan, K.; et al). Key earth materials mapped at ground surface in the area, as shown on Figure 3 include, from geologically youngest to oldest, the following:

a. Alluvial-type deposits. These deposits consist of the following: undifferentiated and/or undivided alluvial fan, channel, or terrace materials (map symbols Qhc, Qhty, Qha, Qf, and Qoa, on Figure 3). These deposits are generally unconsolidated, and consist of layers and lenses of sand, gravel, silt, and clay. These geologic materials are shown to exist along portions of the Napa Valley floor. Alluvial fan deposits (map symbol Qf and colored in pale yellow on Figure 3) are shown to exist at ground surface in the topographically lower and flatter western portions of the subject property.

b. Landslide deposits (map symbol Qls). A few landslides have been map in the region by others (see the yellow colored areas on Figure 3). Arrows within these mapped landslide areas show the general direction of ground surface movement with each slide. A small landslide outcrop is shown on Figure 3 to exist in northern hillsides of the subject property in the vicinity of the Backup Well site.

c. Sonoma Volcanics (map symbols Tsvdg and Tsvasl). The Sonoma Volcanics, as mapped by others, occur as ground surface exposures throughout most of the area shown on Figure 3, including a majority of the subject property. These volcanic rocks are also interpreted to underlie the alluvial fan deposits (Qf) that are shown to exist in the western portion of the subject property. As shown on Figure 3, andesitic lava flows and flow breccias (map symbol Tsvasl) represent the main types of volcanic rocks exposed at ground surface at the subject property,. Harder dacitic lava flows (map symbol Tsvdg) are shown to exist at ground surface far south of the subject property.

   Review of the driller's descriptions of drill cuttings listed on the available logs for the Main Well and the Backup Well reveals that the drillers of those wells encountered typical rocks of the Sonoma Volcanics throughout the total drilled borehole depths of both wells. Typical driller-terminology for the drill cuttings on those logs included: "hard gray rock;" hard fractured gray rock;" "red soft rock;" gray white hard rock;" gray and black rock;" "gray rock stringers;" "fractured black, gray, and red rock;" "red, black and brown fractured stringer." Therefore, based on the driller's logs, the Sonoma Volcanics are interpreted by RCS to extend to minimum depths of 340 ft bgs (in the vicinity of the Main well) and 485 ft bgs (in the vicinity of the Backup well). It is very likely that the volcanic rocks extend to even deeper depths at those sites.

d. Bedrock. Underlying the volcanic rocks at even greater depths beneath the subject property, and also exposed at ground surface in small areas located offsite and to the west of the subject property are geologically older, well consolidated to cemented rocks of the Great Valley Sequence (map symbol KJgv, colored as pale green). Principal rock types in these geologically older Great Valley Sequence rocks are thick-bedded sandstone, pebble conglomerate, siltstone and shale. These geologically older rocks beneath the Sonoma Volcanics are considered to represent the local bedrock. In addition to the Great Valley Sequence rocks, an intrusive granitic (crystalline) rock group (map symbol Tgisl, colored as pink on Figure 3) is shown to exist west of the subject property on Figure 3. While geologic younger than the Great Valley Sequence rocks, and for the purposes of this project, these intrusive granitic rocks are also considered to be part of the bedrock for the area.

   Again, based solely on RCS Geologists' interpretations of the driller's descriptions of the drill cuttings listed on the available driller's logs for the Main Well and the Backup

Well, these fine-grained and/or crystalline bedrock materials are interpreted to occur at depths below the drilled depths of both the Main Well and the Backup Well.

Local Hydrogeologic Conditions

Earth materials exposed throughout the subject property 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

The principal water-bearing materials at and beneath the subject property and its environs are represented by the hard, fractured volcanic flow rocks and volcanic breccias of the Sonoma Volcanics. The occurrence and movement of groundwater in these rocks tend to be controlled primarily 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 and flow breccias deposits following their deposition, and also from mountain building or tectonic processes (faulting and folding) that have occurred over time in the region after the rocks were erupted and 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 beneath the subject property would depend on such factors as:

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

As stated above, the principal rock types exposed at ground surface on the property and also expected in the subsurface beneath the property are a combination of hard, volcanic flows of andesitic and dacitic composition, along with andesitic and flow breccias that appear to be fractured to varying degrees (Figure 3 map symbols, Tsvdg and Tsvasl). Descriptions of drill cuttings by the well driller that are recorded on the available driller's log for the onsite wells are consistent with typical descriptions of Sonoma Volcanic rocks. From our long-term experience with the harder flow rocks for numerous other water well construction projects in Napa County, pumping capacities in individual wells have ranged widely, from rates as low as 5 to 10 gpm, to rates as high as 200 gpm, or more. Any finer-grained, clay-rich, ash deposits tend to have a much lower permeability and a potential to yield only lower rates of groundwater to a new well.

Potentially Nonwater-Bearing Rocks

This category includes all geologically older and fine-grained sedimentary and/or crystalline rocks of the Great Valley Sequence, and the crystalline intrusive rocks mapped by others in the region. These rocks would underlie the volcanic rocks that exist beneath the subject property and that are also exposed directly at ground surface in different directions and at different distances from the subject property. These potentially nonwater-bearing rocks are also interpreted to directly underlie the Sonoma Volcanics at depths greater than 340 ft and 485 ft bgs, as interpreted by RCS from information available on the driller's logs for the Main and Backup wells, respectively.

In essence, these diverse rocks that are well-cemented and well-lithified, or crystalline, have an overall low permeability. Occasionally, localized conditions can allow for small quantities of groundwater to exist in these rocks wherever they may be sufficiently fractured. However, 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.

Geologic Structure

A series of unnamed faults and/or fault zones, as mapped by others, are shown on Figure 3. One of these faults transects the eastern portion of the subject property. These faults that surround the subject property are generally northwest–southeast trending faults. However, the possible impacts of these faults on groundwater availability are unknown due to a complete absence of requisite data. These faults could serve to increase the amount of frequency of fracturing in the local volcanic rocks. If such fractures occurred, it would tend to increase the amount of open area in the rock fractures which, in turn, could increase the ability of the local volcanic rocks to store groundwater. It is unknown if these faults are barriers to groundwater flow.

Please note that is not the purposed of this report to assess the potential seismicity or activity of any faults that may occur in the region.

Proposed Project Groundwater Demands by Others

Groundwater demand estimates for the subject property were provided to RCS by Delta Consulting & Engineering (Delta) of St. Helena in their draft report titled "Regusci Winery Water Use Estimates," dated June 7, 2016; a copy of this report has been attached as an Appendix to this Memorandum. As listed in the Delta report, the proposed (future) water demands for the project are as follows:

a. Winery Process Water = 1.84 acre feet per year (AF/yr)
    - These demands include water used for winery production operations (see page 3 of Delta report under "Combined Flow Breakdown").
b. Potable Water used for Winery Non-Process Water and Residential Use= 2.55 AF/yr
    - This category includes potable water used for the existing onsite residences, water used by winery employees, and water proposed to be used for future

winery visitors and events (see page 3 of Delta report under "Combined Flow Breakdown").

c. Existing Vineyard Irrigation Water = 12.58 AF/yr
   - This demand estimate was reportedly obtained from records provided to Delta by the Regusci vineyard manager (see page 4 of Delta report under "Vineyard Irrigation Water Use").

d. All Other Existing Onsite Irrigation Water = 1.47 AF/yr
   - This represents all irrigation groundwater demand for the lawn, trees, landscaping and garden (see page 8 of Delta report under "Irrigation Summary").

e. Total groundwater for proposed project = a + b + c + d = 18.44 AF/yr
   - Note that 1 AF = 325,851 gallons

As discussed above, all of the existing onsite water demands are currently met by pumping groundwater from the existing the onsite wells. For the winery portion of the project, groundwater demands (items "a" and "b" above) will be met using water pumped solely from the Main Well via a water system dedicated to winery uses. For the remainder of the proposed groundwater uses described above, groundwater would be pumped primarily from the Main Well, but may also be met via pumping from the Backup Well, if needed.

It is important to note that an agreement currently exists between the property owner and the Town of Yountville (TOY), in which some of the properties that surround the subject property (that are owned by the subject property owner) receive recycled water from the TOY for irrigation use. The property owner is currently negotiating with the TOY to expand that agreement to include additional recycled water deliveries for the subject property in the future. Hence, it is possible that in the near future, recycled water from the TOY will offset a currently-unknown portion of onsite irrigation (items "c" and "d" above). Such recycled water use will thereby reduce the overall groundwater demand at the subject property. However, because the details of agreement have not been finalized, the proposed water demand estimates provided by Delta and described above conservatively assume that no recycled water will be used for irrigation purposes at the subject property.

Shown on page 9 of the Delta report is a table labeled "Total Water Use Summary," which lists the proposed "peak daily well demand" (i.e., peak daily groundwater demand) for the property in units of gallons per day (gpd). Based the data presented in this table, the proposed peak daily groundwater demand at the property is estimated as follows:

a. Domestic Water = 3,760 gpd

b. Winery Process Water = 3,000 gpd

c. Vineyard Irrigation Water = 56,399 gpd

d. Landscape Irrigation Water = 11,873 gpd

e. Peak Combined Groundwater Use = a + b + c + d = 75,032 gpd, or 0.23 AF/day

This combined peak daily groundwater demand is only expected to occur on a maximum of 4 days during the month of September each year, when vineyard irrigation is typically the highest, as shown in the Delta report. During times of the year when only landscaping irrigation is occurring (and vineyard irrigation is not occurring), the peak daily groundwater demand is significantly less than 0.23 AF/day. In order to meet the peak daily groundwater demand of 0.23 AF/day, the Main Well and/or the Backup Well would need to pump at a total combined rate of about 52 gpm. This pumping rate assumes that the Main Well and the Backup Well would be pumped at a 100% operational basis, which equates to pumping for 24 hrs/day, 7 days/week, during peak groundwater demand days. Continuously pumping wells on a 100% operational basis for extended periods of time is neither recommended by RCS nor beneficial to the long-term viability of a well.

On a more practical pumping basis of 75% (pumping the Main Well and/or Backup Well, 18 hrs/day, during peak groundwater demand periods), then the total combined pumping requirement for the Main and Backup wells would be approximately 69 gpm. Hence, based on the pumping test data collected by OPS and discussed above, it is likely that the Main Well could meet this peak groundwater demand alone without additional pumping by the Backup Well. Hence, the Backup Well offers redundancy for the project.

Rainfall

Long-term rainfall data for the subject property are essential for estimating the average annual groundwater recharge that may occur at the subject property. Average annual rainfall totals specifically at the subject property are not directly known, because no onsite rain gage exists. However, the nearest rain gage exists roughly 2 miles southwest of the subject property, near Yountville, California. Data for this gage are available from the Napa One Rain website (https://napa.onerain.com/), maintained by Napa County, and the gage is named "Napa River at Yountville Cross Rd." Data from this Napa One Rain gage are available for water year (WY) 2000-01 (October 2000 - September 2001) through WY 2014-15; only partial rainfall data are available for the current WY 2015-16. Since this current WY is incomplete, those data are not factored into our calculations for average annual rainfall herein. The average annual rainfall for WY 2000-01 through 2014-15 at this gage is calculated to be approximately 29.1 inches (2.4 ft). This rain gage is located at a slightly lower elevation (90 ft above sea level, asl) than the subject property (between ±100 and ±700 ft asl), and therefore the average annual rainfall at the subject property is likely to be slightly higher than that experienced at this known gage location. Additionally, because the data record is limited, RCS does not consider these data to be representative of the long-term average annual rainfall in the area surrounding the gage.

The nearest rain gage to the subject property with a significantly longer data record is the gage at the Napa State Hospital. Data for this gage are available from the Western Regional Climate Center (WRCC) website (http://www.wrcc.dri.edu). For this rain gage, the period of record is listed as the years 1893 through 2015. Note that prior to 1919, approximately 5 years of rainfall data are missing from the data set. For the available period of record, the average rainfall (mean rainfall) at this Napa State Hospital gage is reported to be 24.6 inches (2.1 ft), as calculated by the WRCC. This rainfall gage, however, is located at a lower elevation (60 ft asl) than the subject property, and therefore, the total rainfall at the subject property would be greater than that experienced at this known gage location. Also, this rain gage is located roughly 8 miles south of the subject property, thus making it even less likely that these data are representative of the long-term average annual rainfall at the subject property.

To help confirm the average annual rainfall data derived from the Napa One Rain and WRCC gages, RCS reviewed the precipitation data published by the PRISM Climate Group at Oregon State University. This data set, which is freely available from the PRISM website (http://prism.oregonstate.edu/) contains "spatially gridded average annual precipitation at 800m (800-meter) grid cell resolution." The date range for this dataset includes the climatological period between 1981 and 2010. These gridded data can be used to provide an average annual rainfall distributed across the subject property, based on the boundaries of the subject property. Using this data set, RCS determined that the average rainfall for the subject property for the stated date range is 29.6 inches (2.46 ft).

An isohyetal map (a map showing contours of average annual rainfall) is available that covers all of Napa County, and is freely available for download from the online Napa County GIS database (*gis.napa.ca.gov)*. The download page for the file named "isohyetal_cnty" can be accessed via:

> http://gis.napa.ca.gov/giscatalog/catalog_xml.asp?srch_opt=all&db_name=x&theme=x&sort_order=layer&meta_style=fgdc&submit=Submit

As described in the metadata for the file (also available via the download page at the web link shown above), the isohyets are based on a 60-year data period beginning in 1900 and ending in 1960. Unfortunately, and as also stated in the metadata for the file, the contour interval for the map is reported to be "variable due to the degree of variation of annual precipitation with horizontal distance", and therefore the resolution of the data for individual parcels is difficult to discern. The subject property is located within the boundaries of the 35-inch annual total rainfall contour on the map, but is very close (within a ½ mile) to the adjoining 27.5-inch contour to the south. Based on our interpretation of the actual isohyetal contour map (not provided herein), and to be conservative, the long-term average annual rainfall at the subject property could be on the order of 30 inches (2.5 ft).

Table 2, "Comparison of Rainfall Data Sources," shows a comparison of the data collected from the different rainfall sources discussed above.

Table 2 – Comparison of Rainfall Data Sources

Rain Gage and/or Data Source	Years of Available Rainfall Record	Average Annual Rainfall in Inches (Feet)	Elevation Relative to Subject Property
Napa One Rain Napa River at Yountville Cross Rd	WY 2000-01 through present	29.1 (2.4)	Lower
WRCC Napa State Hospital	1893 through 2015	24.6 (2.1)	Lower
PRISM Climate Group	1981 to 2010	29.6 (2.8)	---
Napa County Isohyetal Map	1900 to 1960	30.0 (2.9)	---

Based on the various rainfall data sources described above, RCS will conservatively assume that the long-term average annual rainfall at the subject property is 29 inches (2.4 ft), even though the other available datasets presented above indicate that a higher average annual rainfall may have occurred at the subject property. This 29-inch per year estimate is based on three different data sources (Napa One Rain Napa River at Yountville Cross Rd rain gage, PRISM, and the Napa County isohyetal map) having relatively similar average annual rainfall amounts; these three data sources are also more site specific than the Napa State Hospital rain gage.

Estimate of Groundwater Recharge

Groundwater recharge on a long-term average annual basis at the subject property can be estimated as a percentage of average rainfall that falls on the subject property and becomes available to deep percolate into the aquifers over the long-term. The actual percentage of rain that deep percolates can be variable based on numerous conditions, such as the slope of the land, the soil type that exists at the property, the evapotranspiration that occurs on the property, the intensity of the rainfall, etc. Estimates of each of these factors can be spurious. Therefore, we must look to various analyses of deep percolation into the Sonoma Volcanics by RCS for other properties, and by other consultants and government agencies.

Estimates of groundwater recharge as a percentage of rainfall are presented for a number of watersheds in Napa County in the report titled "Updated Napa County Hydrogeologic Conceptual Model" (LSCE&MBK, 2013) prepared for Napa County. Watershed boundaries within Napa County are shown Figures 8-3 and 8-4 in that report. At the request of RCS, those watershed boundaries were provided to RCS by MBK Engineers (MBK) via email. Figure 4, "Watershed Boundaries," was prepared for this project using those watershed boundaries. As shown on Figure 4, the subject Regusci Winery property is located within the watershed referred to by MBK as "Napa River Watershed near Napa". As shown on Table 8-9 on page 97 of the referenced report (LSCE&MBK, 2013), 17% of the average annual rainfall that occurs within this watershed was estimated to be able to deep percolate as groundwater recharge. Note that, as shown on Table 8-9 of LSCE&MBK (2013), calculations for the "Napa River Watershed Near Napa" include a number of other smaller "up-river" watersheds that are tributary to the Napa River Watershed Near Napa.

As stated above, the ground surface area of the subject property is 162.6 acres. Assuming a conservative value of 29 inches (2.4 ft) of rain falls on the property on a long-term average annual basis, then the total volume of rainfall available for deep percolation over the long term is approximately 390.2 AF (162.6 acres x 2.4 ft). Assuming 17% of the average annual rainfall could deep percolate to the groundwater beneath the subject property, then the average annual groundwater recharge at the subject property would be approximately 66.3 AF/yr.

It is possible that a 17% deep percolation factor is not appropriate for the Sonoma Volcanics. Recharge estimates that have been regularly used by others for the Sonoma Volcanics in different watersheds throughout Napa County range from a quite conservative estimate of 7% to perhaps 14% or so. RCS has typically assigned a deep percolation estimate of 9% to 10% for the Sonoma Volcanics. Those estimates are based, in part, on our review of USGS Water Resources Investigation Reports WRI 77-82 and WRI 03-4229 (USGS 1977 and USGS 2003, respectively) and from our experience in preparing numerous hydrogeologic assessments throughout Napa and Sonoma counties for properties underlain by the Sonoma Volcanics. One groundwater study prepared by others as a part of the Napa Pipe Project Environmental Impact Report estimated that 10.5% rainfall recharge occurred within the Sonoma Volcanics (BHFS 2011).

Recharge rates into geologic materials similar to the Sonoma Volcanics have also been documented in other parts of the world. In the textbook reference "Introduction to Hydrogeology" by J.C. Nonner, 2002, estimates of groundwater recharge were presented as percentages of rainfall for many different rock types in various climates (arid, temperate, and tropical). In that reference (page 172) recharge rates in volcanic rocks in arid regions were discussed in general terms. "Generally, but not everywhere, recharge rates less than 10% of the precipitation were reported for volcanic complexes in arid areas. "For example, recharge percentages on the order of 7 to 9% of an annual precipitation of about 600 mm [23.6 inches] have been assessed for the Deccan Trap basalts..." (Nonner 2002). The text goes on to state on page 173 (Nonner, 2002) that "Rates of recharge from precipitation... for volcanic rock complexes in temperate and tropical areas are higher than the rates for similar volcanic rocks in arid areas" (Nonner 2002). Because the subject property is underlain by volcanic rock aquifers in a temperate climate, an estimate of 10% deep percolation of rainfall is considered to be a conservative estimate by the standards set forth in the Nonner text. While the volcanic rocks mentioned in the Nonner reference exist in other parts on the world, this reference helps to corroborate the recharge rate within the volcanic rocks similar to the Sonoma Volcanics.

A slightly more site-specific estimate of the deep percolation of rainfall at the subject property can be made using the data from the LSCE&MBK (2013) reported in conjunction with the PRISM rainfall data set. Figure 5A, "Watershed Geology," shows the same watershed boundaries (LSCE&MBK 2013) shown on Figure 4, but superimposed on a geologic base map of the region (USGS 2007); Figure 5B shows the geologic legend for that map. Importantly, a brown line is shown on the map to denote/separate the alluvial deposits of the Napa Valley from the hillside areas of the County; this brown line is adapted from DWR Bulletin 118-03 (DWR 2003). The areas within that brown line along the floor of Napa Valley represent the Napa Valley subbasin of the Napa-Sonoma Valley Groundwater Basin, as defined by DWR (Bulletin 118, Update 2013).

As discussed above, the referenced report (LSCE&MBK 2013) estimated that 17% of the average annual rain that falls within the "Napa River Watershed near Napa" is available to deep percolate to recharge the groundwater. It is likely that, in reality, the percentage of rainfall that deep percolates into the alluvial deposits that lie along the floor of the Napa Valley is higher than the percentage of rainfall that deep percolates into the geologic materials that are exposed throughout the hillside areas of the watershed (in general, the Napa County hillsides are composed of either volcanic rocks, or older, well-cemented sandstones and siltstones). The total area within the brown-colored groundwater subbasin boundary shown on Figure 5A contains an area of roughly 45.6 square miles (sq mi). The remainder of the "Napa River Watershed near Napa" watershed area that is not underlain by the brown-lined groundwater subbasin is comprised by a total of 170.3 sq mi. By assuming that the deep percolation percentage of rainfall onto the groundwater subbasin (underlain by alluvium) is 25% or higher (instead of 17%), then the estimated percentage of infiltration in the adjoining hill and mountain areas can be calculated. To do so, the amount of rain that falls in both of the areas must be determined. This can be accomplished using a GIS software package and the PRISM dataset. Because the PRISM dataset is distributed for equal-sized areas throughout the County, then the average rainfall can be calculated for the size or shape of any area within the County. Using the PRISM data set, and the assumptions stated above, Table 3, "Calculation of Theoretical Rainfall Recharge Percentage, Napa River Watershed at St. Helena," was created to determine the percentage of rainfall that may be available for deep percolation.

As shown on Table 3, assuming the average rainfall as calculated using the PRISM data set, three scenarios are presented in which the deep percolation percentage of the valley floor of the Napa Valley can be adjusted to values higher than 17%. The results of the three scenarios shown on Table 3 are as follows:

- Scenario 1 assumes a valley floor deep percolation percentage of 20%, and a resultant deep percolation percentage for the hill and mountain areas of the watershed of 16%.
- Assuming the deep percolation of rainfall in the alluvium is 25% for Scenario 2, the percentage of rainfall that is calculated to deep percolate at the subject property (and throughout the hillside areas of the watershed) would be 15%.
- A deep percolation percentage in the alluvium of 30% for Scenario 3 yields a deep percolation percentage for the hill and mountain areas of 14%.

Therefore, based on the analyses presented in Table 3, and to be conservative, a value of 14% in Scenario 3 may be an appropriate assumption for the percentage of rainfall that can deep percolate to recharge the groundwater beneath the subject property. Assuming a deep percolation of 14%, a surface area of the subject property of 162.6 acres, and a long-term average annual rainfall total of 29 inches (2.4 ft), then the average annual groundwater recharge at the subject property is estimated to be 54.6 AF/yr.

Possible Effects of "Prolonged Drought"

California is currently experiencing a period of prolonged drought. Here, drought is defined as a meteorological drought, that is, a period in which the total annual precipitation is less than the long-term average annual precipitation (DWR 2015). For similar projects in the County, Napa County Planning, Building and Environmental Services Department (PBES) has asked RCS to consider what the effects on groundwater availability at a particular property might be if a period of "prolonged drought" were to occur in the region, assuming the project were to operate in the future as described herein. Recharge volumes estimated in this Memorandum are based on the long-term average rainfall value determined for the subject property using available data. Recall that a calculation of average annual rainfall for any long-term period always includes periods of below-average rainfall and above-average rainfall that occurred during the period over which the average was calculated. Therefore, it is our opinion that the preceding calculations do inherently include consideration of drought year conditions.

However, to help understand what potential conditions might exist in the local volcanic rocks beneath the property during a "prolonged drought period", a "prolonged drought" must be defined. As discussed by DWR, "there is no universal definition of when a drought begins or ends, nor is there a state statutory process for defining or declaring drought." (DWR 2015). California's most significant historical statewide droughts were defined by DWR as occurring during the following periods (DWR 2015):

- WY 1928-29 through WY1933-34 - six years

- WY 1975-76 through WY 1976-77 – two years
- WY 1986-87 through WY 1991-92 – six years
- WY 2006-07 through WY 2008-09 – three years
- Current drought – WY 2011-12 through WY 2014-15 – four years to date, which may extend into WY 2015-16

Table 4, "Drought Period Rainfall as Percentage of Average," shows the average amount of rainfall that occurred during each drought period for which rainfall data exist at the four rain gages discussed above and shown on Table 2; that drought period rainfall amount is also expressed on Table 4 as a percentage of the total rainfall that fell. As shown on Table 4, determining the amount of rain that might fall during a "prolonged drought" is variable, and depends on the period of record for the specific rain gage. Clearly, the WY 1975-76 to WY 1976-77 drought period recorded by the Napa State Hospital rain gage and reported by the WRCC had the lowest total rainfall at 48% of the long-term average, and it lasted for two years. The WY 1928-29 to WY 1933-34 drought period lasted for six years, but rainfall was 70% of the average annual rainfall at the Napa State Hospital gage. It is important to note that the drought year percentage listed on Table 4 is completely dependent on the period of record for each individual gage. An example of this is the Napa One Rain gage data; because the period of record for this gage is short, and includes many drought years, then the last two available drought year period rainfall percentages are shown to range between 76% and 89% of the long-term average.

Hence, for the purposes of this Memorandum, we will conservatively consider a "prolonged" drought period rainfall to be 48% of the average annual rainfall that occurs (using the data from the Napa State Hospital WRCC rain gage). Further, to again be conservative, we will estimate a "prolonged drought period" to last 6 years, which is the longest drought period on record according to DWR (DWR 2015); see Table 4. This six-year period is a conservative estimate, because the 48%-average figure corresponds with a two-year drought period, not a six-year drought period.

To meet six years of groundwater demand for the proposed subject property, a total onsite groundwater extraction of 110.6 AF is estimated to be required (18.44 AF/yr multiplied by 6 years = 110.6 AF). Assuming groundwater recharge is reduced to 48% of the average annual recharge during such a theoretical "prolonged drought period", then a total of approximately 157.2 AF of groundwater recharge might occur during the entire six-year drought period, as calculated below:

- From page 15, the average annual groundwater recharge at the subject property is estimated to be 54.6 AF/yr. Taking 48% of this annual volume yields a drought period recharge volume of 26.2 AF/yr.
- Assuming a drought period duration of 6 years, then 157.2 AF (26.2 AF/yr times 6 years) of groundwater would be able to recharge the volcanic rocks beneath the property by virtue of deep percolation of the direct rainfall recharge within the boundaries of the subject property.

Therefore, assuming a theoretical six-year drought period during which only 48% of the average annual rainfall might occur, a conservative estimate of the total drought-period recharge at the subject property (157.2 AF) would still exceed the estimate of the total groundwater demand (110.6 AF) that may occur over the same six-year period.

Groundwater Quality

Water quality data for the Main Well were provided to RCS Geologists by the property owner. Table 5, "Summary of Available Groundwater Quality Data," summarizes water quality data available from laboratory analyses of groundwater samples collected by others from this well on October 1, 2015. The laboratory analyses were performed by Brelje & Race Laboratories of Santa Rosa, California. Data presented on Table 5 reveal the following with regard to key water quality constituents for groundwater pumped by the Main Well:

- The character of the groundwater from the local volcanic rock aquifer systems appears primarily to be a sodium-bicarbonate ($Mg\text{-}Na\text{-}HCO_3$) type of water.
- Specific conductance (also known as electrical conductivity, or EC) was reported to be 350 micromhos per centimeter (μmhos/cm).
- Total hardness (TH) was reported to be 88 milligrams per liter (mg/L). Water with a TH between 60 and 120 mg/L is typically considered to be "moderately hard."
- The pH of groundwater was reported to be 7.6, indicating that the water is slightly basic (above pH 7).
- Arsenic (As) was detected at a concentration of 2.9 micrograms per liter (μg/L); arsenic has a State Primary Maximum Contaminant Level (MCL) of 10 μg/L for water used for domestic purposes.
- Nitrate was reportedly not detected (ND).
- Iron (Fe) was reportedly detected at a concentration of 630 μg/L. Because the State Secondary MCL for Fe is 300 μg/L for water to be used for domestic purposes, this detected concentration exceeds this Secondary MCL.
- The manganese (Mn) concentration was reportedly 320 μg/L in the Main Well; the State Secondary MCL for this constituent is 50 μg/L for domestic use. Hence, Mn concentrations in this well exceed the Secondary MCL for this constituent.

Key Conclusions and Recommendations

1. The existing property is currently developed with vineyards, a winery, tasting room, vineyard management offices, and residences with associated landscaping. Current water demands for all onsite usage are met by pumping groundwater from the Main Well and the Backup Well.
2. The proposed project consists of a permit modification to the existing winery and/or winery uses.
3. The future annual groundwater demand for the project (including both existing and proposed demands) is estimated to be 18.44 AF/yr by Delta.
4. All future irrigation and domestic (potable) water demands (including winery uses) will be met by pumping groundwater from the Main Well and/or the Backup Well. As reported

by Delta, the peak daily groundwater demand for the subject property is estimated to be 74,692 gpd or 0.23 AF/day, for a maximum of 4 days in September each year when vineyard irrigation is occurring. In order to meet this peak daily groundwater demand, the Main Well and the Backup Wells would need to pump at a total combined rate of 69 gpm. This pumping rate assumes the wells would be pumped on a 75% operational basis (pumping 18 hours per day, during peak groundwater demand periods).

5. Based on the results of the February 2016 constant drawdown tests performed by OPS, the Main Well, is capable of pumping at rates that that are higher than the total combined rates needed to meet the proposed average annual groundwater demand and peak daily groundwater demand of the entire subject property. Hence, the estimated future groundwater demands for the project can be met by pumping the Main Well alone. It is noteworthy that a majority of the water demands listed in this report for the property are existing demands; the Main and/or Backup Well have been historically meeting these demands for a number of years.

6. Groundwater recharge at the subject property on a long-term average annual basis is estimated to be 54.6 AF/yr; this value is based on conservative estimates of average annual rainfall at the property and conservative estimates of the percentage of rainfall that could be available to deep percolate into the fractured and jointed rocks of the Sonoma Volcanics that underlie the subject property. This average annual recharge volume is much higher than the average annual groundwater demand estimated for the subject property of 18.44 AF/yr.

7. Conservative estimates of recharge that may occur during a "prolonged drought" (as defined above) show that, over a six-year drought period in which only 48% of the average annual rainfall might occur, a total 157.2 AF of rainfall recharge would occur within the boundaries of the subject property. This "prolonged drought" recharge estimate exceeds the total estimated groundwater demand of 110.6 AF that is necessary for the subject property over the same six-year drought period.

8. Annual groundwater demands for the subject property will likely be much lower in the future when the agreement for recycled water deliveries between the TOY and the property owner are finalized. Although the volume of recycled water that may be delivered to the subject property in the future is unknown at this time, it is probable that the volume of recycled water delivered will offset a significant portion of the groundwater demand estimated for irrigation of both the existing vineyard and landscaped areas.

9. Based on available water quality data, groundwater pumped by the existing wells contains elevated to excessive concentrations of iron and manganese. Thus, because this water is used for domestic purposes, treatment for these constituents will be needed.

DRAFT
MEMORANDUM

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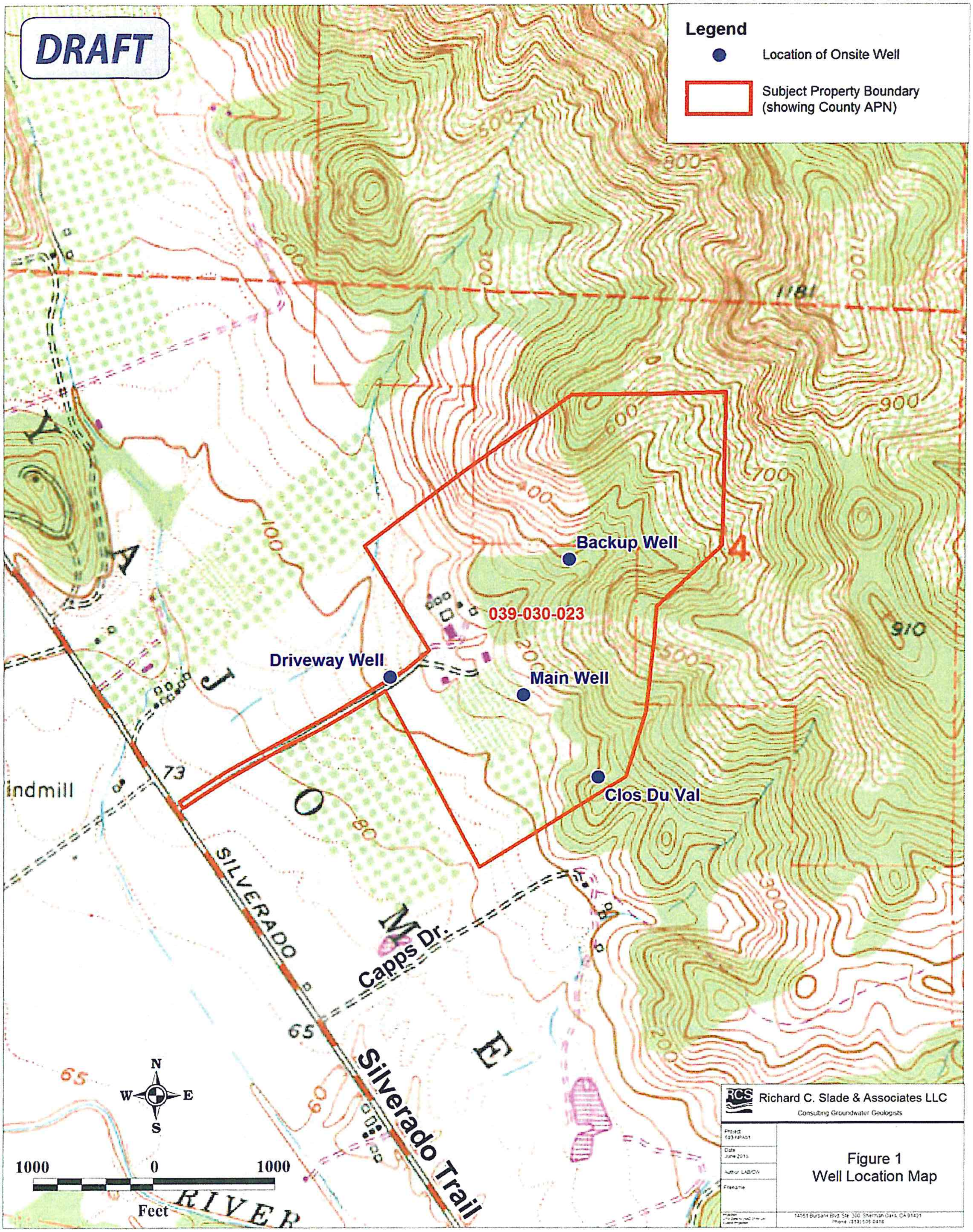

Figure 1
Well Location Map

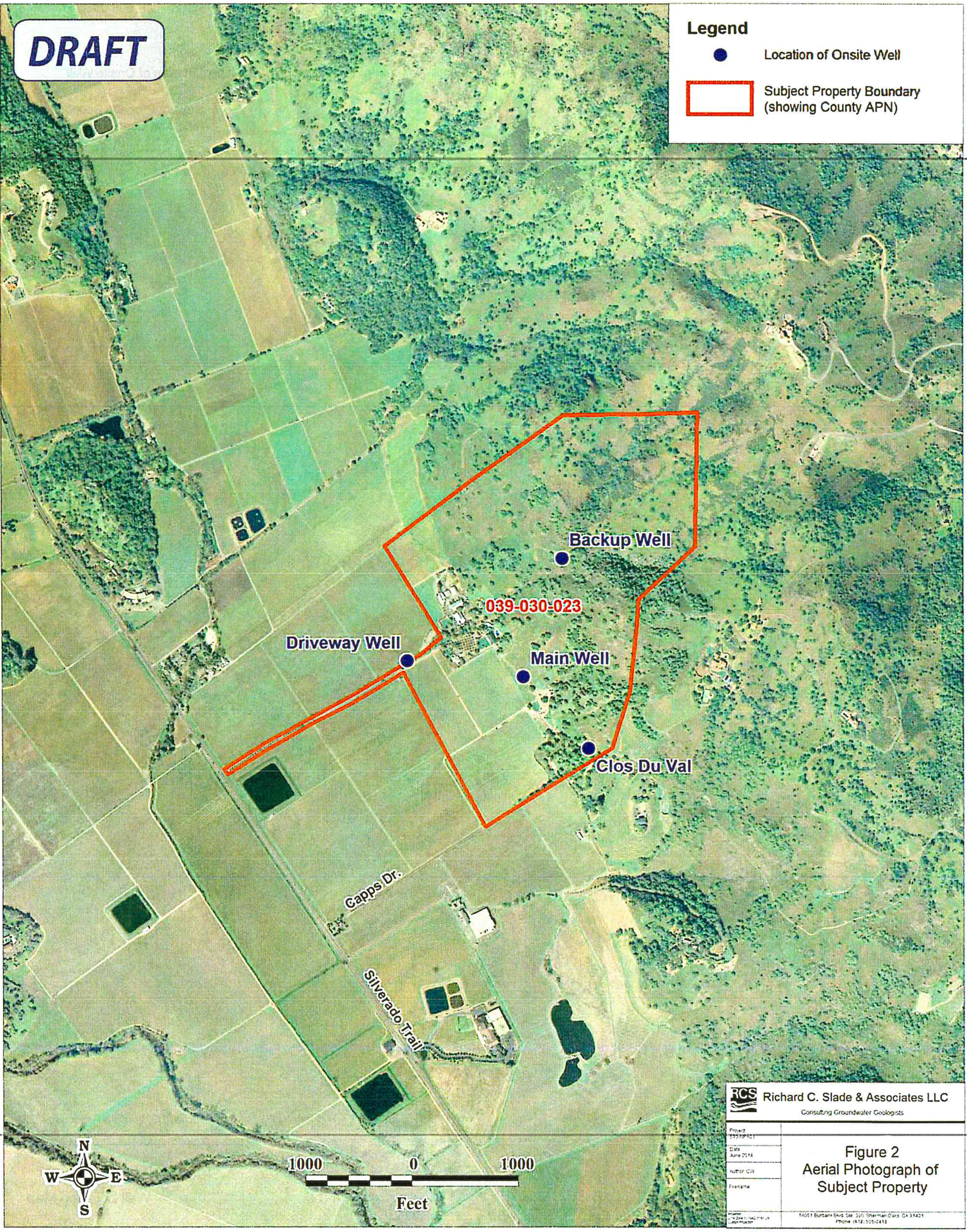

Figure 2
Aerial Photograph of Subject Property

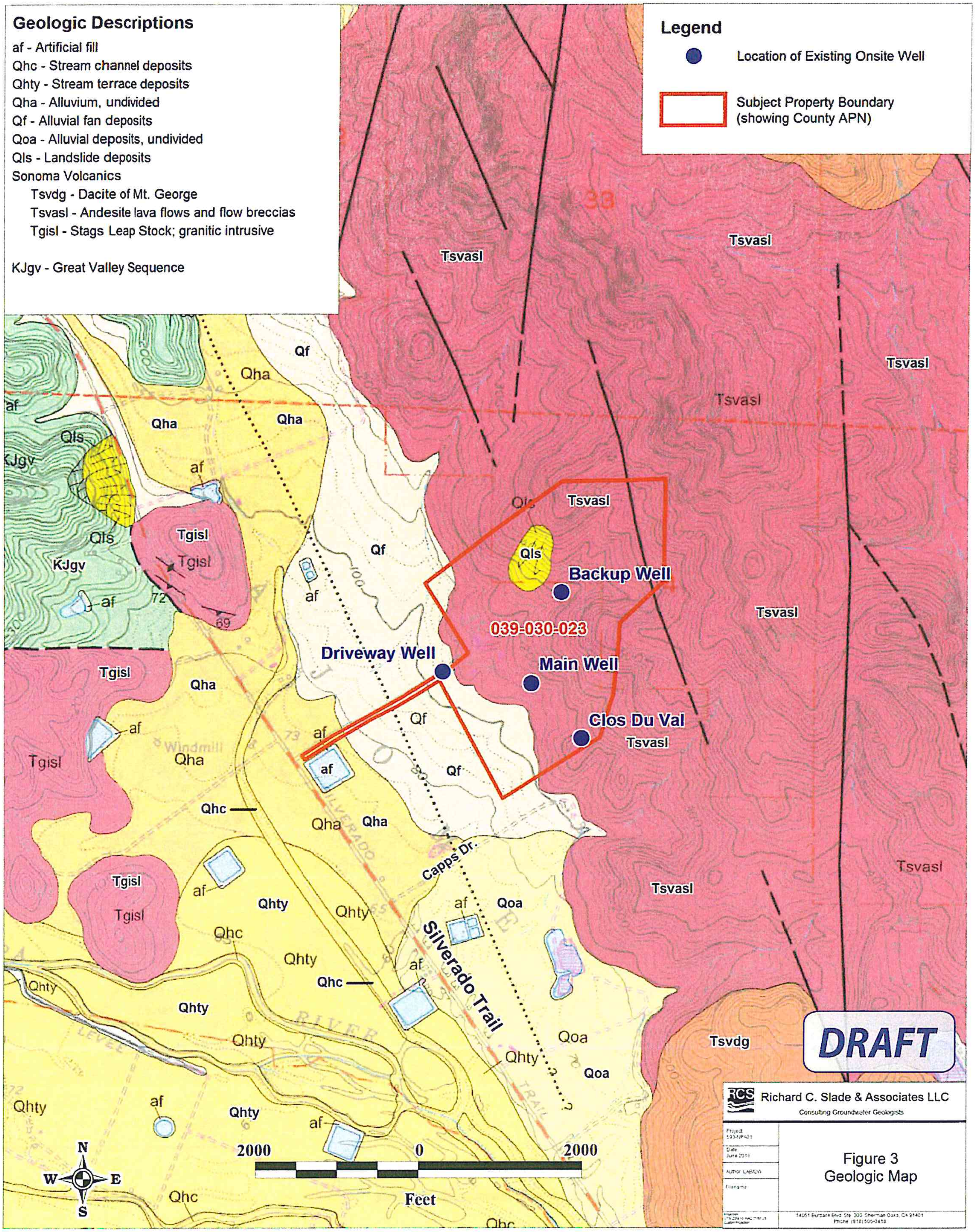

Figure 3
Geologic Map

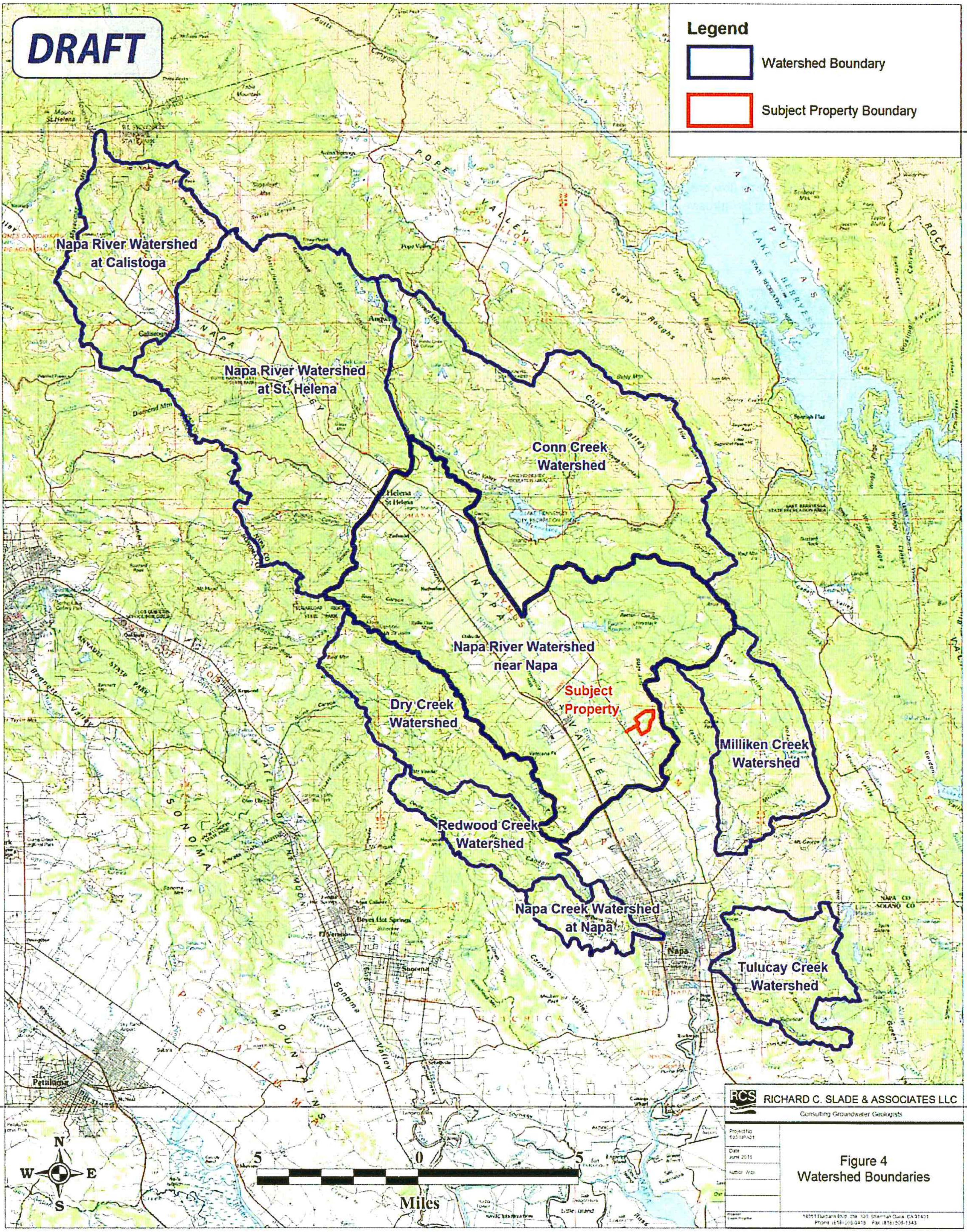

Figure 4
Watershed Boundaries


"Geoloogy Map and Map Database of Eastern Sonoma and Western Napa Counties, California," USGS, 2007
Legend
Watershed Boundaries with Napa County
DWR Bullentin 118 Groundwater Basin Boundary (2003)
See Figure 5B for the Description and Legend of Geologic Units.
Base Geology Map: "Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California" (USGS 2007)
Watershed Boundaries Adapted From "Updated Hydrogeologic Conceptualization and Characterization of Conditions" (LSCE&MBK 2013)
Napa River Watershed at Calistoga
Napa River Watershed at St. Helena
Conn Creek Watershed
Napa River Watershed near Napa
Subject Property
Milliken Water
Dry Creek Watershed
Redwood Creek Watershed
DRAFT
N
W
E
S
2
0
2
4
6
Miles
RCS RICHARD C. SLADE & ASSOCIATES LLC
Consulting Groundwater Geologists
Figure 5A
Watershed Geology

LIST OF MAP UNITS

[Some unit exposures on the map are too small to distinguish the color for unit identification. These units are labeled where possible, and unlabeled units are attributed in the database.]

SURFICIAL DEPOSITS

- af — Artificial fill (Historic)
- afbm — Artificial fill over Bay mud (Historic)
- alf — Artificial levee fill (Historic)
- Qhc — Stream channel deposits (late Holocene)
- Qhay — Younger alluvium (late Holocene)
- Qhty — Terrace deposits (late Holocene)
- Qha — Alluvium (Holocene)
- Qht — Terrace deposits (Holocene)
- Qhf — Alluvial fan deposits (Holocene)
- Qhff — Fine-grained alluvial fan deposits (Holocene)
- Qhl — Natural levee deposits (Holocene)
- Qhb — Basin deposits (Holocene)
- Qhbm — Bay mud (Holocene)
- Qa — Alluvium (Holocene and late Pleistocene)
- Qt — Terrace deposits (Holocene and late Pleistocene)
- Qf — Alluvial fan deposits (Holocene and late Pleistocene)
- Qls — Landslide deposits (Holocene and late Pleistocene)
- Qlsa — Andesitic composition
- Qlsr — Rhyolitic composition
- Qpa — Alluvium (late Pleistocene)
- Qpt — Terrace deposit (late Pleistocene)
- Qpf — Alluvial fan deposits (late Pleistocene)
- Qoa — Alluvium (late and early Pleistocene)
- Qlso — Landslide deposits (late and early Pleistocene)

Clear Lake Volcanics

- Qr — Rhyolite (Pleistocene)
- QTob — Olivine basalt (Pleistocene and Pliocene)
- QTt — Tuff (Pleistocene and(or) Pliocene)
- Tr — Rhyolite (Pliocene)

- QTc — Cache Formation (Pleistocene and(or) Pliocene)
- QTge — Glen Ellen Formation (early Pleistocene? and Pliocene)
- QThg — Huichica and Glen Ellen Formations, undivided (early Pleistocene? and Pliocene)

Sonoma Volcanics

- Tsv — Sonoma Volcanics, undivided (Pliocene and late Miocene)
- Tsr — Rhyolite flows
- Tsrt — Rhyolite plugs
- Tsrs — Soda rhyolite flows
- Tsrp — Perlitic rhyolite
- Tsrb — Rhyolite breccia
- Tsa — Andesite to basalt lava flows
- Tsai — Andesite to dacite plugs
- Tsb — Basalt flows
- Tsfd — Basalt or andesite lava flows and sediments
- Tst — Pumiceous ash-flow tuff
- Tswt — Welded ash-flow tuff
- Tsts — Tuff(?)
- Tsag — Agglomerate
- Tstt — Tuff breccia
- Tsft — Tuff
- Tss — Volcanic sand and gravel
- Tsd — Diatomite

- Twg — Wilson Grove Formation (late Pliocene to late Miocene)
- Tc — Sand and gravel of Cotati (Pliocene and late Miocene)
- Tp — Petaluma Formation (early Pliocene and late Miocene)
- Tdr — Donnell Ranch Volcanics (late Miocene)
- Tn — Neroly Sandstone (late Miocene)
- Tci — Cierbo Sandstone (late Miocene)
- Tbm — Burdell Mountain volcanics (late and middle? Miocene)
- Tms — Unnamed sandstone (middle Miocene)
- Tkt — Kirker Tuff (early Miocene and(or) Oligocene)
- Td — Unnamed sandstone (Eocene and Paleocene)
- Ts — Unnamed sandstone (Eocene? or Paleocene?)

GREAT VALLEY COMPLEX

Great Valley sequence

- KJgv — Sandstone, shale, and conglomerate (Late Cretaceous to Late Jurassic)
- Kgvu — Sandstone, shale, and conglomerate (Late Cretaceous)
- Kv — Venado Formation (Late Cretaceous)
- KJgvl — Sandstone and shale (Early Cretaceous and Late Jurassic)
- KJsp — Sedimentary serpentinite member
- Jk — Knoxville Formation (Late Jurassic)
- Jsp — Sedimentary serpentinite member
- Jgvm — Mélange

Coast Range ophiolite

- Jv — Basaltic pillow lava and breccia (Jurassic)
- Jmi — Mafic intrusive complex (Jurassic)
- Jgb — Gabbro (Jurassic)

- sp — Serpentinite (Jurassic)
- sc — Silica-carbonate rock
- spm — Serpentinite-matrix mélange

FRANCISCAN COMPLEX

- fsr — Melange, including blocks, mapped locally, of:
- sp — Serpentinite
- fs — Graywacke
- ch — Chert
- fgc — Greenstone and chert
- gs — Greenstone
- m — High-grade metamorphic rocks
- Kfss — Sandstone (Late Cretaceous, Turonian?)
- Kfm — Metagraywacke (Late and Early Cretaceous)
- Kfmc — Metachert (Late and Early Cretaceous)
- Kfmg — Metagreenstone (Late and Early Cretaceous)
- KJfs — Graywacke and melange (Early Cretaceous and Late Jurassic)
- KJfc — Chert (Cretaceous to Jurassic)
- KJfgc — Greenstone and chert (Cretaceous to Jurassic)
- KJfgs — Greenstone (Cretaceous to Jurassic)

MAP SYMBOLS

- Contact—Depositional or intrusive contact, dashed where approximately located, dotted where concealed
- Fault—Dashed where approximately located, small dashes where inferred, dotted where concealed, queried where location is uncertain, orange denotes Quaternary-active fault, magenta denotes Holocene active-fault
- Reverse or thrust fault—Dashed where approximately located, small dashes where inferred, dotted where concealed, queried where location is uncertain; sawteeth on upper plate
- Anticline—Dashed where approximately located, dotted where concealed
- Syncline—Dashed where approximately located, dotted where concealed
- Strike and dip of bedding
- Strike and dip of bedding, top indicator observed
- Strike and dip of bedding, approximate
- Overturned bedding
- Overturned bedding, top indicator observed
- Crumpled bedding
- Air photo attitude
- Vertical bedding
- Horizontal bedding
- Strike and dip of foliation
- Strike and dip of foliation and bedding
- Vertical foliation
- Strike and dip of joint

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Legend from "Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California" (USGS 2007)

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FIGURE 5B
DESCRIPTION AND LEGEND OF GEOLOGIC UNITS

Job No. 593-NPA01 June 2016

Table 1
Summary of Well Construction Data
Regusci Winery Property

Reported Well Designation	DWR Well Log No.	Date Drilled	Method of Drilling	Pilot Hole Depth (ft bgs)	Casing Depth (ft bgs)	Casing Type	Casing Diameter (in)	Borehole Diameter (in)	Perforation Intervals (ft bgs)	Type and Size (in) of Perforations	Gravel Pack Size (in)	Sanitary Seal Depth (ft bgs)	Current Status of Well	Post-Construction Yield "Test"		
														Static Water Level (ft) and Date	Reported Yield (gpm)	Type of "Test"
Main	0939902	May 2009	Air Rotary (foam)	340	340	PVC	8	13¾	65-110 120-160 180-220 (?)	Milled Slots 0.032	#6 Sand	65 (cement)	Active	80 5/12/09	250	Air Lift
Backup	384856	July 2005	Air Rotary	485	480	PVC	8	8¾	200-480	Milled Slots 0.032	pea gravel	31* (bentonite/ concrete)	Active	165 ND	200	Air Lift
Clos Du Val	No Available Construction Data					PVC	6 or 8	No Available Construction Data					Emergency Use	No Data		
Driveway	No Available Construction Data					Steel (outer casing)	17 (outer casing)	No Available Construction Data					Abandoned	No Data		

Notes: ft bgs = feet below ground surface
SWL = static water level
brp = below reference point, generally top of wellhead
*Sanitary seal depth not explicitly stated on driller's log, but is deduced based on other information provided on the log (see text of report for further discussion)

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Table 3
Calculation of Theoretical Rainfall Recharge Percentage, Napa River Watershed Near Napa

Portion of "Napa River Watershed Near Napa" (See Figure 5A)	Area		Average Rainfall per PRISM Dataset (1980-2010)	Rainfall Volume	Scenario 1		Scenario 2		Scenario 3	
					Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume
	(sq mi)	(acres)	(in)	(AF)	(%)	(AF)	(%)	(AF)	(%)	(AF)
Valley Floor Portion of Watershed	45.5	29,120	34.7	84,205	20%	16,841	25%	21,051	30%	25,262
Hillside Area Portion of Watershed	172.8	110,592	39.3	362,189	16%	59,046	15%	54,836	14%	50,625
Entire Watershed	218.3	139,712	38.3	446,394	17%	75,887	17%	75,887	17%	75,887

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Table 4
Drought Period Rainfall as Percentage of Average

Statewide Drought Period as Defined by DWR (DWR 2005)	Drought Duration (years)	Average Rainfall by Raingage											
		Napa Hospital Raingage, WRCC Period of Record - 1893 through Sept 2015			Atlas Peak Raingage, CDEC Period of Record - 1988 through Sept 2105			Napa River (Yountville Cross Rd), Napa One Rain Period of Record - 2000 through Sept 2105			Atlas Peak Raingage, Napa One Rain Period of Record - 2007 through Sept 2105		
		[A] Total Gage Average (in)	[B] Drought Period Average (in)	[B÷A] Drought Period Rainfall as % of Average	[C] Total Gage Average (in)	[D] Drought Period Average (in)	[D÷C] Drought Period Rainfall as % of Average	[E] Total Gage Average (in)	[F] Drought Period Ave. (in)	[F÷E] Drought Period Rainfall as % of Average	[G] Total Gage Average (in)	[H] Drought Period Ave. (in)	[H÷G] Drought Period Rainfall as % of Average
WY 1928-29 to WY 1933-34	6	24.6	17.3	70%	ND	ND	ND	ND	ND	ND	ND	ND	ND
WY 1975-76 to WY 1976-77	2	24.6	11.8	48%	ND	ND	ND	ND	ND	ND	ND	ND	ND
WY 1986-87 to WY 1991-92	6	24.6	18.5	75%	40.0**	38.7**	97%**	ND	ND	ND	ND	ND	ND
WY 2006-07 to WY 2008-09	3	24.6	18.1	74%	40.0	23.4	59%	29.1	22.1	76%	33.2**	29.4**	89%**
WY 2011-12 to WY 2014-15	4*	24.6	20.1	82%	40.0	26.9	67%	29.1	22.6	78%	33.2	29.0	87%

* Drought could potentially continue into WY 2015-16; the duration of the current drought is unknown.

** Raingage data does not extend through the entire drought period

ND = No rainfall data avaialble for the corresponding drought period.

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Table 5
Summary of Available Groundwater Quality Data
Regusci Winery

Constituent Analyzed	Units	Maximum Contaminant Level	Main Well
		Date of Samples:	10/1/2015
General Physical Constituents			
Specific Conductance	umhos/cm	900; 1,600; 2,200(1)	350
pH	units	6.5 to 8.5	7.6
Turbidity	NTU	5	0.55
Odor	TON	3	<1
Color	CU	15	10
Aggressive Index (AI)		None	11
Color	CU	15	10
General Mineral Constituents			
Total Dissolved Solids	mg/L	500; 1,000; 1,500(1)	280
Total Hardness		None	88
Alkalinity (Total) as $CaCO_3$		None	100
Bicarbonate		None	120
Calcium		None	14
Magnesium		None	13
Sodium		None	29
Sulfate		250, 500, 600(1)	53
Chloride		250, 500, 600(1)	9.7
Fluoride		2	0.26
Nitrate (as N)		45	<0.4
Detected Inorganic Constituents (Trace Elements)			
Arsenic	µg/L	10	2.9
Chromium		50	1.2
Iron		300	630
Manganese		50	320
Detected Radilogical Constituents			
Gross Alpha	pCi/L	15	0.471

Notes:

<1 = constituent below reporting detection limit

(1) The three listed numbers represent the recommended, upper and short-term State Maximum Contaminant Levels for the constituent.

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APPENDIX
"WATER USE ESTIMATES"
BY
DELTA CONSULTING & ENGINEERING

Water Use Estimates

Wine Production Water Use

Winery Production (WP) = 50,000 gallons

Estimated Gallons of Process Water Used per Gallon of Wine Produced= 12 gallons ww/gallon of wine produced
Gallons of Process Water Used Per Year= 600,000 gallons/year

Design for Average Peak Daily Water Use

Month	Day/mo	Estimated % of Water Use	Monthly Water Use (gallons)	Average Daily Water Use (gallons)	Month
Jan	31	5%	30,000	970	Jan
Feb	28	5%	30,000	1,070	Feb
Mar	31	6%	36,000	1,160	Mar
Apr	30	6%	36,000	1,200	Apr
May	31	6%	36,000	1,160	May
Jun	30	6%	36,000	1,200	Jun
Jul	31	6%	36,000	1,160	Jul
Aug	31	13%	78,000	2,520	Aug
Sep	30	15%	90,000	3,000	Sep
Oct	31	15%	90,000	2,900	Oct
Nov	30	12%	72,000	2,400	Nov
Dec	31	5%	30,000	970	Dec
	TOTAL	100%	600,000		

Peak Average Daily PW Use:	3,000	gpd
	Sep	

Domestic Water Use

Winery	Maximum Quantity (persons)	Water Use (GPP)[1]	Days Contributed	Gallons per Day	Annual DW Used (gallons)
Guests/day	150	3	365	450	
Max Guests/week	400	3	52		62,400
Food & Wine Pairing[4]	12	5	208	60	12,480
Small Events[3]	50	8	10	400	4,000
Medium Events[3]	150	8	5	1,200	6,000
Large Events[3,5]	200	8	1	1,600	1,600
Winery Staff (weekdays)[5]	16	15	260	240	62,400
Winery Staff (weekends)	7	15	105	105	11,025
	Peak Estimated Winery DW Flows[5] =			1,840	159,905

Other on-site Staff	Maximum Quantity (persons)	Water Use (GPP)[1]	Days Contributed (5 days/wk)	Gallons per Day	Annual DW Used (gallons)
Vineyard Management Staff	5	15	260	75	19,500
Office Staff	6	15	260	90	23,400
Shop Staff	3	15	260	45	11,700
Grounds Staff	4	15	260	60	15,600
	Peak Estimated DW Use =			270	70,200

Water Use Estimates

Domestic Water Use (con't)

Residential	Bedrooms	Water Use (GPD)[2]	Days Contributed	Gallons per Day	Annual DW Used (gallons)
Caretaker's Dwelling	4	150	365	600	219,000
Residence 1	2	150	365	300	109,500
Residence 2	3	150	365	450	164,250
Residence 3	2	150	365	300	109,500
		Peak Estimated DW Use =		1,650	602,250

	Gallons per Day	Annual DW Used (gallons)
Total Peak Estimated DW Use =	3,760	832,355
Average Estimated Daily DW Use =	2,280	

Assumptions and notes:

1) GPP = gallons per person; Values From "Napa County Regulations for Design, Construction and Installation of Alternative Sewage Treatment Systems", Appendix 1, Table 4, 2006
2) GPD = gallons per day per bedroom, no low-flow devices; Value From "Napa County Regulations for Design, Construction and Installation of Alternative Sewage Treatment Systems", Appendix 1, Table 4, 2006
3) Events shall utilize rented dishware which shall not be washed on-site.
4) Food and Wine Pairing is a addition to normal tasting water use for those guests and will only occur 4 days per week.
5) The large event and weekday winery staff are used to estimate the peak water use flows. This combination provides the peak water use.

Estimated Average Monthly and Daily Domestic Water Use

Month	Day/mo	Winery Estimated % of DW use[3]	Winery Monthly DW Use (gallons)	Winery Average Daily DW Use (GPD)	Other Staff DW Use (GPD)[1]	Residential DW Use (GPD)[2]	Total Average Daily DW Use (GPD)[4]	Month	Total Monthly DW Use (gallons)
Jan	31	3%	4,797	155	270	1,650	2,075	Jan	61,887
Feb	28	3%	4,797	171	270	1,650	2,091	Feb	56,397
Mar	31	3%	4,797	155	270	1,650	2,075	Mar	61,887
Apr	30	8%	12,792	426	270	1,650	2,346	Apr	68,232
May	31	8%	12,792	413	270	1,650	2,333	May	69,612
Jun	30	13%	20,788	693	270	1,650	2,613	Jun	75,958
Jul	31	13%	20,788	671	270	1,650	2,591	Jul	77,878
Aug	31	13%	20,788	671	270	1,650	2,591	Aug	77,878
Sep	30	15%	23,986	800	270	1,650	2,720	Sep	79,426
Oct	31	12%	19,189	619	270	1,650	2,539	Oct	76,279
Nov	30	6%	9,594	320	270	1,650	2,240	Nov	65,034
Dec	31	3%	4,797	155	270	1,650	2,075	Dec	61,887
	TOTAL	100%	159,905		70,200	602,250			832,355

Estimated Total Peak Daily DW Flow:	3,760	gpd
Estimated Total Annual DW Flow:	832,355	gpy

Assumptions and notes:

1) DW use by "other staff" is based upon peak flow for 100% of the year.
2) DW use generated by the residences assumes maximum occupancy for 100% of the year.
3) Percent of annual DW volume generated each month is based on the winery visitation and employees only.
4) Total average Daily DW flow is the sum of the DW used by the winery visitation, winery employees, other staff, and residences.

Water Use Estimates

Combined Annual Estimated Water Use Summary

			Percentage
Total Estimated PW Use =	600,000	gallons/year	42%
Total Estimated DW Use =	832,355	gallons/year	58%

Total Estimated Water Use =	1,432,355	Gallons per year

Combined Flow Breakdown

		PROCESS USE		DOMESTIC USE		COMBINED USE TOTALS			
Month	Day/mo	Monthly PW Use (gallons)	Daily PW Use (gallons)	Monthly DW Use (gallons)	Daily DW Use (gallons)	Total Monthly Use (gallons)	Combined Annual Percentage Use:	Month	Combined Average Daily Use (gpd)
Jan	31	30,000	970	61,887	2,075	91,887	6%	Jan	3,045
Feb	28	30,000	1,070	56,397	2,091	86,397	6%	Feb	3,161
Mar	31	36,000	1,160	61,887	2,075	97,887	7%	Mar	3,235
Apr	30	36,000	1,200	68,232	2,346	104,232	7%	Apr	3,546
May	31	36,000	1,160	69,612	2,333	105,612	7%	May	3,493
Jun	30	36,000	1,200	75,958	2,613	111,958	8%	Jun	3,813
Jul	31	36,000	1,160	77,878	2,591	113,878	8%	Jul	3,751
Aug	31	78,000	2,520	77,878	2,591	155,878	11%	Aug	5,111
Sep	30	90,000	3,000	79,426	2,720	169,426	12%	Sep	5,720
Oct	31	90,000	2,900	76,279	2,539	166,279	12%	Oct	5,439
Nov	30	72,000	2,400	65,034	2,240	137,034	10%	Nov	4,640
Dec	31	30,000	970	61,887	2,075	91,887	6%	Dec	3,045
	TOTAL	600,000		832,355		1,432,355	100%		

Process and Domestic Water Use Summary

Summary of Water Uses	Peak Daily Water Use (gpd)	Annual Water Use (gpy)
Domestic Water		
Winery	1,840	159,905
Other on-site Staff	270	70,200
Residential	1,650	602,250
Total Domestic Water	3,760	832,355
Winery Process Water	3,000	600,000
Total Water Use	6,760	1,432,355
Total Peak Daily Water Use	6,760	gpd
Total Annual Water Use	1,432,355	gpy

Water Use Estimates

Vineyard Irrigation Water Use

Average of 2013 through 2015 Actual Use

Month	Day/mo	Monthly Percent of Annual Water Use	Monthly Water Use (hours)	Monthly Water Use (gallons)	Days Watered in Month	Daily Water Use (gallons)	Month
Jan	31	0%					Jan
Feb	28	0%					Feb
Mar	31	0%					Mar
Apr	30	4%	44	157,952	2	78,976	Apr
May	31	6%	97	232,524	4	53,659	May
Jun	30	24%	246	971,158	6	171,381	Jun
Jul	31	17%	218	711,647	6	125,585	Jul
Aug	31	26%	293	1,061,239	6	176,873	Aug
Sep	30	20%	189	827,188	4	225,597	Sep
Oct	31	3%	57	137,100	1	137,100	Oct
Nov	30	0%					Nov
Dec	31	0%					Dec
	TOTAL	100%	1,144	4,098,808			

Peak Daily Vineyard Irrigation Water Use:	225,597	gpd
Annual Vineyard Irrigation Water Use:	4,098,808	gpy

Peak Vineyard Irrigation Well Demand:	56,399	gpd

("Peak Vineyard Irrigation Well Demand" is determined by dividing the "Peak Daily Vineyard Irrigation Water Use" by 4 days. See notes below.)

Assumptions and Notes:

1) Irrigation values obtained from records provided by vineyard management. Irrigation values include all vineyard blocks on the subject parcel.
2) Storage shall be provided for vineyard irrgation. The minimum amount provided shall be 1 acre-foot or 325,851 gallons. The storage volume is greater than the peak daily flow.
3) Vineyard irrigation occurs approximately every 4 to 6 days.
4) The proposed storage shall allow for a reduced daily demand on the well. The Peak Well Demand is determined by spreading the the Peak Daily Use over a minimum of 4 days until irrgation occurs again.

Water Use Estimates

Landscape Irrigation Water Use

Values listed below are Delta's estimate based on water use values provided by Jim Regusci.

Lawn Irrigation

Total Lawn Sprinklers: 110

Month	Day/mo	GPM per Sprinkler	Sprinker Duration per Day (minutes)	Daily Water Use (gallons)	Days Sprinklered per week	Weekly Water Use (gallons)	Weeks Watered per Month	Monthly Water Use (gallons)
Feb	28	0.5	15	825	3	2,475	4	9,900
Mar	31	0.5	15	825	3	2,475	4	9,900
Apr	30	0.5	15	825	3	2,475	4	9,900
May	31	0.5	15	825	3	2,475	4	9,900
Jun	30	0.5	15	825	3	2,475	4	9,900
Jul	31	0.5	15	825	3	2,475	4	9,900
Aug	31	0.5	15	825	3	2,475	4	9,900
Sep	30	0.5	15	825	3	2,475	4	9,900
Oct	31	0.5	15	825	3	2,475	4	9,900
Nov	30	0.5	15	825	3	2,475	4	9,900
	TOTAL							99,000

Peak Daily Lawn Irrigation Water Use:	825	gpd
Annual Lawn Irrigation Water Use:	99,000	gpy

Assumptions and Notes:

1) The lawn is only sprinklered ten months out of the year
2) The lawn's water use is equally distributed throughout the ten months

Tree Irrigation

Total Number of trees:	296	
Number of drip emitters per tree:	3	
Flow rate per emitter:	3	gph
Total Gallons per hour per tree:	9	gph

Month	Day/mo	Hours/day	Daily Water Use (gallons)	Days Watered per Month	Monthly Water Use (gallons)
Jan	31	2	5,328	1	5,328
Feb	28	2	5,328	1	5,328
Mar	31	2	5,328	1	5,328
Apr	30	2	5,328	1	5,328
May	31	2	5,328	1	5,328
Jun	30	2	5,328	1	5,328
Jul	31	2	5,328	1	5,328
Aug	31	2	5,328	1	5,328
Sep	30	2	5,328	1	5,328
Oct	31	2	5,328	1	5,328
	TOTAL				53,280

Peak Daily Tree Irrigation Water Use:	5,328	gpd
Annual Tree Irrigation Water Use:	53,280	gpy

Assumptions and Notes:

1) Trees are watered once a month for ten months out of the year
2) The tree's water use is equally distributed throughout the ten months

Water Use Estimates

Landscape Irrigation

The landscaping irrigation consists of three different zones:
1) Winery Landscape Irrigation by Sprinklers
2) Residence 2 and Residence 3 Landscape Irrigation by Drip Emitters
3) Residence 1 Landscape Irrigation by Sprinklers

Winery Landscape Irrigation by Sprinklers
Total Winery Landscape Sprinklers: 44

Month	Day/mo	GPM per Sprinkler	Sprinker Duration per Day (minutes)	Daily Water Use (gallons)	Days Watered per week	Weekly Water Use (gallons)	Weeks Watered per Month	Monthly Water Use (gallons)
Jan	31	0.5	20	440	3	1,320	4	5,280
Feb	28	0.5	20	440	3	1,320	4	5,280
Mar	31	0.5	20	440	3	1,320	4	5,280
Apr	30	0.5	20	440	3	1,320	4	5,280
May	31	0.5	20	440	3	1,320	4	5,280
Jun	30	0.5	20	440	3	1,320	4	5,280
Jul	31	0.5	20	440	3	1,320	4	5,280
Aug	31	0.5	20	440	3	1,320	4	5,280
Sep	30	0.5	20	440	3	1,320	4	5,280
Oct	31	0.5	20	440	3	1,320	4	5,280
	TOTAL							52,800

Peak Daily Landscape Irrigation Water Use:	440	gpd
Annual Landscape Irrigation Water Use:	52,800	gpy

Residnece 2 and Residence 3 Landscape Irrigation by Drip Emitters
Total Landscape Drip Emitters: 668

Month	Day/mo	Number of Zones to irrigate[3]	Gallons per hour	Water Duration per Day (minutes)	Daily Water Use (gallons)	Days Watered per week	Weekly Water Use (gallons)	Weeks Watered per Month	Monthly Water Use (gallons)
Jan	31	2	2	30	60	2	120	4	480
Feb	28	2	2	30	60	2	120	4	480
Mar	31	2	2	30	60	2	120	4	480
Apr	30	2	2	30	60	2	120	4	480
May	31	2	2	30	60	2	120	4	480
Jun	30	2	2	30	60	2	120	4	480
Jul	31	2	2	30	60	2	120	4	480
Aug	31	2	2	30	60	2	120	4	480
Sep	30	2	2	30	60	2	120	4	480
Oct	31	2	2	30	60	2	120	4	480
	TOTAL								4,800

Peak Daily Landscape Irrigation Water Use:	60	gpd
Annual Landscape Irrigation Water Use:	4,800	gpy

Water Use Estimates

Residence 1 Landscape Irrigation by Sprinklers

Total Landscape Sprinklers: 32

Month	Day/mo	GPM Per Sprinkler	Sprinker Duration per Day (minutes)	Daily Water Use (gallons)	Days Watered per week	Weekly Water Use (gallons)	Weeks Watered per Month	Monthly Water Use (gallons)
Jan	31	0.5	15	240	3	720	4	2,880
Feb	28	0.5	15	240	3	720	4	2,880
Mar	31	0.5	15	240	3	720	4	2,880
Apr	30	0.5	15	240	3	720	4	2,880
May	31	0.5	15	240	3	720	4	2,880
Jun	30	0.5	15	240	3	720	4	2,880
Jul	31	0.5	15	240	3	720	4	2,880
Aug	31	0.5	15	240	3	720	4	2,880
Sep	30	0.5	15	240	3	720	4	2,880
Oct	31	0.5	15	240	3	720	4	2,880
	TOTAL							28,800

Peak Daily Landscape Irrigation Water Use:	240	gpd
Annual Landscape Irrigation Water Use:	28,800	gpy

Total Peak Daily Landscape Water Use:	740	gpd
Total Annual Landscape Water Use:	86,400	gpy

Assumptions and Notes:

1) The landscape is watered ten months out of the year
2) The landscape's water use is equally distributed throughout the ten months
3) One zone is for Residnece 2 and one zone is for Residence 3. Both zones have identical water use parameters.

Garden Irrigation

Linear Feet of Drop Hose	4,980	Linear Feet
Drip emitter spacing:	1	feet
Flow rate per emitter:	0.5	gph
Number of emitters:	4,980	

Month	Day/mo	Hours/day	Daily Water Use (gallons)	Days Watered per week	Weekly Water Use (gallons)	Weeks Watered per Month	Monthly Water Use (gallons)
Apr	30	2	4,980	2	9,960	4	39,840
May	31	2	4,980	2	9,960	4	39,840
Jun	30	2	4,980	2	9,960	4	39,840
Jul	31	2	4,980	2	9,960	4	39,840
Aug	31	2	4,980	2	9,960	4	39,840
Sep	30	2	4,980	2	9,960	4	39,840
	TOTAL						239,040

Peak Daily Garden Irrigation Water Use:	4,980	gpd
Annual Garden Irrigation Water Use:	239,040	gpy

Assumptions and Notes:

1) The garden is only watered for six months out of the year
2) The garden's water use is equally distributed through the six months

Water Use Estimates

Irrigation summary

Summary of Irrigation Water Uses	Peak Well Demand (gpd)	Annual Water Use (gpy)
Vineyard Irrigation Water Use	56,399	4,098,808
Landscape Irrigation Water Use		
Lawn Irrigation Water Use	825	99,000
Tree Irrigation Water Use	5,328	53,280
Landscape Irrigation Water Use	740	86,400
Garden Irrigation Water Use	4,980	239,040
Total Landscape Irrigation Water Use	11,873	477,720
Total Water Use	68,272	4,576,528
Total Peak Daily Irrigation Well Demand	68,272	gpd
Total Annual Irrigation Water Use	4,576,528	gpy

Water Use Estimates

Total Water Use Summary

Summary of Water Uses	Peak Daily Well Demand (gpd)	Annual Water Use (gpy)
Water		
Winery, Staff & Residentail Domestic Water	3,760	832,355
Winery Process Water	3,000	600,000
Irrigation Water		
Landscape Irrigation	11,873	477,720
Vineyard Irrigation	56,399	4,098,808
Total Well Demand	75,032	6,008,883
Average Daily Water Use (gallons per year / 365 days)	16,462.69	

Summary of Water Uses Stored in Water Tanks	Peak Daily Water Use (gpd)	Annual Water Use (gpy)
Winery, Staff & Residential Domestic Water	3,760	832,355
Winery Process Water	3,000	600,000
Landscape Irrigation Water	11,873	477,720
Peak Daily Water Use	18,633	1,910,075
Water Use Maximum Daily Demand	27,950	(1.5 x Peak Daily Water Use)
Residential Fire Hydrant Storage	12,000	
Winery Fire Hydrant Storage	26,400	
Fire Sprinkler Storage	TBD	
Proposed Tank Storage Amount	66,350	gallons

Summary of Water Uses Stored in Pond	Peak Daily Water Use (gpd)	Annual Water Use (gpy)
Vineyard Irrigation Water	225,597	4,098,808
Proposed Pond Minimum Storage Amount	325,851	gallons