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Water Availability Analysis

**WATER AVAILABILITY ANALYSIS FOR
CASTELLO DI AMOROSA
4045 NORTH SAINT HELENA HIGHWAY, CALISTOGA, CA 94515
APN 020-390-012 & 020-230-001**

Napa County Planning, Building & Environmental Services (PBES) requires this Water Availability Analysis (WAA) to be prepared to support Use Permit Modification P19-00459. This WAA outlines groundwater use for Castello di Amorosa, an existing pre-Winery Definition Ordinance (WDO) winery on the subject parcels referenced above at 4045 North Saint Helena Highway, Calistoga, CA 94515. This WAA supersedes the previous WAA and Water Use Analysis that were prepared by Bartelt Engineering for this use permit modification permit review. Within the five-year time span of this permit review, there have been several Napa County policy changes related to the analysis of water availability for a project. These policy changes have stemmed from drought, drought related emergency orders mandated by the State of California (which are no longer in effect), and Napa County's concerns about its duty to protect the public trust in terms of groundwater use and interactions with surface waters. Throughout this permit review process Napa County has continuously recognized there is no increase in water use from the project, which should preclude the requirement for a WAA. However, Napa County has determined that a WAA must be provided to complete the permit application documents, and that the WAA must comply with the most current policy documents published in January 2024, to fulfill Napa County's duties to protect the public trust as it relates to surface water and groundwater.

USE PERMIT MODIFICATION – GENERAL DESCRIPTION

Use permit modification application P19-00459 was submitted by the applicant related to Castello di Amorosa's participation in Napa County's Compliance Program. The permit application seeks to clarify the hospitality and employment program, uses within the winery buildings, and propose minor improvements to expand upon existing parking areas. There is no change to the approved annual production volume of 250,000 gallons of wine.

A small reduction in the vineyard area is required to accommodate the parking expansion. Under the proposed plan, approximately 0.35± acres (net) of vineyard would be removed to accommodate the new parking areas. Employee parking currently occurring near the reservoir will no longer be provided. Refer to the Use Permit Drawings prepared by Bartelt Engineering for the details of the existing and proposed site conditions.

Along with the clarification of uses within the winery buildings, the applicant proposes to clarify current winery staffing and hospitality figures. The winery currently employs a total of 153 people (77 full-time, 72 part-time, and 4 harvest/seasonal) but only 110 employees are working on any given day (56 full-time employees, 50 part-time employees, and four harvest/seasonal employees).

The winery currently offers tours and tastings without food and tours and tastings with food to a maximum number of 1,000 visitors per weekday Monday through Friday, 3,500 visitors on the busiest Saturdays, and 2,000 visitors on Sundays. The busiest Saturdays occur throughout the year and often when there is a three-day holiday weekend (e.g. Labor Day Weekend). This results in a weekly maximum of 10,500 visitors to the winery.

Wine & Food pairing “Luncheons” for parties of up to 160 guests are offered 38 times a year. The winery’s current marketing plan also includes 54 cellar dinners per year for groups of up to 300 guests, 10 club events per year for groups of up to 400 guests, and one club dinner per year for up to 900 guests, with additional staff for each event type of up to 15, 11, and 45, respectively.

EXISTING DEVELOPMENT

Currently, the subject parcels, separated for assessment purposes (SFAP), APN 020-390-012 and APN 020-230-001, are 40.0± acres and 68.9± acres, respectively. The winery production and hospitality buildings, two groundwater wells, one surface water reservoir, one 83,000 gallon cistern, one 35,000 gallon water storage tank, a solar panel system, a portion of the winery’s wastewater treatment system, 8.25± acres of vineyard, roads, parking spaces, and landscaping exist on parcel 020-390-012 (SFAP) (the “Winery parcel”). Parcel 020-230-001 (SFAP) (the “Residential parcel”) is developed with three residences and associated wastewater treatment systems, a farm management/agricultural building, the remaining portion of the winery’s wastewater treatment system not on the Winery parcel, 20.76± acres of vineyard, roads, parking spaces, landscaped areas, as well as miscellaneous structures associated with vineyard operations. Refer to the Overall Site Plan in the Attachments for a map of the existing site features. Water for all uses on the property is supplied by two groundwater wells and one surface water reservoir described in more detail below.

WATER SUPPLY SYSTEM

Groundwater Wells

Two groundwater wells are used to supply the various potable water and irrigation needs of the property. The groundwater wells and subsequent water storage and supply systems are regulated as a Non-Transient Non-Community (NTNC) water system by Napa County under permit #2800043. Well #1, the project well, was constructed in 1987 under Napa County permit 18894. It is located immediately adjacent to the winery building and approximately 75 feet from Nash Creek. It has a 51 foot deep concrete seal, an eight inch diameter PVC casing with the perforations beginning at 145 feet below ground surface elevation, and was completed to a depth of 245 feet below ground surface elevation. The ground surface elevation at the location of Well #1 is approximately 486 feet (NAVD88 vertical datum). Well #2 was constructed in 2004 under Napa County permit 96-12662. Well #2 is located approximately 150 feet southeast of Well #1 and approximately 100 feet away from Nash Creek. Well #2 has a 60 foot deep concrete seal, an eight inch diameter PVC casing with the perforations beginning at 120 feet below ground surface elevation, and was completed to a depth of 560 feet below ground surface elevation. The ground surface elevation at the location of Well #2 is approximately 475 feet (NAVD88 vertical datum).

Well #1 is the primary water source for the winery, farm management building, and residences. For purposes of this analysis, Well #1 will be referred to as the Project Well. Groundwater from the Project Well is pumped into a two compartment, 35,000 gallon storage tank on the hillside above the winery. The upper compartment has a 19,000 gallon capacity and is dedicated to potable use. Water flows out of the upper compartment, through a 5 micron filter and UV disinfection unit, to the winery, farm management

building, and residences via gravity flow. The lower compartment has a 16,000 gallon capacity and is dedicated to fire protection.

Well #2 is primarily used for landscape irrigation and as a supplement source for the fire suppression system or vineyard irrigation. However, it is also an approved backup source for the potable water system. Groundwater from Well #2 is primarily pumped into the adjacent 83,000 gallon above ground cistern that supplies the irrigation systems. The Well #2 pump system is also connected to the pipe that fills the 35,000 gallon tank. The piping between Well #2 and the 35,000 tank fill piping is separated by a valve that can be manually opened or closed when needed.

Surface Water Reservoir

On March 9, 1992, The State of California Water Resources Control Board issued permit #20603 authorizing the collection of up to 20 acre-feet/year in the already existing reservoir on Nash Creek for use as vineyard irrigation. Castello Di Amorosa conveys irrigation water from the reservoir through a piping system to a booster pump and pressure tank system at the headworks of the vineyard irrigation system.

TIER 1 ANALYSIS

Groundwater Demand

The total groundwater demand for the property is summarized below based on the Guidelines for Estimating Residential and Non-residential Water Use from the Napa County WAA Guidance Document (2015):

TABLE 1: ESTIMATED GROUNDWATER DEMAND SUMMARY	
Description	Estimated Groundwater Demand Summary (acre-feet/year)
Residential	
Primary Residence	0.75
Second Unit	0.75
Guest Cottage	0.10
Total Residential	1.60
Winery	
Process Water	5.38
Domestic and Landscaping	1.25
Employees	1.54
Tours and Tasting	5.03
Marketing Events	1.02
Total Winery	14.22
Agriculture	
Vineyard Irrigation	-
Farm Management	0.17
Total Agriculture	0.17
Total Estimated Groundwater Demand =	15.98

As summarized in Table 1, the total groundwater demand for the property is estimated to be 15.98 acre-feet/year. The total groundwater demand from the winery is estimated to be 14.22 acre-feet/year. The average annual vineyard irrigation demand is approximately 11.2 acre-feet/year and is not included in Table 1 because the demand can be supplied by the 20 acre-feet/year available from the surface water reservoir. Refer to Table I in the Attachments for a more detailed analysis of the groundwater demand.

The applicant would like to note that all winery process wastewater (5.38 acre-feet/year) is recycled as about 1.73 acres of landscaping irrigation and as vineyard irrigation in a 2.37 acre vineyard block on the Residential parcel. The winery process wastewater treatment and irrigation system were approved by Napa County under permits P15-00331 and E15-00906.

Groundwater Recharge

Based on a coordination meeting between Napa County staff and the Castello Di Amorosa consultant team on May 16, 2024, Napa County staff requested Castello Di Amorosa commission a study to estimate the potential groundwater recharge on the subject parcel. Subsequently, Richard C. Slade & Associates LLC, consulting groundwater geologists, has prepared a Groundwater Recharge Analysis for the subject parcel. Their analysis, included in the Attachments, determined a recharge potential of 40.5 acre-ft/year.

Groundwater Demand and Groundwater Recharge Summary

The total groundwater demand is 15.98 acre-feet/year and the total groundwater recharge potential of the subject parcel is 40.5 acre-feet/year. Therefore, estimated total water demand on this parcel of 15.98 acre-feet is less than the estimated groundwater recharge volume of 40.5 acre-feet and the Tier 1 Water Criterion is met.

TIER 2 ANALYSIS – WELL/SPRING INTERFERENCE CHECK

As required by the WAA, projects must perform a well interference check to determine if any wells or springs located on adjoining parcels are within 500 feet or 1,500 feet of the Project Well, respectively. Based on information obtained through Napa County public records, there are no springs in the project vicinity and no neighboring wells located within 500 feet of the Project Well. Well #2 is located approximately 150 feet from the Project Well. However, as described in the Tier 3 Analysis below, the Project Well will be replaced in a location greater than 500 feet from Well #2. Therefore, the Tier 2 well interference criterion is presumptively met. See the attached Well Location Exhibit for the Project Well's current location and proposed relocation relative to non-project wells.

TIER 3 ANALYSIS – GROUNDWATER/SURFACE WATER INTERACTION CRITERIA

As required by Napa County's May 12, 2015 WAA Guidance Document and the Interim Napa County Well Permit Standards and WAA Requirements – January 2024, the project must examine the horizontal distance between the Project Well and Significant Streams as determined by the Napa County Well Permit Standards, Figure 1. Based on Figure 1, the Project Well is within 1,500 feet of a Significant Stream, Nash Creek. Therefore, the applicant must prove that a hydraulic separation between the Project Well and Nash Creek is provided by geologic conditions at the site or assume connectivity and propose modifications to the Project Well to reduce impacts. The applicant proposes a modification to the Project Well to reduce impacts and satisfy the WAA Tier 3 criteria.

The proposed method of modification to the Project Well to reduce its impact on Nash Creek is to replace the Project Well. The applicant has applied for Napa County permit E23-00112 to replace the Project Well. The review and approval of E23-00112 is associated with the review and approval of this use permit modification (P19-00459). In the May 16, 2024, coordination meeting between Napa County staff and the Castello Di Amorosa consultant team, Napa County staff confirmed that replacing the Project Well would qualify as a proposed modification that if it was replaced in a manner that reduced impact to Nash Creek relative to existing conditions. The sections below discuss the replacement project well's reduced impact on Nash Creek.

Existing Project Well Characteristics

As stated in the Water Supply System section above, the Project Well is located immediately adjacent to the winery building and approximately 75 feet from Nash Creek. It has a 51 foot deep concrete seal, an eight inch diameter PVC casing with the perforations beginning at 145 feet below ground surface elevation, and was completed to a depth of 245 feet below ground surface elevation. The ground surface elevation at the location of the Project Well is approximately 486 feet (NAVD88 vertical datum). The ground surface elevation of Nash Creek, adjacent to the Project Well, is approximately 486 feet at the top of bank and 483 feet at the flowline. In its current location, the Project Well is located near the portion of Nash Creek immediately downstream of the existing reservoir's outfall. Based on information obtained from Napa County records related to the NTNC water system, the Project Well is currently equipped with a pump system rated at 50 gallons per minute.

Replacement Project Well – Reduction of Impact on Nash Creek

Napa County's May 12, 2015 WAA Guidance Document lists several criteria to use when assessing the impact of pumping groundwater from a well on adjacent surface waters. The criteria to be used when assessing impact includes horizontal distance, the pumping rate of the well, the well depth, depth and interval of screens in the casing, and the well seal depth. The following discussion will describe how the impact for each of these criteria is being reduced by the replacement project well.

The Project Well is currently 75 feet from Nash Creek. The exact location of the replacement project well has not been determined due to unknown factors related to this use permit modification's review process and the suitability of subsurface conditions in the potential drilling locations. Rather than propose a singular location, Bartelt Engineering, in coordination with the applicant, has identified a general area of the property for the replacement project well that would reduce its impact on Nash Creek and maintain a 500 foot horizontal separation from all surrounding wells. At minimum, the replacement project well will be installed 130 feet from Nash Creek. At maximum, the replacement project well will be installed 700 feet from Nash Creek. See the Well Location Exhibit in the Attachments for the potential replacement project well locations highlighted in purple. Additionally, as shown on the Well Location Exhibit, the replacement project well will primarily be adjacent to the existing surface reservoir. Considering the surface water reservoir is approved to store water that can be used by the subject parcel, relocating the Project Well adjacent to the reservoir can be reasonably assumed to reduce the impact from existing conditions.

The existing pumping rate of the Project Well is 50 gallons per minute. The replacement project well could be equipped with a 30-40 gallon per minute pump system and still comfortably meet the requirements of the water supply system. As detailed in the Wastewater Feasibility Study prepared by Bartelt Engineering for this use permit

modification, the peak daily demand of the winery is 16,323 gallons. The daily peak water demand of the farm management building is based on the number of farm management employees. Napa County records from the farm management building's construction permits (B12-00773 and E12-00750), indicate a daily maximum of 10 employees and associated water demand of 150 gallons per day. The peak daily residential demand is estimated based on the annual demand in Table 1. The total demand of 1.6 acre-feet/year is equal to approximately 521,330 gallons per year. The average daily demand is approximately 1,430 gallons per day. Applying a peaking factor of 1.5 results in a peak daily demand of approximately 2,150 gallons. Summing up the winery, farm management, and residential peak daily requirements results in a total estimated peak daily water demand from the Project Well of 18,623 gallons per day. If the replacement well were to be pumped at 40 gallons per minute for eight hours, the total yield would be 19,200 gallons. If the replacement well were to be pumped at 30 gallons for 11 hours, the total yield would also be 19,200 gallons. In each case, the reduced pumping rate would be capable of meeting the peak daily demand requirements. The exact pumping rate of the replacement project well can not be determined until it is developed, but this example shows that even a 40% reduction in pumping rates from current conditions could meet the requirements of potable water demand on the subject parcel.

The existing Project Well is relatively shallow and was completed to a depth of 245 feet below ground surface. The ground surface elevation at the Project Well is 486 feet according to the NAVD88 vertical datum. Therefore, the bottom of the Project Well is at a relative elevation of 241 feet. To the maximum extent practical, the replacement project well will be constructed to a depth greater than 245 feet below ground surface or deeper than a relative elevation of 241 feet, whichever is lower.

Currently, the perforations in the Project Well's casing begin at 145 feet below the ground surface elevation. The ground surface elevation at the Project Well is 486 feet. Therefore, the screening begins at an elevation of 341 feet, according to the NAVD88 vertical datum. To the maximum extent practical, the uppermost casing perforations of the replacement project well will begin at 150 feet below the ground surface or at a relative elevation of 341 feet, whichever is lower, regardless of location.

The replacement well must have a minimum 50 foot deep surface seal to comply with the NTNC permit requirements. To the maximum extent practical, the replacement project well will be constructed with a 50 to 60 foot deep surface seal.

Upon successful completion and start up of the replacement project well, the existing Project Well will be demolished.

Tier 3 Analysis - Summary

The Project Well is located within 1,500 feet of Nash Creek, a Significant Stream and a tributary of the Napa River. According to the Napa County Water Availability Analysis (WAA) Guidance Document Adopted May 12, 2015, the Project Well is therefore considered to have adverse impact on the surface waters of Nash Creek, even though Nash Creek is already impacted by the vineyard irrigation reservoir. To protect the local navigable waterway, the Napa River, as stated in Napa County's document titled, "Application of Public Trust Doctrine to Projects Dependent on Groundwater," dated January 10, 2024, Castello Di Amorosa must modify the Project Well to reduce impacts. To reduce the impacts, the Project Well will be replaced. To the maximum extent practical, the proposed replacement project well will be located further from Nash Creek, pumped at a reduced

rate, installed with a deeper surface seal and depth to perforations in the casing, and likely drilled to a depth more consistent with Well #2 (560 feet). However, anyone of these measures will reduce the impact on Nash Creek. In coordination with the review and approval process for P19-00459, the applicant will update their E23-00112 permit documents to reflect the proposed location, construction, and operational requirements of the replacement project well.

CONCLUSION

This Water Availability Analysis provides information about the property's water supply system, groundwater demand, groundwater recharge potential, and the location of the Project Well relative to surrounding wells and surface waters. The intent of the analysis is to demonstrate that all water use on the property complies with Napa County's Tier 1, Tier2, and Tier 3 Water Availability Analysis requirements. The analysis has demonstrated the subject parcel's groundwater recharge potential of 40.5 acre-feet/year, as determined by Richard C. Slade & Associates LLC, exceeds the estimated groundwater demand of 15.98 acre-feet/year, satisfying Napa County's Tier 1 requirements. Additionally, by replacing the Project Well in a location shown on the Well Location Exhibit in the Attachments, Napa County's Tier 2 and 3 requirements can be satisfied. The applicant has already submitted permit application E23-00112 for the replacement well and is therefore committed to replacing the project well and reducing the impact that pumping groundwater has on Nash Creek. With the information provided in this WAA, the use permit application package, and replacement well permit E23-00112, Castello Di Amorosa has demonstrated compliance with Napa County's May 12, 2015 WAA Guidance Document, the Interim Napa County Well Permit Standards and WAA Requirements – January 2024, and the Application of Public Trust Doctrine to Projects Dependent on Groundwater, dated January 10, 2024, prepared by the Napa County Office of County Counsel.



A handwritten signature in black ink, appearing to be "D. Hoime", written in a cursive style.

Dane Hoime, RCE 81942

August 14th, 2024

ATTACHMENTS

Table I – Estimated Groundwater Demand

Overall Site Map

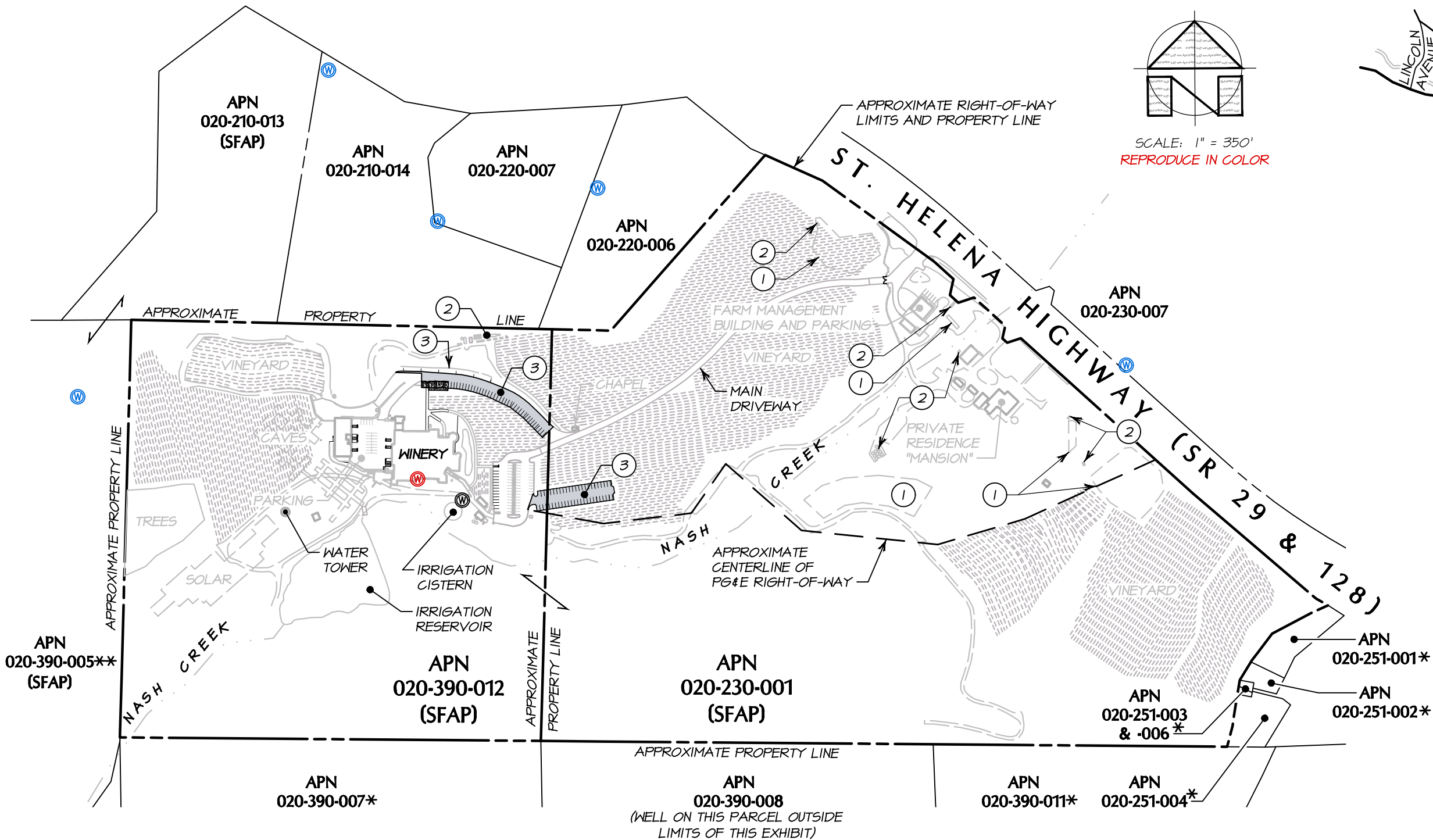
Well Location Exhibit

Groundwater Recharge Analysis, Prepared by Richard C. Slade & Associates LLC

Castello di Amorosa
Groundwater Demand
Table I

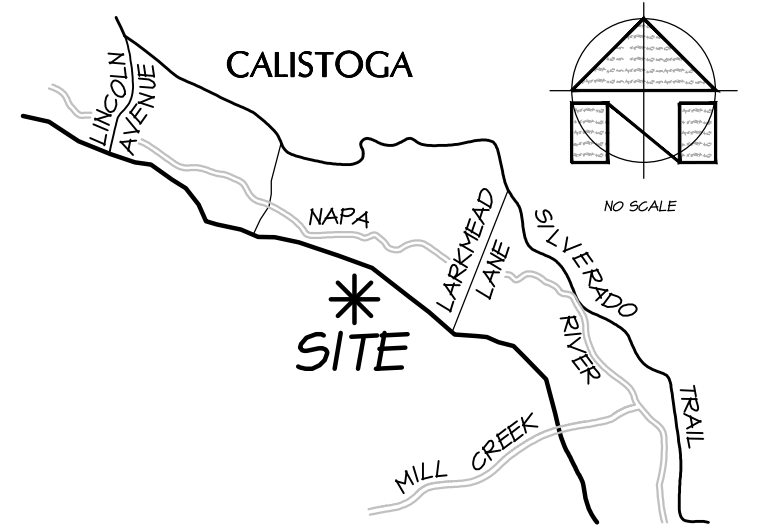
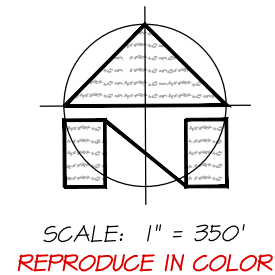
Description	Water Usage Rate ¹	Quantity Unit	Water Demand (acre-feet/year)
<u>Residential</u>			
Primary Residence	0.75 acre-feet/year	1 Residence	0.75
Secondary Unit ²	0.75 acre-feet/year	1 Residence	0.75
Guest Cottage	0.10 acre-feet/year	1 Guest Cottage	0.10
Total Residential			1.60
<u>Agricultural</u>			
Vineyards ^{3,4} Irrigation	0.39 acre-feet/acre/year	28.7 acres	11.19
Farm Management Building Employees ⁵	15 gallons/shift	3,650 Shifts/year	0.17
Total Agricultural			0.17
<u>Winery</u>			
Process Water	2.15 acre-feet/100,000 gallon of wine	250,000 Gallons of wine/year	5.38
Domestic & Landscaping	0.50 acre-feet/100,000 gallon of wine	250,000 Gallons of wine/year	1.25
Employees ⁶	15 gallons per shift	33,366 Shifts/year	1.54
Tasting Room Visitation	3 gallons per visitor	546,000 Visitors/year	5.03
Events and Marketing, with on-site catering	15 gallons per visitor	22,065 Visitors/year	1.02
Total Winery			14.22
Estimated Groundwater Demand (acre-feet/year)			15.98
NOTES: 1) Water usage rates from <i>Appendix B: Estimated Water Use of Specified Land Use</i> of Napa County WAA-Guidance Document (2015) 2) Secondary Residence's estimated water use based on its current use as a Primary Residence rental. 3) The surface water reservoir on the property (State Waterboard Permit #20603) supplies 20 acre-feet/year of water to be used for vineyard irrigation. Vineyard irrigation water demand not exceeding 20 acre-feet/year is not included in the total estimated groundwater demand. 4) Vineyard irrigation Water Usage Rate is based on information provided by Owner. 5) Up to 10 daily employees estimated in documentation for permits B12-00773 and E12-00750. Assume 10 employees/day, 365 days/year. 6) Based on 110 employees which is the maximum number on any give day.			

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OVERALL SITE MAP

SCALE: 1" = 350'



LOCATION MAP

NO SCALE

LEGEND:

- ① WASTEWATER DISPERSAL FIELD
- ② WASTEWATER TREATMENT STRUCTURE(S)
- ③ PROPOSED PARKING
- Ⓜ WELL #1
- Ⓜ WELL #2
- Ⓜ NON-PROJECT WELL

NOTES:

* NO RECORDED WELL INFORMATION FOR THIS PARCEL.

** A NEW WELL WAS DRILLED ON APN 020-390-005 IN JANUARY 2024 UNDER PERMIT E23-00405 WHICH SERVES APN 020-390-005 AND APN 020-210-013.

WELL LOCATIONS ARE APPROXIMATE AND ARE BASED ON DATA OBTAINED FROM NAPA COUNTY RECORDS.

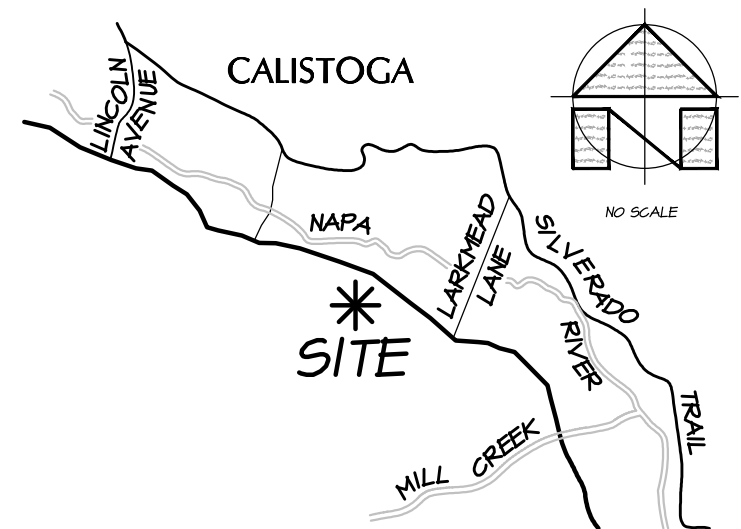
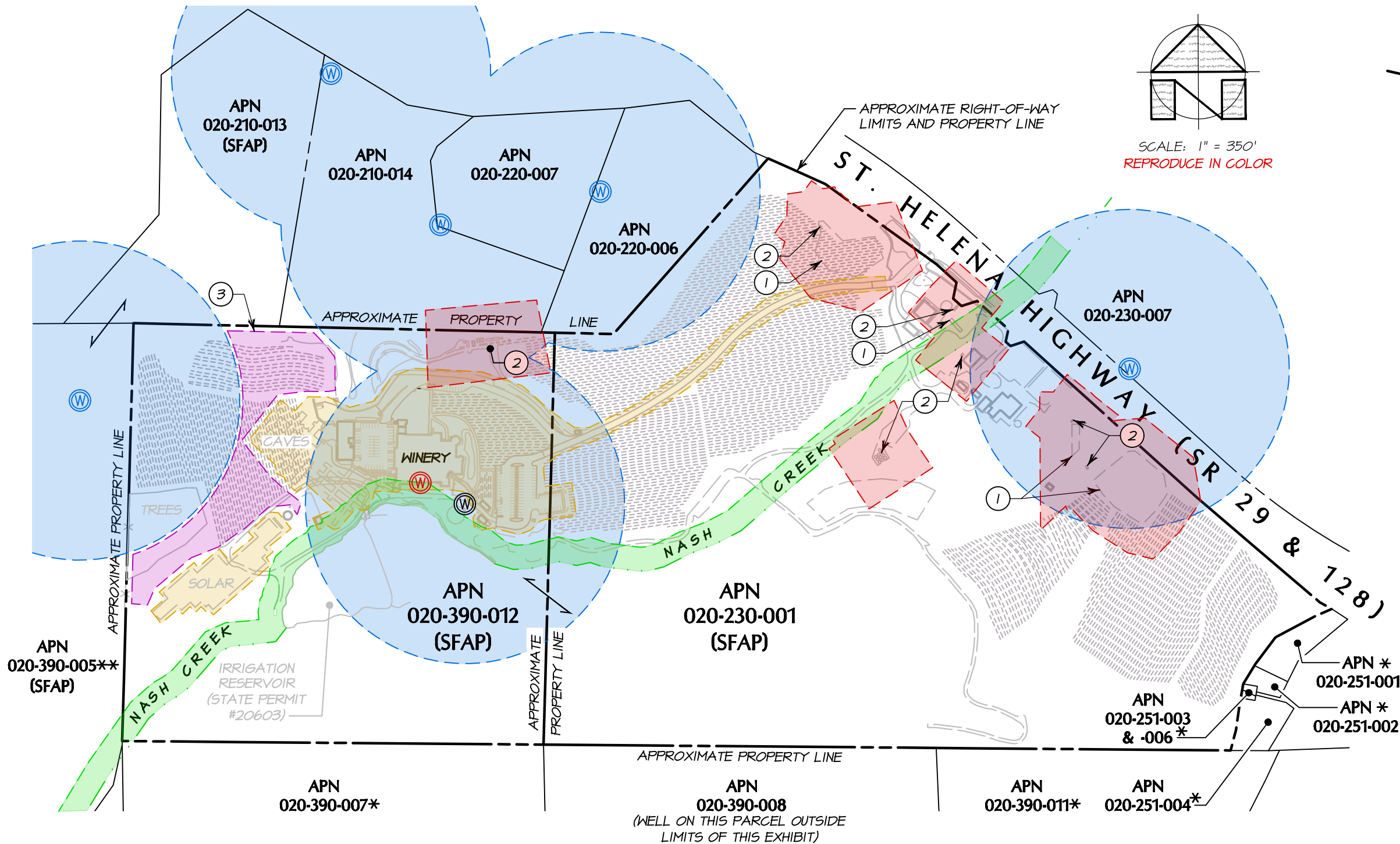
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ENGINEERING

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Castello di Amorosa
4045 N. Saint Helena Highway
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APN 020-390-012 & 020-230-001
Job No. 05-38
August 2024
Sheet 1 of 1

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LOCATION MAP
NO SCALE

LEGEND:

- WAA TIER 2 WELL 500' ZONE OF INFLUENCE
- EXISTING BUILDING/ROAD INFRASTRUCTURE
- 100' SETBACK TO WASTEWATER INFRASTRUCTURE
- DISTANCE BETWEEN WELL #1 AND NASH CREEK
- WELL #1 POTENTIAL REPLACEMENT AREA
- WELL #1 (PROJECT WELL TO BE REPLACED)
- WELL #2 (IRRIGATION/STANDBY WELL)
- NON-PROJECT WELL
- WASTEWATER DISPERSAL FIELD
- WASTEWATER TREATMENT STRUCTURE(S)
- POTENTIAL WELL REPLACEMENT AREA SELECTED TO INCREASE DISTANCE FROM NASH CREEK TO REDUCE IMPACTS OF PUMPING AND MAINTAIN A 500' DISTANCE FROM SURROUNDING WELLS.
- WAA WATER AVAILABILITY ANALYSIS

WELL LOCATION EXHIBIT
SCALE: 1" = 350'

NOTES:

- * NO RECORDED WELL INFORMATION FOR THIS PARCEL.
- ** A NEW WELL WAS DRILLED ON APN 020-390-005 IN JANUARY 2024 UNDER PERMIT E23-00405 WHICH SERVES APN 020-390-005 AND APN 020-210-013.
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APN 020-390-012 & 020-230-001
Job No. 05-38
August 2024
Sheet 1 of 1



MEMORANDUM

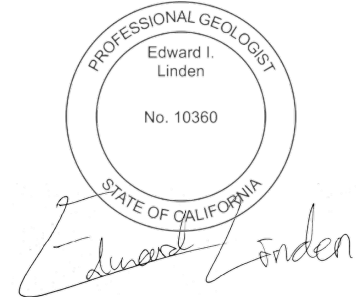
August 10, 2024

To: Mr. Scott Greenwood-Meinert
Coblentz Patch Duffy & Bass LLP
One Montgomery Street, Suite 3000
San Francisco, CA 94104
Sent via email: sgreenwood-meinert@coblentzlaw.com

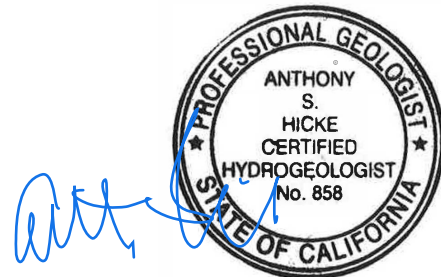
CC: Mr. Dane Hoime, P.E.
Bartelt Engineering
Sent via email: daneh@barteltengineering.com

From: Edward Linden & Anthony Hicke
Richard C. Slade & Associates LLC (RCS)

Re: Results of Groundwater Recharge Analysis for the
Castello Di Amorosa Winery
4045 St Helena Hwy, Napa County, CA 94515



RCS Job No. 822-NPA01



Introduction

This Memorandum presents the results of a groundwater recharge analysis by RCS for the Castello Di Amorosa Winery property (the subject property), located at 4045 St Helena Hwy, in Napa County, California. This property consists of two contiguous parcels identified by Napa County Assessor's Parcel Numbers (APNs) 020-390-012 and 020-230-001, with a total assessed acreage of 108.9 acres, as reported in the May 30, 2024, version of the County's GIS parcel layer (Napa County, 2024b). Figure 1, "Regional Map," shows, superimposed on a topographic map of the area, the approximate boundaries of the subject property, the local groundwater basin (DWR, 2021), and the watersheds tributary to the Napa River (LSCE & MBK, 2013). Most of the subject property does not fall within any groundwater basins defined in DWR Bulletin 118 (2021), but 6% of the property is within the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin (DWR, 2021). As shown on Figure 1, the entire property is within the Napa River at St. Helena Watershed that was defined by LSCE & MBK (2013). Note, that the entire Napa River at St. Helena (black boundary) is within the Napa River Watershed near Napa (orange boundary).

Groundwater Recharge Estimate

Napa County's guidelines for calculation of groundwater recharge for the purposes of WAAs in response to the Governor's Executive Order N-7-22 and historic drought periods in the State have been addressed in various published documents (Napa County, 2022a & 2024a). The County has mandated that such groundwater recharge estimates for projects outside of the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin (DWR, 2021) be calculated on a parcel-specific basis, and that the calculation must consider "average rainfall" to be the average annual



MEMORANDUM

rainfall that has occurred during the 10 water year^a period of 2012 to 2021 defined in the County's 10-year average precipitation dataset^b (PBES & LSCE, 2022). Conversely, allowable groundwater extractions for properties within the Napa Valley Subbasin are to be calculated as 0.3 AFY^c of allowable groundwater extractions for each assessed acre of the subject property, according to current requirements (Napa County, 2015 & 2024a).

As described above, 6% of the 108.9-acre subject property is within the Napa Valley Subbasin, whereas the remaining 94% falls outside of the basin. Based on these spatial relationships between the subject property and the groundwater basin, two calculations were necessary to estimate an average annual groundwater recharge volume for the property: one for the portion of the subject property that is within the groundwater basin, and a separate parcel-specific groundwater recharge value for the portion of the property that is outside of the groundwater basin. The sum of these calculations represents the average annual volume of groundwater recharge at the subject property, calculated in accordance with current Napa County requirements (2015, 2022a & 2024a), and represents the allowable volume of groundwater extraction from the subject property.

Groundwater Recharge Estimate Within Groundwater Basin

Multiplication of the 6.53-acre portion (6%) of the subject property that falls within the groundwater basin by the 0.3 AFY/acre County-designated recharge factor results in an allowable groundwater extraction total of 2.0 AFY for the portion of the property within the groundwater basin.

Parcel-Specific Precipitation (Outside of Groundwater Basin)

Spatial analysis of the County's 10-year average rainfall data set (PBES & LSCE, 2022) determined that the area-weighted average rainfall for the 10-water-year period of 2012 to 2021 within the 102.37-acre portion (94%) of the subject property that is outside of the groundwater basin is 2.77 ft (33.24 inches). Multiplying this rainfall average by the 102.37-acre portion of the property outside of the groundwater basin results in a total of 283.6 AFY. This value is the average volume of rainfall calculated to fall each water year on the portion of the subject property that is outside of the groundwater basin, in accordance with the County's 10-year (Water Years 2012 to 2021) average methodology.

Parcel-Specific Groundwater Recharge (Outside of Groundwater Basin)

Groundwater recharge on a long-term average annual basis on the portion of the subject property that is outside of the groundwater basin can be estimated as a percentage of the average rainfall that falls on this portion of the property and undergoes deep percolation, ultimately becoming groundwater within the underlying aquifer system(s). The actual percentage of rainfall that undergoes deep percolation is a function of numerous local and regional conditions, including ground surface slopes; soil types; ground cover; evapotranspiration; and the frequency, intensity, and duration of rainfall, among other possible factors.

^a Here, a water year is defined as beginning on October 1 and ending on September 30 of the following year (e.g., water year 2021 begins on October 1, 2020, and ends on September 30, 2021).

^b A "prolonged drought analysis" is no longer required for WAA preparation due to the required use of the 10-year annual rainfall average or the unit groundwater use of 0.3 AFY/ac (Napa County, 2022b).

^c AFY = acre-feet per year; 1 acre-foot = 325,851 gallons



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Estimates of groundwater recharge as a percentage of rainfall were presented for several watersheds that are tributary to the Napa River in LSCE & MBK (2013). A local subset of those same watershed boundaries is depicted on Figure 1 of this Memorandum. The local subwatershed that contains the subject property is referred to by LSCE & MBK (2013) as the "Napa River Watershed at St. Helena". As noted above, the Napa River Watershed at St. Helena is entirely contained by the Napa River Watershed near Napa. On Table 8-10 of LSCE & MBK (2013), referred to thereon as "Recharge (% of Precip.)", the deep percolation rate for the Napa River Watershed near Napa is 17%, whereas the deep percolation rate for the Napa River Watershed at St. Helena is 14%. To present a more conservative analysis for the purposes of this Memorandum, the lower deep percolation rate of 14% for the Napa River Watershed at St. Helena was selected, as it represents the portion of the larger watershed in which the subject property is located.

Multiplication of the 14% groundwater recharge rate in LSCE & MBK (2013) with the average volume of rainfall that falls on the portion of the subject property outside of the groundwater basin each water year (283.6 AFY) results in a parcel-specific average groundwater recharge rate of 39.7 AFY for that portion of the property, by the County's current 10-year precipitation average methodology. However, this value still does not consider the possible effect that ground surface slopes might impart on the rate of groundwater recharge.

Effect of Slope on Groundwater Recharge Potential (Outside of Groundwater Basin)

Any estimate of the percentage of rainfall entering an aquifer system via deep percolation that is reliant upon estimates of rainfall, evapotranspiration, and surface water outflow over an entire watershed, such as the estimates provided by LSCE & MBK (2013), inherently includes the effects of ground surface slope. To provide a more site-specific estimate of the potential effects of ground slope on groundwater recharge over the portion of the subject property that is outside of the groundwater basin, an analysis of ground surface slope has been included in this Memorandum.

Many basic geologic references assume that recharge potential is reduced on steeper slopes because steeper slopes tend to increase surface water runoff rates and less time is therefore available for rainfall to percolate (infiltrate) into the ground before running off as surface flow. Page 56 of LSCE & MBK (2013) asserts that deep percolation recharge from rainfall is "significantly reduced" for land areas with slopes angles (inclinations) $>30^{\circ}$. On page 11 of LSCE & MBK (2013), an assessment of slope angles $>30^{\circ}$ is also mentioned, and this was attributed to a prior LSCE report, namely "LSCE 2011" therein; that document is likely to be the reference listed as "2011a" on page 134 of LSCE & MBK (2013). LSCE (2011) states on page 29 that "areas in which the slope of the land surface exceeds 30 degrees, beyond which recharge potential is significantly reduced". No other references or data are presented in any of the above-referenced documents to quantify the qualitative description of "significantly reduced". Because the various factors that affect groundwater recharge are likely interrelated (Yeh et al., 2009), assigning a value to define the amount that recharge is diminished as a function of slope is extremely difficult. No references were reviewed by RCS that quantify the possible reduction of deep percolation that might occur as a function of ground surface slope angle.

The watershed-wide estimates of the deep percolation rate of rainfall for the Napa River Watershed at St. Helena were based on water balance calculations that considered rainfall throughout the entire watershed (LSCE & MBK, 2013), which inherently include all slopes within the watershed, including those $>30^{\circ}$. For the purposes of this Memorandum, and to provide a



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more conservative and site-specific estimate of groundwater recharge for the subject property outside of the groundwater basin, it has been assumed that deep percolation at the subject property does not occur on areas with slopes $>30^\circ$, and that rainfall on the areas with slopes $>30^\circ$ would leave the property through some other process (e.g., surface runoff, evapotranspiration, etc.).

Spatial analysis of a U.S. Geological Survey (USGS) digital elevation model (2020) determined that 97% (99.30 acres) of the ground surface of the subject property outside of the groundwater basin is sloped at $\leq 30^\circ$, with the remaining 3% (3.07 acres) sloped $>30^\circ$. Therefore, based on the preceding discussion of deep percolation rate as a function of ground surface slope, groundwater recharge over the portion of the subject property outside of the groundwater basin was removed from these calculations to account for the steeply sloped portions of the property; again, this conservatively assumes that no groundwater recharge occurs on the more steeply sloped portions of the property that are outside of the groundwater basin.

Recalculation of the area-weighted average rainfall only over the areas of the subject property that are both outside the groundwater basin and sloped at $\leq 30^\circ$ results in nearly the same average annual rainfall of 2.77 ft (33.25 inches). Multiplication of this rainfall depth over the same areas of the subject property that are both outside the groundwater basin and sloped at $\leq 30^\circ$ (99.30 acres) results in a groundwater recharge rate of 38.5 AFY, which represents the volume of groundwater recharge that is assumed to occur over the portion of the subject property that is outside of the groundwater basin.

Site-Wide Estimated Groundwater Recharge

Based on the calculations presented above, the total annual average groundwater recharge at the subject property can be calculated as the sum of the groundwater recharge on the portion of the subject property within the groundwater basin (2.0 AFY) and the groundwater recharge on the portion of the subject property outside of the groundwater basin (38.5 AFY). This total, 40.5 AFY, is therefore the volume of groundwater that can be extracted annually from the subject property for any new or modified water uses, according to the County's current WAA requirements (2015, 2022a, & 2024a).

Closure/Disclaimer

This Memorandum regarding RCS's estimate of average annual groundwater recharge at the Castello Di Amorosa Winery at 4045 St Helena Hwy, in Napa County, CA has been prepared for Mr. Scott Greenwood-Meinert and applies only to the evaluation of the subject property for the requirements discussed herein. This Memorandum has been prepared in accordance with the care and skill generally exercised by reputable professionals, under similar circumstances, and in this or similar localities. No other warranty, either express or implied, is made to the conclusions or professional advice presented herein.

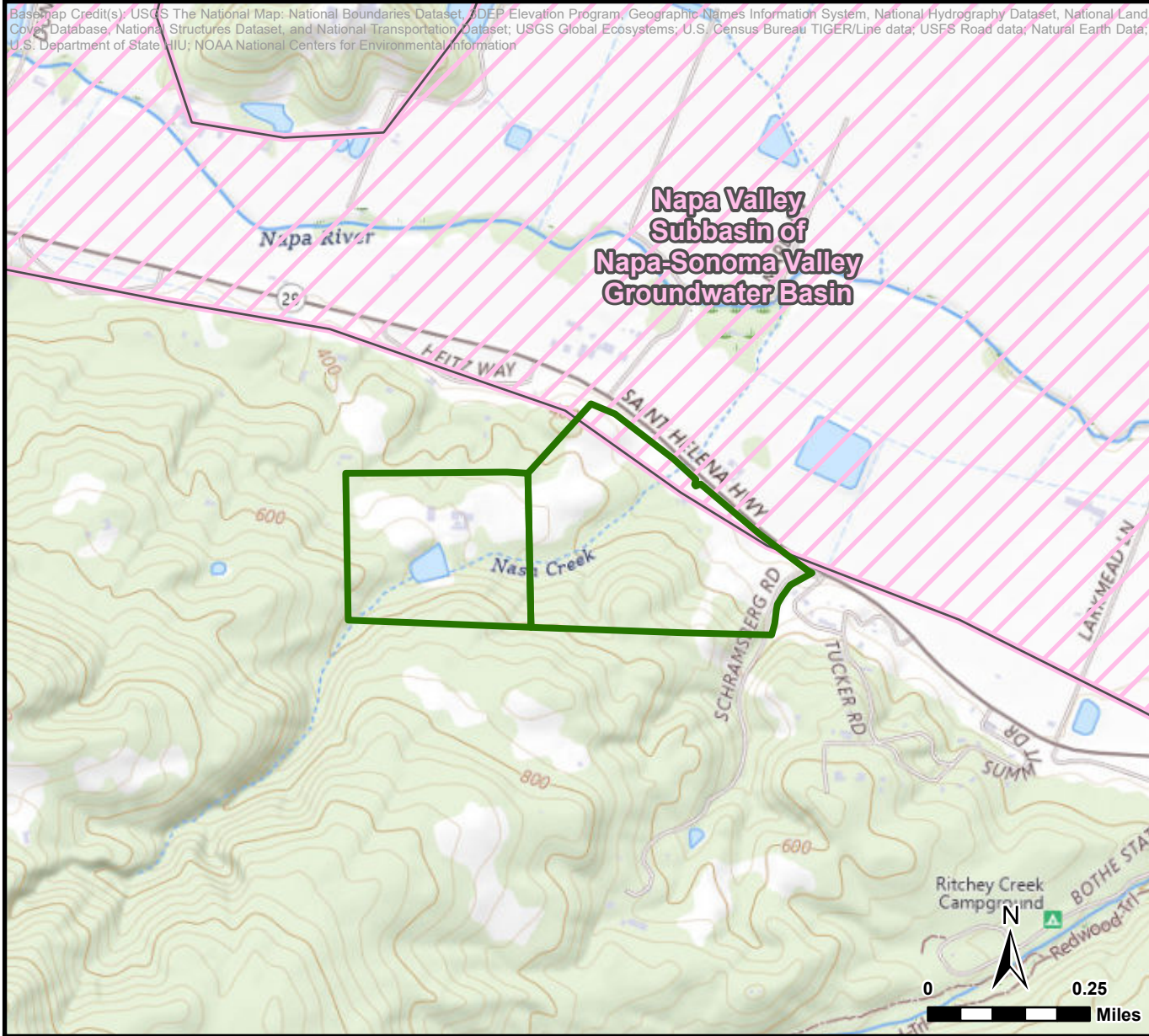


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Base map Credit(s): USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State; IUI; NOAA National Centers for Environmental Information



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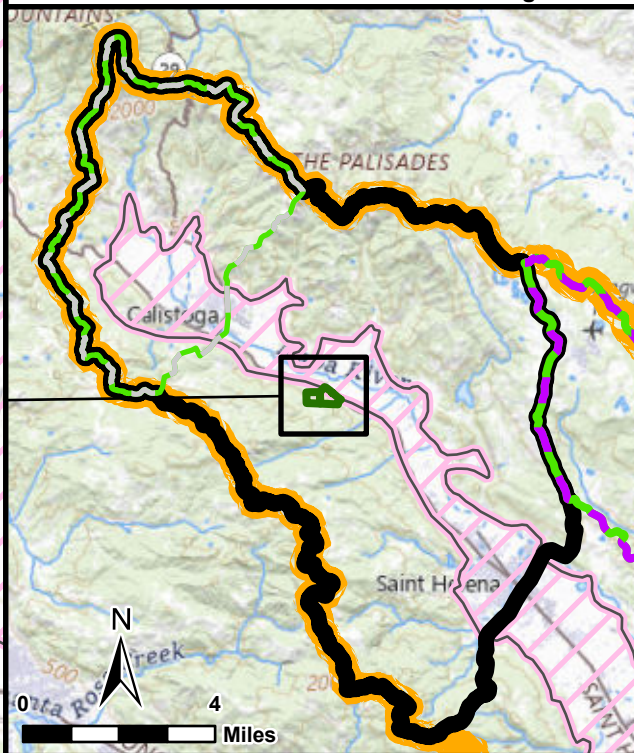
-  Subject Parcel (Napa County, 5/30/24)
-  Groundwater Basin with Name (DWR, 2021)



Figure 1
Regional Map

RCS Job No. 822-NPA01

August 2024



Watersheds in LSCE & MBK (2013)

-  Conn Creek Watershed
-  Napa River Watershed at Calistoga
-  Napa River Watershed at St. Helena
-  Napa River Watershed near Napa