DELTA CONSULTING & ENGINEERING
OF ST. HELENA

WATER AVAILABILITY ANALYSIS

FOR THE

DALLA VALLE WINERY
USE PERMIT

PROJECT LOCATED AT

7776 SILVERADO TRAIL
NAPA, CA 94558

COUNTY: NAPA
APN: 031-060-027

INITIAL SUBMITTAL: AUGUST 24, 2015

PREPARED FOR REVIEW BY:

NAPA COUNTY PLANNING, BUILDING
AND ENVIRONMENTAL SERVICES
1195 THIRD STREET
NAPA, CA 94559

1104 ADAMS STREET, SUITE 203 - ST. HELENA, CALIFORNIA 94574
707-963-8456 TELE + 707-963-8528 FAX

TABLE OF CONTENTS

I.	BACKGROUND	2
II.	TIER 1 ANALYSIS	2
	A. EXISTING WATER USAGE	3
	B. PROPOSED WATER USAGE	4
	C. WATER USAGE SUMMARY	5
	D. AQUIFER RECHARGE ANALYSIS	5
	E. WATER USE AND RECHARGE SUMMARY	7
III.	TIER 2 ANALYSIS	8
IV.	REPORT CONCULUSION	8
V.	APPENDIX	9

I. BACKGROUND

This water availability analysis is prepared for the proposed Dalla Valle Winery Very Minor Use Permit Modification in accordance with the *Water Availability Analysis (WAA)*, Adopted May 12, 2015, as provided by the County of Napa Planning Building, and Environmental Services Department.

Based on the WAA, all projects fall within three Tiers of screening when determining the level of analysis required by the County of Napa. See Table 1 from the WAA below:

Table 1: Project Screening Criteria Applicability

Tier	Criteria Type	Napa Valley Floor	MST	All Other Areas
1	Water Use	Yes	Yes	Yes
2	Well Interference	No[1]	No[1]	Yes
3	Groundwater/Surface Water Interaction	No[1]	No[1]	No[1]

1. Further analysis may be required under CEQA if substantial evidence, in the record, indicates a potentially significant impact may occur from the project.

The subject parcel is located in the Agriculture Watershed Zoning District. This project is subject to the analysis required in both Tier 1 and Tier 2. Tier 3 is not expected to be required according to Table 1 above.

II. TIER 1 ANALYSIS

Tier 1 of the WAA requests the applicant estimate the existing and proposed water usage for the entire parcel, and then compare the total estimated parcel water usage to the applicable water use criteria. As noted in Table 2A of the WAA (referenced below), the water use criteria is subject to the parcel location.

Table 2A: Water Use Criteria

Project parcel location	Water Use Criteria (acre-feet per acre per year)
Napa Valley Floor	1.0
MST Groundwater Deficient Area	0.3 or no net increase, whichever is less [1]
All Other Areas	Parcel Specific [2]

1. Does not apply to the Ministerial Exemption as outlined in the Groundwater Conservation Ordinance

2. Water use criteria for project shall be considered in relation to the average annual recharge available to project property, as calculated by the applicant or their consultant.

The subject parcel has been determined to be located in 'All Other Areas' with respect to The Tier 1 Parcel Location, therefore the WAA requires the applicant to determine the average annual groundwater recharge potential located on the parcel. This analysis will identify the existing and proposed water uses on the parcel, estimate the total annual water usage, and then calculate the potential average annual recharge volume available to the parcel.

A. Parcel Water Use

Appendix B of the WAA includes guidelines for determining the estimated water use for specified land uses. A summary of these guidelines, including the values applied in this report, are identified in the table below:

Water Use Guidelines per Appendix B of WAA

Use	Recommended Water Use Values	Applied Water Use Values	Unit
Primary Residence	0.5 to 0.75	0.50	AF per Year
Second Dwelling	0.20 to 0.30	0.20	AF per Year
Winery			
Process Water	0.0215	0.0215	AF per 1,000 gal Wine Produced per Year
Domestic Water	0.005	0.005	AF per 1,000 gal Wine Produced per Year
Employees	15	15	Gallons Per Shift
Tasting Room Visitation	3	3	Gallons Per Visitor
Events and Marketing	15	15	Gallons Per Visitor
Vineyards			
Irrigation	0.2 to 0.5	0.25	AF per Acre Planted per Year
Heat Protection	0.25	per Owner	AF per Acre Planted per Year
Frost Protection	0.25	0.25	AF per Acre Planted per Year
Landscaping	-	0.5	AF per year for entire property

Table 1: Water use guidelines

B. Existing Water Usage

The existing water use for the property consists of a winery (currently producing 5,000 gallons of wine per year, but permitted to produce up to 20,000 gallons), one main residence, one second dwelling unit, vineyard irrigation, and vineyard heat protection. The water source on the parcel comes from three wells on the parcel. The existing water use is broken down into residential domestic water use, winery domestic water use and winery process water use, and vineyard water use. Based on the existing marketing plan, the following is a list of all water use related activities on the property:

Existing Property Uses

Use	Value	Unit
Residence	1	Main Residence
	1	Second Dwelling
Winery		
Wine Produced (Permitted)	20	Thousand Gallons per Year
Employees (Full + Part Time)	2 Full, 2 Part-Time	Employee Shifts per Day
Employees (Full + Part Time)	800	Employee Shifts per Year*
Vineyard	21	Acres

* 5-day work weeks for Full-Time (50 weeks), 3-day work weeks for Part-Time

Table 2: Existing Property Uses

Applying the water usage values identified in Appendix B of the WAA to the existing uses on the parcel, as well as data provided by the Owner about water use for heat protection, the existing water usage for the parcel is estimated as follows:

Existing Water Usage

Residential		
Main residence	0.500	AF per Year
Second Dwelling	0.200	AF per Year
Winery		
Process Water	0.430	AF per Year
Domestic Water	0.100	AF per Year
Employees	0.037	AF per Year
Vineyard Irrigation	5.250	AF per Year
Vineyard Heat Protection	0.050	AF per Year
Total Water Usage	**6.567**	**AF per Year**

Table 3: Existing Water Use

The estimated existing water usage on the parcel utilizing the Appendix B values is 6.57 acre-feet per year.

C. Proposed Water Usage

The proposed winery development will add a barrel storage building and remove 0.25 acre of vineyard. Approximately 2,200 square feet of additional landscaping is proposed along with the new building. The production plan remains the same with an annual permitted winery production of 20,000 gallons of wine per year with 2 full time and 2 part time employees, one main residence, and one second dwelling unit. Based on the existing production plan and the minor change to the vineyard layout, the following is a list of all water use related activities on the property:

Proposed Property Uses

Use	Value	Unit
Residence	1	Main Residence
	1	Second Dwelling
Winery		
Wine Produced (Permitted)	20	Thousand Gallons per Year
Employees (Full + Part Time)	2 Full, 2 Part-Time	Employee Shifts per Day
Employees (Full + Part Time)	800	Employee Shifts per Year*
Vineyard	20.75	Acres
Additional Landscaping	0.05	Acres

* 5-day work weeks for Full-Time (50 weeks), 3-day work weeks for Part-Time

Table 4: Proposed Property Use

Applying the water usage values identified in Appendix B of the WAA to the proposed uses on the parcel, the proposed water usage for the parcel is estimated as follows:

Proposed Water Usage

Residential		
Main residence	0.500	AF per Year
Second Dwelling	0.200	AF per Year
Winery		
Process Water	0.430	AF per Year
Domestic Water	0.100	AF per Year
Employees	0.037	AF per Year
Vineyard Irrigation	5.188	AF per Year
Vineyard Heat Protection	0.050	AF per Year
Landscaping	0.030	AF per Year
Total Water Usage	**6.534**	**AF per Year**

Table 5: Proposed Water Use

The estimated proposed water usage on the parcel utilizing the Appendix B values is 6.53 acre-feet per year.

D. Water Usage Summary

Accounting for all of the water uses on the parcel, existing and proposed, the proposed annual water usage due to this very minor modificiation will decrease by an estimated 0.03 acre-feet per year (10,589 gallons per year). See the table below for the comparison between the existing and proposed water use:

Proposed Decrease in Water Usage

Existing Water Usage	6.567	AF per Year
Proposed Water Usage	6.534	AF per Year
Expected Water Usage Decrease	**-0.032**	**AF per Year**

Table 6: Water Use Comparison

E. Aquifer Recharge Analysis

A number of factors influence the potential aquifer recharge rates. These factors include, but are not limited to, local precipitation, soil permeability, and the land gradient. This analysis will review each of these factors in determining the site-specific aquifer recharge potential.

Local Precipitation

Precipitation infiltration is the most substantial factor contributing to on-site aquifer recharge. The Western Regional Climate Center (WRCC) has compiled average rainfall data in Oakville from 1948 to 1981 for each month. This information can be found in Appendix A of this report. Based on this information, the average annual precipitation near the project site is 32.17 inches per year (2.68 feet per year). As the property contains approximately 26.46 acres of land, the total rainfall on the property is calculated to be 70.94 acre-feet per year, which is approximately 23.11 million gallons of water.

While the quantity of rainfall derived on the subject property is able to be identified by using precipitation records and basic volume calculations, the actual quantity of precipitation that infiltrates into the ground and recharges the groundwater is only a small percentage of this water. How much of the rainfall that can potentially infiltrate in order to recharge the aquifer is based on the property's soil types and their respective permeability.

Soil Permeability

Information on soil types and formations and soil permeability is publicly available via the Web Soil Survey (websoilsurvey.sc.egov.usda.gov). This website is produced by the National Cooperative Soil Survey and is operated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

The Web Soil Survey is used to determine what soil types are found on the subject property and each soil's respective permeability. The Web Soil Survey provides the Saturated Hydraulic Conductivity (Ksat) for each soil formation in micrometers per second. Due to the complex nature of soil types and soil combinations that produce each unique soil formation, a weighted average of the minimum permeability of all soil layers found in a formation is used. Please see Appendix B for the Web Soil Survey Report prepared for this parcel, including a more detailed description of how the Ksat is calculated. Please also see the Appendix C for the Slope Analysis and Soil Type Map which identifies the soil formations located on this property.

Per the Web Soil Survey, the following soil formations and their respective permeability are found on the subject property:

Soil Number	Soil Name	Soil Permeability (mm/sec)	Soil Permeability (cm/hr)	Area (sqft)	Area (acres)
107	Boomer Loam, 2 to 15 percent slopes	9	3.24	912,187	20.94
109	Boomer Gravelly Loam, 30 to 50 percent slopes	9	3.24	240,477	5.52
			Total Area:	1,152,664	26.46

Table 7: Soil Information

The project site consists of two different soils, Boomer Loam and Boomer Gravelly Loam. The following analysis will look at each soil group relative to the various land gradients existing on the parcel.

Land Gradient

In conjunction with the soil permeability, the gradient (or slopes) of the property also is a significant factor in determining the aquifer recharge capacity. Lands with steeper slopes increase the velocity of storm water runoff, creating a higher percentage of surface storm water runoff and a smaller percentage of storm water infiltration Inversely, flatter slopes allow for a slower surface storm water runoff rate and a higher infiltration potential. For this analysis, the slopes were classified into three categories: less than 15% slope, 15-25% slope, and greater than 25% slope.

The subject property's topographic information was determined using elevation data taken from the publicly available contour data (at 5-foot intervals) of the Napa River Watershed Area prepared by Towill, Inc. in May, 2003, and available from the Napa County GIS Data Catalog (https://gis.napa.ca.gov/). Please see the Slope Analysis and Soil Type Map in the Appendix C.

Recharge Potential

The final recharge potential for a parcel is based on the combination of the soil permeability and the land gradient. The *City of Rohnert Park City-Wide Water Supply Assessment* (dated January, 2005, and available from the City of Rohnert Park (https://www.ci.rohnert-park.ca.us/)), provides methodology to determine categories of Recharge Potential. Based on this report, there are four categories of recharge potential: Very Low, Low, Moderate and High and they are defined as follows:

- Very Low – permeability <0.5 cm/hr and slope >15%
- Low – permeability <0.5 cm/hr and slope <15%, permeability 0.5 – 1.5 cm/hr and slope <25%
- Moderate - permeability 0.5 – 1.5 cm/hr and slope <15%, permeability 1.5 – 5.0 cm/hr and slope >15%, permeability >5 cm/hr and slope >25%
- High - permeability 1.5 - 5 cm/hr and slope <15%, permeability >5 cm/hr and slope 15-25%

See the table below of a summary of the recharge potential acreage on the parcel. Areas with very low/low recharge potential are shown in gray and areas with moderate/high recharge potential are shown in green.

			Area (sqft) Slope Class (%)			Area (acre) Slope Class (%)		
Soil Number	Soil Name	Soil Permeability (cm/hr)	< 15%	15% - 25%	> 25%	< 15%	15% - 25%	> 25%
107	Boomer Loam, 2 to 15 percent slopess	3.24	799314	110975	1899	18.35	2.55	0.04
152	Boomer Gravelly Loam, 30 to 50 percent slopes	3.24	52804	147881	39792	1.21	3.39	0.91
		Total Area:	**852,118**	**258,856**	**41,690**	**19.56**	**5.94**	**0.96**

Table 8: Recharge Potential

As shown above, 96% of the parcel (25.50 acres) is classified as having moderate or high recharge potential.

Based on the methodology followed in the *Water Availability Analysis* (prepared for the Woolls Ranch Winery by Luhdorff & Scalmanini and dated May, 2014), we conservatively assume that a 10% groundwater recharge takes place in areas with moderate or high recharge potential and that no groundwater recharge takes place in areas with very low or low recharge potential. The average annual groundwater recharge volume is calculated by applying the average rainfall of 32.17 inches to the areas delineated as having moderate or high recharge potential. See the table below for a summary of the average annual recharge volume.

Recharge Potential		Total Area (sqft)	Total Area (acres)	Recharge Rate	Average Annual Rainfall (inches)	Average Recharge Volume (acre-feet)	Average Recharge Volume (gallons)
	Very Low/Low	41690.28	0.96	0%	32.17	0.00	0.00
	Moderate	1110974.01	25.50	10%	32.17	6.84	2,227,795
		Total:	26.46			6.84	2,227,795

Table 9: Summary of Recharge volume

Based on this analysis, we conclude that this parcel should experience an average annual groundwater recharge of 2,227,795 gallons or 6.84 acre-feet.

F. Water Use and Recharge Summary

The total estimated annual proposed water use for the parcel is 6.53 acre-feet.
The total estimated annual ground water recharge for the parcel is 6.84 acre-feet.

The estimated water use on this parcel is less than the applicable water use criteria of ground water recharge and therefore the Tier 1 Water Criterion is met.

III. TIER 2 ANALYSIS

As required by the WAA, projects within the AW zoning must perform a well interference check to determine if any neighboring wells are located within 500 feet of the wells or springs used on the property. To determine the likelihood of neighboring wells within 500 feet of the parcel's wells and spring, a Well Interference Map is prepared. Research on the neighboring properties located five properties which may have wells near or inside the 500 foot radius from the subject parcel's wells. Please see the Well Interference Map located in the Appendix D.

Based on research of the neighboring properties in Napa County's environmental database, only one well was found to be within close proximity of one of the project wells. The well is located at 7652 Silverado Trail and is approximately 700 feet away from the closest project well. All other wells from the five properties were either not able to be located or were found to be outside the 500 feet setback.

As part of the improvements for the proposed barrel storage building, Dalla Valley Winery is required to install a new 56,000 gallon water tank for fire protection (sprinkler and hydrant) water storage. With the new water tank, Dalla Valle Winery has applied to Napa County to drill two additional new wells. The two new wells will assist in replenishing the new fire water tank and also allow flexibility in meeting the winery water demand during the peak irrigation and/or production periods. The annual overall proposed water use on the parcel is expected to decrease as noted above.

IV. REPORT CONCULUSION

Based on the analysis completed in this report, the proposed winery development meets both Tier 1 and Tier 2 Criterions and is therefore in compliance of the with the requirements of the WAA.

V. APPENDIX

A. Historical Local Annual Average Precipitation – Oakville
B. USGS Web Soil Survey
C. Slope Analysis and Soil Type Map
D. Well Interference Map

APPENDIX A:

Historical Annual Average Precipitation – Oakville

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

Historical Local Annual Average Precipitation

	Information Source	Location
Rainfall	California Department of Water Resources	Oakville, CA

	Precipitation	
Month	Avg Rainfall[a] (in)	10-Year Rainfall[b] (in)
Jan	7.74	10.84
Feb	5.70	7.98
Mar	3.80	5.32
Apr	1.84	2.58
May	0.46	0.64
Jun	0.15	0.21
Jul	0.07	0.10
Aug	0.08	0.11
Sep	0.36	0.50
Oct	1.95	2.73
Nov	4.01	5.61
Dec	6.01	8.41
	32.17	45.04

Notes:
[a] Average Rainfall per http://www.wrcc.dri.edu/htmlfiles/ca/ca.ppt.html
[b] 10-Year Rainfall Is the Month Average Rainfall multiplied by 1.4

APPENDIX B:

USGS Web Soil Survey

United States Department of Agriculture

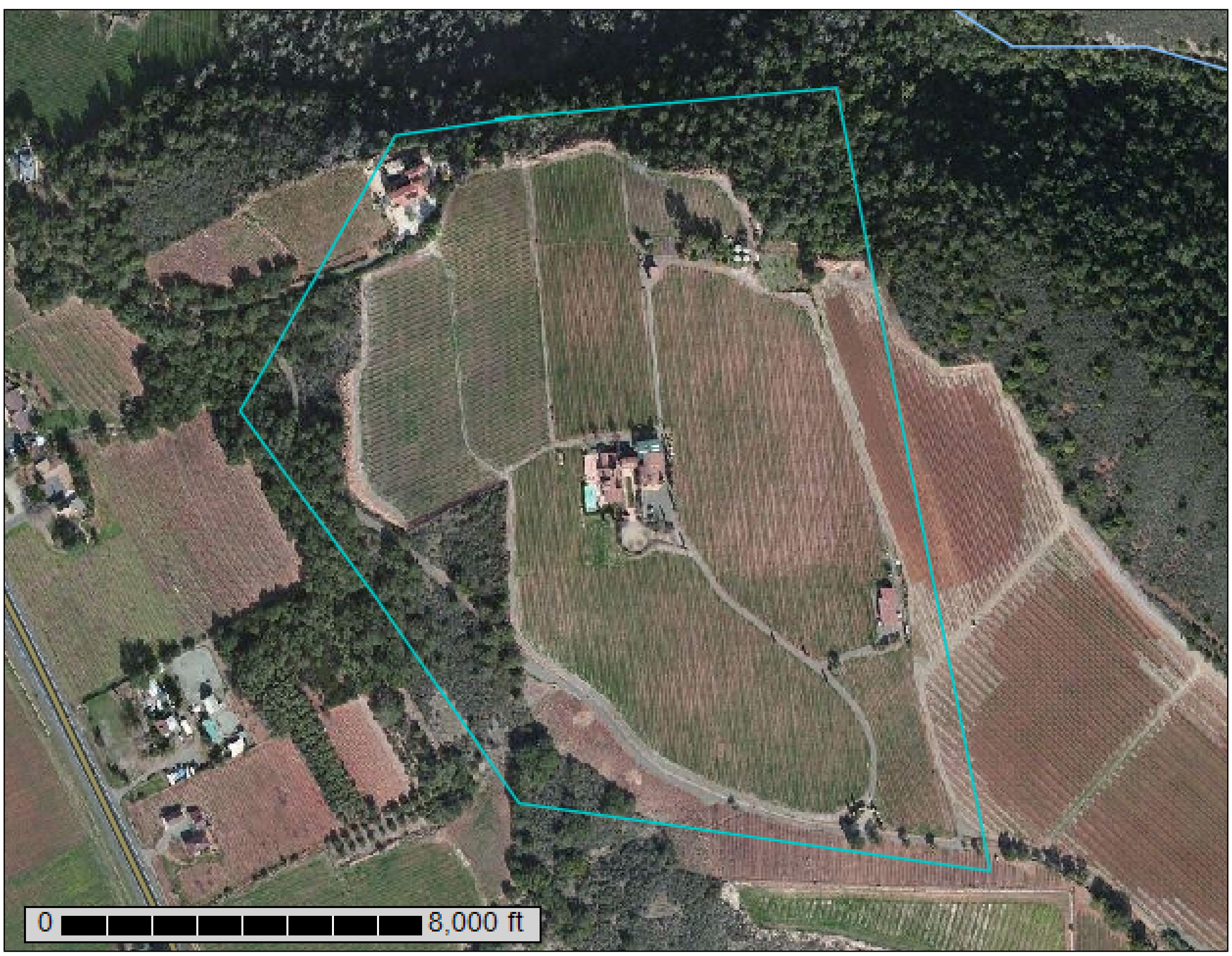
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Napa County, California

K-106: Dalla Valle Winery



August 21, 2015

Contents

Preface......2
How Soil Surveys Are Made......5
Soil Map......7
Soil Map......8
Legend......9
Map Unit Legend......10
Map Unit Descriptions......10
Napa County, California......12
107—Boomer loam, 2 to 15 percent slopes......12
109—Boomer gravelly loam, 30 to 50 percent slopes......13
Soil Information for All Uses......14
Soil Properties and Qualities......14
Soil Physical Properties......14
Saturated Hydraulic Conductivity (Ksat), Standard Classes......14
Soil Reports......19
Soil Physical Properties......19
Engineering Properties......19
References......23

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:3,650 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 4, 2012—Feb 17, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Napa County, California (CA055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
107	Boomer loam, 2 to 15 percent slopes	25.1	64.7%
109	Boomer gravelly loam, 30 to 50 percent slopes	13.7	35.3%
Totals for Area of Interest		**38.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Napa County, California

107—Boomer loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: hdk7
Elevation: 600 to 5,500 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 54 to 55 degrees F
Frost-free period: 210 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Boomer and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Hillslopes, plateaus
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from igneous rock

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 44 inches: gravelly clay loam
H3 - 44 to 54 inches: weathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

109—Boomer gravelly loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hdk9
Elevation: 600 to 5,500 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 54 to 55 degrees F
Frost-free period: 210 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Boomer and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from igneous rock

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 44 inches: clay loam, gravelly clay loam
H2 - 4 to 44 inches: weathered bedrock
H3 - 44 to 59 inches:

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat), Standard Classes

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are:

Very low: 0.00 to 0.01

Low: 0.01 to 0.1

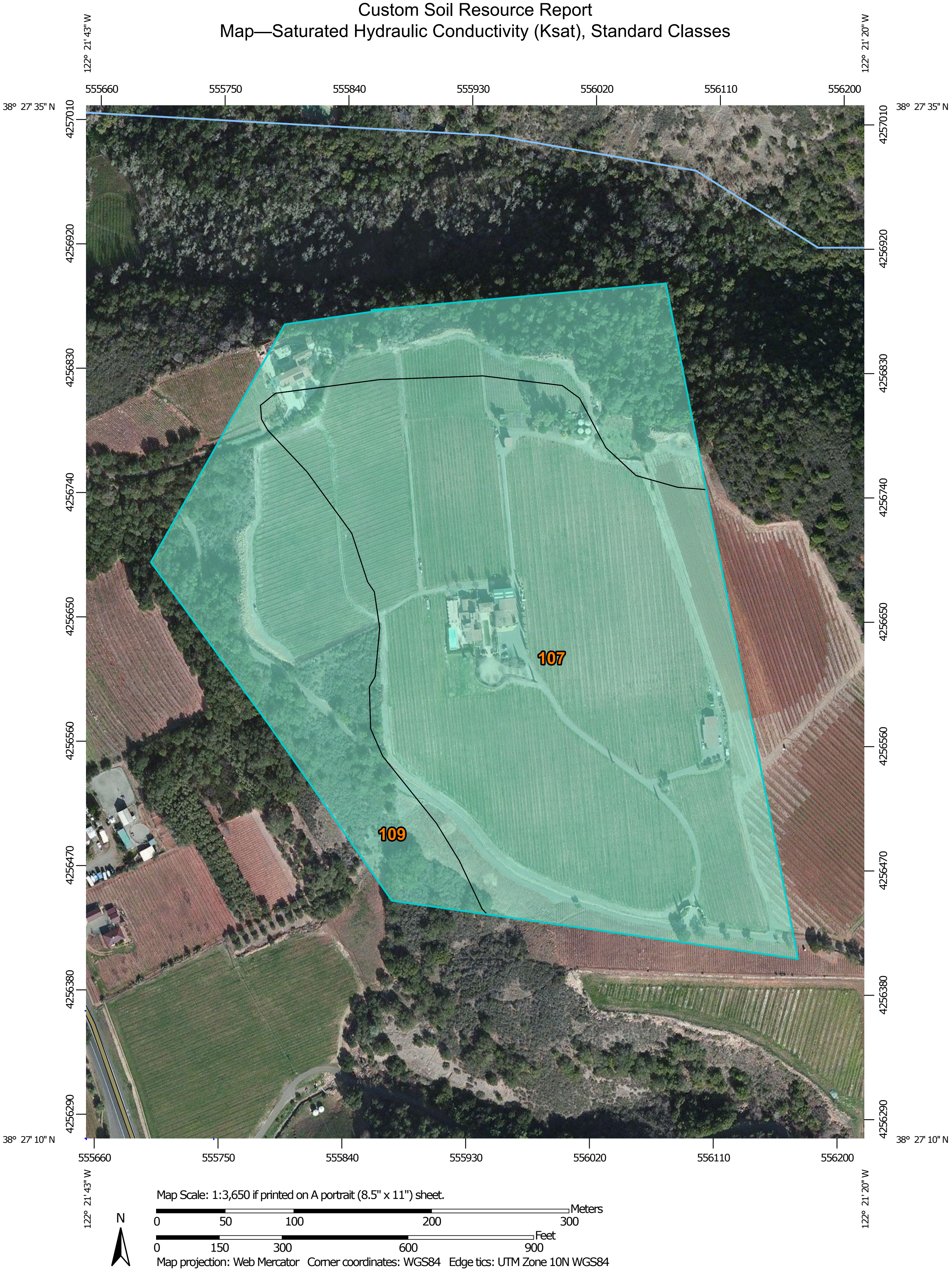
Moderately low: 0.1 to 1.0

Moderately high: 1 to 10

High: 10 to 100

Very high: 100 to 705

Map—Saturated Hydraulic Conductivity (Ksat), Standard Classes



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Lines

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Points

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 4, 2012—Feb 17, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Saturated Hydraulic Conductivity (Ksat), Standard Classes— Summary by Map Unit — Napa County, California (CA055)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
107	Boomer loam, 2 to 15 percent slopes	9.0000	25.1	64.7%
109	Boomer gravelly loam, 30 to 50 percent slopes	9.0000	13.7	35.3%
Totals for Area of Interest			**38.8**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Units of Measure: micrometers per second

Aggregation Method: Minimum or Maximum

Component Percent Cutoff: None Specified

Tie-break Rule: Slowest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba).

Engineering Properties–Napa County, California

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*Pct*	*Pct*					*Pct*	
107—Boomer loam, 2 to 15 percent slopes														
Boomer	85	C	0-4	Loam	CL, CL-ML	A-4, A-6	0- 0- 0	0- 0- 0	90-95-100	90-95-100	80-85-90	50-65-80	20-30-40	5-10-15
			4-44	Gravelly clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	90-95-100	65-78-90	55-70-85	50-68-85	30-40-50	10-18-25
			44-54	Weathered bedrock	—	—	0- 0- 0	—	—	—	—	—	—	—
109—Boomer gravelly loam, 30 to 50 percent slopes														
Boomer	85	C	0-4	Gravelly loam	GC, GC-GM	A-2, A-4, A-6	0- 0- 0	0- 0- 0	55-65-75	50-60-70	45-58-70	20-35-50	20-30-40	5-10-15
			4-44	Clay loam, gravelly clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	90-95-100	65-78-90	55-70-85	50-68-85	30-40-50	10-18-25
			44-59	Weathered bedrock	—	—	0- 0- 0	—	—	—	—	—	—	—

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

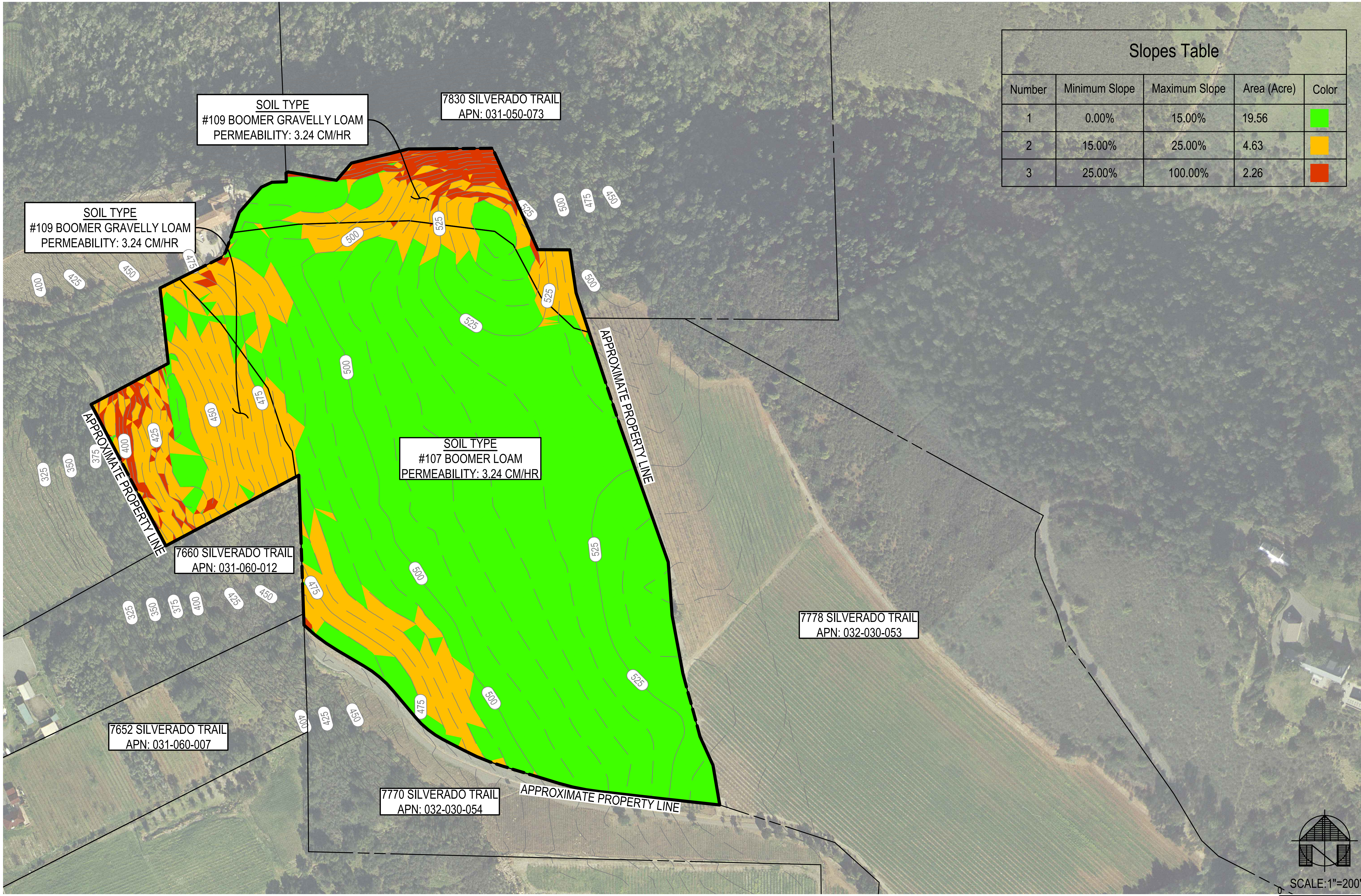
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX C:

Slope Analysis and Soil Type Map



Slopes Table

Number	Minimum Slope	Maximum Slope	Area (Acre)	Color
1	0.00%	15.00%	19.56	
2	15.00%	25.00%	4.63	
3	25.00%	100.00%	2.26	

SLOPE ANALYSIS AND SOIL TYPE MAP

IMAGERY FROM NAPA COUNTY 2005 IMAGERY: 6458_1928 & 6458_1924

DALLA VALLEY WINERY
SLOPE ANALYSIS AND SOIL TYPE MAP

NAPA CA

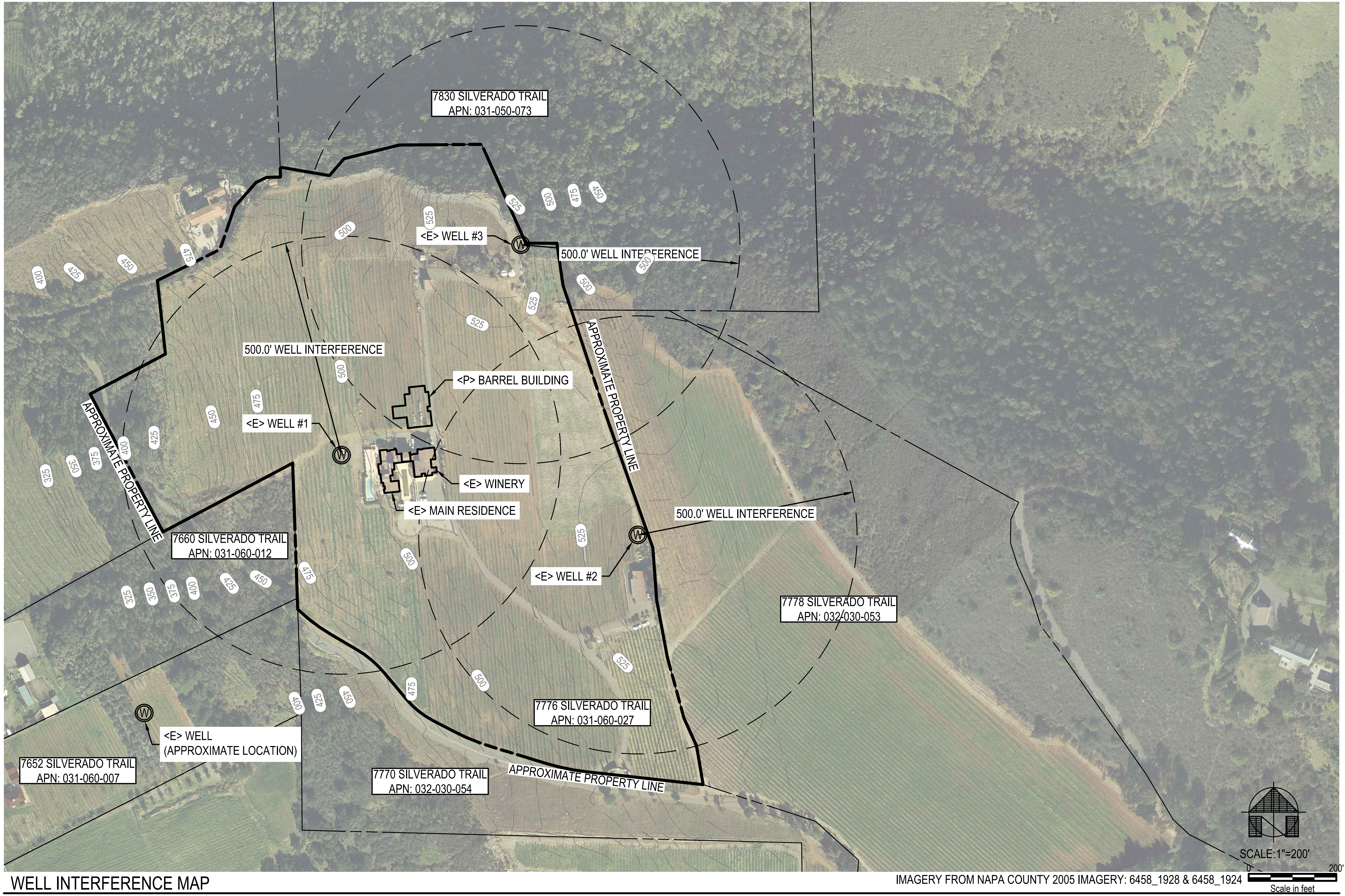
DELTA CONSULTING & ENGINEERING
OF ST. HELENA
1104 ADAMS STREET, SUITE 203 - ST. HELENA, CALIFORNIA 94574
707-963-8456 + 707-963-8528 FAX

DATE: 08/24/15
SCALE: 1"=200'
JOB #: K-106
APN: 031-060-027

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

APPENDIX D:

Well Interference Map



WELL INTERFERENCE MAP

IMAGERY FROM NAPA COUNTY 2005 IMAGERY: 6458_1928 & 6458_1924

DALLA VALLEY WINERY
WELL INTERFERENCE MAP

NAPA CA

Delta Consulting & Engineering
of St. Helena
1104 Adams Street, Suite 203 · St. Helena, California 94574
707-963-8456 + 707-963-8528 Fax

DATE:	08/24/15
SCALE:	1"=200'
JOB #:	K-106
APN:	031-060-027