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Water Availability Analysis

Brasswood (formerly Cairdean) Winery, Use Permit Major Modification
Application No. P19-00004-MOD
Planning Commission Hearing, November 20, 2019



WATER AVAILABILITY ANALYSIS

BRASSWOOD CELLARS
3125 ST. HELENA HWY. NORTH
ST. HELENA, CA

APN 022-070-028

PROPERTY OWNER:

Brasswood Cellars
3125 St. Helena Hwy. North
St. Helena, CA 94574



Project# 4118030.0
June 6, 2019

RECEIVED

JUN 10 2019

Napa County Planning, Building
& Environmental Services



I. Executive Summary

Brasswood Cellars (APN 022-070-028) proposes to increase production from 50,000 gallons of wine per year to 95,000 gallons with no increase in full time employees or visitors. There is one well on the 50.31-acre parcel. A Water Use Criteria of 0.52 ac-ft/ac/year has been adopted from the RSA+ Groundwater Recharge Report attached. This provides an annual allowable water allotment of 26.16 ac-ft/yr. In accordance with the Tier 2 Water Availability Analysis, an exhibit of the existing wells within 500 feet of the project well has been attached with this report.

Below is a summary of the existing and proposed water use. Detailed calculations can be found on the next page.

Usage Type	Existing Usage [af/yr]	Proposed Usage [af/yr]
Vineyard		
Irrigation	0.51	0.51
Landscaping	0.25	0.25
Irrigation from winery process water	0	-0.42
Winery		
Process Water	0.77	1.46
Domestic Water	0.25	0.28
Totals (Acre-ft per Year)	1.78	2.08
Estimated Water Recharge Rate (Acre-ft per Year)	26.16	26.16

The proposed modifications for the Brasswood Cellars project will result in an increase in the use of groundwater of 0.30 af/yr for a total annual usage of 2.08 af/yr which is less than the estimated groundwater recharge rate for the parcel of 26.16 af/yr.



II. Groundwater Use Calculation

Existing Vineyard Irrigation and Landscaping Water Demand

Vineyard – Irrigation only – (0.65 af/ac-yr x	0.79	acres vineyard) =	0.51	af/yr
Landscape – (0.5 af / 100,000 gallon wine x	50,000	gal wine/year) =	0.25	af/yr

Existing Winery Process Water Demand

Process Water – (5 gal water / 1 gallon wine x	50,000	gal wine/year) =	0.77	af/yr
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Existing Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 260 days/yr x	4	employees/day) =	0.05	af/yr
PT Employees – (15 gal/person/day x 156 days/yr x	6	employees/day) =	0.04	af/yr
Harvest Employees – (15 gal/person/day x 60 days/yr x	4	employees/day) =	0.01	af/yr
Visitors – (3 gal/person/day x 52 weeks/yr x	175	visitors/week) =	0.08	af/yr
Marketing Events – (25 visitors @ 10 gal/guest x	24	days/yr) =	0.02	af/yr
Marketing Events – (50 visitors @ 10 gal/guest x	24	days/yr) =	0.04	af/yr
Marketing Events – (100 visitors @ 10 gal/guest x	2	days/yr) =	0.01	af/yr

Total = 0.25 af/yr

Total Existing Water Demand Total = 1.78 af/yr

Proposed Vineyard Irrigation and Landscaping Water Demand

Vineyard – Irrigation from well – (0.65 af/ac-yr x	0.79	acres vineyard) =	0.51	af/yr
Landscape – (No change from existing) =			0.25	af/yr
Irrigation from process water =			-0.42	af/yr

Proposed Winery Process Water Demand

Process Water – (5 gal water / 1 gallon wine x	95,000	gal wine/year) =	1.46	af/yr
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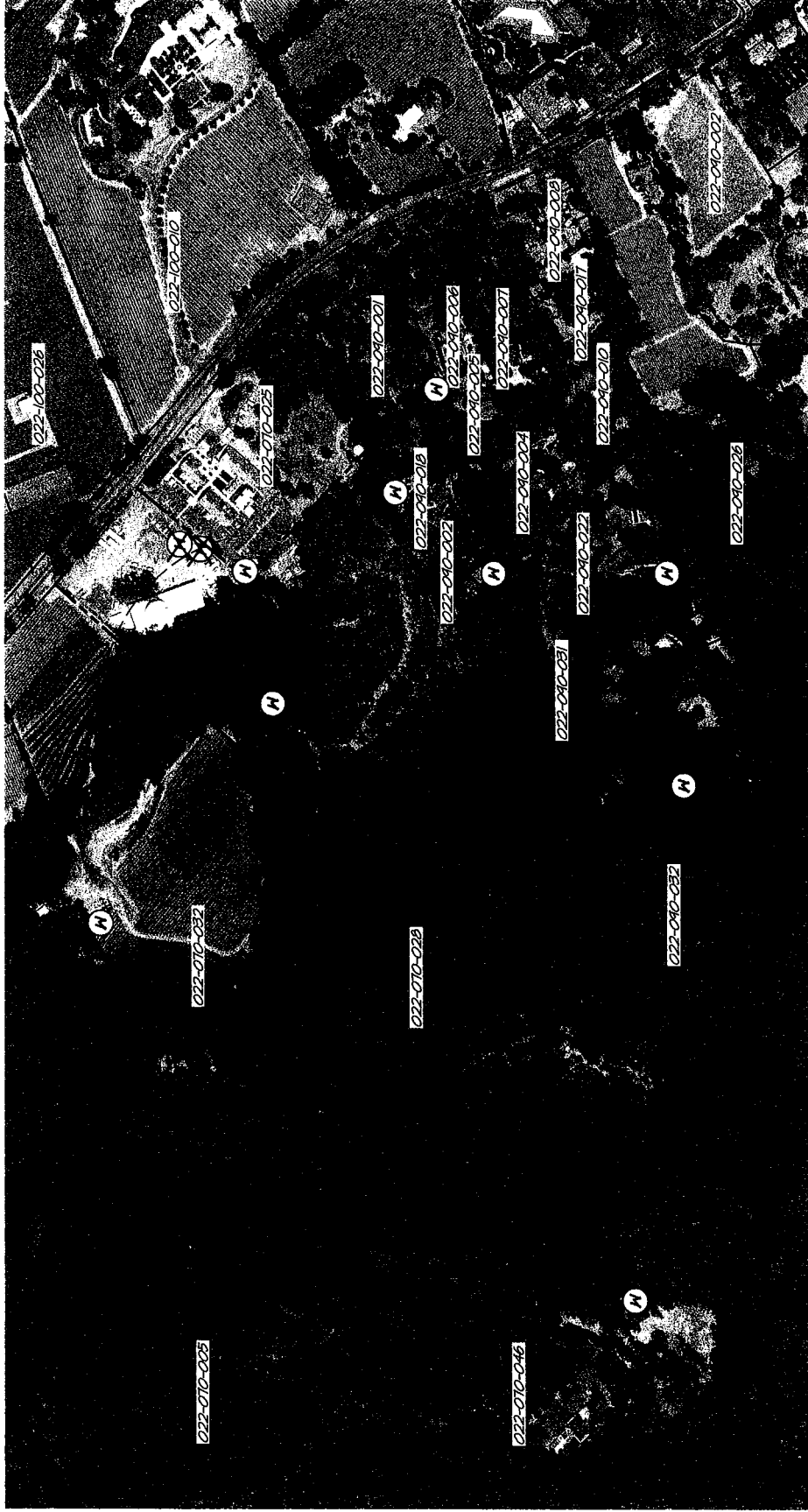
Proposed Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 260 days/yr x	10	employees/day) =	0.12	af/yr
Harvest Employees – (15 gal/person/day x 60 days/yr x	4	employees/day) =	0.01	af/yr
Average Visitors – (3 gal/person/day x 52 weeks/yr x	175	visitors/week) =	0.08	af/yr
Marketing Events – (30 visitors @ 10 gal/guest x	24	days/yr) =	0.02	af/yr
Marketing Events – (50 visitors @ 10 gal/guest x	24	days/yr) =	0.04	af/yr
Marketing Events – (100 visitors @ 10 gal/guest x	2	days/yr) =	0.01	af/yr

Total = 0.28 af/yr

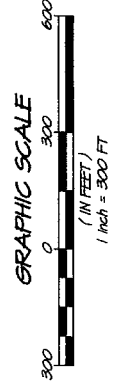
Total Proposed Water Demand Total = 2.08 af/yr

BRASSWOOD CELLARS WELLS WITHIN 500 FEET



LEGEND

- 022-070-028 ASSESSORS PARCEL NUMBER
- WELL LOCATION
- ⊗ DESTROYED WELL



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SEPT. 26, 2018 4118030.0 Enh-Wellis - 500ft.dwg



ANNUAL GROUNDWATER RECHARGE RATE

BRASSWOOD CELLARS
3111 ST. HELENA HWY. NORTH
SAINT HELENA, CALIFORNIA

APN 022-070-028

PROPERTY OWNER:

Brasswood Cellars
3111 St. Helena Hwy. North
St Helena, CA 94574

Project# 4118030.0
October 25, 2018



INTRODUCTION

This report determines the annual groundwater recharge rate for the Brasswood Cellars property. The proposed winery is located on APN 022-070-028. This parcel has an area of +/- 50.31 acres. The parcel has slopes ranging from 3-60%.

For the analysis, the parcel has been divided into four areas, impervious, vineyard, grassland, and coastal oak tree areas.

METHODOLOGY

The groundwater recharge rate has been determined by examining the annual rainfall, runoff and species-specific evapotranspiration during winter months. The Annual Precipitation Chart and Watershed Types and Factors page in the Napa County Road and Street Standards were used to determine the annual rainfall amount and site runoff volumes. It was determined that the average annual rainfall amounts to 35 inches per year.

The runoff volumes were determined by calculating the site-specific runoff coefficient. The runoff coefficients were calculated using aerial images to view the terrain and the county topography to estimate the slopes in each area.

The evapotranspiration losses were calculated using the Water Use Classifications of Landscape Species (WUCOLS) methodology for the vineyard, grassland, and coastal oak tree areas. Only evapotranspiration from the winter was considered, as it is assumed that evapotranspiration in summer will be from irrigation water.

The groundwater recharge rate was calculated as the difference of the total annual rainfall and losses from the stormwater runoff and evapotranspiration. Refer to attached calculations.

$$\text{Average Recharge Rate} = \text{Average Rainfall} - \text{Runoff} - \text{Evapotranspiration}$$

CONCLUSION

The Brasswood Cellars property has an annual rainfall of 35 inches per year, equating to 146.74 acre-feet per year for the parcel.

Total evapotranspiration volume that occurs through the vineyard, grassland, and oak tree areas is 20.89 acre-feet per year. The stormwater runoff from the parcel totals 99.73 acre-feet per year. The total average evapotranspiration and runoff is 120.86 acre-feet per year. This equates to a groundwater recharge rate of 26.16 acre-feet per year, or 0.52 acre-feet per acre per year.



**Brasswood Cellars
Groundwater Recharge Rate**

Parcel 022-070-028

Site Description	Hydrologic Soil Group	Area (ac)	Total Annual Rainfall (in/yr)	Total Rainfall (ft ³ /yr)
Impervious Area	B/C	2.23	35	283,322
Vineyard Area	C	0.79	35	100,370
Grass and Shrubs	B/C	1.33	35	168,977
Coastal Oak Trees	B/C	45.96	35	5,839,218
Total		50.31	35	6,351,886

Site	January (E _o) (in)	February (E _o) (in)	March (E _o) (in)	October (E _o) (in)	November (E _o) (in)	December (E _o) (in)	Total E _o (in)	Landscape Coefficient (k _c)	Landscape Evapotrans. (E _t) (in) = Total E _o x k _c	Total Landscape Evapotranspiration (ft ³ /yr)
Impervious Area	0	0	0	0	0	0	0	0	0.00	0
Vineyard Area	1.03	1.53	2.93	3.53	1.64	1.17	11.83	0.08	0.95	2,714
Grass and Shrubs	1.03	1.53	2.93	3.53	1.64	1.17	11.83	0.68	8.04	38,838
Coastal Oak Trees	1.03	1.53	2.93	3.53	1.64	1.17	11.83	0.44	5.21	868,409
Total										909,960

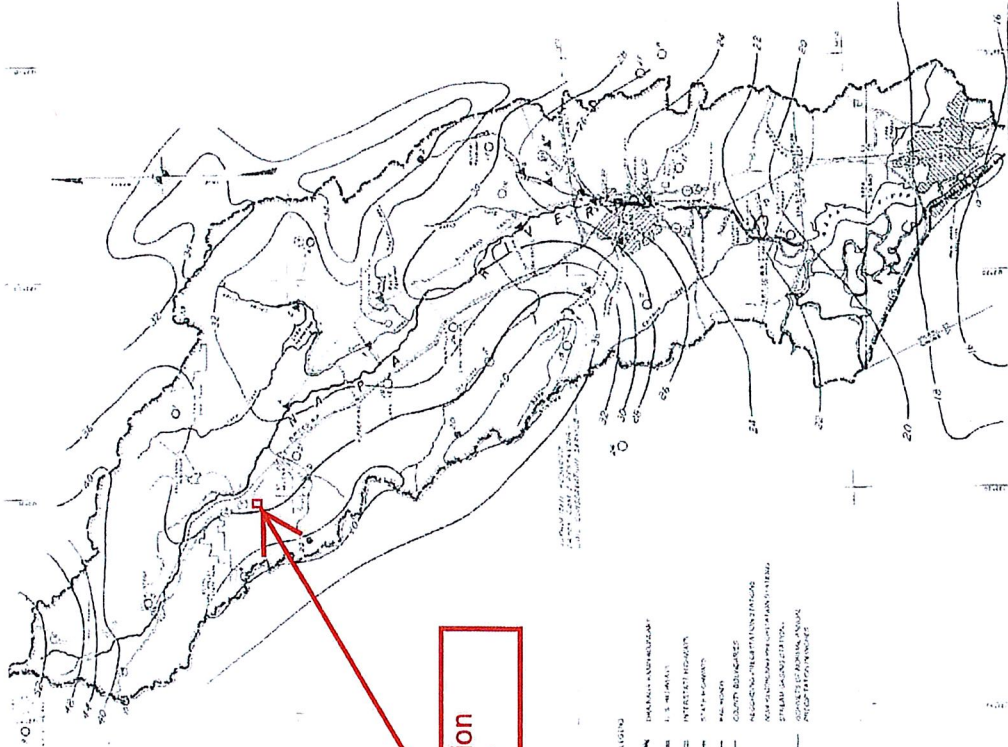
Site	Runoff	
	Run-Off Coefficient (C)	Total Runoff (ft ³ /yr)
Impervious Area	0.90	254,989
Vineyard Area	0.44	44,163
Grass and Shrubs	0.44	74,350
Coastal Oak Trees	0.68	3,970,668
Total		4,344,170

Site	Groundwater Recharge Rate					
	Total Rainfall (ft ³ /yr)	Total Crop Evapotranspiration (ft ³ /yr)	Total Runoff (ft ³ /yr)	Total Stormwater loss on site (ft ³ /yr)	Groundwater Recharge Rate (ft ³ /yr)	Groundwater Recharge Rate (in-ft/acc/yr)
Impervious Area	283,322	0	254,989	254,989	28,332	0.29
Vineyard Area	100,370	2,714	44,163	46,877	53,493	1.55
Grass and Shrubs	168,977	38,838	74,350	113,187	55,789	0.96
Coastal Oak Trees	5,839,218	868,409	3,970,668	4,839,077	1,000,141	0.50
Total	6,351,886	909,960	4,344,170	5,254,130	1,137,756	0.52

PRECIPITATION CHART LOWER COUNTY

FLOOD CONTROL
GENERAL DESIGN MEMORANDUM
NAPA RIVER CHANNEL IMPROVEMENTS
NAPA COUNTY, CALIFORNIA
HYDROLOGY AND HYDRAULIC ANALYSIS
NORMAL ANNUAL PRECIPITATION AND
HYDROLOGIC INDEX MAP
U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF
ENGINEERS

TO ACCOMPANY REPORT FILE NO.
DATED 12 March 75 50-47-1



BRASSWOOD CELLARS GROUNDWATER RECHARGE EXHIBIT



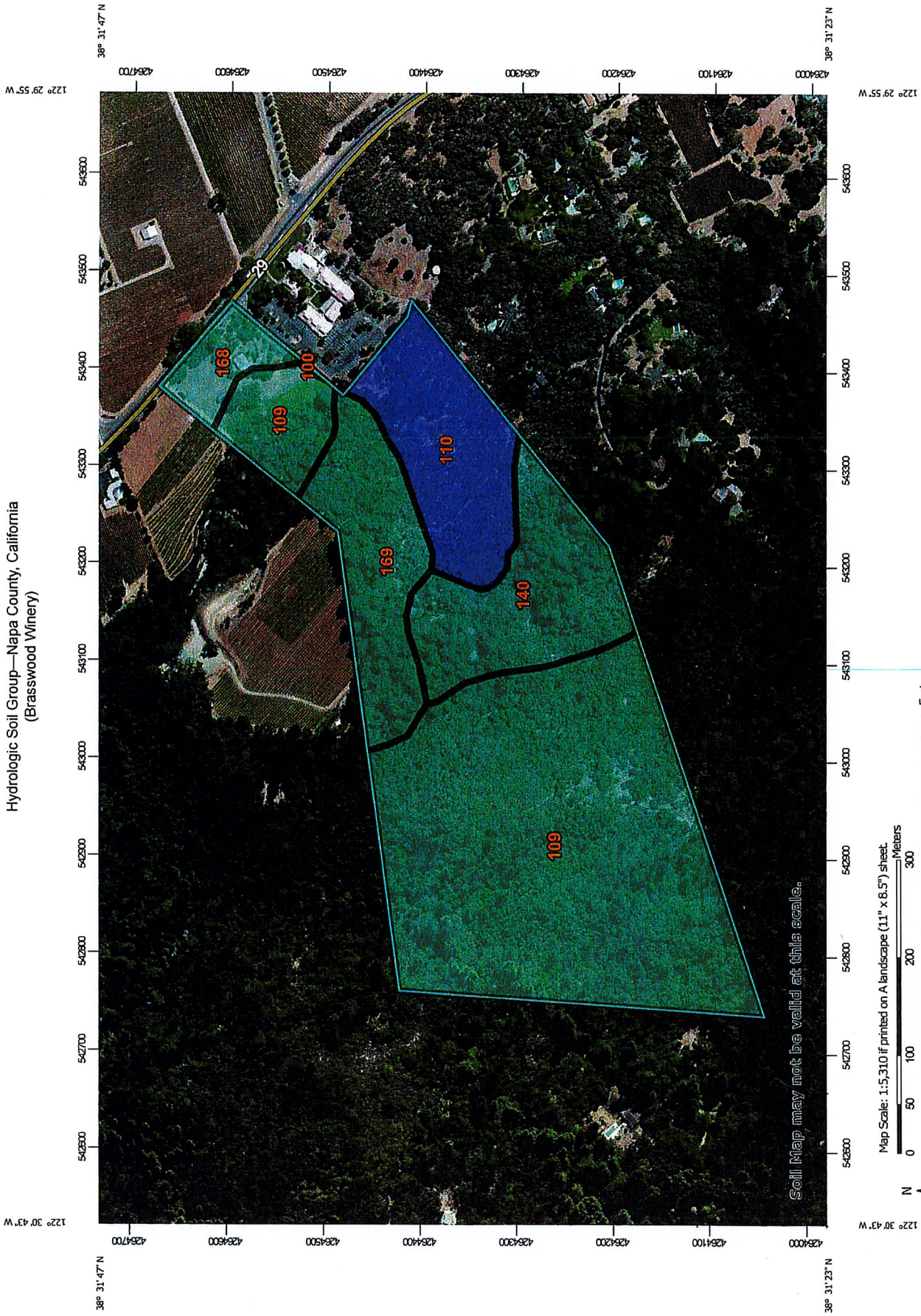
SITE DESCRIPTION	AREA (ACRES)
IMPERVIOUS AREA	2.33
VINEYARD AREA	0.59
GRASS AND SHRUBS	1.35
COASTAL OAK TREES	46.05
TOTAL SITE AREA	50.31

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08/03/2018 4/18/2020 Extr-Groundwater.dwg



Hydrologic Soil Group—Napa County, California
(Brasswood Winery)

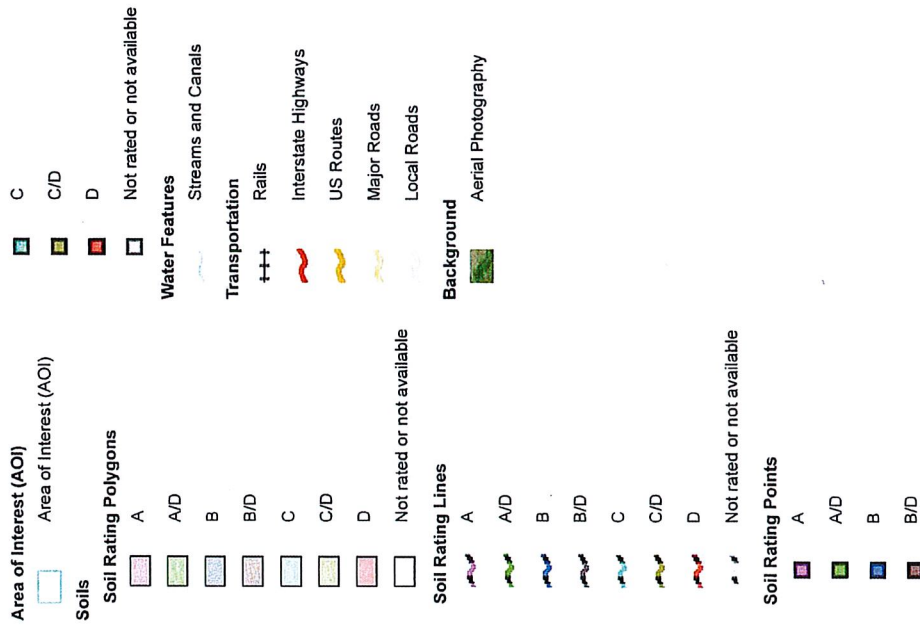


Soil Map may not be valid at this scale.

Map Scale: 1:5,310 if printed on A landscape (11" x 8.5") sheet.

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

MAP LEGEND



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:
 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 10, Sep 25, 2017

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

Date(s) aerial images were photographed: Nov 2, 2010—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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	Aiken loam, 2 to 15 percent slopes	C	0.0	0.1%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	C	30.6	57.3%
110	Boomer-Forward-Felta complex, 30 to 50 percent slopes	B	6.9	12.9%
140	Forward silt loam, 12 to 57 percent slopes, MLRA 15	C	7.5	14.0%
168	Perkins gravelly loam, 2 to 5 percent slopes	C	1.9	3.6%
169	Perkins gravelly loam, 5 to 9 percent slopes	C	6.5	12.1%
Totals for Area of Interest			53.4	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

TABLE 1. Crop coefficients used in daily modeling of soil water processes in vineyards, oak trees and grasslands

Vineyards		Oak trees		Grasslands	
Period	K _c	Period	K _c	Period	K _c
3/1-4/15	0.10	3/1-3/31	0.5	3/1-3/15	0.90
4/16-4/30	0.20	4/1-10/1	0.6	3/16-4/30	0.95
5/1-5/15	0.25	10/2-11/25	0.5	5/1-5/15	0.25
5/16-5/31	0.30	11/26-2/28	0.4	5/16-6/15*	0.10
6/1-6/15	0.35			6/16*-10/13	0.00
6/16-6/30	0.40			10/14-10/31	0.25
7/1-9/30	0.50			11/1-2/28	0.75
10/1-10/15	0.30				
10/16-10/31	0.20				
11/1-11/15	0.15				
11/16-11/30	0.05				
12/1-2/28	0.01				

Sources: Allen et al. 1998 (grasses and trees); Caprile 2007 (vineyards).

* Variable date depending on available soil moisture.

Oak Trees - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-3/31	31	0.5	15.5	
10/01	1	0.6	0.6	Weighted K _c =
10/2-11/25	55	0.5	27	80.7/182 = 0.44
11/26-2/28	95	0.4	37.6	
Totals=	182		80.7	

Vineyard - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-4/15	31	0.1	3.1	
10/1-10/15	15	0.3	4.5	
10/16-10/31	16	0.2	3.2	
11/1-11/15	15	0.15	2.25	Weighted K _c =
11/16-11/30	15	0.05	0.75	14.7/182 = 0.08
12/1-2/28	90	0.01	0.9	
Total=	182		14.7	

Grasslands - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-3/15	15	0.9	13.5	
3/16-3/31	16	0.95	15.2	Weighted K _c =
10/1-10/13	13	0.00	0.00	123.2/182 = 0.68
10/14-10/31	18	0.25	4.5	
11/1-2/28	120	0.75	90	
Totals=	182		123.2	

Grass & Shrubs

WATERSHED TYPES AND FACTORS

RUN-OFF PRODUCING CHARACTERISTICS OF WATERSHEDS SHOWING FACTORS FOR EACH CHARACTERISTIC FOR VARIOUS WATERSHED TYPES				
WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.20 0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt, and silt loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.06 0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.10 0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

Sum = 0.20 + 0.08 + 0.06 + 0.10 = 0.44

Coastal Oak Trees

WATERSHED TYPES AND FACTORS

WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.38 0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.12 0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt, and silt loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.08 0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.10 0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

Sum = 0.38 + 0.12 + 0.08 + 0.10 = 0.68

Vineyard Area

WATERSHED TYPES AND FACTORS

RUN-OFF PRODUCING CHARACTERISTICS OF WATERSHEDS SHOWING FACTORS FOR EACH CHARACTERISTIC FOR VARIOUS WATERSHED TYPES				
WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.14 0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.08 0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt, and silt loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.12 0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.10 0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

Sum = 0.14 + 0.08 + 0.12 + 0.10 = 0.44