Attachment 11

BARTELT ENGINEERING

April 2016
September 2016 - Revised
Job #14-41

RECEIVED
SEP 12 2016
CITY OF CALISTOGA

DRAINAGE ANALYSIS FOR AUBERT WINERY 333 SILVERADO TRAIL, CALISTOGA, CA 94515 APN 011-050-031

As required by the City of Calistoga Public Works Department, Bartelt Engineering has prepared a Drainage Analysis for the Aubert Winery Use Permit Modification project to compare pre-construction and post-construction peak storm water runoff.

A hydrology analysis was prepared based on the United States Department of Agriculture (USDA) Urban Hydrology for Small Watersheds Technical Release 55 (TR-55)[1] procedures for calculating storm runoff volume, peak rate of discharge, hydrographs and storage volumes.

PROJECT DESCRIPTION

The 2.0± acre subject parcel is currently developed with an existing winery, driveway, parking area, landscaping and grassland areas. The proposed project will consist of one (1) phase having a disturbed area of approximately 0.75± acres. The disturbed area includes the proposed winery building and driveway expansion, new employee parking and truck turnaround areas, as well as planters and equipment storage areas.

EXHIBITS

The attached Hydrology Exhibits show the site, approximate property line locations and locations of the existing structures and proposed development areas. The exhibits were created using topographic information taken from the "Topographic Map of the lands of RBC Wine Company" prepared by Terra Firma Surveys, Incorporated dated November 6, 2014 and Bartelt Engineering's Use Permit Drawings. Information on pre-construction (existing) and post-construction (proposed) conditions is also summarized on the exhibits. The parcel is entirely in Zone X which is defined as "areas determined to be outside the 0.2% annual chance floodplain" by FEMA[2] and therefore not impacted by a 500 year flood. Refer to the attached FIRM Exhibit for further information.

EXISTING SITE FEATURES

Slopes on the parcel range between zero (0) and 75 percent. According to the NRCS Soil Report, the soil types found on the parcel are primarily Bale Loam, (map symbol 103, Hydrologic Soil Group "B"), Clear Lake Clay (map symbol 117, Hydrologic Soil Group "C") and Forward-Kidd Complex (map symbol 141, Hydrologic Soil Group "B").

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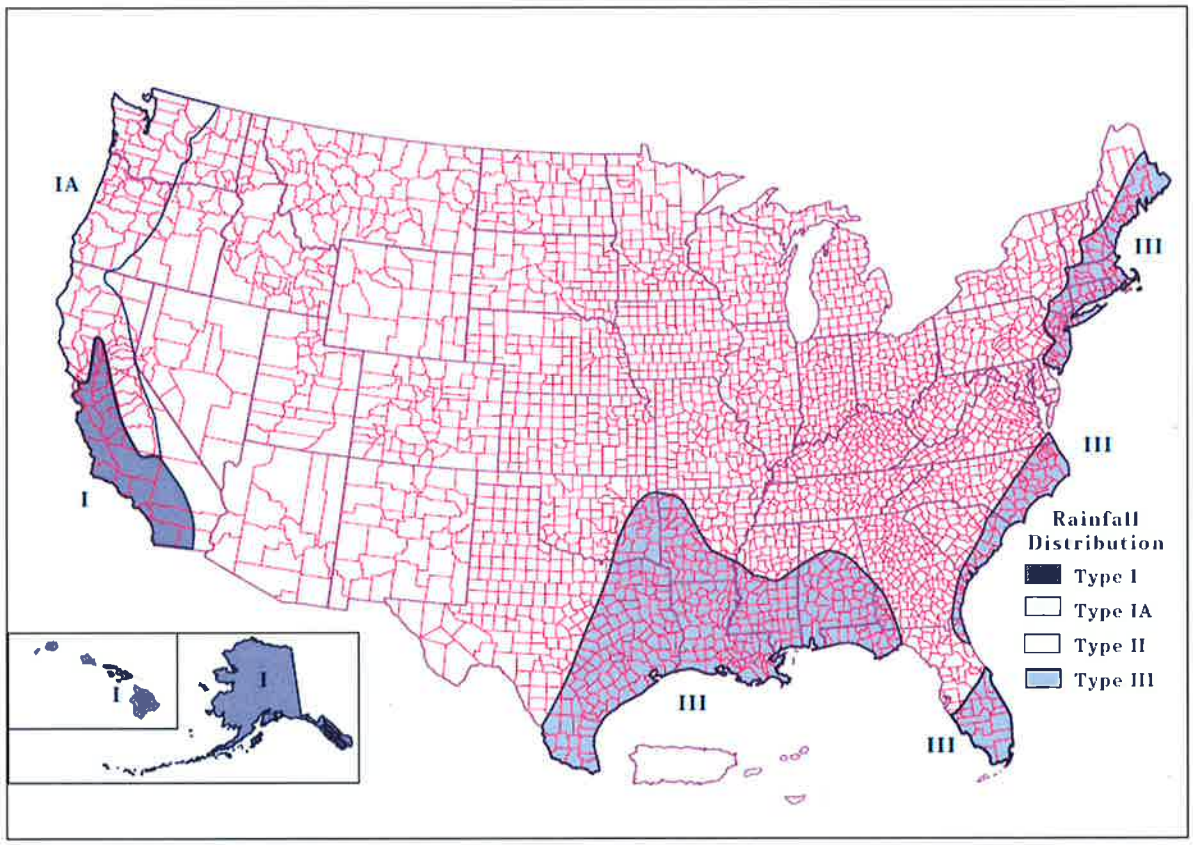
[1] United States Department of Agriculture (USDA). WinTR-55 Small Watershed Hydrology Software. 32-bit Window Based Application. Version 1.00.10, April 2011

[2] United States Department of Homeland Security, Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), 06055C0229E, effective on 09/26/2018.

RAINFALL

Rainfall data used in the TR-55 procedures includes four (4) regional rainfall time distributions (Types I, IA, II, and III) all over a 24-hour period. The rainfall distributions are based on geographic boundaries which are shown on the following figure:

FIGURE 1: APPROXIMATE GEOGRAPHIC BOUNDARIES FOR RAINFALL DISTRIBUTIONS



The 24-hour rainfall data utilized in this analysis are based on point precipitation frequency estimations provided by National Oceanic Atmosphere Administration (NOAA)[3] for a Type 1A rainfall distribution. The table below summarizes the precipitation (rainfall) over various storm recurrence intervals (storm frequency):

[3] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS) from NOAA Atlas 14, Volume 6, Version 2; location name: Calistoga, CA, US, latitude: 38.5820°, longitude: -122.5662° and elevation: 345 ft.

TABLE 1: RAINFALL DATA FOR A 24-HOUR PERIOD			
Storm Frequency:	2-Yr	10-Yr	100-Yr
Rainfall (in):	4.99	7.55	11.6

See the attached rainfall distribution for further information.

TIME OF CONCENTRATION

The time of concentration (Tc) represents the time it takes for runoff to travel to a point of interest from the hydraulically most distant point. A time of concentration was determined for both existing and proposed conditions as described below.

Existing Conditions

Based on existing conditions, initial overland sheet flow at the furthest extent of the drainage area is limited to 100 feet through light woods with an average slope of 17.0%. Overland sheet flow transitions to shallow concentrated flow and travels for approximately 47 feet over unpaved areas followed by 243 feet over paved areas and 189 feet over unpaved areas. The average slope for the shallow concentrated unpaved and paved areas is 0.5%. Based on these parameters the total time of concentration for this drainage area at the point of concentration was calculated to be approximately 0.155 hours or 9.3± minutes.

Proposed Conditions

Based on proposed conditions, initial overland sheet flow at the furthest extent of the drainage area is limited to 100 feet through light woods with an average slope of 17.0%. Overland sheet flow transitions to shallow concentrated flow and travels for approximately 47 feet over unpaved areas followed by 379 feet over paved areas. The average slope for the shallow concentrated unpaved and paved areas is 0.5%. Based on these parameters the total time of concentration for this drainage area at the point of concentration was calculated to be approximately 0.149 hours or 8.9± minutes.

LAND USE AND CURVE NUMBER DETAILS

As part of the analysis, the parcel was subdivided into areas based on the type of land use (i.e. pavement, gravel, grassland, etc.), soil type and condition (i.e. good, fair or poor). A runoff curve number is assigned based on the land use information and hydrologic soil group. A curve number is an empirical value which aids in predicting storm water runoff or infiltration. A lower curve number means a lower potential for runoff and a higher curve number means a higher potential for runoff.

These subdivided areas are shown on the attached Hydrology Exhibits and summarized in the following tables for both the pre-construction (existing) conditions and post-construction (proposed) conditions.

TABLE 2A: PRE-CONSTRUCTION LAND USE AREAS AND CURVE NUMBER DETAILS

Land Use	Condition	Hydrologic Soil Group	Area (acres)	Curve Number
Paved parking lots, roofs, driveways		B	0.54±	98
Open space; grass cover > 75% *(includes planters)*	Good	B	0.01±	61
Pasture, grassland or range	Fair	B	0.73±	69
Wooded – grass combination	Fair	B	0.46±	65
	Fair	C	0.26±	76
Total Area			2.00±	
Total Weighted Curve Number				77

TABLE 2B: POST-CONSTRUCTION LAND USE AREAS AND CURVE NUMBER DETAILS

Land Use	Condition	Hydrologic Soil Group	Area (acres)	Curve Number
Paved parking lots, roofs, driveways		B	0.890±	98
Permeable Pavers		B	0.039±	75
Gravel areas		B	0.007±	85
Open space; grass cover > 75% *(includes planters)*	Good	B	0.015±	61
Pasture, grassland or range	Fair	B	0.35±	69
Woods – grass combination	Fair	B	0.46±	65
	Fair	C	0.26±	76
Total Area			2.00±	
Total Weighted Curve Number				82

The total area and weighted curve number is then used to determine the stormwater runoff for the site as calculated in the following section.

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HYDROLOGY RESULTS

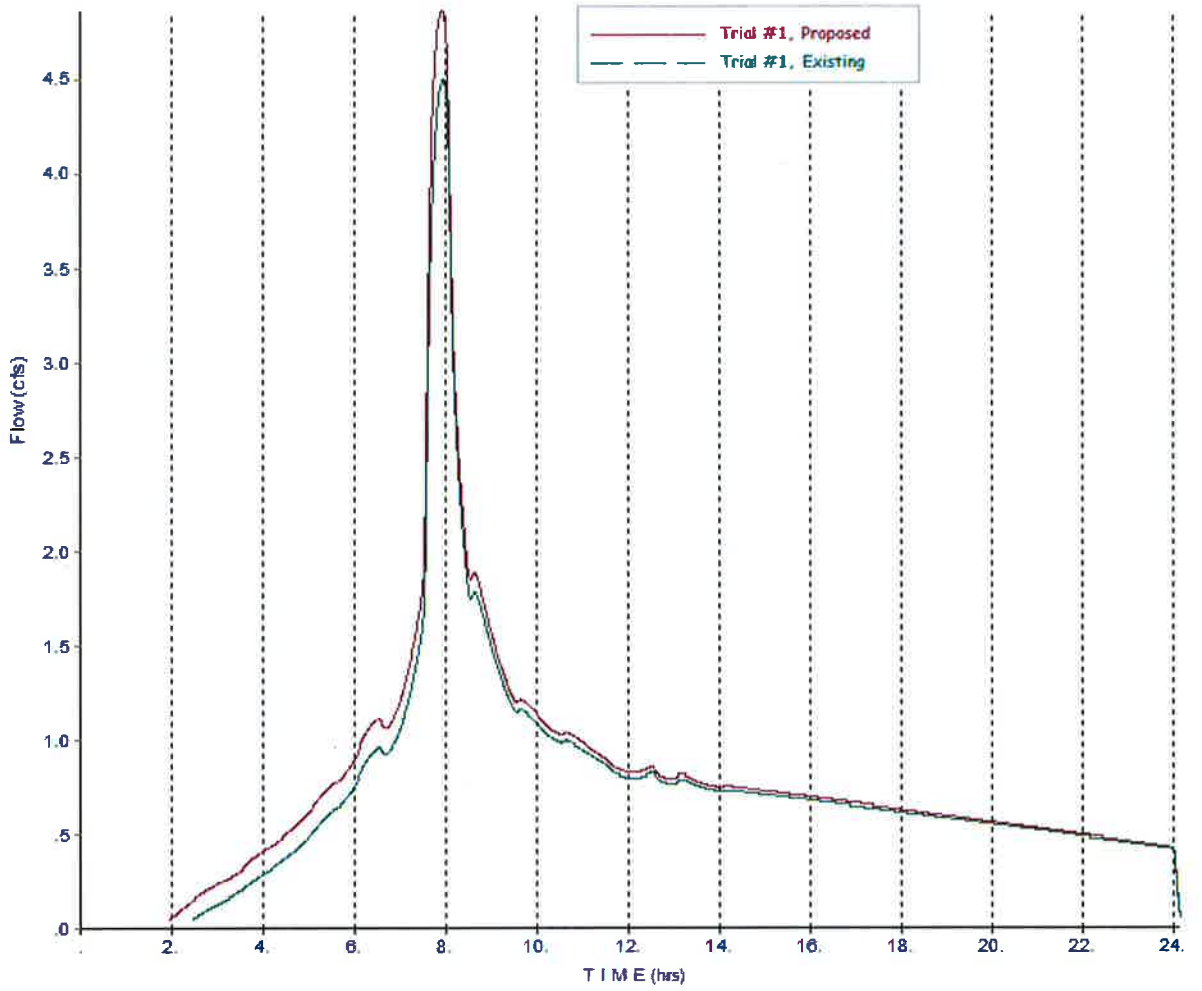
The calculated 2 year, 10 year and 100 year 24-hour peak runoff flow rate at the point of concentration for the pre-construction (existing) and post-construction (proposed) drainage area conditions are as follows:

TABLE 3: HYDROLOGY SUMMARY

Storm Event	Parameter	Pre-Construction (Existing Conditions)	Post-Construction (Proposed Conditions)	Difference (Proposed - Existing Conditions)
2 Year	Runoff Amount (in)	2.60	3.06	0.46
	Tc (hr)	8.00	7.95	-0.05
	Rate (cfs)	1.25	1.54	0.29
10 Year	Runoff Amount (in)	4.86	5.43	0.57
	Tc (hr)	7.95	7.94	-0.01
	Rate (cfs)	2.46	2.81	0.35
100 Year	Runoff Amount (in)	8.65	9.32	0.67
	Tc (hr)	7.94	7.93	-0.01
	Rate (cfs)	4.50	4.87	0.37

As part of the proposed improvements the difference between the post-construction and pre-construction runoff rate will be detained onsite. As shown in the above table, the difference in runoff is calculated to be 0.67 inches for the 100 year storm event. A hydrograph showing the existing and proposed flow rate over a 24-hour period for the 100 year storm event is shown in the figure below.

FIGURE 2: HYDROGRAPH FOR A 100 YEAR STORM EVENT



See the attached hydrographs for the 2 year, 10 year, and 100 year 24-hour storm events.

DETENTION BASIN STORAGE

A detention/infiltration basin and bioretention/infiltration basin are proposed to store the difference between the post-construction and pre-construction runoff volume for all storm events up to and including the 100 year 24-hour storm. The runoff volume stored in the basins is proposed to infiltrate into the ground and/or be released offsite at the pre-construction runoff rate via an overflow structure. The minimum runoff storage volume is calculated below:

Runoff Volume (acre-feet) = Runoff Amount (in) x Drainage Area (mi^2)

$$\text{Runoff Volume} = 0.67 \times \left(2 \text{ acres} \times \frac{1 \text{ mi}^2}{640 \text{ acres}}\right) \times 53.33 = 0.112 \text{ acre-feet}$$

The proposed basins are sized to store a minimum of 0.088 acre-feet of runoff (4,864 ft^3).

Detention/infiltration Basin

In general surface drainage from the proposed improvements is directed to the infiltration/detention basin that is proposed to be located under the truck turnaround area equipped with permeable pavers. Stormwater runoff that lands and is directed to the permeable pavers will percolate down through the pavers, filter through the crushed rock and permeable material layers before infiltrating into the native subgrade soil. Rainfall-stormwater volumes that exceed the infiltration rate of the native subgrade soil will be temporary stored in the void space of the drain rock underlying the truck turnaround area and allowed to infiltrate over time into the native subgrade soil. Collected stormwater that exceeds the storage volume will overflow into the bioretention basin located adjacent and at a lower gradient than the infiltration/detention basin.

Based on the proposed truck turnaround permeable paver design, stormwater is proposed to be stored in the void space of the permeable pavement subbase. The surface area of the proposed permeable paver truck turnaround is approximately 65 feet long by 25 feet wide. This equates to a surface area of 1,625 ft^2. Assuming a 40% void volume in the permeable pavement subbase and a subbase depth of 4.5 feet, the detention/infiltration basin has a storage volume of approximately 2,925 ft^3. Refer to the attached Permable Paver Section detail for a description of the proposed design.

Bioretention/infiltration Basin

The proposed bioretention/infiltration basin has a surface area of 648 ft^2 to satisfy drainage design requirements (bioretention facility BRF-A) as demonstrated in the Stormwater Control Plan[4] prepared by Bartelt Engineering and submitted in conjunction with this Use Permit Modification Application. With a proposed depth of 3 feet and a 1:1 side slope, the proposed detention/infiltration basin has a storage volume of 1,944 ft^3.

[4] The associated Bay Area Stormwater Agencies Association (BASMAA) Stormwater Control Plan provides calculations to meet EPA NPDES Phase II design requirements.

Total Storage Volume Provided

The total volume of storage provided for stormwater runoff is the sum of the infiltration/detention basin volume and the bioretention/infiltration basin volume. The total storage volume provided is calculated below:

Total Storage Volume = Infiltration/detention Basin Volume + Bioretention/infiltration Basin Volume

Total Storage Volume = 1,944 ft^3 + 2,925 ft^3 = 4,869 ft^3

The total storage volume provided (4,869 ft^3) is greater than the required minimum runoff storage volume (4,864 ft^3).

CONCLUSIONS

As demonstrated in this hydrology analysis, the peak storm water runoff rate is projected to slightly increase as a result of the proposed project development. The proposed detention/infiltration and bioretention/infiltration basins are sized to store the difference between the post-construction and pre-construction runoff volume for all storm events up to and including the 100 year 24-hour storm and be released at pre-construction rates. If the capacity of the bioretention/infiltration basin is exceeded, water would overflow and exit the parcel into the existing drainage course located near the vineyard avenue and access road located on APN 011-050-007. The proposed detention/infiltration basin satisfies NPDES Phase II design requirements for post-construction.

Full design calculations and construction plans will be completed after approval of the Use Permit Modification under consideration.

ATTACHMENTS

Pre-Construction Hydrology Exhibit

Post-Construction Hydrology Exhibit

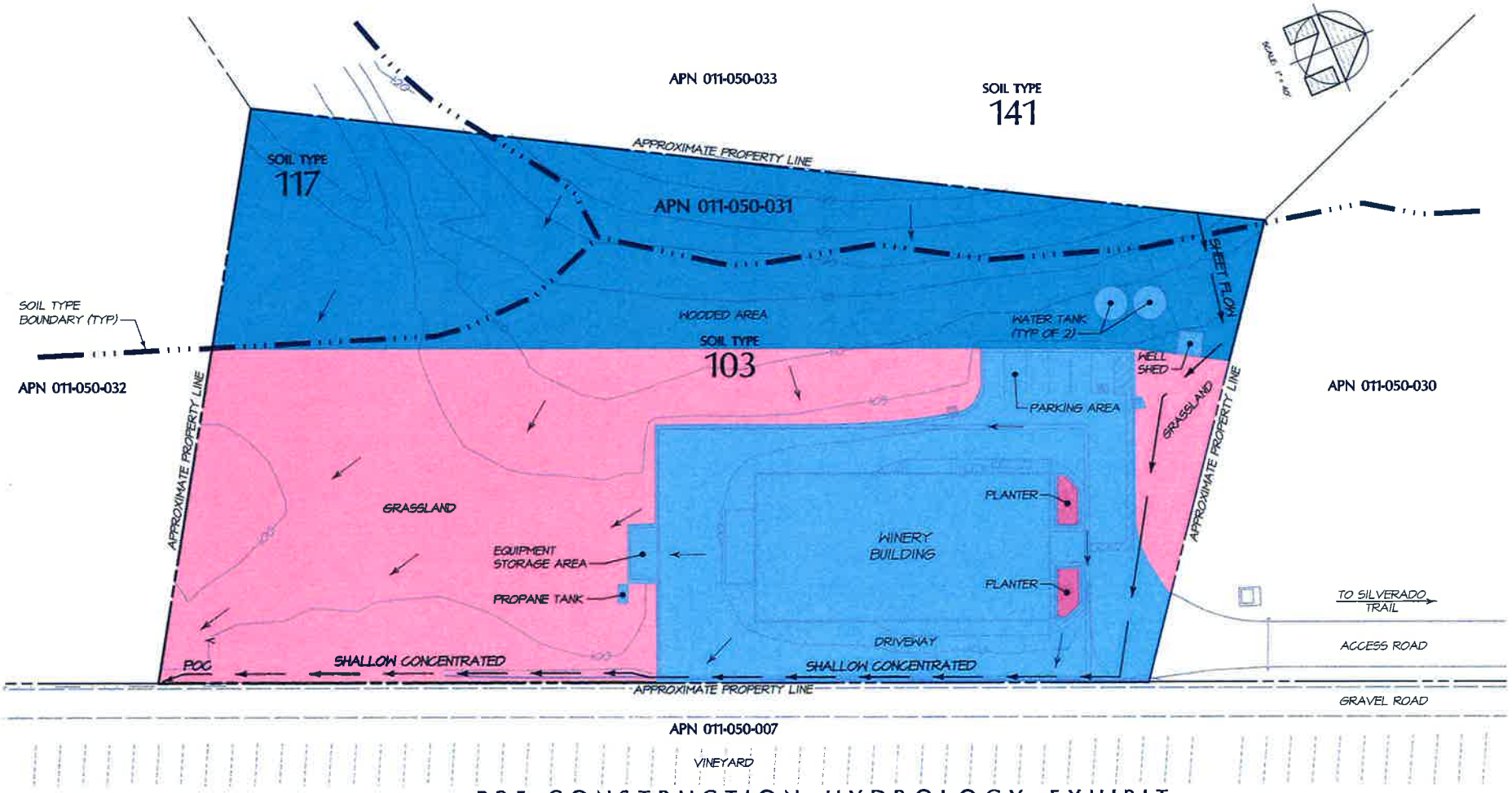
Permeable Paver Section Detail

Flood Insurance Rate Map

Custom Soil Resource Report

Rainfall Data

Tr-55 Software Output and Hydrographs



PRE-CONSTRUCTION HYDROLOGY EXHIBIT

SCALE: 1" = 40'

BARTELT ENGINEERING
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1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

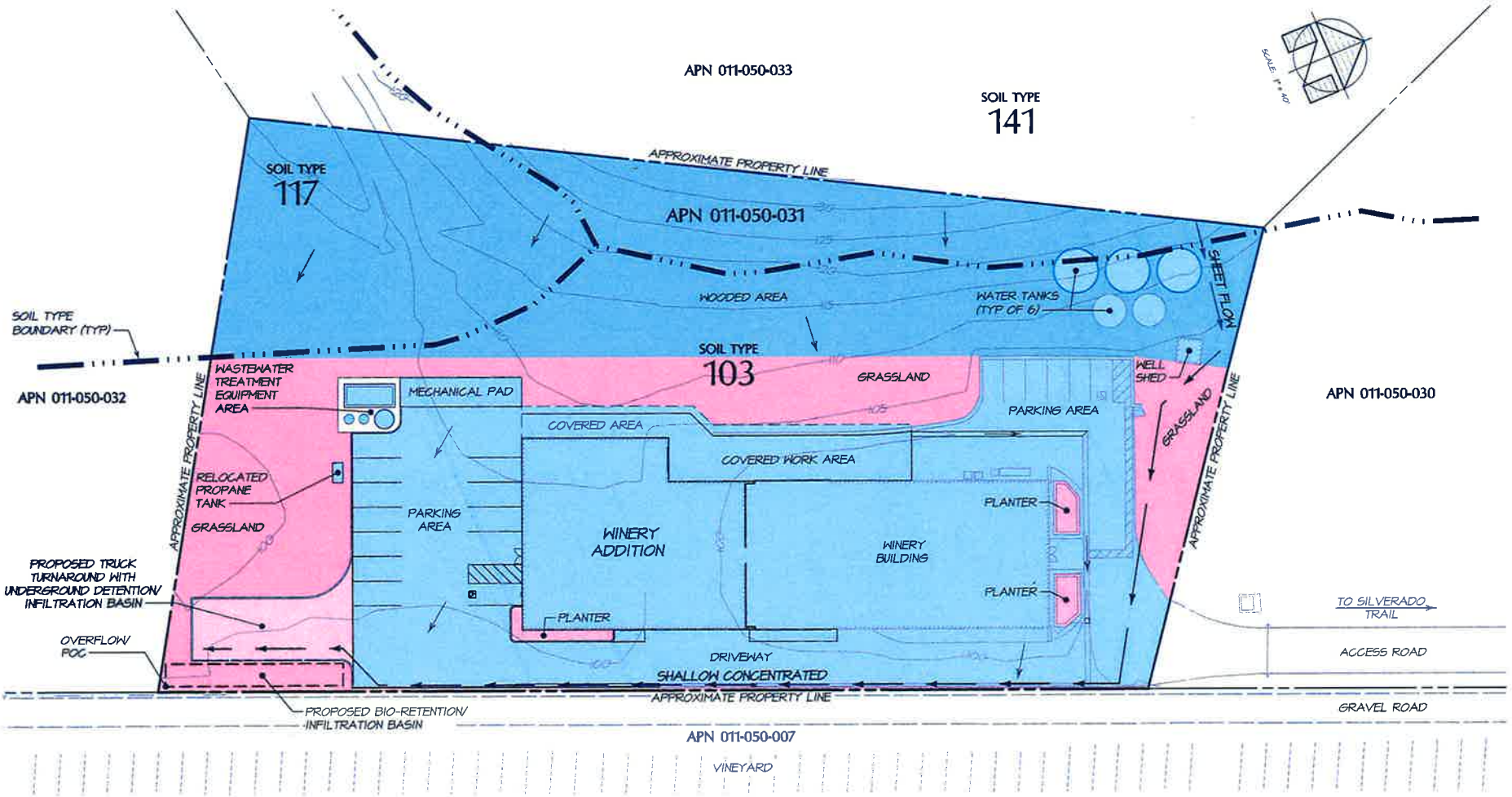
TIME OF CONCENTRATION

FLOW TYPE	LENGTH (FT)	SLOPE (FT/FT)	TIME (HR)
SHEET FLOW	100	0.17	0.122
SHALLOW CONCENTRATED	479	0.05	0.033
TOTAL	579		0.155

DRAINAGE AREAS

EXISTING AREAS	SQUARE FEET	ACRES
BUILDING & PAVEMENT	23,545±	0.54±
PLANTERS	300±	0.01±
GRASSLAND	31,998±	0.73±
WOODED AREA	31,277±	0.72±
TOTAL	87,120±	2.00±

Aubert Winery
333 Silverado Trail
Calistoga, CA 94515
011-050-031
Job No. 14-41
September 2016
Sheet 1 of 2



POST-CONSTRUCTION HYDROLOGY EXHIBIT

SCALE: 1" = 40'

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TIME OF CONCENTRATION

FLOW TYPE	LENGTH (FT)	SLOPE (FT/FT)	TIME (HR)
SHEET FLOW	100	0.17	0.122
SHALLOW CONCENTRATED	426	0.05	0.027
TOTAL	526		0.149

DRAINAGE AREAS

PROPOSED AREAS	SQUARE FEET	ACRES
BUILDING, PAVEMENT & STRUCTURES	38,718±	0.89±
GRAVEL AREAS	286±	0.01±
PERMEABLE PAVERS	1,716±	0.04±
PLANTERS	657±	0.01±
GRASSLAND	15,146±	0.35±
WOODED AREA	30,537±	0.70±
TOTAL	87,120±	2.00±

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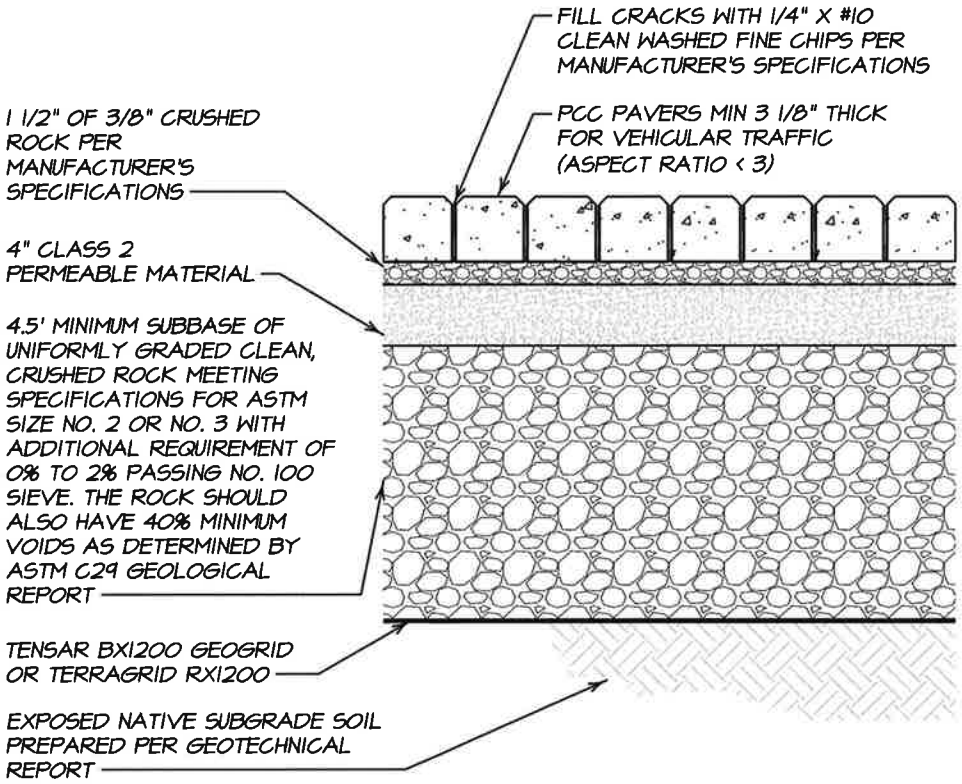
Sheet 2 of 2

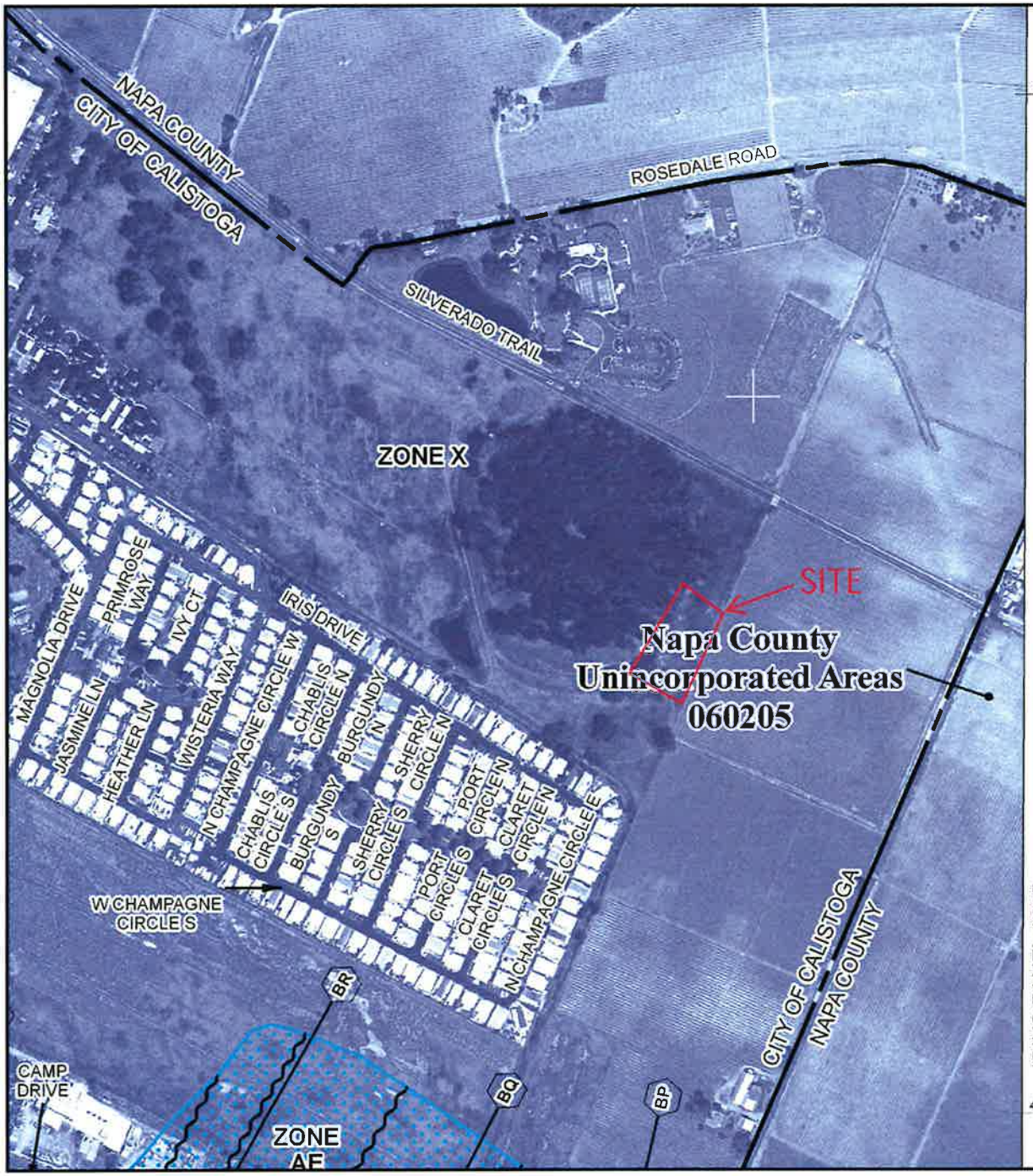


NOTES:

1. DESIGN, MATERIAL, AND CONSTRUCTION GUIDELINES TO FOLLOW MANUFACTURER'S SPECIFICATIONS.
2. ALL SOIL SUBGRADES SHALL SLOPE TOWARD ANY PROPOSED SUBDRAINS.
3. SUBGRADE SOIL MAXIMUM CROSS SLOPE IS TWO (2) PERCENT. MAXIMUM LONGITUDINAL SLOPE IS 0.5 PERCENT TOWARD ANY PROPOSED STORM DRAINS.

PERMEABLE PAVER SECTION

NO SCALE



MAP SCALE 1" = 500'

250 0 500 1000 FEET

METER

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0229E

FIRM

FLOOD INSURANCE RATE MAP

NAPA COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 229 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CALISTOGA, CITY OF	060205	0229	E
NAPA COUNTY	060205	0229	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06055C0229E

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency

JOINS PANEL 0225

Custom Soil Resource Report
Soil Map

Map Scale: 1:849 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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: 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.

Map Unit Legend

Napa County, California (CA055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
103	Bale loam, 0 to 2 percent slopes	1.5	80.4%
117	Clear Lake clay, overwashed	0.2	13.0%
141	Forward-Kidd complex, 50 to 75 percent slopes	0.1	6.6%
Totals for Area of Interest		**1.9**	**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

103—Bale loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdk3
Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Alluvial fans

117—Clear Lake clay, overwashed

Map Unit Setting

National map unit symbol: hdkk
Elevation: 1,500 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Clear Lake

Setting

Landform: Basin floors, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 18 inches: fine sandy loam
H2 - 18 to 69 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C

141—Forward-Kidd complex, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hdlb
Elevation: 400 to 4,500 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 54 to 55 degrees F
Frost-free period: 200 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Forward and similar soils: 60 percent
Kidd and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Forward

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 rhyolite

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 35 inches: loam, gravelly loam
H2 - 4 to 35 inches: weathered bedrock
H3 - 35 to 59 inches:

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 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 (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B

Description of Kidd

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 14 to 18 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D

NOAA Atlas 14, Volume 6, Version 2
Location name: Calistoga, California, US*
Latitude: 38.5820°, Longitude: -122.5662°
Elevation: 347 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.156 (0.139-0.178)	0.189 (0.168-0.215)	0.232 (0.206-0.265)	0.267 (0.234-0.308)	0.315 (0.266-0.377)	0.352 (0.290-0.432)	0.390 (0.312-0.492)	0.429 (0.333-0.559)	0.483 (0.357-0.659)	0.525 (0.374-0.746)
10-min	0.224 (0.199-0.255)	0.271 (0.241-0.309)	0.333 (0.295-0.380)	0.383 (0.336-0.441)	0.452 (0.381-0.541)	0.505 (0.416-0.619)	0.559 (0.448-0.705)	0.615 (0.477-0.801)	0.692 (0.512-0.945)	0.753 (0.536-1.07)
15-min	0.271 (0.241-0.308)	0.328 (0.291-0.373)	0.403 (0.356-0.459)	0.463 (0.406-0.534)	0.546 (0.461-0.654)	0.610 (0.503-0.748)	0.676 (0.541-0.852)	0.744 (0.577-0.968)	0.837 (0.620-1.14)	0.911 (0.648-1.29)
30-min	0.398 (0.354-0.452)	0.481 (0.427-0.547)	0.590 (0.522-0.673)	0.679 (0.596-0.783)	0.801 (0.676-0.959)	0.895 (0.737-1.10)	0.991 (0.794-1.25)	1.09 (0.846-1.42)	1.23 (0.908-1.68)	1.34 (0.950-1.90)
60-min	0.578 (0.514-0.656)	0.699 (0.621-0.795)	0.858 (0.759-0.979)	0.987 (0.866-1.14)	1.16 (0.982-1.39)	1.30 (1.07-1.60)	1.44 (1.15-1.82)	1.59 (1.23-2.06)	1.78 (1.32-2.44)	1.94 (1.38-2.76)
2-hr	0.883 (0.785-1.00)	1.06 (0.942-1.21)	1.29 (1.14-1.47)	1.47 (1.29-1.69)	1.71 (1.45-2.05)	1.90 (1.56-2.32)	2.08 (1.66-2.62)	2.26 (1.75-2.94)	2.51 (1.86-3.42)	2.69 (1.92-3.82)
3-hr	1.14 (1.01-1.29)	1.36 (1.21-1.55)	1.65 (1.46-1.89)	1.88 (1.65-2.17)	2.18 (1.84-2.61)	2.41 (1.98-2.95)	2.63 (2.10-3.31)	2.85 (2.21-3.71)	3.14 (2.32-4.28)	3.36 (2.39-4.76)
6-hr	1.72 (1.53-1.95)	2.08 (1.85-2.37)	2.53 (2.24-2.89)	2.88 (2.52-3.32)	3.33 (2.81-3.99)	3.66 (3.02-4.49)	3.98 (3.19-5.02)	4.30 (3.34-5.60)	4.71 (3.49-6.43)	5.02 (3.57-7.12)
12-hr	2.44 (2.17-2.77)	3.05 (2.71-3.47)	3.81 (3.37-4.34)	4.39 (3.85-5.05)	5.12 (4.32-6.13)	5.65 (4.65-6.93)	6.16 (4.93-7.77)	6.65 (5.16-8.66)	7.28 (5.39-9.94)	7.74 (5.51-11.0)
24-hr	3.37 (3.03-3.83)	4.39 (3.94-4.99)	5.63 (5.04-6.41)	6.58 (5.86-7.55)	7.79 (6.74-9.18)	8.65 (7.36-10.4)	9.48 (7.91-11.6)	10.3 (8.38-12.9)	11.3 (8.90-14.7)	12.1 (9.22-16.1)
2-day	4.45 (4.00-5.05)	5.77 (5.18-6.56)	7.44 (6.66-8.47)	8.74 (7.78-10.0)	10.5 (9.05-12.3)	11.7 (9.97-14.1)	13.0 (10.8-15.9)	14.2 (11.6-17.8)	15.8 (12.4-20.5)	17.0 (13.0-22.7)
3-day	5.20 (4.68-5.91)	6.70 (6.02-7.62)	8.64 (7.74-9.84)	10.2 (9.06-11.7)	12.3 (10.6-14.4)	13.8 (11.8-16.6)	15.4 (12.8-18.8)	17.0 (13.8-21.3)	19.1 (15.0-24.8)	20.7 (15.8-27.7)
4-day	5.82 (5.23-6.60)	7.48 (6.71-8.50)	9.63 (8.63-11.0)	11.4 (10.1-13.0)	13.7 (11.9-16.2)	15.5 (13.2-18.6)	17.3 (14.4-21.2)	19.1 (15.6-24.0)	21.6 (17.0-28.0)	23.5 (18.0-31.4)
7-day	7.18 (6.45-8.16)	9.21 (8.27-10.5)	11.8 (10.6-13.5)	14.0 (12.4-16.0)	16.9 (14.6-19.9)	19.1 (16.2-22.9)	21.3 (17.8-26.1)	23.6 (19.2-29.6)	26.7 (21.0-34.7)	29.1 (22.3-38.9)
10-day	8.17 (7.34-9.28)	10.5 (9.40-11.9)	13.4 (12.0-15.3)	15.8 (14.1-18.2)	19.0 (16.5-22.4)	21.4 (18.2-25.7)	23.9 (19.9-29.2)	26.3 (21.5-33.0)	29.6 (23.3-38.4)	32.2 (24.6-42.9)
20-day	10.8 (9.71-12.3)	13.9 (12.5-15.8)	17.7 (15.9-20.2)	20.7 (18.4-23.7)	24.5 (21.2-28.9)	27.3 (23.3-32.8)	30.0 (25.0-36.8)	32.7 (26.6-41.0)	36.1 (28.4-46.9)	38.7 (29.5-51.6)
30-day	13.1 (11.7-14.8)	16.8 (15.0-19.1)	21.3 (19.1-24.2)	24.7 (22.0-28.3)	29.0 (25.1-34.2)	32.1 (27.3-38.5)	35.0 (29.2-42.8)	37.8 (30.8-47.4)	41.4 (32.6-53.7)	43.9 (33.6-58.7)
45-day	16.0 (14.4-18.2)	20.5 (18.4-23.3)	25.8 (23.1-29.3)	29.7 (26.4-34.1)	34.5 (29.9-40.7)	37.9 (32.3-45.5)	41.1 (34.3-50.3)	44.1 (35.9-55.2)	47.7 (37.6-61.9)	50.3 (38.5-67.2)
60-day	19.0 (17.1-21.6)	24.2 (21.7-27.5)	30.2 (27.0-34.3)	34.6 (30.7-39.6)	39.9 (34.5-47.0)	43.6 (37.1-52.2)	46.9 (39.1-57.4)	50.1 (40.8-62.7)	53.9 (42.4-69.9)	56.6 (43.2-75.6)

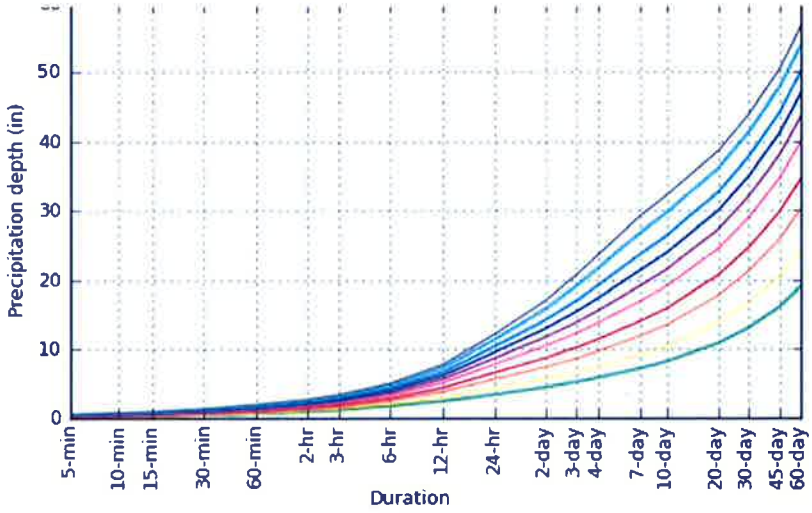
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

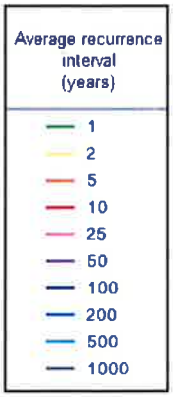
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

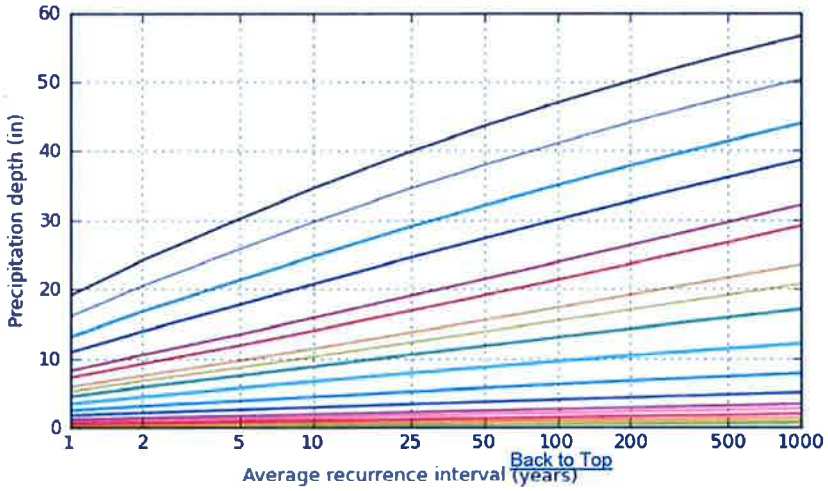
Please refer to NOAA Atlas 14 document for more information.

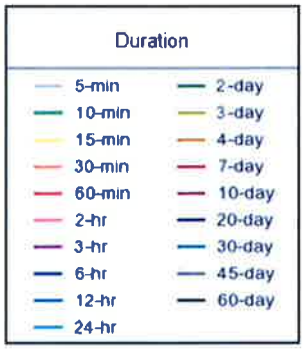
Back to Top

PF graphical









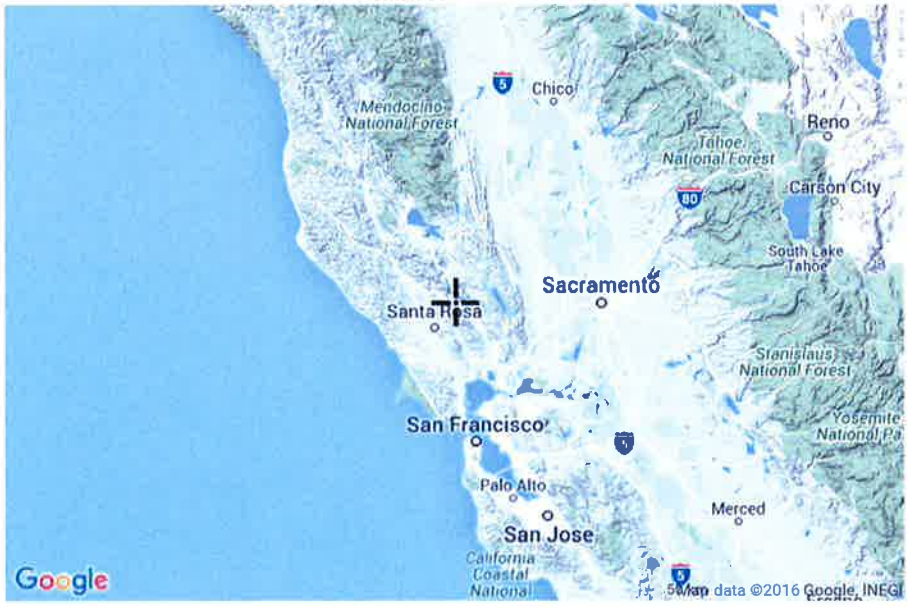
Back to Top

NOAA Atlas 14, Volume 6, Version 2

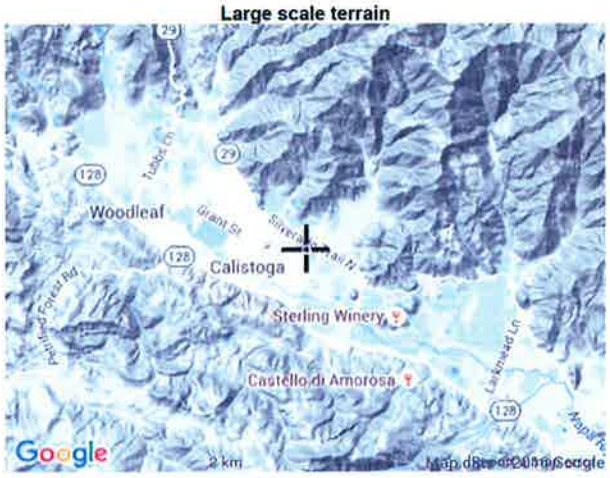
Maps & aerials

Created (GMT): Fri Feb 19 19:42:04 2016

Small scale terrain

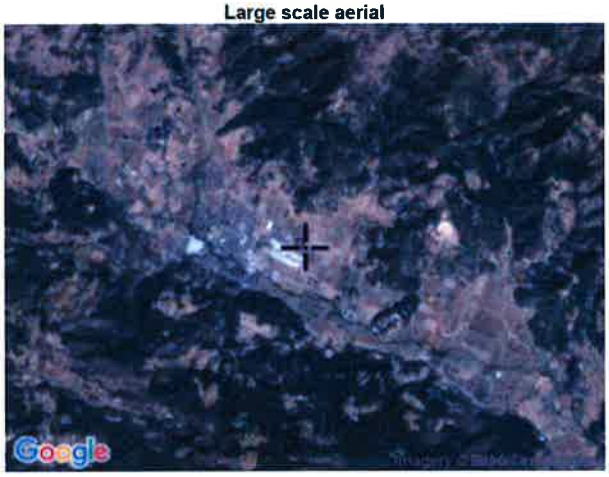


Large scale terrain



Large scale map

Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910

Project: Aubert Winery

Subareas: (Proposed, Existing) Storm: 10-Yr

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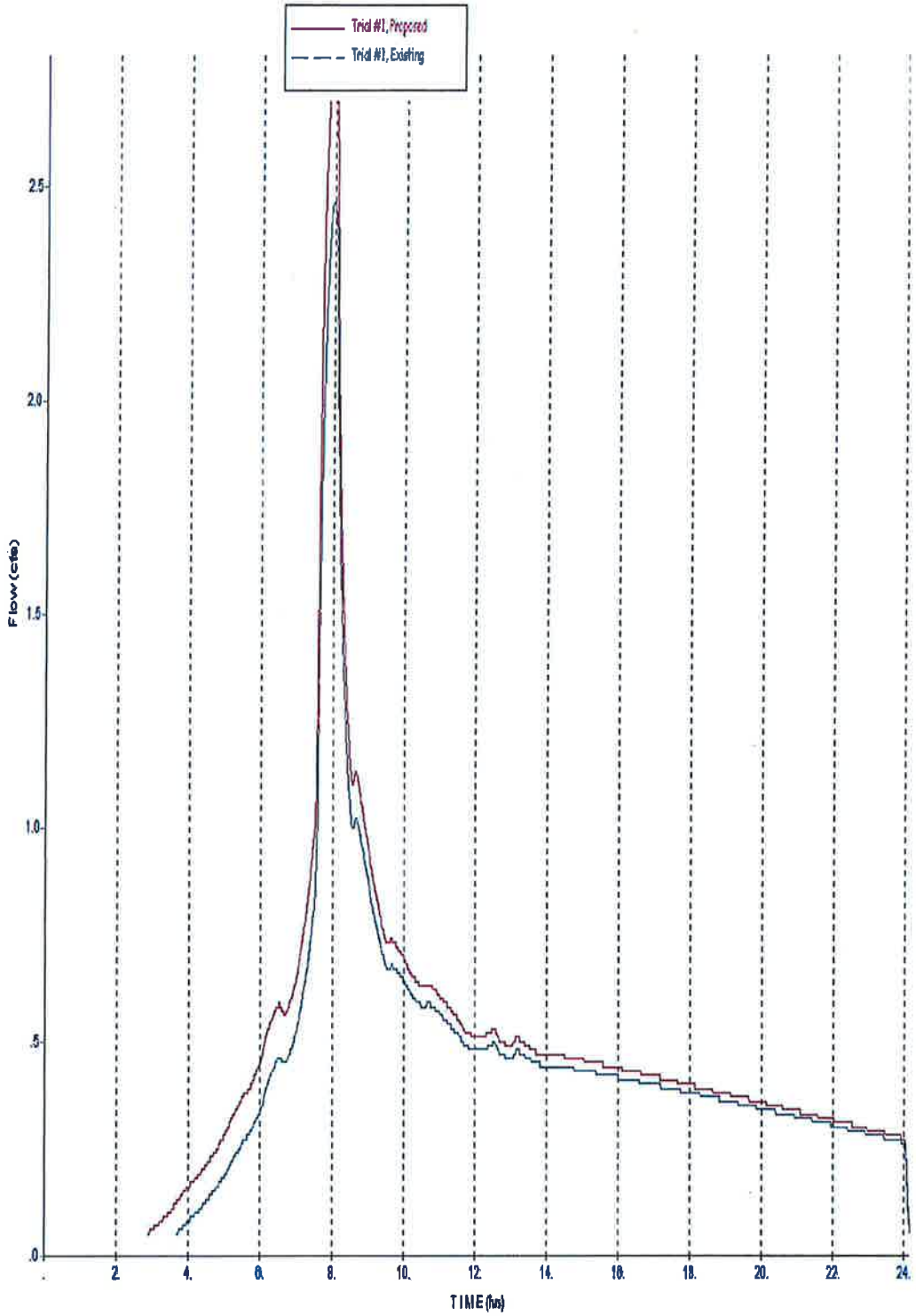

Project: Aubert Winery

Subareas: (Proposed, Existing) Storm: 100-Yr

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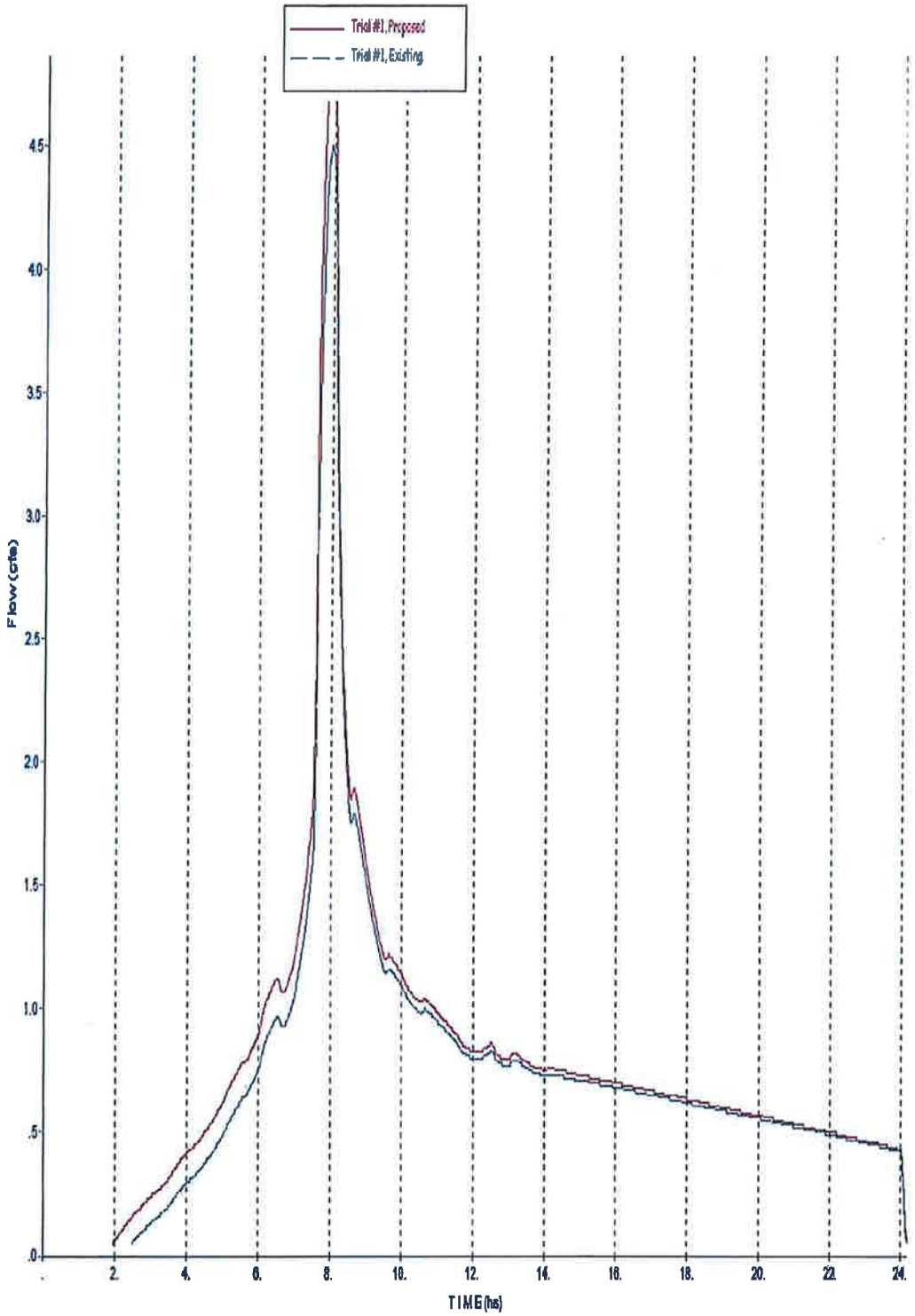

Project: Aubert Winery

Subareas: (Proposed, Existing) Storm: 2-Yr

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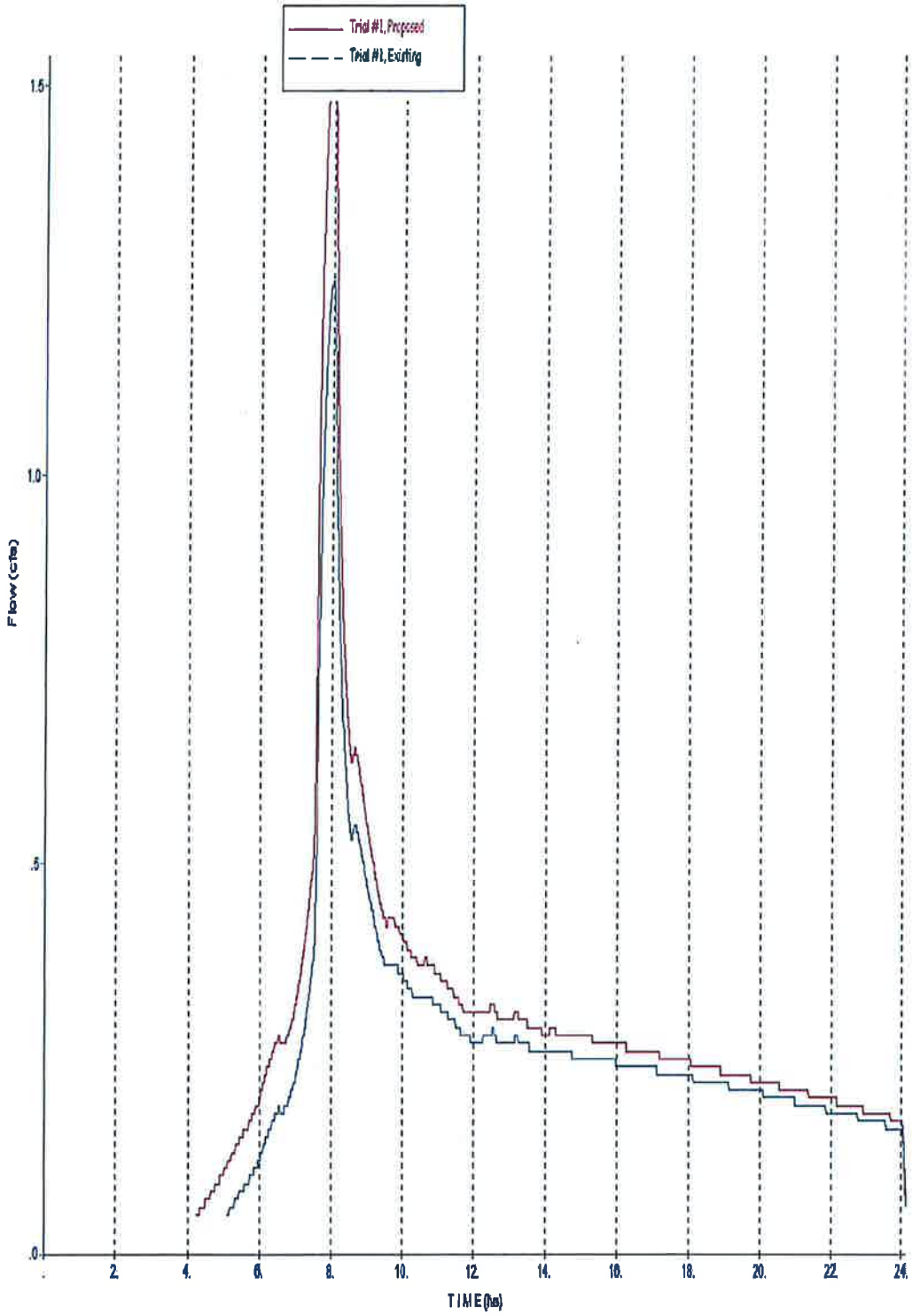

WinTR-55 Current Data Description

--- Identification Data ---

User: Christina
Project: Aubert Winery
SubTitle:
State: California
County: Napa
Filename: S:\MyFiles\Correspondence\1441\2015 UP MOD\Reports\BE\Stormwater\Drainage\Working\Hydrolog

Date: 9/10/2016
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Proposed		Outlet	2	82	.149
Existing		Outlet	2	77	.155

Total area: 4 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
4.99	.0	7.55	.0	.0	11.6	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type IA
Dimensionless Unit Hydrograph: <standard>

Christina

Aubert Winery

Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
4.99	.0	7.55	.0	.0	11.6	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type IA
Dimensionless Unit Hydrograph: <standard>

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Napa County, California

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
SUBAREAS			
Proposed	1.54	2.81	4.87
Existing	1.25	2.46	4.50
REACHES			
OUTLET	2.78	5.28	9.36

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Aubert Winery

Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS						
Proposed	1.54	7.95	2.81	7.94	4.87	7.93
Existing	1.25	8.00	2.46	7.95	4.50	7.94
REACHES						
OUTLET	2.78		5.28		9.36	

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Napa County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Proposed	2.00	0.149	82	Outlet	
Existing	2.00	0.155	77	Outlet	

Total Area: 4 (ac)

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Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Proposed							
SHEET	100	0.1700	0.400				0.122
SHALLOW	47	0.0500	0.050				0.004
SHALLOW	379	0.0500	0.025				0.023
					Time of Concentration		.149
Existing							
SHEET	100	0.1700	0.400				0.122
SHALLOW	236	0.0500	0.050				0.018
SHALLOW	243	0.0500	0.025				0.015
					Time of Concentration		.155

Christina Aubert Winery

Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Proposed	Open space; grass cover > 75%	(good)	B	.01	61
	Paved parking lots, roofs, driveways		B	.89	98
	Gravel (w/ right-of-way)		B	.01	85
	User defined urban (Click button or		B	.04	75
	Pasture, grassland or range	(fair)	B	.35	69
	Woods - grass combination	(fair)	B	.44	65
	Woods - grass combination	(fair)	C	.26	76
	Total Area / Weighted Curve Number			2	82
				=	==
Existing	Open space; grass cover > 75%	(good)	B	.01	61
	Paved parking lots, roofs, driveways		B	.54	98
	Pasture, grassland or range	(fair)	B	.73	69
	Woods - grass combination	(fair)	B	.46	65
	Woods - grass combination	(fair)	C	.26	76
	Total Area / Weighted Curve Number			2	77
				=	==