

## **Exhibit D**

**SCS Method Hydrology Calculations + USLE Soil Loss Calculations**

**Prepared by Munselle Civil Engineering, dated March 2019**

# **Mt. Veeder Vineyards**

## **SCS Method Hydrology Calculations and USLE Soil Loss Calculations**

March, 2019

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### **Introduction:**

The project site is located on a 114.9-acre property at 1300 Mt. Veeder Road. This project proposes to develop 18.69 acres of new vineyard – six vineyard blocks located in the northeastern and southeastern portions of the property. An un-named blueline stream separates the northeastern-most vineyard block (Block B) from the southeastern vineyard blocks (Blocks C through F). Refer to Tabs 3 and 5 for additional information about the project site.

The existing drainage patterns will remain; stormwater runoff will remain as sheetflow and shallow concentrated flow, and no drainage improvements to collect or redirect stormwater runoff are proposed. Subdrains per the geotechnical engineer are proposed in only two blocks – Blocks B and E. No tree removal is proposed. In addition, no new impervious surfaces will be constructed with this project. Drainage analysis is required to address post-project runoff quantity and quality; the SCS Method is used to calculate and compare pre-project and post-project runoff quantities and the USLE (Universal Soil Loss Equation) is used to calculate and compare pre-project and post-project soil losses. The USLE soil loss calculations provide an estimation of potential effects to stormwater runoff quality.

Since there will be no increase in impervious area, no tree removal, and no changes to the ground slope, which determines velocity and therefore time of concentration, we can expect that the post-project time of concentration will be approximately the same as the pre-project time of concentration. Thus, post-project runoff quantity should remain approximately the same as pre-project runoff quantity. Refer to the following SCS Method Hydrology Calculations and USLE Soil Loss Calculations, which demonstrate that there will be no net negative impact to stormwater runoff quantity or quality.

Refer to the Hydrology Maps, which depict both the block areas used in the SCS Method Hydrology Calculations, as well as the transects, through those areas, used in the USLE Soil Loss Calculations.

### **Conclusions:**

The proposed project will:

- mimic the existing drainage patterns,
- not significantly increase runoff volume, and
- maintain storm water runoff quality.













MT. VEEDER VINEYARDS - SCS Method Hydrology Calculations - Block B.6												
March, 2019												
<b>RUNOFF CURVE NUMBER</b>												
Soil Name / Hydro Group	Cover Description			CN	Area (ac)	CNxArea						
<b>Pre-Project</b>												
132/Fagan clay loam, 15-30%	Annual grass, good condition			75	1.19	89.25						
Hydro Group C												
<b>Post-Project</b>												
132/Fagan clay loam, 15-30%	Annual grass, good condition			75	1.19	89.25						
Hydro Group C												
<b>RUNOFF CALCULATIONS</b>	$(Q=[P-0.2((1000/CN)-10)]2/[P+0.8((1000/CN)-10)])$											
Frequency (yr)	2	5	10	25	50	100						
24-hr Rainfall, P (in)	4.08	5.20	6.10	7.30	8.21	9.11						
<b>Pre-Project</b>												
Runoff, Q (in)	1.73	2.61	3.37	4.41	5.23	6.05						
<b>Post-Project</b>												
Runoff, Q (in)	1.73	2.61	3.37	4.41	5.23	6.05						
<b>TIME OF CONCENTRATION</b>	(Part 630 Hydrology, National Engineering Handbook, Watershed Lag method)											
	Lo (ft)	S	Slope (%)	Tc (hr)								
<b>Pre-project</b>	279	3.33	13.26	0.26								
<b>Post-project</b>	279	3.33	13.26	0.26								
<b>GRAPHICAL PEAK DISCHARGE</b>	<b>Pre-Project</b>						<b>Post-project</b>					
Drainage Area, A (ac)		1.19						1.19				
Runoff CN		75						75.0				
Time of Concentration, Tc (hr)		0.26						0.26				
Rainfall Distribution		IA						IA				
Pond/swamp areas (% of Am)		0						0				
Frequency	2	5	10	25	50	100		2	5	10	25	50
24-hr rainfall, P (in)	4.08	5.20	6.10	7.30	8.21	9.11		4.08	5.20	6.10	7.30	8.21
Initial Abstraction, Ia		0.667						0.667				
Ia/P		0.163	0.128	0.109	0.091	0.081	0.073		0.163	0.128	0.109	0.091
Unit peak discharge, qu (cfs/ac/in)		0.200	0.217	0.227	0.235	0.235	0.235		0.200	0.217	0.227	0.235
Runoff, Q (in)		1.73	2.61	3.37	4.41	5.23	6.05		1.73	2.61	3.37	4.41
Pond/swamp adjustment		1						1				
Peak discharge, qp (cfs)		0.41	0.67	0.91	1.23	1.46	1.69		0.41	0.67	0.91	1.23
(qp=qu x A x Q x Fp, unit peak discharge per Part 650, Engineering Field Handbook, Chapter 2, Exhibit 2-1A)												











MT. VEEDER VINEYARDS - USLE Soil Loss Calculations - Cover Calculations																				
March, 2019																				
Transect Block A				Transects Block B				Transect Block C												
<b>Pre-project cover calculations:</b>				<b>Pre-project cover calculations:</b>				<b>Pre-project cover calculations:</b>												
0% Canopy				0% Canopy				0% Canopy												
90% Ground Cover				90% Ground Cover				90% Ground Cover												
50% Grass 50% Weeds				50% Grass 50% Weeds				50% Grass 50% Weeds												
% Grd Cover	80%	90%	95+%	% Grd Cover	80%	90%	95+%	% Grd Cover	80%	90%	95+%									
Grass	0.013	0.006	0.003	Grass	0.013	0.006	0.003	Grass	0.013	0.006	0.003									
Weeds	0.043	0.022	0.011	Weeds	0.043	0.022	0.011	Weeds	0.043	0.022	0.011									
Wt'd Avg	0.014			Wt'd Avg	0.014			Wt'd Avg	0.014											
<b>Post-project cover calculations:</b>				<b>Post-project cover calculations:</b>				<b>Post-project cover calculations:</b>												
Non-tilled vinerows, 90% cover			0.012	Non-tilled vinerows, 90% cover			0.012	Non-tilled vinerows, 90% cover			0.012									
Vinerows, 0.75' wide, 25% Ground Cover			9%	Vinerows, 0.75' wide, 25% Ground Cover			10%	Vinerows, 0.75' wide, 25% Ground Cover			9%									
Middles, 5.25' wide, 98% Ground Cover			63%	Middles, 5.25' wide, 98% Ground Cover			73%	Middles, 5.25' wide, 98% Ground Cover			62%									
Avenues, 95% Ground Cover			28%	Avenues, 95% Ground Cover			17%	Avenues, 95% Ground Cover			29%									
Overall coverage			91%	Overall coverage			90%	Overall coverage			91%									

Transects Block D				Transects Block E				Transects Block F				
<b>Pre-project cover calculations:</b>				<b>Pre-project cover calculations:</b>				<b>Pre-project cover calculations:</b>				
0% Canopy				0% Canopy				0% Canopy				
90% Ground Cover				90% Ground Cover				90% Ground Cover				
50% Grass 50% Weeds				50% Grass 50% Weeds				50% Grass 50% Weeds				
% Grd Cover	80%	90%	95+%	% Grd Cover	80%	90%	95+%	% Grd Cover	80%	90%	95+%	
Grass	0.013	0.006	0.003	Grass	0.013	0.006	0.003	Grass	0.013	0.006	0.003	
Weeds	0.043	0.022	0.011	Weeds	0.043	0.022	0.011	Weeds	0.043	0.022	0.011	
Wt'd Avg	0.014			Wt'd Avg	0.014			Wt'd Avg	0.014			
<b>Post-project cover calculations:</b>				<b>Post-project cover calculations:</b>				<b>Post-project cover calculations:</b>				
Non-tilled vinerows, 90% cover			0.012	Non-tilled vinerows, 90% cover			0.012	Non-tilled vinerows, 90% cover				
Vinerows, 0.75' wide, 25% Ground Cover			7%	Vinerows, 0.75' wide, 25% Ground Cover			9%	Vinerows, 0.75' wide, 25% Ground Cover				
Middles, 5.25' wide, 98% Ground Cover			52%	Middles, 5.25' wide, 98% Ground Cover			61%	Middles, 5.25' wide, 98% Ground Cover				
Avenues, 95% Ground Cover			41%	Avenues, 95% Ground Cover			31%	Avenues, 95% Ground Cover				
Overall coverage			91%	Overall coverage			91%	Overall coverage				

		NAPA COUNTY RESOURCE CONSERVATION DISTRICT					
		USLE LAYOUT AND PRACTICE ALTERNATIVES				A=(R)(K)(LS)(C)(P)	
FOR:	Mt. Veeder Vineyards						
USER:	Munselle Civil Engineering						
DATE:	March, 2019						
		Transect Block A		Transect Block B.1		Transect Block B.2	
FACTOR:	DESCRIPTION:	Pre-project	Post-project	Pre-project	Post-project	Pre-project	Post-project
	Area (acres)	0.94	0.94	0.56	0.56	4.43	4.43
R	Rainfall	16.55	16.55	16.55	16.55	16.55	16.55
K	Soil Erosiveness	0.32	0.32	0.32	0.32	0.32	0.32
	Slope length (ft)	232	232	134	134	376	376
S	Gradient (%)	15.56	15.56	11.04	11.04	14.87	14.87
LS	Calculated LS	3.782	3.782	1.798	1.798	4.527	4.527
C	Cover	0.014	0.012	0.014	0.012	0.014	0.012
P	Practice	1	1	1	1	1	1
A	Soil loss, tons/acre	0.28	0.24	0.13	0.11	0.34	0.29
	Soil loss, tons	0.26	0.23	0.07	0.06	1.49	1.27

FOR:	Mt. Veeder Vineyards						
USER:	Munselle Civil Engine						
DATE:	March, 2019						
		Transect Block B.3		Transect Block B.4		Transect Block B.5	
FACTOR:	DESCRIPTION:	Pre-project	Post-project	Pre-project	Post-project	Pre-project	Post-project
	Area (acres)	2.89	2.89	2.12	2.12	2.67	2.67
R	Rainfall	16.55	16.55	16.55	16.55	16.55	16.55
K	Soil Erosiveness	0.32	0.32	0.32	0.32	0.32	0.32
	Slope length (ft)	323	323	324	324	385	385
S	Gradient (%)	19.41	19.41	10.49	10.49	13.97	13.97
LS	Calculated LS	6.006	6.006	2.605	2.605	4.208	4.208
C	Cover	0.014	0.012	0.014	0.012	0.014	0.012
P	Practice	1	1	1	1	1	1
A	Soil loss, tons/acre	0.45	0.38	0.19	0.17	0.31	0.27
	Soil loss, tons	1.29	1.10	0.41	0.35	0.83	0.71

FOR:	Mt. Veeder Vineyards						
USER:	Munselle Civil Engine						
DATE:	March, 2019						
		Transect Block B.6		Transect Block C		Transect Block D	
FACTOR:	DESCRIPTION:	Pre-project	Post-project	Pre-project	Post-project	Pre-project	Post-project
	Area (acres)	1.19	1.19	0.52	0.52	0.22	0.22
R	Rainfall	16.55	16.55	16.55	16.55	16.55	16.55
K	Soil Erosiveness	0.32	0.32	0.32	0.32	0.32	0.32
	Slope length (ft)	279	279	104	104	119	119
S	Gradient (%)	13.26	13.26	11.63	11.63	11.76	11.76
LS	Calculated LS	3.336	3.336	1.701	1.701	1.848	1.848
C	Cover	0.014	0.012	0.014	0.012	0.014	0.012
P	Practice	1	1	1	1	1	1
A	Soil loss, tons/acre	0.25	0.21	0.13	0.11	0.14	0.12
	Soil loss, tons	0.29	0.25	0.07	0.06	0.03	0.03

FOR:	Mt. Veeder Vineyards						
USER:	Munselle Civil Engine						
DATE:	March, 2019						
		Transect Block E		Transect Block F.1		Transect Block F.2	
FACTOR:	DESCRIPTION:	Pre-project	Post-project	Pre-project	Post-project	Pre-project	Post-project
	Area (acres)	0.55	0.55	1.4	1.4	1.01	1.01
R	Rainfall	16.55	16.55	16.55	16.55	16.55	16.55
K	Soil Erosiveness	0.32	0.32	0.32	0.32	0.32	0.32
	Slope length (ft)	162	162	311	311	261	261
S	Gradient (%)	16.11	16.11	20.68	20.68	25.71	25.71
LS	Calculated LS	3.312	3.312	6.410	6.410	7.800	7.800
C	Cover	0.014	0.012	0.014	0.012	0.014	0.012
P	Practice	1	1	1	1	1	1
A	Soil loss, tons/acre	0.25	0.21	0.48	0.41	0.58	0.50
	Soil loss, tons	0.14	0.12	0.67	0.57	0.58	0.50

Factor C for Permanent Pasture, Range, Idle Land, or Grazed Woodland<sup>1</sup>. Source: Table 10 "Predicting Rainfall Erosion Losses", USDA Handbook No. 537 .

VEGETATIVE OVERHEAD CANOPY		SOIL SURFACE COVER Percent Ground Cover (winter months)						
Type and height <sup>2</sup>	Percent Cover <sup>3</sup>	Type <sup>4</sup> G=grass W=weed	0	20	40	60	80	95+
No appreciable canopy	-----	G W	0.45 0.45	0.20 0.24	0.10 0.15	0.042 0.091	0.013 0.043	0.003 0.011
Tall grassy weeds or bushes with average drop fall height of less than 3 ft.	25 50 75	G W G W G W	0.36 0.36 0.26 0.26 0.17 0.17	0.17 0.20 0.13 0.16 0.10 0.12	0.09 0.13 0.07 0.11 0.06 0.09	0.038 0.083 0.035 0.076 0.032 0.068	0.013 0.041 0.012 0.039 0.011 0.038	0.003 0.011 0.003 0.011 0.003 0.011
Appreciable brush or bushes, with average drop fall height of 6 ½ ft.	25 50 75	G W G W G W	0.40 0.40 0.34 0.34 0.28 0.28	0.18 0.22 0.16 0.19 0.14 0.17	0.09 0.14 0.08 0.13 0.08 0.12	0.040 0.087 0.038 0.082 0.036 0.078	0.013 0.042 0.012 0.041 0.012 0.040	0.003 0.011 0.003 0.011 0.003 0.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft.	25 50 75	G W G W G W	0.42 0.42 0.39 0.39 0.36 0.36	0.19 0.23 0.18 0.21 0.17 0.20	0.10 0.14 0.09 0.14 0.09 0.13	0.041 0.089 0.040 0.087 0.039 0.084	0.013 0.042 0.013 0.042 0.012 0.041	0.003 0.011 0.003 0.011 0.003 0.011

Refer to Cover Calculations for weighted averages used in USLE Soil Loss Calculations

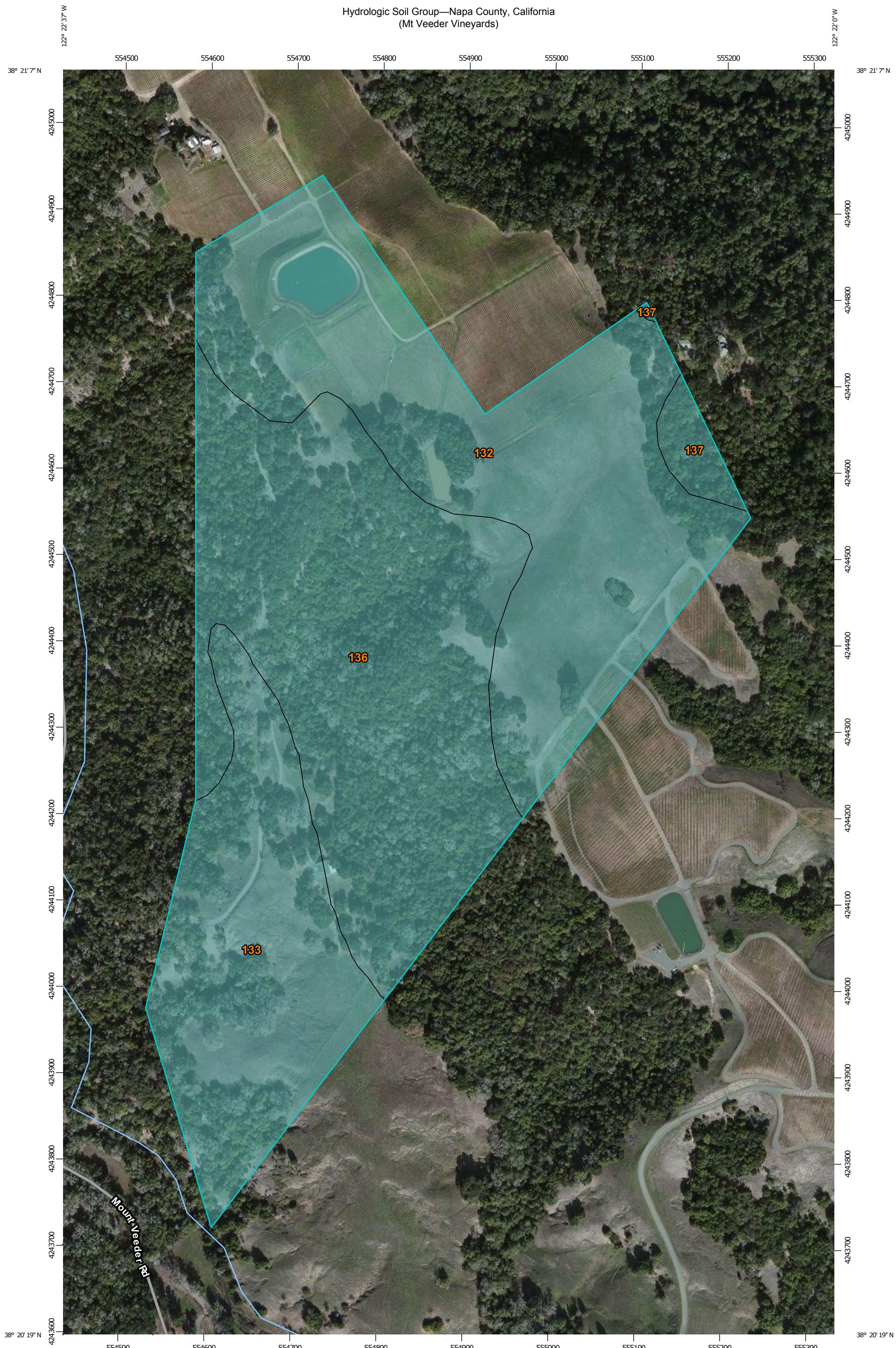
USLE C Factors for Vineyards under Productive Conditions (3+ years old), interpolated. Source: Table 8  
 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991, pg. C-9

	Percent Cover (winter months)								
	40%	50%	60%	70%	75%	80%	85%	90%	
Tilled Vinerows	0.2	0.144	0.088	0.058	0.043	0.028	0.019	0.013	0.007
Non-Tilled Vinerows	0.16	.0115	0.07	0.046	0.034	0.022	0.017	0.012	0.006

Refer to the Cover Calculations;  
 0.012 is used for the post-project  
 condition in the USLE Soil Loss  
 Calculations for all blocks,  
 because all blocks will have 90%  
 (or greater) cover.



Hydrologic Soil Group—Napa County, California  
(Mt Veeder Vineyards)



Map Scale: 1:4,100 if printed on B portrait (11" x 17") sheet.

Meters

0 50 100 150 200 250 300

Feet

0 150 300 600 900

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



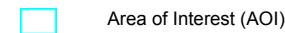
Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

9/12/2016  
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## MAP LEGEND

### Area of Interest (AOI)



### Soils

#### Soil Rating Polygons

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

#### Soil Rating Lines

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

#### Soil Rating Points

	A
	A/D
	B
	B/D

### C

### C/D

### D

### 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 8, Sep 23, 2015

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.



## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Napa County, California (CA055)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
132	Fagan clay loam, 15 to 30 percent slopes	C	41.0	38.0%
133	Fagan clay loam, 30 to 50 percent slopes	C	23.4	21.7%
136	Felton gravelly loam, 30 to 50 percent slopes	C	41.6	38.5%
137	Felton gravelly loam, 50 to 75 percent slopes	C	1.9	1.8%
<b>Totals for Area of Interest</b>			<b>107.9</b>	<b>100.0%</b>

## 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



**NOAA Atlas 14, Volume 6, Version 2****Location name: Napa, California, USA\*****Latitude: 38.3451°, Longitude: -122.3742°****Elevation: 733.06 ft\*\***

\* source: ESRI Maps

\*\* source: USGS

**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) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.147 (0.131-0.167)	0.182 (0.161-0.206)	0.226 (0.201-0.258)	0.263 (0.231-0.303)	0.313 (0.265-0.375)	0.352 (0.290-0.432)	0.392 (0.314-0.494)	0.433 (0.336-0.564)	0.490 (0.363-0.669)	0.536 (0.381-0.760)
10-min	0.211 (0.188-0.240)	0.260 (0.231-0.296)	0.325 (0.288-0.370)	0.377 (0.331-0.434)	0.449 (0.379-0.537)	0.505 (0.416-0.619)	0.562 (0.450-0.708)	0.621 (0.482-0.809)	0.703 (0.520-0.960)	0.768 (0.546-1.09)
15-min	0.255 (0.227-0.290)	0.315 (0.280-0.358)	0.393 (0.348-0.448)	0.456 (0.401-0.525)	0.543 (0.459-0.650)	0.611 (0.503-0.748)	0.680 (0.545-0.857)	0.751 (0.583-0.978)	0.850 (0.629-1.16)	0.929 (0.661-1.32)
30-min	0.370 (0.330-0.420)	0.456 (0.406-0.519)	0.569 (0.504-0.649)	0.662 (0.581-0.762)	0.788 (0.665-0.942)	0.886 (0.730-1.08)	0.985 (0.790-1.24)	1.09 (0.846-1.42)	1.23 (0.912-1.68)	1.35 (0.958-1.91)
60-min	0.546 (0.486-0.620)	0.673 (0.599-0.765)	0.840 (0.744-0.958)	0.977 (0.857-1.12)	1.16 (0.982-1.39)	1.31 (1.08-1.60)	1.45 (1.17-1.83)	1.61 (1.25-2.09)	1.82 (1.35-2.48)	1.99 (1.41-2.82)
2-hr	0.841 (0.749-0.955)	1.03 (0.916-1.17)	1.28 (1.13-1.46)	1.48 (1.30-1.70)	1.75 (1.48-2.09)	1.96 (1.61-2.40)	2.17 (1.74-2.73)	2.39 (1.85-3.11)	2.69 (1.99-3.67)	2.92 (2.08-4.15)
3-hr	1.08 (0.966-1.23)	1.33 (1.18-1.51)	1.64 (1.46-1.87)	1.90 (1.66-2.18)	2.24 (1.89-2.68)	2.50 (2.06-3.07)	2.77 (2.22-3.49)	3.05 (2.36-3.96)	3.42 (2.53-4.67)	3.72 (2.65-5.28)
6-hr	1.64 (1.46-1.86)	2.01 (1.79-2.28)	2.49 (2.21-2.84)	2.88 (2.53-3.31)	3.40 (2.87-4.07)	3.80 (3.13-4.65)	4.20 (3.37-5.29)	4.61 (3.58-6.00)	5.17 (3.82-7.05)	5.60 (3.99-7.95)
12-hr	2.31 (2.06-2.63)	2.89 (2.57-3.29)	3.63 (3.22-4.14)	4.23 (3.71-4.86)	5.02 (4.24-6.00)	5.62 (4.63-6.89)	6.23 (4.99-7.85)	6.84 (5.31-8.91)	7.68 (5.68-10.5)	8.32 (5.92-11.8)
24-hr	3.20 (2.88-3.63)	4.08 (3.66-4.63)	5.20 (4.66-5.92)	6.10 (5.44-6.99)	7.30 (6.33-8.60)	8.21 (6.99-9.83)	9.11 (7.61-11.1)	10.0 (8.18-12.6)	11.3 (8.87-14.6)	12.2 (9.34-16.3)
2-day	4.18 (3.76-4.74)	5.33 (4.79-6.05)	6.81 (6.11-7.75)	8.00 (7.13-9.17)	9.60 (8.32-11.3)	10.8 (9.21-12.9)	12.0 (10.0-14.7)	13.3 (10.8-16.6)	15.0 (11.8-19.4)	16.3 (12.4-21.7)
3-day	4.84 (4.36-5.49)	6.17 (5.55-7.01)	7.88 (7.07-8.97)	9.26 (8.24-10.6)	11.1 (9.62-13.1)	12.5 (10.7-15.0)	13.9 (11.6-17.0)	15.4 (12.5-19.2)	17.3 (13.6-22.4)	18.8 (14.4-25.1)
4-day	5.40 (4.86-6.13)	6.89 (6.19-7.83)	8.79 (7.88-10.0)	10.3 (9.19-11.8)	12.3 (10.7-14.5)	13.9 (11.8-16.6)	15.4 (12.9-18.9)	17.0 (13.9-21.3)	19.1 (15.0-24.7)	20.7 (15.8-27.6)
7-day	6.61 (5.95-7.50)	8.47 (7.62-9.62)	10.8 (9.68-12.3)	12.6 (11.2-14.5)	15.0 (13.0-17.7)	16.8 (14.3-20.1)	18.5 (15.5-22.6)	20.3 (16.5-25.4)	22.6 (17.8-29.2)	24.3 (18.6-32.4)
10-day	7.57 (6.81-8.59)	9.72 (8.73-11.0)	12.4 (11.1-14.1)	14.4 (12.9-16.5)	17.1 (14.8-20.1)	19.0 (16.2-22.8)	20.9 (17.4-25.6)	22.8 (18.6-28.5)	25.2 (19.9-32.6)	27.0 (20.7-36.0)
20-day	9.91 (8.92-11.2)	12.7 (11.5-14.5)	16.2 (14.5-18.4)	18.8 (16.7-21.5)	22.0 (19.1-25.9)	24.3 (20.7-29.2)	26.6 (22.2-32.5)	28.7 (23.4-35.9)	31.5 (24.8-40.8)	33.5 (25.6-44.6)
30-day	12.0 (10.8-13.6)	15.4 (13.8-17.4)	19.4 (17.4-22.1)	22.4 (20.0-25.7)	26.1 (22.7-30.8)	28.8 (24.5-34.5)	31.3 (26.1-38.2)	33.7 (27.5-42.1)	36.7 (28.9-47.6)	38.9 (29.8-51.9)
45-day	14.7 (13.2-16.7)	18.7 (16.8-21.2)	23.4 (21.0-26.6)	26.9 (24.0-30.8)	31.2 (27.0-36.7)	34.2 (29.1-40.9)	37.0 (30.8-45.2)	39.6 (32.3-49.6)	42.9 (33.8-55.6)	45.3 (34.7-60.5)
60-day	17.5 (15.8-19.9)	22.1 (19.9-25.1)	27.5 (24.6-31.2)	31.4 (28.0-36.0)	36.2 (31.4-42.6)	39.5 (33.7-47.3)	42.6 (35.5-52.0)	45.5 (37.1-56.9)	49.1 (38.7-63.6)	51.7 (39.6-69.0)

<sup>1</sup> 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.

K Factor, Whole Soil—Napa County, California  
(Mt Veeder Vineyards)



## MAP LEGEND

Area of Interest (AOI)	
	Area of Interest (AOI)
<b>Soils</b>	
<b>Soil Rating Polygons</b>	
	.02
	.05
	.10
	.15
	.17
	.20
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available
<b>Soil Rating Points</b>	
	.02
	.05
	.10
	.15
	.17
	.20
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available
<b>Soil Rating Lines</b>	
	.02
	.05
	.10
	.15
	.17
	.20
	Not rated or not available
<b>Water Features</b>	
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available

## 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 8, Sep 23, 2015

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.



## K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — Napa County, California (CA055)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
132	Fagan clay loam, 15 to 30 percent slopes	.32	33.9	37.6%
133	Fagan clay loam, 30 to 50 percent slopes	.32	17.3	19.2%
136	Felton gravelly loam, 30 to 50 percent slopes	.15	38.1	42.3%
137	Felton gravelly loam, 50 to 75 percent slopes	.15	0.9	1.0%
<b>Totals for Area of Interest</b>			<b>90.2</b>	<b>100.0%</b>

## Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

## Rating Options

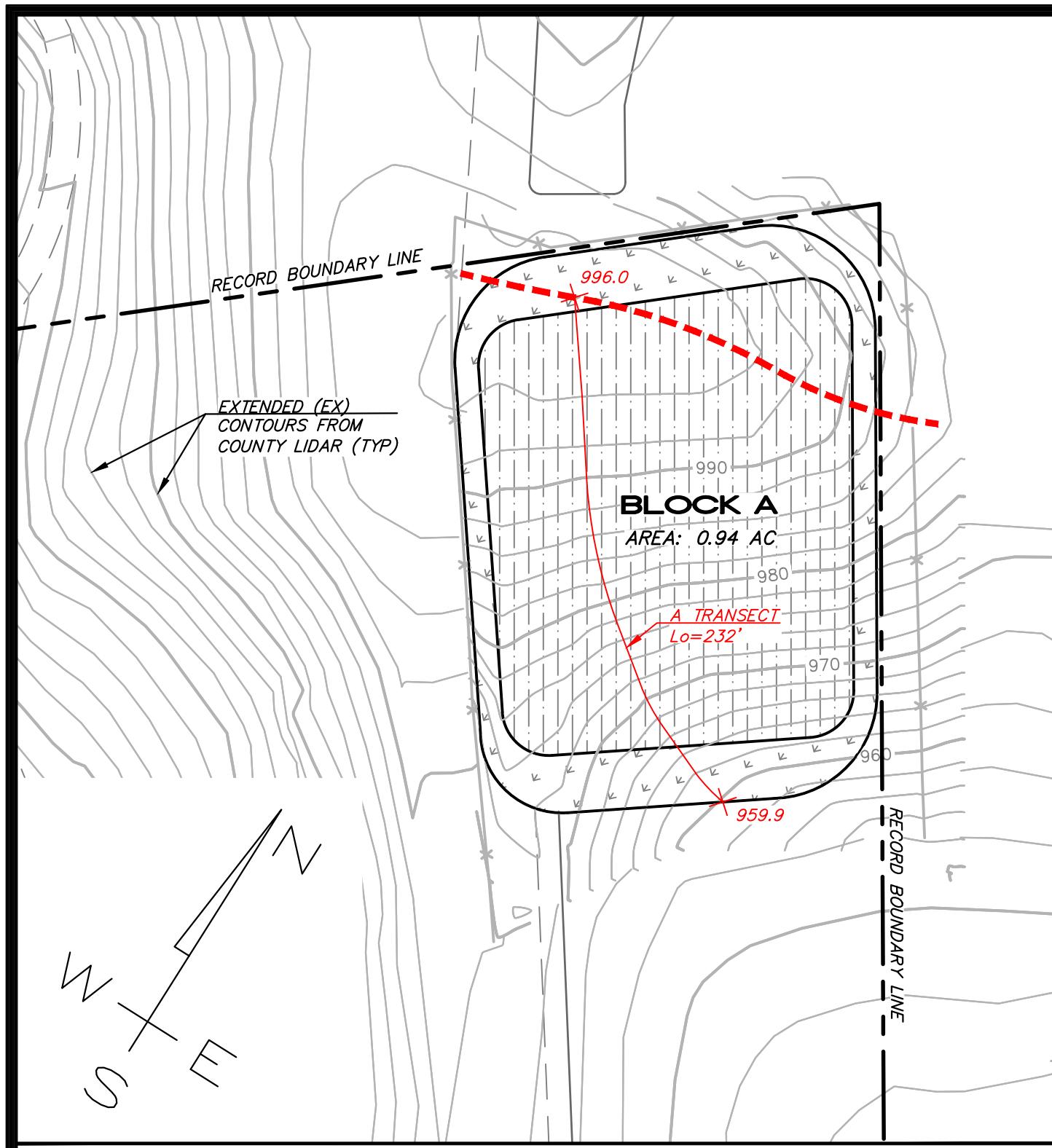
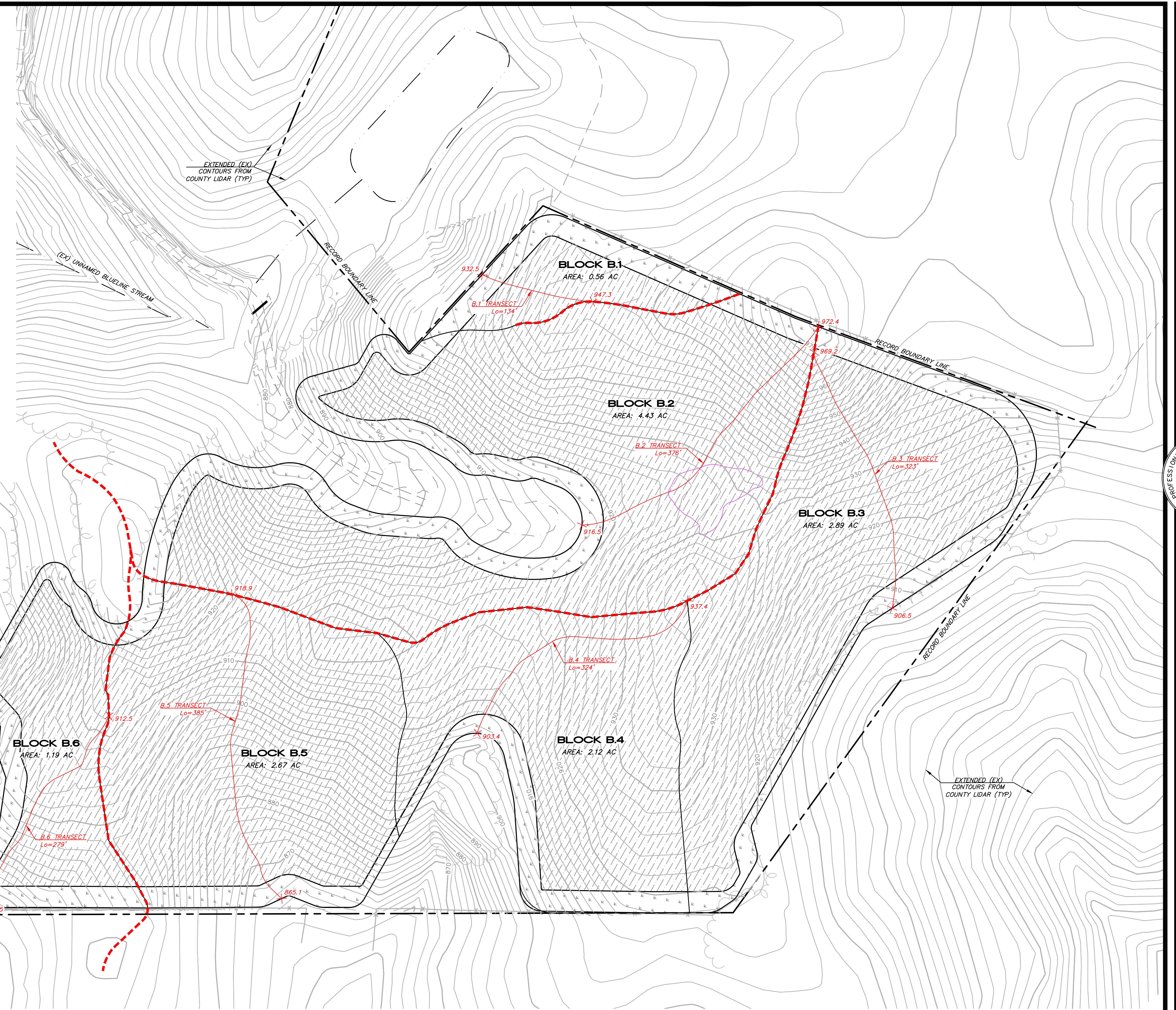
*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

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

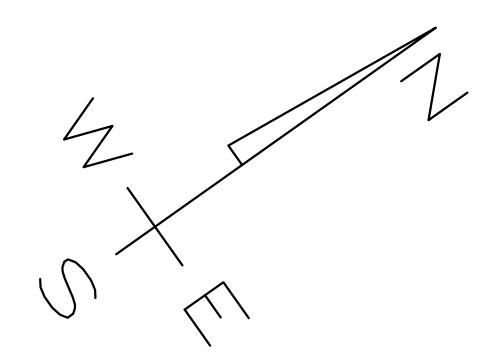


**BLOCK A****LEGEND**

- RECORD BOUNDARY LINE
- - - EXISTING ACCESS ROAD/VINEYARD AVENUE
- - - EXISTING APPROXIMATE RIDGE LINE
- TRANSECTS USED IN USLE CALCULATIONS
- EXISTING UNNAMED STREAM

**HYDROLOGY MAP - BLOCK B**

SCALE: 1' = 60'  
0 60 120 180  
(GRAPHIC SCALE IN FEET)



MARCH 2019

JOB NO.  
24-16

SHEET NO.

1

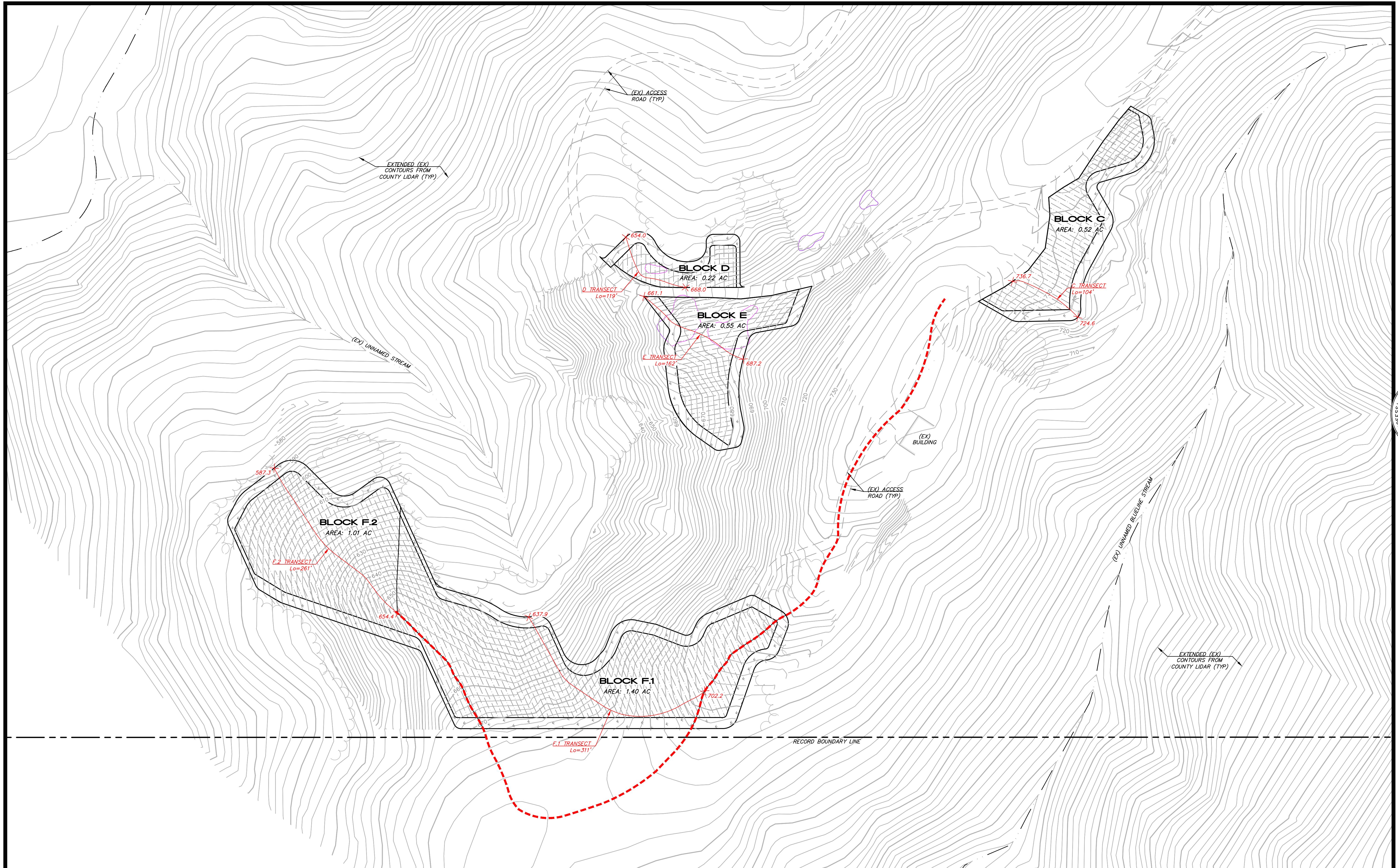
OF 2 SHEETS

MUNSELLE CIVIL ENGINEERING  
CIVIL ENGINEERING + LAND PLANNING  
519 CENTER STREET  
HEALDSBURG, CA 95448  
(707) 395-0968

PROFESSIONAL ENGINEER & LAND SURVEYOR  
REGISTERED CORP. L. MUNSELLE  
No. 639441  
Ex. 9-30-18  
STATE OF CALIFORNIA  
CIVIL ENGINEERING  
LAND SURVEYING  
MUNSELLE

CORP. L. MUNSELLE  
DATE  
RECE 09/04/11  
CONTRACT NO. 09041

MT. VEEDER VINEYARDS  
HYDROLOGY MAP - BLOCKS A - B  
APN 081-230-029  
1300 MT. VEEDER ROAD  
NAPOLEON, CA

**LEGEND**

- RECORD BOUNDARY LINE
- - - EXISTING ACCESS ROAD/VINEYARD AVENUE
- - - EXISTING APPROXIMATE RIDGE LINE
- TRANSECT
- EXISTING UNNAMED STREAM

**HYDROLOGY MAP - BLOCKS C-F**

SCALE: 1' = 60'  
0 60 120 180  
(GRAPHIC SCALE IN FEET)

N  
S  
E  
W

MARCH 2019

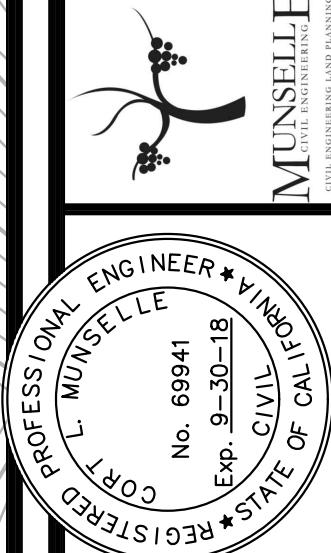
JOB NO.  
24-16

SHEET NO.

2

OF 2 SHEETS

**MUNSELLE CIVIL ENGINEERING**  
CIVIL ENGINEERING • LAND PLANNING  
518 CENTER STREET  
HEALDSBURG, CA 95448  
(707) 395-0968



*[Signature]*  
CORPL. MUNSELLE  
RECE 090421

**MT. VEEDER VINEYARDS**  
**HYDROLOGY MAP - BLOCKS C - F**  
APN 034-230-029  
1300 MT. VEEDER ROAD  
NAPO, CA