EXHIBIT F

Hardten Vineyard – 3393 Atlas Peak Rd.
Soil Loss Analysis
Prepared by Napa Valley Vineyard Engineering, Inc
November 14, 2019
Revised May 6, 2020
Revised July 13, 2020

INTRODUCTION
This analysis is to predict the affect the proposed vineyard development project will have on local soil erosion. Modeling of existing and proposed conditions was performed using the Universal Soil Loss Equation (USLE). Following is a summary of the data used and the results of the analysis.

RAINFALL DATA
The 2 year, 6 hour rainfall depth is used to determine the "R" value in the USLE. The rainfall depth for the project site was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2, Precipitation Frequency Data for California, which uses the latitude and longitude of a site to interpolate rainfall depths between data points. The latitude and longitude of the project are estimated to be 38.4026°, N -122.2422° W, based on information obtained from All Topo V7 USGS mapping software. The 2-year, 6 hour rainfall depth at the project site ranges from 1.76-inches to 2.25-inches. This analysis conservatively uses the high end of the range (2.25-inches), which equals an "R" value of 96.17. "R" is constant in the pre-project and post-project models.

SOIL EROSIVENESS
Each soil type listed in the United States Department of Agriculture, Soil Conservation Service (SCS), Napa County Soil Survey has an erodibility factor ("K"). Soils within the project area are mapped as:

SCS #100, Aiken loam (K=0.24)
SCS #152, Hambright Rock outcrop (K=0.10)

 "K" is constant in the pre-project and post-project models.

SLOPE LENGTH and STEEPNESS
Topographic mapping from the Napa County GIS database (2002), was used to determine slope steepness on the project site. Transects were selected to analyze the soil loss from the longest and steepest slopes throughout the project area. Where slope steepness, vegetative cover, or soil type along a transect varies significantly, complex slope equations were used to estimate soil loss. Slope lengths and gradients used in the pre-project and post-project models are identified on the USLE transect maps and in the USLE spreadsheets included in the Appendix.

VEGETATIVE COVER

Cover factors ("C") for pre-project and post-project conditions were determined using the guidelines provided in the SCS pamphlet entitled "The Universal Soil Loss Equation: Special Applications For Napa County, California (guide).

Pre-Project

The project area is generally sparsely covered open grassland. Block C has a small pocket of tree canopy, and an area of sparse brush. The ground cover in the proposed vineyard areas is approximately 65% with "grassy" vegetation interspersed with broadleaf plants ("woody"). Site observation was used to determine ground cover, as well as the percentage of "woody" vegetation vs. "grassy" vegetation along each selected transect. Detailed "C" factor calculations for each transect are shown on the USLE spreadsheets included in the Appendix.

Post-Project

The project proposes a no-till permanent cover crop, which may be mowed and strip sprayed along the vinerow. Using these practices, a minimum ground cover of 70% will be obtained each winter. Using the table in the guide, "USLE "C" Factors for Vineyards", the C factor for 70% ground cover is 0.047.

PRACTICE FACTOR

The accepted practice factor for the existing conditions is 1.0. Using the table in the guide, "P ("Practice") Factors for USLE in Napa Valley Vineyards, the practice factor for vineyard rows running uphill and downhill is 1.0. The practice factor remains constant in the pre-project and post-project models.

RESULTS

Calculations to determine the predicted soil loss using the parameters described above are shown in the USLE spreadsheets, and results are summarized as follows:

Transect	pre- project soil loss (tons/acre)	post-project soil loss (tons/acre)
A	1.16	1.03
B	1.78	1.72
C1	1.23	1.20
C2	1.47	1.26

CONCLUSION

The analysis presented above and the supporting information in the Appendix, demonstrate that the proposed vineyard development will not increase soil loss from the project site.

APPENDIX

USLE SPREADSHEETS & TRANSECT MAP

FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe

Napa Valley Vineyard Engineering Inc.

USLE CALCULATIONS   A=(R)(K)(LS)(C)(P)

FOR:	Hardten Pre		
DATE:	7/13/2020		
TRANSECT:		A	
SOIL TYPE:		100	
T :		3	

FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	96.17									
K	Soil Erosiveness	0.24									
	Slope length (ft)	103									
S	Gradient	7.7									
LS	Calculated LS	0.95									
C	Cover	0.053	*								
P	Practice	1									
A	Soil loss, tons/acre	1.16		0.00		0.00		0.00		0.00	

*no canopy, 65%cover

	60%G	.035(.6)=	0.021
	40%W	.079(.4)=	0.032
			0.053

FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
		Napa Valley Vineyard Engineering Inc.									
		USLE CALCULATIONS		A=(R)(K)(LS)(C)(P)							
FOR:	Hardten Pre										
DATE:	7/13/2020										
TRANSECT:		B									
SOIL TYPE:		152/100									
T :		1,3									
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
	Slope length (ft)	112		112		112					
S	Gradient	9.4		18.8		13.4					
LS	Calculated LS	1.32		3.39		2.15					
F	Fraction	0.19		0.35		0.46					
K	Soil Erosiveness	0.10		0.10		0.24					
C	Cover	0.057	*	0.048	**	0.048	**				
	Product	0.001		0.006		0.011					
	Combined LS	0.0185									
R	Rainfall	96.17									
P	Practice	1									
A	Soil loss, tons/acre	1.78									

*25% bushes (drop fall less than 3'), 65%cove **no canopy, 65%cover

40%G	.032(.4)=	0.013		60%G	.035(.6)=	0.021
60%W	.073(.6)=	0.044		40%W	.079(.4)=	0.032
		0.057				0.053

		Napa Valley Vineyard Engineering Inc.										
		USLE CALCULATIONS			A=(R)(K)(LS)(C)(P)							
FOR:	Hardten Pre											
DATE:	7/13/2020											
TRANSECT:		C1				C2						
SOIL TYPE:		152				100						
T :		1				3						
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	96.17				96.17					
K	Soil Erosiveness	0.10				0.24					
	Slope length (ft)	261				101					
S	Gradient	11.5				8.9					
LS	Calculated LS	2.66				1.16					
C	Cover	0.048	*			0.055	**				
P	Practice	1				1					
A	Soil loss, tons/acre	1.23		0.00		1.47		0.00		0.00	
		*no canopy, 65%cover				**50% canopy, 65%cover					
		60%G	.035(.6)=	0.021		50%G	.033(.5)=	0.017			
		40%W	.079(.4)=	0.032		50%W	.076(.5)=	0.038			
				0.053				0.055			

		Napa Valley Vineyard Engineering Inc.								
		USLE CALCULATIONS		A=(R)(K)(LS)(C)(P)						
FOR:	Hardten Post									
DATE:	7/13/2020									
TRANSECT:	A									
SOIL TYPE:	100									
T :	3									
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	96.17								
K	Soil Erosiveness	0.24								
	Slope length (ft)	103								
S	Gradient	7.7								
LS	Calculated LS	0.95								
C	Cover	0.047	*							
P	Practice	1								
A	Soil loss, tons/acre	1.03		0.00		0.00		0.00		0.00

*no till, strip spray (70% cover)

		Napa Valley Vineyard Engineering Inc.										
		USLE CALCULATIONS		A=(R)(K)(LS)(C)(P)								
FOR:	Hardten Post											
DATE:	7/13/2020											
	TRANSECT:	B										
	SOIL TYPE:	152/100										
	T :	1,3										
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
	Slope length (ft)	112		112		112					
S	Gradient	9.4		18.8		13.4					
LS	Calculated LS	1.32		3.39		2.15					
F	Fraction	0.19		0.35		0.46					
K	Soil Erosiveness	0.10		0.10		0.24					
C	Cover	0.047	*	0.047		0.047					
	Product	0.001		0.006		0.011					
	Combined LS	0.0179									
R	Rainfall	96.17									
P	Practice	1									
A	Soil loss, tons/acre	1.72									
		*no till, strip spray (70% cover)									

		Napa Valley Vineyard Engineering Inc.									
		USLE CALCULATIONS		A=(R)(K)(LS)(C)(P)							
FOR:	Hardten Post										
DATE:	7/13/2020										
TRANSECT:		C1		C2							
SOIL TYPE:		152		100							
T :		1		3.00							
FACTOR:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
R	Rainfall	96.17		96.17							
K	Soil Erosiveness	0.10		0.24							
	Slope length (ft)	261		101							
S	Gradient	11.5		8.9							
LS	Calculated LS	2.66		1.16							
C	Cover	0.047	*	0.047							
P	Practice	1		1							
A	Soil loss, tons/acre	1.20		1.26		0.00		0.00		0.00	
		*no till, strip spray (70% cover)									