8G: Soil Loss Analysis Haas Vineyard

Includes: USLE Calculations
December 8, 2023

BACKGROUND

The subject site is located on Glass Mountain, APN 021-352-036, in the St Helena USGS Quad. The property is situated on the Napa River watershed. Elevations within the proposed vineyard blocks range 570ft to 295ft asl. Mapped bedrock units in the area are Sonoma Volcanics [3].

The NRCS web soil survey lists the soil types in the vineyard area as Boomer Gravelly loam, 109 [1]; see Site Plan – Aerial Map for soil boundaries. The Napa County Soil Survey [4] describes the Boomer Series as well drained soils on uplands formed in material weathered from mixed igneous rocks. The hazard of erosion is moderate and Boomer soils are typically used for timber, wildlife habitat, and recreation.

Soil data (K and T factors) were not listed in the NRCS web soil survey, however it was referenced for Hydraulic Soil Group (HSG) [**Error! Reference source not found.**]. The NRCS web soil survey notes that map data may not be valid for the map scale for this project. The soils map was created at a scale of 1:24,000 or 1 in = 2,000 ft. Enlarged maps can cause misunderstandings of the accuracy of soil line placement. The USLE Special Applications for Napa County [**Error! Reference source not found.**] was used as reference for K and T factors. The following soil properties were used for this project:

Soil Type	Soils description	K	T
109	Boomer Gravelly Loam, 14 to 60 percent slopes	0.20	3

Average slope across vineyard blocks ranges from 5-24% with an average of 15%.

The energy of precipitation (R) value was determined by getting the Point Precipitation Frequency Estimate for the subject site from the NOAA PFDS site (the 6-hr duration with 2-year recurrence interval with 90% confidence interval). The value of 1.9 was converted to an R value of 65 from Table A-1 [5]

Existing cover conditions were evaluated in the field on June 14, 2023 and effort was made to interpret pre-fire conditions for “existing cover”, which is estimated at 75% canopy, 13+ ft drop fall height and 60% groundcover comprised of 50% weeds and 50% grass. Please refer to Application Section 7: Photos for visual documentation of (post-fire) existing cover crop in each block. Post-development will establish a 75% cover crop throughout.

An up/down-hill row direction for a P factor of 1 was assumed for soil loss calculations. An up-downhill row direction represents the “worst-case” scenario and any row direction that deviates from up/down-hill and approaches parallel to contours would *improve* (i.e. reduce) soil loss.

Erosion Calculation Results

Soil Loss in tons/acre were computed using the following formula [6]:

$$A = (R) \times (K) \times (LS) \times (C) \times (P) \qquad \text{with } A < T+2$$

Where:

A = Predicted Soil Loss (tons/acre)
R = Rainfall & Runoff Factor (energy of precipitation)
K = Soil Erosiveness (NRCS whole soil, surface layer, dominant condition)
LS = Erosion Energy (function of line length and steepness)
C = Factor for cover crop, surface residue, roughness, and canopy
P = Factor for contouring or cross-slope farming (1.0 if contouring is not applicable)
T = Soil Loss Tolerance

Flow line locations are shown on Site Plan: Topo and ECP Detail.

As presented, there will be no net increase in soil loss from the site. Erosion calculations for the Pre- and Post- project site are summarized in TABLE 1.

References

1. *Custom Soil Reource Report for Napa County, California, Haas Vineyard*, from USDA NRCS Web Soil Survey, May 2023
2. *Guides for Erosion & Sediment Control*, USDA Soil Conservation Service, Davis, CA, 1991
3. Jennings, C.W., et al., *Geologic map of California*, California Geological Survey, 2010, https://ngmdb.usgs.gov/Prodesc/proddesc_96750.htm
4. Lambert, G., Kashiwagi, J. et al., *Soil Survey of Napa County, California*, USDA in cooperation with UC Agricultural Experiment Station, August 1978
5. *USLE Special Applications for Napa County*, USDA, NRCS, May 1994
6. Wischmeier, W.H., and Smith, D.D. *Predicting rainfall erosion losses – a guide to conservation planning.* USDA, Agriculture Handbook No. 537. 1978

Haas - 02 Swanston Rd

ESTABLISHED VEGETATION

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

	Flowline FID	7	8	3	2	0	1	5	6
Var	DESCRIPTION	1a	1b	2a	2b	3a	3b	4a	4b
R	Rainfall & Runoff Factor	65	65	65	65	65	65	65	65
K	Soil Erosiveness	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	Slope length (ft)	144	260	252	104	247	308	114	162
	Δelevation (ft)	19	38	45	9	56	71	20	9
S	Gradient (%)	11	15	17	5	23	24	19	9
LS^2	Calculated LS (Napa Equ.)	1.854	3.809	4.442	0.545	6.569	7.753	3.468	1.490
C	Cover PRE	Table Lookup							
	Drop Fall Height (ft)	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
	% Canopy Cover	75%	75%	75%	75%	75%	75%	75%	75%
	% Ground Cover	60%	60%	60%	60%	60%	60%	60%	60%
	% W	50%	50%	50%	50%	50%	50%	50%	50%
	% G	50%	50%	50%	50%	50%	50%	50%	50%
C	Cover PRE	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
C	Cover POST	75%	75%	75%	75%	75%	75%	75%	75%
C	Cover POST	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
P	Cover PRE	1	1	1	1	1	1	1	1
P	Cover POST	1	1	1	1	1	1	1	1
A	Soil loss, tons/acre PRE	1.5	3.0	3.6	0.4	5.3	6.2	2.77	1.19
A	Soil loss, tons/acre POST	0.8	1.7	2.0	0.2	2.9	3.4	1.5	0.66
	T =	3	3	3	3	3	3	3	3
	T+2 =	5	5	5	5	5	5	5	5
LS^2	Guides for Erosion & Sediment Control, USDA Soil Conservation Service, Davis, CA, 1991								

TABLE 1 USLE Calculation table and results

TABLE 10.—*Factor* **C** *for permanent pasture, range, and idle land*[1]

Vegetative canopy		Cover that contacts the soil surface						
			Percent ground cover					
Type and height[2]	Percent cover[3]	Type[4]	0	20	40	60	80	95+
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	.45	.24	.15	.091	.043	.011
Tall weeds or short brush with average drop fall height of 20 in	25	G	.36	.17	.09	.038	.013	.003
		W	.36	.20	.13	.083	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.076	.039	.011
	75	G	.17	.10	.06	.032	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or bushes, with average drop fall height of 6½ ft	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.087	.042	.011
	50	G	.34	.16	.08	.038	.012	.003
		W	.34	.19	.13	.082	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.078	.040	.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.089	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.087	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.084	.041	.011

[1] The listed **C** values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 ft.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in deep.

W: cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Table 2 C values for non-farmed, natural vegetation [6]

TABLE 9.—*Mulch factors and length limits for construction slopes*[1]

Type of mulch	Mulch Rate	Land Slope	Factor C	Length limit[2]
	Tons per acre	*Percent*		*Feet*
None	0	all	1.0	—
Straw or hay,	1.0	1-5	0.20	200
tied down by	1.0	6-10	.20	100
anchoring and				
tacking	1.5	1-5	.12	300
equipment[3]	1.5	6-10	.12	150
Do.	2.0	1-5	.06	400
	2.0	6-10	.06	200
	2.0	11-15	.07	150
	2.0	16-20	.11	100
	2.0	21-25	.14	75
	2.0	26-33	.17	50
	2.0	34-50	.20	35
Crushed stone,	135	<16	.05	200
¼ to 1½ in	135	16-20	.05	150
	135	21-33	.05	100
	135	34-50	.05	75
Do.	240	<21	.02	300
	240	21-33	.02	200
	240	34-50	.02	150
Wood chips	7	<16	.08	75
	7	16-20	.08	50
Do.	12	<16	.05	150
	12	16-20	.05	100
	12	21-33	.05	75
Do.	25	<16	.02	200
	25	16-20	.02	150
	25	21-33	.02	100
	25	34-50	.02	75

[1] From Meyer and Ports (24). Developed by an interagency workshop group on the basis of field experience and limited research data.

[2] Maximum slope length for which the specified mulch rate is considered effective. When this limit is exceeded, either a higher application rate or mechanical shortening of the effective slope length is required.

[3] When the straw or hay mulch is not anchored to the soil, C values on moderate or steep slopes of soils having K values greater than 0.30 should be taken at double the values given in this table.

Table 3 C values for mulch cover [6]