

Erosion Analysis-Babu Vineyard Block C
3300 White Sulphur Springs Road
St. Helena, Napa County, California
APN 027-010-033

Prepared for
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Michael Sherwood, PG #8839 (Exp. 6/2023)



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INTRODUCTION

This memorandum documents the analyses of erosion required by County of Napa showing that the proposed vineyard development complies with County of Napa policy requiring that post-Project erosion rates do not exceed baseline erosion rates existing prior to this proposed vineyard development. The Babu property address is 3600 White Sulphur Springs Road, APN 027-010-033, about two miles west of St. Helena. Two acres of existing vineyard (Blocks A and B) were evaluated for a previous ECPA in 2017. The erosion analyses are consistent with and based upon the Erosion Control Plan (ECP) prepared by O'Connor Environmental, Inc. The erosion analysis compares existing site conditions to proposed vineyard conditions using the Universal Soil Loss Equation per applicable USDA guidance. The erosion analysis is coordinated with the hydrologic analysis comparing existing site conditions to proposed vineyard conditions prepared by O'Connor Environmental, Inc. (OEI) using the USDA NRCS hydrologic model TR-55 implemented with WMS 10.0 (by Aquaveo). The hydrologic analysis is summarized in a separate report. This February 2022 revised assessment includes updates to the project footprint which has been reduced compared to the original assessment and assumes a constant erosivity throughout the entire project area as requested by Napa County PBES staff.

EROSION ANALYSIS

Approach

The USLE worksheets supporting the erosion analysis are attached (Appendix A). The results of the USLE analysis are summarized in Table 1 and Figure 1 & 2. Table 1 provides the estimated erosion rate for three pre-Project and eleven post-Project USLE hillslope segments. Figure 1 shows the location of the vineyard block and USLE hillslope segments for pre-Project conditions; Figure 2 shows USLE hillslope segments for post-Project conditions, including drainage modifications specified in the ECP.

In the fall of 2020 the Glass fire burned through the project area destroying most vegetation and ground cover. Since then, salvage logging of dead trees has been conducted further altering ground cover conditions. Although currently ground cover is very sparse due to the recent fire and subsequent clean up activities, per Napa County PBES recommendations our erosion analysis has modeled existing conditions with pre-fire cover. Previous erosion analyses for nearby vineyard Block B informed our choice of existing cover factor which represents, conservatively, full cover forest conditions with 50-75% canopy cover and 95% ground cover (100%W). Cover factors for each USLE segment and sub-segment presented in Appendix A represent the outcome of discussions with the County Staff for previous analyses. As mentioned above soil erosivity has been held constant for all USLE segments and sub-segments in the pre- and post-project conditions in this 2022 update. In our previous draft of this assessment soil erosivity was calculated based on weighted averages of erosivity of the two soil types mapped within the project area (Boomer-Forward-Felta Complex (ID 111) and Felton gravelly loam (ID 136)). At the request of Napa

County PBES staff a single erosivity for the Felton gravelly loam (which covers the majority of the project area) was used for pre and post project USLE calculations.

The location and orientation of USLE segments in Block C are identical for pre- and post-Project conditions. In the post-project condition segments have been subdivided due to proposed cross-field ditches.

Results

The USLE analysis found that the estimated erosion rate for pre-Project conditions in Block C ranges from 0.63 to 1.01 tons per acre per year, and are reduced under post-Project conditions to range from 0.35 to 0.92 tons per acre per year (Table 1). The erosion rate reductions are achieved by installing cross-field ditches that interrupt the sheet flow accumulation length across the vineyard (reducing the LS factor) and by specifying that the vineyard cover crop be maintained without tillage and without the use of herbicides to achieve maximum ground cover (85%) as shown in the USLE worksheets (Appendix A).

Table 1. Summary of USLE analysis.

| Pre Project | Soil loss | Post Project | | Soil loss |
|--------------------|------------------|---------------------|-------------------|------------------|
| Segment | tons/acre | Segment | SubSegment | tons/acre |
| C1 | 0.63 | C1 | a | 0.50 |
| | | | b | 0.57 |
| | | | c | 0.57 |
| C2 | 0.97 | C2 | a | 0.67 |
| | | | b | 0.88 |
| | | | c | 0.92 |
| | | | d | 0.35 |
| C3 | 1.01 | C3 | a | 0.54 |
| | | | b | 0.91 |
| | | | c | 0.84 |
| | | | d | 0.76 |

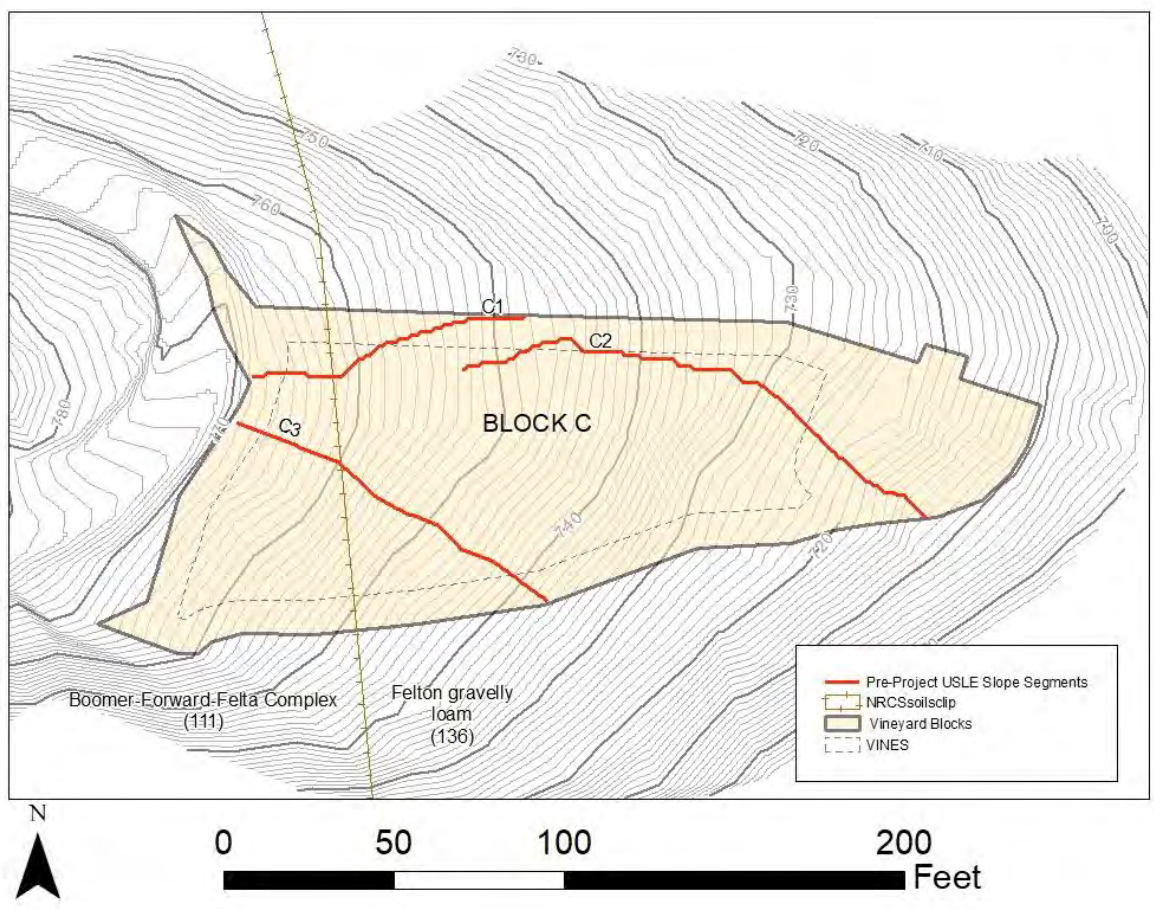


Figure 1. Map of proposed vineyard block and USLE hillslope segments for pre-Project Conditions.

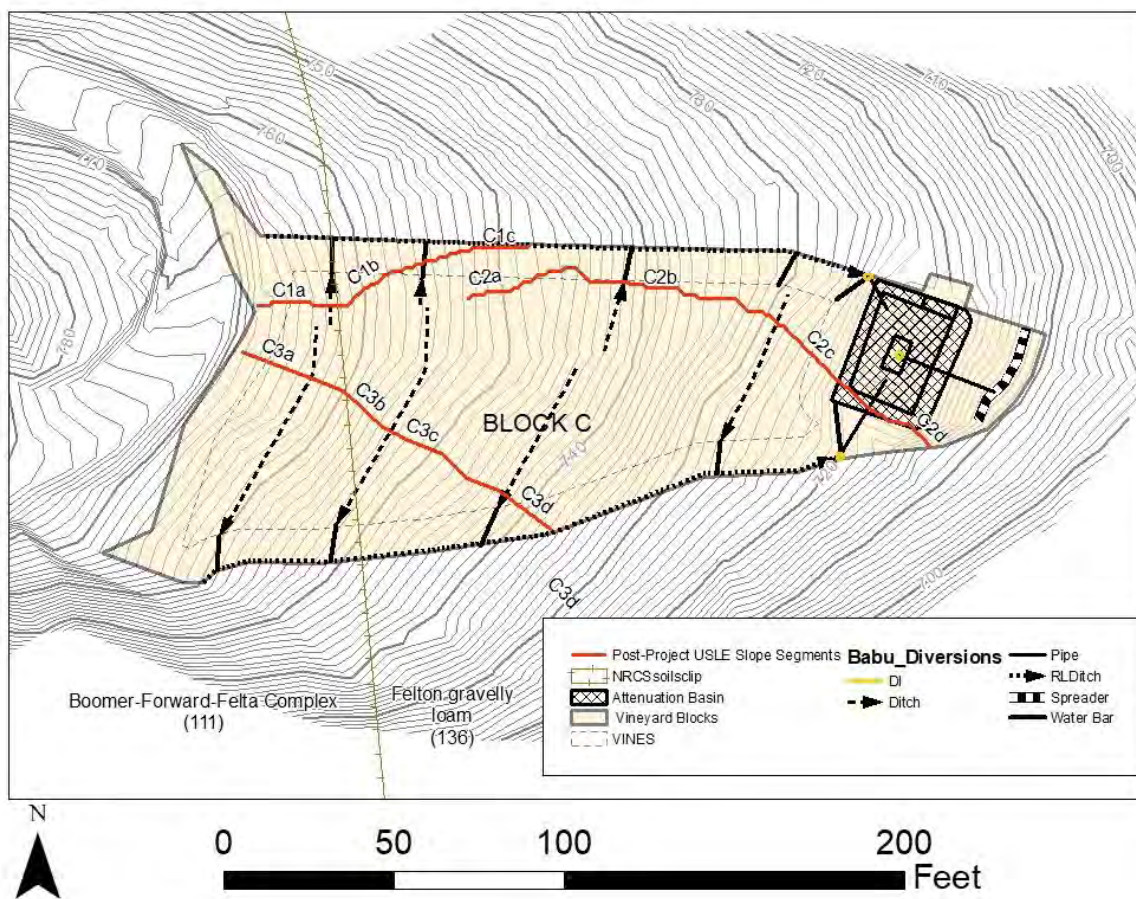


Figure 2. Map of proposed vineyard block and USLE hillslope segments for post-Project Conditions.

SUMMARY

As shown in Table 1, pre-Project erosion rates in vineyard Block C are reduced under post-Project conditions. The average erosion rate declines from 0.87 tons per acre per year to 0.68 tons per acre per year. These reductions in erosion are achieved through implementing the ECP that minimizes erosion primarily by reducing the flow accumulation length of sheet flow with cross-field ditches and by maintaining a permanent cover crop allowing no tillage and no use of herbicides.

Appendix A

USLE CALCULATIONS

| | | OEI | | | | | | | |
|---|------------------------------------|--|-----------|----------------------|-----------|--|-----------|--|--|
| | | USLE CALCULATIONS | | A=(R)(K)(LS)(C)(P) | | | | | |
| FOR: | Babu St Helena BLOCK C Pre-Project | | | | | | | | |
| DATE: | 2/9/2022 | | | | | | | | |
| | TRANSECT: | C1 | | C2 | | C3 | | | |
| | SOIL TYPE: | Boomer-Forward-Felta Complex and Felton gravelley loam | | Felton gravelly loam | | Boomer-Forward-Felta Complex and Felton gravelley loam | | | |
| | T= | 4 | | 4 | | 4 | | | |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | /Describe | | |
| R | Rainfall | 100 | | 100 | | 100 | | | |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | | |
| | Slope length (ft) | 90 | | 167 | | 111 | | | |
| S | Gradient | 22.2 | | 24.6 | | 29.8 | | | |
| LS | Calculated LS | 3.790 | | 5.90 | | 6.139 | | | |
| C | Cover | 0.011 | Forest | 0.011 | Forest | 0.011 | Forest | | |
| P | Practice | 1 | | 1 | | 1 | | | |
| A | Soil loss, tons/acre | 0.63 | | 0.97 | | 1.01 | | | |
| Forest = 50 - 75%+ tree canopy w/ 95% ground cover (100% W) C=0.011 | | | | | | | | | |

| | | OEI | | | | | |
|---|-----------------------------|----------------------|-----------|----------------------|-----------|----------------------|-------|
| | | USLE CALCULATIONS | | A=(R)(K)(LS)(C)(P) | | | |
| FOR: | Babu St Helena Post-Project | | | | | | |
| DATE: | 2/9/2022 | | | | | | |
| | TRANSECT: | C1a | | C1b | | C1c | |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | |
| | T= | 4 | | 4 | | 4 | |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | |
| R | Rainfall | 100 | | 100 | | 100 | |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | |
| | Slope length (ft) | 23 | | 33 | | 34 | |
| S | Gradient | 22.9 | | 22.0 | | 21.9 | |
| LS | Calculated LS | 1.993 | | 2.278 | | 2.284 | |
| C | Cover | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines |
| P | Practice | 1 | | 1 | | 1 | |
| A | Soil loss, tons/acre | 0.50 | | 0.57 | | 0.57 | |
| Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | | |

| | | | | | | | | |
|---------|--------------------|---|-----------|----------------------|-----------|----------------------|-------|----------------------|
| DATE: | 2/9/2022 | | | | | | | |
| | TRANSECT: | C2a | | C2b | | C2c | | C2d |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam |
| | T= | 4 | | 4 | | 4 | | 4 |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | | Value |
| R | Rainfall | 100 | | 100 | | 100 | | 100 |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | 0.15 |
| | Slope length (ft) | 52 | | 52 | | 56 | | 7 |
| S | Gradient | 21.0 | | 26.1 | | 26.3 | | 27.3 |
| LS | Calculated LS | 2.680 | | 3.545 | | 3.711 | | 1.397 |
| C | Cover | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines | 0.017 |
| P | Practice | 1 | | 1 | | 1 | | 1 |
| | | | | | | | | |
| A | Soil loss, tons/ac | 0.67 | | 0.88 | | 0.92 | | 0.35 |
| | | | | | | | | |
| | | Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| | | | | | | | | | |
|---|--------------------|----------------------|-----------|----------------------|-----------|----------------------|-----------|----------------------|-----------|
| DATE: | 2/9/2022 | | | | | | | | |
| | TRANSECT: | C3a | | C3b | | C3c | | C3d | |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | |
| | T= | 4 | | 4 | | 4 | | 4 | |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | /Describe | Value | /Describe |
| R | Rainfall | 100 | | 100 | | 100 | | 100 | |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | 0.15 | |
| | Slope length (ft) | 22 | | 31 | | 40 | | 18 | |
| S | Gradient | 24.6 | | 32.9 | | 27.8 | | 35.3 | |
| LS | Calculated LS | 2.150 | | 3.637 | | 3.390 | | 3.048 | |
| C | Cover | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines |
| P | Practice | 1 | | 1 | | 1 | | 1 | |
| A | Soil loss, tons/ac | 0.54 | | 0.91 | | 0.84 | | 0.76 | |
| Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | | | | |

| | | OEI | | | | | | | |
|---|------------------------------------|--|-----------|----------------------|-----------|--|-----------|--|--|
| | | USLE CALCULATIONS | | A=(R)(K)(LS)(C)(P) | | | | | |
| FOR: | Babu St Helena BLOCK C Pre-Project | | | | | | | | |
| DATE: | 2/9/2022 | | | | | | | | |
| | TRANSECT: | C1 | | C2 | | C3 | | | |
| | SOIL TYPE: | Boomer-Forward-Felta Complex and Felton gravelley loam | | Felton gravelly loam | | Boomer-Forward-Felta Complex and Felton gravelley loam | | | |
| | T= | 4 | | 4 | | 4 | | | |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | /Describe | | |
| R | Rainfall | 100 | | 100 | | 100 | | | |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | | |
| | Slope length (ft) | 90 | | 167 | | 111 | | | |
| S | Gradient | 22.2 | | 24.6 | | 29.8 | | | |
| LS | Calculated LS | 3.790 | | 5.90 | | 6.139 | | | |
| C | Cover | 0.011 | Forest | 0.011 | Forest | 0.011 | Forest | | |
| P | Practice | 1 | | 1 | | 1 | | | |
| A | Soil loss, tons/acre | 0.63 | | 0.97 | | 1.01 | | | |
| Forest = 50 - 75%+ tree canopy w/ 95% ground cover (100% W) C=0.011 | | | | | | | | | |

| | | OEI | | | | | |
|---|-----------------------------|----------------------|-----------|----------------------|-----------|----------------------|-------|
| | | USLE CALCULATIONS | | A=(R)(K)(LS)(C)(P) | | | |
| FOR: | Babu St Helena Post-Project | | | | | | |
| DATE: | 2/9/2022 | | | | | | |
| | TRANSECT: | C1a | | C1b | | C1c | |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | |
| | T= | 4 | | 4 | | 4 | |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | |
| R | Rainfall | 100 | | 100 | | 100 | |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | |
| | Slope length (ft) | 23 | | 33 | | 34 | |
| S | Gradient | 22.9 | | 22.0 | | 21.9 | |
| LS | Calculated LS | 1.993 | | 2.278 | | 2.284 | |
| C | Cover | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines |
| P | Practice | 1 | | 1 | | 1 | |
| A | Soil loss, tons/acre | 0.50 | | 0.57 | | 0.57 | |
| Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | | |

| | | | | | | | | |
|---|--------------------|----------------------|-----------|----------------------|-----------|----------------------|-------|----------------------|
| DATE: | 2/9/2022 | | | | | | | |
| | TRANSECT: | C2a | | C2b | | C2c | | C2d |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam |
| | T= | 4 | | 4 | | 4 | | 4 |
| FACTOR: | DESCRIPTION | Value | /Describe | Value | /Describe | Value | | Value |
| R | Rainfall | 100 | | 100 | | 100 | | 100 |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | 0.15 |
| | Slope length (ft) | 52 | | 52 | | 56 | | 7 |
| S | Gradient | 21.0 | | 26.1 | | 26.3 | | 27.3 |
| LS | Calculated LS | 2.680 | | 3.545 | | 3.711 | | 1.397 |
| C | Cover | 0.017 | Vines | 0.017 | Vines | 0.017 | Vines | 0.017 |
| P | Practice | 1 | | 1 | | 1 | | 1 |
| A | Soil loss, tons/ac | 0.67 | | 0.88 | | 0.92 | | 0.35 |
| Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | | | |

| | | | | | | | | |
|---|--------------------|----------------------|--|----------------------|--|----------------------|--|----------------------|
| DATE: | 2/9/2022 | | | | | | | |
| | TRANSECT: | C3a | | C3b | | C3c | | C3d |
| | SOIL TYPE: | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam | | Felton gravelly loam |
| | T= | 4 | | 4 | | 4 | | 4 |
| FACTOR: | DESCRIPTION | Value /Describe | | Value /Describe | | Value /Describe | | Value /Describe |
| R | Rainfall | 100 | | 100 | | 100 | | 100 |
| K | Soil Erosiveness | 0.15 | | 0.15 | | 0.15 | | 0.15 |
| | Slope length (ft) | 22 | | 31 | | 40 | | 18 |
| S | Gradient | 24.6 | | 32.9 | | 27.8 | | 35.3 |
| LS | Calculated LS | 2.150 | | 3.637 | | 3.390 | | 3.048 |
| C | Cover | 0.017 Vines | | 0.017 Vines | | 0.017 Vines | | 0.017 Vines |
| P | Practice | 1 | | 1 | | 1 | | 1 |
| A | Soil loss, tons/ac | 0.54 | | 0.91 | | 0.84 | | 0.76 |
| Vines = Permanent Cover Crop No till, No spray (85% cover) C= 0.017 | | | | | | | | |