

Marineau Vineyard (P22-00212): Analysis of Greenhouse Gas Impacts from Land Conversion

January 25, 2024

Introduction

The vineyard project proposes developing a 1.24 ac portion of the site into vineyard (Figure 1). A site-specific greenhouse gas (GHG) analysis was conducted to evaluate the impact of converting the land from its natural habitat to vineyard. The project site was severely damaged by the 2020 Glass Fire, which would be considered a high-severity fire. Wildfires impact Carbon storage and Carbon sequestration abilities of the resulting landscape.

- Carbon stock is the amount of carbon physically present in the existing vegetation and other organic material inside of the project boundary.
- Carbon sequestration is the rate at which carbon is captured from the atmosphere and stored in the vegetation and organic matter within the project boundary (primarily through photosynthesis).

The handling of wildfire impacts on the GHG analysis are outlined in the Methods section below.

The framework for this analysis was designed based on metrics presented in the *Regional Carbon Stock Inventory Report for Napa County* prepared by Ascent in August 2023 [1]. The Ascent report relied heavily on metrics presented in the *Technical Documentation for the California Natural and Working Lands Carbon and Greenhouse Gas Model (CALAND)*, prepared by Lawrence Berkely National Lab (June 2019) [10]. The CALAND report and associated journal articles were referenced for additional metrics and for context¹.

Methods

GHG impacts for the project were evaluated by building two scenarios over a 40-yr duration. Carbon stock and sequestration components for both scenarios are summarized in Table 1.

a) BASELINE SCENARIO

- i. Description: The Baseline Scenario considers remaining Carbon stock and recovery potential of post-fire conditions within the boundaries of the vineyard project without the proposed vineyard development. See Photo 1 and Photo 2 for reference on the baseline conditions, which were taken after harvesting the majority of dead trees. The calculations consider the following three components:
 - Carbon Stock - Land Cover Types: The CALAND documentation [10] categorizes non-regeneration of forest after a high-severity wildfire as a conversion of land cover type to shrubland. There will be no change of land cover type for the grassland portions, which would recover as the same designation. As such, baseline landcover types were assumed to be shrubland (and a minor grassland component) for Carbon stock and sequestration rates; Carbon stock values were obtained from Table 1 of the Ascent 2023 Napa County Inventory Report [1].
 - Carbon Stock – Dead Canopy: A standing dead tree component (8% of total canopy area, Figure 2) was included in the Carbon Stock [9]. Based on property owner information, about 25% of standing dead trees were milled for use on-site (Photo 3) and 75% was chipped for use on-site (Photo 4). Appendix F2 of the CALAND report (Figure 3) was referenced for Carbon transfer fractions² of forest products after fire [10].

¹ The property owner engaged Ascent Environmental Inc. to review and comment on the GHG analysis presented herein. Valuable feedback was received and incorporated into this work. An email acknowledgement from Ascent staff is attached to this report.

² Carbon transfer fractions are a unitless number used to calculate how much existing carbon is converted from one pool to another (ex. from harvested wood to burning. These fractions are applied to known densities of carbon (MT) per defined area (ac).

- **Carbon Sequestration – Land Cover Types:** Appendix B of the CALAND report compiles the net exchange of Carbon for soil and vegetation over time [10]. Their table is broken down by land cover type, region, and ownership. Each line includes a value and a margin of error, from which a maximum and minimum estimate of Carbon sequestration per acre per year was calculated, where a negative value indicates a net loss of Carbon over time. This scenario utilized shrubland (for non-regenerated forest portion) and grassland.

b) **VINEYARD SCENARIO**

- Description: The Vineyard Scenario considers post-development conditions within the boundaries of the vineyard project and gives credit for landscaping activities on the property. The calculations consider the following four components:
 - **Carbon Stock – Land Cover Type:** The post-development scenario used cultivated land cover type (for vineyard) and grassland (for grassy avenues) per Table 1 of the Ascent 2023 Napa County Inventory Report [1].
 - **Carbon Stock – Dead Canopy:** A standing dead tree component (8% of total canopy area, Figure 2) was considered for the Carbon Stock [9]. Based on property owner information, about 25% of standing dead trees were milled for use on-site and 75% was chipped for use on-site. Appendix F2 of the CALAND report (Figure 3) was referenced for Carbon transfer fractions of forest products after fire [10]. Since the material will remain on-site, the dead canopy component is present in both scenarios.
 - **Carbon Sequestration – Land Cover Types:** Appendix B of the CALAND report compiles the net exchange of Carbon for soil and vegetation over time [7]. Their table is broken down by land cover type, region, and ownership. Each line includes a value and a margin of error, from which a maximum and minimum estimate of Carbon sequestration per acre per year was calculated, where a negative value indicates a net loss of Carbon over time. This scenario utilized “Cultivated Land” (for vine area) and “Grassland” (for grassy avenues).
 - **Carbon Sequestration – Site Enhancements: Conservation Management Practices (CMPs):** The California COMET-Planner tool [4] was designed to evaluate the Carbon sequestration potential of conservation practices over conventional agriculture practices. The CALAND “Cultivated Land” metric is assumed to be for conventional annual and perennial crops (explained more in Discussion section). As such, results from the CA COMET-Planner tool were used to quantify benefits from sustainable farming practices outlined in the vineyard ECP including compost application(s), permanent legume mix cover crop, mulch applications, and no-till management.
 - **Carbon Sequestration – Site Enhancements: Landscaping:** The analysis also considered Carbon sequestration for new landscape plantings located on the subject parcel and outside the vineyard development area using the iTree Planting Calculator (Figure 4) [7]. New landscape plant metrics were assembled based on Phases I and II of the Lutsko & Associates Planting Plan [8]. It is assumed that iTree Planting Calculator output accounts for both Carbon Stock and Carbon Sequestration potential of the plantings, but the metric was listed under the Sequestration totals since the tool evaluated sequestration potential over a set time period. In this case, a 40-year duration was considered with a 20% mortality rate.

Table 1 Summary of components in each analysis scenario

	Carbon Stock	Carbon Sequestration
Baseline Scenario	Shrubland Grassland Dead Canopy	Shrubland Grassland
Vineyard Scenario	Vineyard Grassland Dead Canopy	Vineyard Grassland CMPs Landscaping

Results

The CA COMET-Planner tool was used to evaluate the benefit of several conservation practices outlined in the Vineyard ECP, including compost application(s), permanent legume mix cover crop, mulch applications, and no-till management. Raw outputs are listed in Figure 5 and a in Summary Table 2 below³.

Table 2 Results from CA COMET-Planner Tool

VINEYARD CONSERVATION MANAGEMENT PRACTICES (CMPs)			MIN	MAX
CA COMET-PLANNER CALC				
NRCS Conservation Practice	Unit (# acres)	MT CO ₂ e / unit / yr	Unit (# yrs)	Unit (# yrs)
Compost (C/N <= 11), 2 tons/ac	1	1.53	2	5
Compost (C/N >= 11), 6 tons/ac	1	4.44		
Permanent Cover (grasses)	1	1.45		
Permanent Cover (legume mix)	1	2.95	1	20
Mulch (wood chips)	1	0.34		
Mulch (natural materials)	1	0.34	1	5
No Till	1	0.34	35	35
PROJECT TOTAL (MT CO₂e / ac)			18.25	80.25

The following summary tables (Table 3, Table 4) include maximum, minimum, and average carbon for each component outlined above. Two items have MAX and MIN values:

- Sequestration Land Cover calculations use CALAND Appendix B, which have Max and Min values and a margin of error, from which Max and Min values were calculated,
- CA COMET-Planner Tool results were evaluated with a range of year units for when each CMP is estimated to be applied over the 40-yr period (Table 2),

All other metrics are constants in Min and Max fields. Full metric calculations are included in Appendix A for reference.

Table 3 Baseline Scenario

BASELINE SCENARIO: SUMMARY		MIN	MAX	AVE
CARBON STOCK: Land Cover Types	MT CO ₂ e	70	70	70
CARBON STOCK: Dead Canopy	MT CO ₂ e	0	0	0
SEQUESTRATION: Land Cover Types	MT CO ₂ e	41	107	74
Baseline Scenario Total	MT CO₂e	111	176	143

Table 4 Vineyard Scenario

VINEYARD SCENARIO: SUMMARY		MIN	MAX	AVE
CARBON STOCK: Land Cover Types	MT CO ₂ e	8	8	8
CARBON STOCK: Dead Canopy	MT CO ₂ e	0	0	0
SEQUESTRATION: Land Cover Types	MT CO ₂ e	-36	21	-7
SEQUESTRATION: Site Enhancements	MT CO ₂ e	217	294	255
Vineyard Scenario Total	MT CO₂e	189	322	256

Table 5 Scenario Comparison and Greenhouse Gas Balance

BALANCE		MIN	MAX	AVE
Vineyard Scenario Total	MT CO ₂ e	189	322	256
Baseline Scenario Total	MT CO ₂ e	111	176	143
BALANCE_{MIN} = (VINEYARD)_{MIN} - (BASELINE)_{MAX}	MT CO ₂ e	13		
BALANCE_{MAX} = (VINEYARD)_{MAX} - (BASELINE)_{MIN}	MT CO ₂ e		212	
BALANCE_{AVE} = (VINEYARD)_{AVE} - (BASELINE)_{AVE}	MT CO ₂ e			112

³ The COMET-Planner tool results are rounded to the nearest integer. Therefore, a unit of 100-acres was used as an input and the results were divided by 100 to obtain sequestration per acre, but with additional significant figures.

Discussion

The results show that the Vineyard Scenario will sequester enough carbon for a net positive balance over the 40-year time span used in the study.

The CALAND report [10] and other literature contain discussion to indicate that calculation method used in this analysis likely underestimated the sequestration potential for the Vineyard Scenario.

- Appendix B of the CALAND Land Cover Type “Cultivated Land” is a general category that does not differentiate between annual crops (alfalfa, wheat, maize, beets, corn, etc.) and perennial crops such as orchards and vineyards. To keep the model universally applicable to all categories, CALAND did not include any vegetative carbon exchange. Because CALAND's "Cultivated Land" cover type is based on a representation of all existing cultivated land types in California, this cover type designation is assumed to represent conventionally managed agriculture. In 2019, only 4 percent of agricultural land in California was certified organic [3]. The Cultivated land soil carbon exchange is $0.19 \pm 0.26 \text{ Mg C / ha / yr}$, which has a negative (emission) value for the Min case. Appendix B values are assumed to be for “conventional” agriculture that do not include CMPs (ex. no-till, mulch, compost, cover crop, etc.). The CALAND documentation acknowledged that perennial crops would sequester carbon in the vegetation, but left it out of the model to keep it applicable to annual crops too and due to a lack of reliable data of vegetation sequestration [10].
- Carlisle et al with the California Sustainable Winegrowing Alliance performed a literature review on factors related to greenhouse gas emissions in vineyards. They acknowledge that land clearing has a CO₂e emission component and discusses ample evidence that vineyards provide a valuable carbon sink over time. They found that root biomass is likely an important contributor to soil Carbon sequestration in vineyards due to the deep root system that develops over time. They also compile studies on enhanced Carbon sequestration with conservation management practices including compost soil amendments, no till farming, targeted irrigation/fertilizer, and cover crops. The report discusses that not all data presented in their literature review was collected in California and that more work is needed to quantify GHG vegetative sequestration in California vineyards [4].
- The COMET-Planner Tool (www.comet-planner.com) was created to evaluate approximate greenhouse gas mitigation and carbon sequestration potentials for various conservation practices. A California specific version of the tool (www.comet-planner-cdfahsp.com) was developed to support the California Department of Food and Agriculture (CDFA) Healthy Soils Program and the California Air Resources Board (CARB). Results from the CA COMET-Planner Tool were used to quantify potential benefits from the CMPs planned in the vineyard ECP. The tool result units were in MT CO₂e / acre / yr, where in this analysis, those results were multiplied out by the number of years that each CMP was expected to be utilized over the 40-year period. A conservative range of years was assumed for the Min case and a less conservative range for the Max case (Table 2).
- Similar to “Cultivated Land”, the “Grassland” Land Cover Type only includes soil carbon flux. In the CALAND model, grassland is a negative value (i.e. Carbon emission) that assumes a static carbon density in the soil which reduces over time due to vegetation carbon uptake [10]. Appendix D1 of the CALAND report does include scalars for compost application, but they were not used in this analysis. In vineyards, with perennial cover crops and legume mixes, studies show that there is a sequestration of Carbon over time [4].

The analysis presented herein used established metrics from Ascent, CALAND, and the CA COMET-Planner Tool to evaluate the Vineyard Scenario versus the Baseline Scenario. Even with the conservative methods and with the limitations noted above, the results predict the Vineyard Scenario will most likely sequester more carbon than the baseline condition.

Conclusions

- 1) The Vineyard Scenario predicts the project will most likely sequester more carbon than the Baseline Scenario.
- 2) The carbon sequestration estimates in the Vineyard Scenario are likely conservatively low since vegetative carbon sequestration is not considered in the CALAND metrics for cultivated land or grassland.

References:

1. Ascent, 2023 (August). *Regional Carbon Stock Inventory Report for Napa County*.
2. *Biological Resource Reconnaissance Survey, Marineau Property: 4000 Silverado Trail, Napa County, CA*, prepared by WRA, Inc., June 2022
3. *California Has 4th Largest Organic Farmland Share in the U.S.*, from the California Ag Network, 1/25/22, (<https://californiaagnet.com/2022/01/25/california-has-4th-largest-organic-farmland-share-in-the-u-s/#:~:text=The%20analysis%20found%20that%20there,a%20percentage%20of%20total%3A%203.97%25>)
4. Carlisle et al (2010). *California Vineyard Greenhouse Gas Emissions: Assessment of the Available Literature and Determination of Research Needs*, California Sustainable Winegrowing Alliance
5. COMET-Planner, *Carbon and Greenhouse gas evaluation for NRCS conservation practice planning, A companion report to www.comet-planner.com*, prepared by USDA NRCS and Colorado State University, June 2020
6. COMET-Planner Tool for the CA Department of Food and Agriculture Healthy Soils Program, <http://comet-planner-cdfahsp.com/>, prepared by staff at USDA National Resource Conservation District and Colorado State University. Accessed: October 2023
7. iTree Planting Calculator, <https://planting.itreetools.org/app/report/>, Accessed: October 2023
8. Lutsko & Associates Planting Plan (Phases I and II), 5-25-22
9. Pearson, T., Brown, S., and Netzer, N. (2009). *Baseline greenhouse gas emissions and removals for forests and rangelands in California*. Winrock International, for the California Energy Commission. PIER Energy-Related Environmental Research.
10. Vittorio and Simmonda, (2019). *California Natural and Working Lands Carbon and Greenhouse Gas Model (CALAND), Technical Documentation*, Lawrence Berkeley National Labs.

Attachments

- Email from Brenda Hom, Senior Climate Change Specialist at Ascent Environmental Inc.
- Figures
- Photos
- Appendix A: Greenhouse Gas Calculation Tables
- Lutsko & Associates Planting Plan (Phases I and II, 5-25-22)

Ascent review email

Coda Rainsford

From: Brenda Hom <Brenda.Hom@ascent.inc>
Sent: Tuesday, January 30, 2024 16:14
To: Coda Rainsford
Cc: Honey Walters; Sebastien Marineau; Justin Loughner
Subject: Ascent Review of MEMO_GHG MEMO_SEBASTIEN_REV1.5.DOCX
Attachments: Memo_GHG Memo_Sebastien_REV1.5.pdf

Hello Coda,

Ascent has reviewed the following attached document and associated calculations:

*Marineau Vineyard (P22-00212): Analysis of Greenhouse Gas Impacts from Land Conversion
REV 1.5, January 25, 2024
(MEMO_GHG MEMO_SEBASTIEN_REV1.5.DOCX)*

We found no substantial errors with the calculations and text and approve of its analysis.

Thank you,

Brenda Hom and Honey Walters

Honey L. Walters

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*Note: My email address has changed, please
update your address book.*

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FIGURES



Figure 1 Excerpt of Canopy Inset Map from HDVine ECP Site Plan (5/25/23)

The assumption is made that the midpoint of each decrease in canopy coverage class is the proportion of the vegetation killed by the fire. The proportion volatilized is dependent on fire intensity (Table 5, McNaughton et al. 1998; Carvalho et al. 2001). If the volatilized proportion is subtracted from the proportion of vegetation killed, then the remaining fraction is the dead wood, soot and charcoal pool.

The remaining fraction is divided using the following proportions: 22% charcoal, 44% soot, 32% dead wood (Table 5; Comery 1981, Raison et al. 1985, Fearnside et al. 1993, Neary et al. 1996). Dead wood decomposition occurs for two years from the fire-occurrence midway between the two censuses to the endpoint at the second census. Decomposition occurs at a rate of 0.05 yr^{-1} as determined by Harmon et al. (1987) for the Sequoia National Park in California (but see Chambers et al., 2000).

Table 5. Assumptions for the Fate of Carbon after Fire-induced Decreases in Canopy Coverage

	<i>Fire Intensity</i>		
	High (%)	Mid (%)	Low (%)
Volatilized	60	40	20
Not volatilized	25	15	8
Charcoal	5.5	3.3	1.8
Soot	11	6.6	3.5
Dead wood	8.0	4.8	2.6
Surviving vegetation	15	45	72

Figure 2 Excerpt from Pearson et al (2009) for calculating standing dead wood component.

Appendix F2: Direct transfers of Forest carbon due to specific fuel reduction practices.

The carbon transfer fractions (unitless) are the fractions of the existing carbon densities (Mg C ha^{-1}) associated with each of the pools specified by the parameter that are transferred from one pool to another, to wood products, or to the atmosphere via decay, burning, or bioenergy due to fuel reduction practices. The carbon transfers are fractions of the pool specified by the parameter and occur in the areas managed by the specific practice in the same year management occurs. These values apply across Forests in all regions and ownerships.

Parameter	Carbon transfer fractions due to fuel reduction practices									Source
	Prescribed Burn			Thinning			Understory Treatment			
	Extra Slash Utilization			Extra Slash Utilization			Extra Slash Utilization			
	None	Medium	High	None	Medium	High	None	Medium	High	
Aboveground Main Canopy & Standing Dead to Harvest	0	0	0	0.2	0.2	0.2	0	0	0	Prescribed burn and understory treatment do not involve harvest. Thinning is assigned same values as partial cut (Appendix F1).
Harvest to Wood	0	0	0	0.2	0.2	0.2	0	0	0	
Harvest to Energy	0	0	0	0.75	0.75	0.75	0	0	0	
Harvest to Sawmill Decay	0	0	0	0.01	0.01	0.01	0	0	0	
Harvest to Slash	0	0	0	0.04	0.04	0.04	0	0	0	
Understory to Slash	0.55	0.55	0.55	0.7	0.7	0.7	0.5	0.5	0.5	Pearson et al., 2009 (prescribed burn); Thinning is assigned same values as partial cut (Appendix F1); Understory treatment based on expert opinion.
Down Dead to Slash	0.53	0.53	0.53	0.42	0.42	0.42	0	0	0	Wiechmann et al., 2015; (prescribed burn) Thinning is assigned same values as partial cut (Appendix F1); Understory based on expert opinion.
Litter to Slash	0.6	0.6	0.6	0.42	0.42	0.42	0	0	0	
Slash to Energy	0	0.125	0.25	0	0.125	0.25	0	0.125	0.25	"None" extra slash utilization based on expert opinion. Medium and high extra slash utilization are aspirational, exploratory values and not based on feasibility.
Slash to Wood	0	0.125	0.25	0	0.125	0.25	0	0.125	0.25	
Slash to Burning	1	0.75	0.5	0.25	0	0	0.25	0	0	
Slash to Decay	0	0	0	0.75	0.75	0.5	0.75	0.75	0.5	
Aboveground Main Canopy to Standing Dead	0.03	0.03	0.03	0	0	0	0	0	0	Prescribed burn is based on Wiechmann et al., 2015; Thinning is assigned same values as partial cut (Appendix F1); Understory treatment based on expert opinion.
Understory to Down Dead	0.45	0.45	0.45	0.3	0.3	0.3	0.5	0.5	0.5	Prescribed burn is based on medium intensity fire from Pearson et al., 2009; Thinning is assigned same values as partial cut (Appendix F1); Understory treatment based on expert opinion.

Figure 3 Appendix F2 from CALAND Report (2019) for conversion factors of milled and chipped dead wood.

This data was produced from the i-Tree Planting Calculator version 2.6.0 for Calistoga (County Subdivision); CA.									
Location: Calistoga (County Subdivision); CA									
Electricity Emissions Factor: 252.4									
Fuel Emissions Factor: 52									
Lifetime: 40									
Project Lifetime Tree Mortality: 20									
Run Date: 10-4-2023									
Group Identifier	#	Species	DBH (cm)	Distance to Building (meters)	Direction	Building Vintage	TreeCondition	CrownLight Exposure	CO2 Sequestered (kilograms)
1	(1.0)	Southern magnolia(Magnolia grandiflora)	2.54	>18	north (0°)	post-1980	excellent	full sun	2,976.60
2	(4.0)	Chinese dogwood(Cornus kousa ssp. Chinensis)	2.54	>18	north (0°)	post-1980	excellent	full sun	11,840.00
3	(6.0)	Eastern redbud(Cercis canadensis)	2.54	>18	north (0°)	post-1980	excellent	full sun	9,174.30
4	(7.0)	Coastal live oak(Quercus agrifolia)	2.54	>18	north (0°)	post-1980	excellent	full sun	12,596.90
5	(5.0)	Peach(Prunus persica)	2.54	>18	north (0°)	post-1980	excellent	full sun	14,186.30
6	(8.0)	Hollyleaf cherry(Prunus ilicifolia)	2.54	>18	north (0°)	post-1980	excellent	full sun	26,347.00
7	(13.0)	European Olive(Olea europaea ssp. europea)	2.54	>18	north (0°)	post-1980	excellent	full sun	30,487.70
8	(42.0)	Rhamnus spp(Rhamnus)	2.54	>18	north (0°)	post-1980	excellent	full sun	83,368.10
9	(1.0)	Rhus tree(Toxicocendron succedaneum)	12.7	>18	north (0°)	post-1980	excellent	full sun	3,034.40
								Total (kg)	194,011.40
								Total (MT)	194.01

Approximate Carbon Sequestration and Greenhouse Gas Emission Reductions and Payments Associated with Selected Conservation Practices*					
(metric tonnes CO ₂ equivalent per year) ⓘ					
NRCS Conservation Practices	Unit Value (acres or feet)	Carbon Dioxide	Nitrous Oxide	Methane	Total CO ₂ Equivalent
 Compost (C/N < or = 11) Application to Orchards or Vineyards, Purchased from a certified composting facility - 2 tons/acre ⓘ	100 Acre(s)	169	-16	--	153
 Plant Permanent Grass Cover in Orchard/Vineyard Alleys - Orchard or Vineyard Alleyways ⓘ	100 Acre(s)	137	8	--	145
 Plant Permanent Grass/Legume Cover in Orchard/Vineyard Alleys - Orchard or Vineyard Alleyways ⓘ	100 Acre(s)	300	-5	--	295
 Add Mulch to Orchard/Vineyards - Wood Chips ⓘ	100 Acre(s)	53	-19	--	34
 Add Mulch to Orchard/Vineyards - Natural Materials ⓘ	100 Acre(s)	53	-19	--	34
 Conventional Till to No Till in Orchard/Vineyard Alleys - No-till or Strip-till ⓘ	100 Acre(s)	32	3	--	34
 Compost (C/N > 11) Application to Orchards, On- farm produced compost - 6 tons/acre ⓘ	100 Acre(s)	462	-18	--	444
Totals		1,205	-66	1	1,139

Figure 5 Outputs from California COMET-Planner tool regarding conservation management practices.

PHOTOS



Photo 1 View of vineyard area (June 5, 2021)



Photo 2 Baseline Conditions, July 2023 (non-regeneration of forest to shrubland).



Photo 3 Milled wood to remain on-site (July 2022).



Photo 4 Wood-chips (to remain on-site), September 2023

APPENDIX A

Greenhouse Gas Calculation Tables

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VINEYARD SCENARIO	SEBASTIEN MARINEAU									
CARBON STOCK: Land Cover Types	Area acres	Carbon Stock MT C/acre	Total Carbon NEW MT C	Total CO2e NEW MT CO2e	Source					
Vineyard	1.09	1.78	1.94	7.12	CALAND, Appendix B					
Grassland	0.15	1.42	0.21	0.78	CALAND, Appendix B					
NEW Landscape Planting Plan ¹										grassy avenues
Total (Land Cover Impacts)	1.24	-	2.15	7.90						
¹ Assume "C Stock" portion of NEW Landscape Planting Plan is captured in iTreeTool total below										
CARBON STOCK: Dead Canopy	Area TBR acres	Carbon Stock MT C/acre	Transfer Fraction unitless	Total Carbon TBR MT C	Total CO2e TBR MT CO2e	Source				
Total Canopy Area	1.165									
Standing Dead (Coast Live Oak):	0.093					ASCENT, Table 1				
[8% of Total Canopy, per Pearson et al]						Pearson et al, 2009, Table 5				
25% of area Milled On-site (1 - Harvest to Wood)	0.023	23.87	0	0.00	0.00	ASCENT, Table 1				
75% of area Chipped On-site Harvest to Slash	0.070		0	0.00	0.00	CALAND, Appendix F2				
Total (Canopy Impacts)	1.165	-		0.00	0.00	ASCENT, Table 1				
All dead, woody debris to be chipped or milled on-site										
Time Duration: 40 yrs										
SEQUESTRATION: Land Cover Types	Area acres	Sequestration MIN MT CO2e/acre/yr	Sequestration MAX MT CO2e/acre/yr	Total Sequestration MIN MT CO2e /40 yrs	Total Sequestration MAX MT CO2e /40 yrs	Source				
Vineyard (Soil)	1.09	-0.10	0.67	-4.53	29.14	CALAND, Appendix B				
Grassland (med compost)	0.15	-5.21	-1.38	-31.28	-8.29	CALAND, Appendix B				
Total (Sequestration Rate Impact)	1.24	-	-	-35.81	20.85	CALAND, Appendix D1				
SEQUESTRATION: Site Enhancements	Area acres	Sequestration MIN MT CO2e/acre/yr	Sequestration MAX MT CO2e/acre/yr	Total Sequestration MIN MT CO2e /40 yrs	Total Sequestration MAX MT CO2e /40 yrs	Source				
NEW Landscape Planting Plan ¹	1.24			194.01	194.01	iTreeTool (20% Mortality)				
Vineyard Conservation Management Practices (CMPs)				22.63	99.51	CA COMET-Planner				
Total (Site Enhancements)	1.24	-	-	216.64	293.52					
¹ Totals calculated with iTreeTool Calculator in reference to Lutsko & Associates Planting Plan (Phases I and II, 5-25-22)										
VINEYARD SCENARIO: SUMMARY		MIN	MAX	AVE						
CARBON STOCK: Land Cover Types	MT CO2e	8	8	8						
CARBON STOCK: Dead Canopy	MT CO2e	0	0	0						
SEQUESTRATION: Land Cover Types	MT CO2e	-36	21	-7						
SEQUESTRATION: Site Enhancements	MT CO2e	217	294	255						
Vineyard Scenario Total	MT CO2e	189	322	256						
BALANCE		MIN	MAX	AVE						
Vineyard Scenario Total	MT CO2e	189	322	256						
Baseline Scenario Total	MT CO2e	111	176	143						
BALANCE_{MIN} = (VINEYARD)_{MIN} - (BASELINE)_{MAX}		13								
BALANCE_{MAX} = (VINEYARD)_{MAX} - (BASELINE)_{MIN}			212							
BALANCE_{AVE} = (VINEYARD)_{AVE} - (BASELINE)_{AVE}				112						