Letter 6

CENTER for BIOLOGICAL DIVERSITY

July 28, 2009

SENT VIA EMAIL

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Re: Comments on the Fairfax DEIR

Dear CAL FIRE:

6-1 The Center for Biological Diversity ("Center") submits the following comments for the Fairfax Draft Environmental Impact Statement ("Fairfax DEIR"). The Center is a non-profit, public interest, conservation organization dedicated to the protection of native species and their habitats through applying sound science, policy and environmental law. The Center has over 40,000 members, many of whom reside in California.

The California Environmental Quality Act ("CEQA") mandates that the environmental impacts of a project be considered and analyzed, and that agencies "mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so." Pub. Res. Code § 21002.1(b); *see also* Pub. Res. Code § 21002 ("[It is the] policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures which will avoid or substantially lessen the significant environmental effects of such projects."). Mitigation of a project's significant impacts is one of the "most important" functions of CEQA. *Sierra Club v. Gilroy City Council*, 222 Cal.App.3d 30, 41 (1990).

6-2 As the lead agency, it is CAL FIRE's duty to ensure that the Fairfax EIR conforms with applicable law. With regard to GHG emissions analysis under CEQA, the Attorney General's Office has recently stated that:

> Lead agencies should make a good-faith effort, based on available information, to calculate, model, or estimate the amount of CO_2 and other GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities.
>
> The question for the lead agency is whether the GHG emissions from the project . . . are considerable when viewed in connection with the GHG emissions from past projects, other current projects, and probable future projects.

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> Unlike more localized, ambient air pollutants which dissipate or break down over a relatively short period of time (hours, days or weeks), GHGs accumulate in the atmosphere, persisting for decades and in some cases millennia. The overwhelming scientific consensus is that in order to avoid disruptive and potentially catastrophic climate change, then it's not enough simply to stabilize our annual GHG emissions. *The science tells us that we must immediately and substantially reduce these emissions.*
>
> The decisions that we make today do matter. Putting off the problem will only increase the costs of any solution. Moreover, delay may put a solution out of reach at any price. *The experts tell us that the later we put off taking real action to reduce our GHG emissions, the less likely we will be able to stabilize atmospheric concentrations at a level that will avoid dangerous climate change.*[1]
>
> [Agencies should] evaluate *at least one alternative* that would ensure that the [agency] contributes to a lower-carbon future.

See Climate Change, the California Environmental Quality Act, and General Plan Updates: Straightforward Answers to Some Frequently Asked Questions California Attorney General's Office [Rev. 3/06/09] (emphasis added).

6-3

The California Resources Agency has also addressed the issue of GHG emissions and has pointed out that the following must be considered when assessing GHG emissions associated with logging:

- Type of Forest Management (Clear Cutting or other types of logging management)[2]
- Age of forest at issue, tree type[3]
- Store of Carbon in Bio Mass, Soil[4], and Old Growth
- Rate new growth sequesters carbon
- Changes to system overall
- Reduction of carbon stores v. rate of carbon uptake
- Increases and Decreases in Carbon to Environmental Setting
- Cumulative Impacts

[1] This goes to the heart of the problem. Forest conversion immediately disrupts the ongoing process of C sequestration by a forest, causes immediate and ongoing emissions, and any sequestration by vineyards will not make up for the losses and foregone sequestration.

[2] A forest conversion is essentially a clear-cut but without any tree replanting.

[3] Absent from the DEIR is an accurate accounting of the fact that "young-growth timber (redwood and Douglas-fir)" will be cut. DEIR 1-2.

[4] The DEIR almost completely ignores the issue of soil carbon and does not calculate the emissions associated with loss of soil carbon stores.

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6-3 Cont'd *See* Powerpoint Presentation of Resource Agency (presented at February, 2009, Board of Forestry meeting).

6-4 The above statements from the Attorney General and Resources Agency make clear that agencies must give careful attention to the greenhouse gas ("GHG") emissions associated with the projects they approve and must calculate, model, or estimate all of the GHG emissions associated with a particular project. After fully quantifying a project's emissions, an EIR must determine the cumulative significance of the project's greenhouse gas pollution. An impact is considered significant where its "effects are individually limited but cumulatively considerable." CEQA Guidelines § 15065(a)(3). Climate change is the classic example of a cumulative effects problem; emissions from numerous sources are combining to create the most pressing environmental and societal problem of our time. *See Center for Biological Diversity v. Diversity v. NHTSA*, 508 F.3d 508, 550 (9th Cir. 2007), ("the impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct."); *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 720 (1990) ("Perhaps the best example [of a cumulative impact] is air pollution, where thousands of relatively small sources of pollution cause a serious environmental health problem."). While a particular project's greenhouse gas emissions may represent only a tiny fraction of total emissions, courts have rejected the notion that the incremental impact of a project is not cumulatively considerable when it is so small that it would make only a *de minimis* contribution to the problem as a whole. *Communities for a Better Env't v. California Resources Agency*. 103 Cal.App.4th 98, 117 (2002) ("The relevant issue was not the relative amount of traffic noise resulting from the project when compared to existing traffic noise, but whether any additional amount of traffic noise should be considered significant given the nature of the existing traffic noise problem. From *Kings County* and *Los Angeles Unified*, the guiding criterion on the subject of cumulative impact is whether any additional effect caused by the proposed project should be considered significant given the existing cumulative effect.").

6-5 This Project, unfortunately, is particularly problematic from a GHG perspective because it "would convert forests and grasslands to vineyards, a reservoir, corporation yard, and roads." DEIR at 4-13. As explained below, forests are one of this planet's greatest attributes in terms of sequestering carbon, and, consequently, any loss of forest is cause for serious concern. In this particular instance, 171 acres of forest would be clear-cut and lost (DEIR at 4-13), and therefore, alternatives and/or mitigation must be presented in the DEIR to address this significant environmental impact. Indeed, the lead agency for this DEIR, CAL FIRE, has already stated that forest conversions such as this one are a significant GHG threat that require mitigation: "One of the activities recognized as having adverse impacts to C02 sequestration potential of California's forests is deforestation through conversion . . . [L]oss to conversions are recognized as potential threats to the Forest Sector in relation to achieving [AB 32 GHG] goals . . . [C]onversions will require GHG accounting to analyze and mitigate the direct and indirect impacts associated with these types of projects. . . . Even before carbon sequestration was in the national spotlight it was acknowledged that the most significant threat to resource values associated with forest lands is when those forestlands are converted to non-timberland uses . . . [C]onversion of forests to other non-forest uses [] has been shown in many studies to reduce the potential for carbon sequestration and elevate carbon release on a long-term basis . . . ." CAL FIRE Official Response for THP 04-08-024-AMA.

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I. THE DEIR MUST ENSURE INFORMED DECISION-MAKING

CEQA demands, among other things, that enough information be provided regarding a project to ensure informed decision-making. Moreover, CEQA requires that the information "be presented in a manner calculated to adequately inform the public and decision makers, who may not be previously familiar with the details of the project." *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova,* 40 Cal. 4th 412, 442 (2007). The statement in the DEIR regarding greenhouse gas emissions falls well short of those standards and is therefore deficient from an informational standpoint. As stated by the California Supreme Court:

> The preparation and circulation of an EIR is more than a set of technical hurdles for agencies and developers to overcome. The EIR's function is to ensure that government officials who decide to build or approve a project do so with a full understanding of the environmental consequences, and, equally important, that the public is assured those consequences have been taken into account.

Id. at 449-50, *see also East Peninsula Ed. Council, Inc. v. Palose Verdes Peninsula Unified School Dist.,* 210 Cal.App.3d 155, 174 (1989) ("Where failure to comply with the law results in a subversion of the purposes of CEQA by omitting information from the environmental review
6-6 process, the err is prejudicial"); *Laurel Heights Improvement Assn. v. Regents of University of California,* 47 Cal. 3d 376, 402 (1988) ("CEQA's fundamental goal of … informed decision making").

The DEIR fails to discuss the importance of the fact that 171 acres of trees will no longer be sequestering carbon. This is a big deal, especially when considered in light of the many other conversions that have occurred or are occurring just in Sonoma County alone. As explained in *Forests: Opportunities for Greenhouse Gas Emission Reduction in Sonoma County*, Michelle Passero, December 2007, p. 3:

> Over the past several years, Sonoma County has witnessed an increasing threat of forestland conversion to non-forest uses, vineyards in particular. Between 1990 and 1997, at least 1,630 acres of dense oak woodlands were converted to vineyards[5] and from 1989 to 2004, 851 acres of timberland were approved for conversion, primarily to vineyards. More recently, an application to convert approximately 1,700 acres of forestland to vineyards has been submitted to the County, which is still pending. According to Sonoma County's Permit and Resource Management Department, once the time and money has been invested to convert timberland to croplands, these lands are almost never restored to forests.
>
> The climate impacts of this forestland conversion are twofold. First, the conversion of these forestlands results in direct emissions of CO_2 to the atmosphere. Second, the future capacity of the forest to remove additional CO_2 from the atmosphere is significantly diminished because there is very little chance that these lands will be restored to forests

[5] Merenlender, Adina and Brooks, Colin. GIS in Rangeland Management, Vineyard Expansion in Sonoma County: Mapping, Monitoring, and Changing Policies

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based on the history of conversions in Sonoma County. The potential net difference between the overall carbon stored in a vineyard and forestland could be anywhere from 15 tons of carbon per acre to over a thousand tons per acre, depending on several factors, including forest type, age, site class and maturity and management of the vineyard. Such a reduction in overall carbon stocks means net emissions of CO_2 to the atmosphere upon conversion of the forestland to vineyards.

6-7

While the DEIR does show in its calculations that carbon sequestration will be severely diminished as a result of the Project's conversion of forest to vineyard (*see* Table 4-3), the DEIR essentially ignores those calculations – there is no discussion of their meaning from a GHG perspective. Instead, the DEIR concludes, without justification, that the diminished sequestration is inconsequential. As discussed above, however, courts have made clear that even tiny impacts can be cumulatively significant and that this is especially so when dealing with GHG emissions. Moreover, time and again, the lead agency (CAL FIRE), has explicitly stated that it believes a) conversion can be a significant GHG problem, and b) that young forests such as the one being logged here, are important sequesterers of carbon due to their sequestration rates. *See, e.g.,* CAL FIRE's Official Response for THP 04-08-024-AMA. Put another way, this Project would result in the complete loss of 171 acres of what the lead agency itself believes is one of our best weapons against climate change. Therefore, the DEIR's conclusion that this Project does not have a significant GHG impact makes no sense, and the failure to discuss the importance of lost sequestration prevents an informed decision.

6-8

The DEIR similarly fails to adequately address the emissions that will be associated with the following logging impacts that will occur when the 171 acres are cut : a) loss of young redwood and Douglas fir trees, b) severe soil disturbance, c) loss of understory, d) site preparation/prevention of development of understory, e) burning or decay of leftover slash material, and e) emissions associated with the actual cutting, movement and development of the trees (*e.g.*, gray emissions). For instance, the removal of the forest canopy by clear-cutting exposes the soil to direct sunlight, which tends to increase soil respiration; soil preparation (such as discing) also increases soil respiration; and soil erosion associated with clear-cutting and soil preparation can cause significant losses of soil carbon. All of these factors are substantial additions to the greenhouse gas emissions, and therefore are impacts of the Project, and must be addressed.

It is also important to note that GHG emissions are now more than ever understood to be at a tipping point. In addressing the impacts of the GHG emissions from this Project, it is important to take into account the impacts of ecological tipping points, irreversible changes in the climate expected to occur when atmospheric concentrations of greenhouse gases reach a certain level. [6]

[6] It is well-accepted that there will be tipping points. (Meehl et al. at 775, 2007). Reaching any single tipping point can bring severe economic and ecologic consequences. But perhaps more worrisome is the linkage between tipping points such that reaching one tipping point may in turn trigger a second. An example is the connection between Arctic sea ice and permafrost melt rates; recent evidence indicates that the loss of Arctic sea ice, one tipping point, accelerates permafrost thaw, a second tipping point. (Lawrence et al. 2008). Permafrost refers to permanently frozen land; this surface stores large amounts of carbon. As permafrost thaws due to global warming, it releases carbon, often as methane. (Christensen et al. 2004). Methane has a global warming potential that is approximately

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The issue of tipping points adds to the need for this Project to fully disclose its greenhouse gas emissions. The greenhouse gases emitted from conversion/clear-cutting are indubitably adding to the overall atmospheric concentration of greenhouse gases at a time that the global climate is potentially approaching critical tipping points. In addition, these emissions in the short term would contradict the efforts throughout the state (including in the forest sector) to reduce greenhouse gas emissions to 1990 levels by 2020.

The best available scientific evidence now indicates that a warming of 2°C is not "safe" and would not prevent dangerous interference with the climate system. In order to avoid dangerous anthropogenic interference (DAI) with the climate system, sound climate analysis must minimize the risk of severe and irreversible outcomes. Stabilizing greenhouse gas emissions at 350 ppm CO2eq, would reduce the mean probability of overshooting a 2°C temperature rise to 7 percent. A 350 ppm CO2eq stabilization level is also consistent with that proposed by leading climatologists, who have concluded that in order "to preserve a planet for future generations similar to that in which civilization developed and to which life on Earth is adapted . . . CO2 will need to be reduced from its current 385 ppm to at most 350 ppm."[7] While current CO2 levels exceed 350 ppm, a pathway toward 350 ppm is possible though the rapid phase-out of coal emissions, improved agricultural and forestry practices, and possible future capture of CO2 from biomass power plants. *Id.* In short, time is of the essence when addressing GHG emissions, and therefore, timing must be properly considered and accounted for when determining and addressing the emissions associated with the loss of 171 acres of forest. Carbon sequestration foregone, especially in the short term, and carbon emitted, especially in the short term, is significant. And the DEIR makes no effort to address that fact.

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In sum, the DEIR is not a credible CEQA document from an informational standpoint. The public and decision-makers are not provided any discussion of the meaning of the DEIR's numbers despite the vast differences between a redwood forest and a vineyard in terms of carbon storage and carbon sequestration and despite the fact that even the lead agency, CAL FIRE, has found that forest conversions "will require GHG accounting to analyze and mitigate the direct and indirect impacts associated with these types of projects." CAL FIRE Official Response for THP 04-08-024-AMA.

6-10

Moreover, the DEIR fails to discuss the temporal aspects of GHG emissions, especially the fact that short term emissions are extremely problematic because they contribute to an already existing problem at a time when GHG reductions are necessary. Until the informational deficiencies are corrected, the DEIR is illegal.

II. THE DEIR MUST ADEQUATELY IDENTIFY AND QUANTIFY ALL GREENHOUSE GAS EMISSIONS ASSOCIATED WITH THE PROJECT

6-11

The removal of a tree in the name of conversion results in the direct removal of that tree's carbon as well as a loss of future carbon sequestration by that tree. In addition, there is also loss of

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25 times greater than that of carbon dioxide over 100 years. The multiplicative effect of reaching several tipping points on a similar time scale would drastically increase the costs associated with climate change.

[7] Hansen, J. et al., *Target Atmospheric CO2: Where Should Humanity Aim?* Open Atmospheric Sci. J. 217, 226 (2008).

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6-11 Cont'd carbon from a) soil disturbance, b) loss of understory, c) burning or decay of leftover slash material, and d) other emissions associated with the conversion/logging such as trucking and cutting tools (*e.g.*, gray emissions). All of these impacts must be quantified in order to do an accurate assessment of the carbon implications of the loss of 171 acres of forest.

6-12 In its recent white paper, CEQA & Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (Jan. 2008), the California Air Pollution Control Officers Association (CAPCOA) set forth methodologies for analyzing greenhouse gas pollution (CAPCOA 2008). The CAPCOA information should be helpful for addressing emissions from a) logging machinery, b) the transportation of logs and any other byproducts, c) the construction and maintenance of roads, and d) the creation of vineyards. Moreover, the OPR paper on CEQA And Climate Change discusses various models such as the EMFAC model (page 17), which can be used to "calculate emission rates from all motor vehicles in California. The emission factors are combined with data on vehicle activity (miles traveled and average speeds) to assess emission impacts."

While the Fairfax DEIR provides calculations for potential emissions it does so in only a general way and is only a partial accounting. For instance, no accounting is made for the type of forest being cut (here, redwood/Douglas fir). This is especially problematic given that redwood trees

> are famous for their enormous stocks of standing biomass and represent perhaps the most massive forests, per unit area, on earth. Measurements of old-growth (>200 years) redwood stands have yielded standing carbon stocks ranging from 1,650 to 1,784 t C equivalent per ha (Hallin, 1934, Westman and Whittaker, 1975, and Fujimori, 1977). Equally impressive is the rate at which carbon is sequestered in growing redwood stands. A 100 year old redwood stand measured by Olson et al (1990) yielded 3,600 cubic meters per ha, equivalent to 648 t C per ha (at specific gravity 0.36 g oven dry biomass/cm3 for second-growth redwood (Markwardt and Wilson, 1935)), or a mean annual carbon increment of 6.48 t C per ha per year.[8]

In short, conversion of redwood forest means losing one of the most important forest systems on Earth when it comes to carbon sequestration/storage, and the DEIR ignores that fact entirely. *See also* Figures 34, 40, 41and Tables 24, 25, 29 (inserted on the following pages) in Christensen, Glenn A.; Campbell, Sally J.; Fried, Jeremy S., tech. eds. 2008. California's forest resources, 2001–2005: five-year Forest Inventory and Analysis report. Gen. Tech. Rep. PNW-GTR-763. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 183 p., accessed at http://www.fs.fed.us/pnw/publications/gtr763/ on July 25, 2009.

6-13 The DEIR also admits that it "does not account for tractor emissions, small engine emissions (e.g., weedeaters), or the initial emissions associated with logging and conversion of the site." DEIR at 4-15. This means no carbon accounting was made for soil and understory impacts or for the many

[8] Winrock International. *Measuring and Monitoring Plans for Baseline Development and Estimation of Carbon Benefits for Change in Forest Management in Two Regions, March 2004.* Accessed at http://www.energy.ca.gov/reports/CEC-500-2004-070/CEC-500-2004-070F.PDF on July 25, 2009.

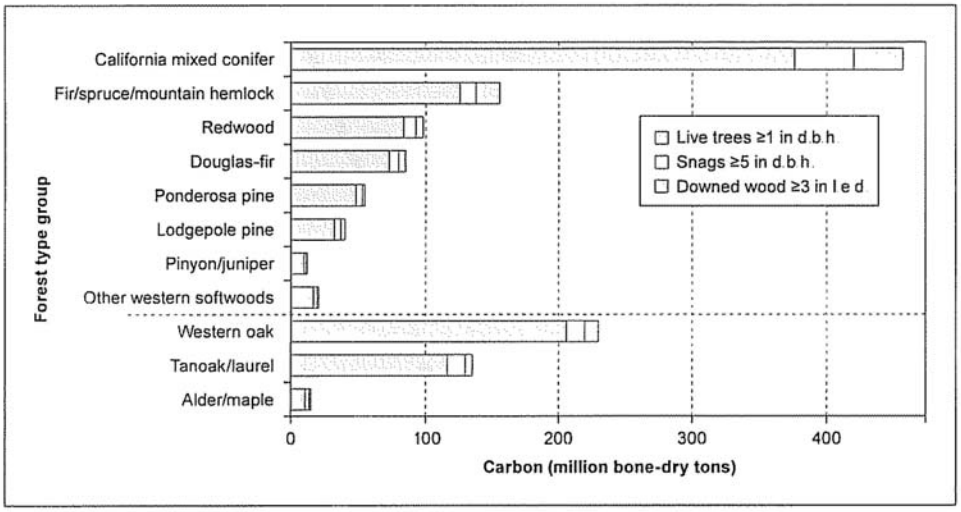

Figure 33—Carbon mass of live trees, snags, and down wood (coarse woody material) by forest type group on forest land in California, 2001–2005; d.b.h. = diameter at breast height; l.e.d. = large end diameter

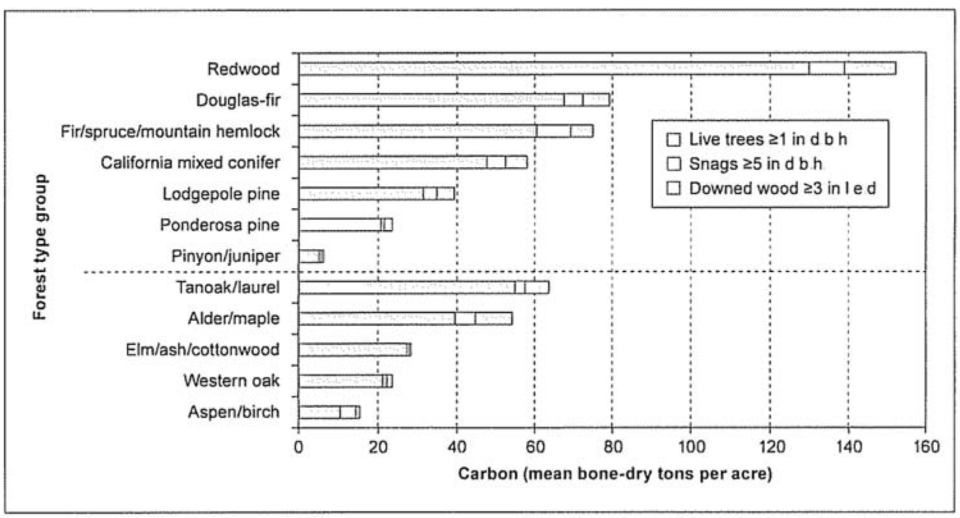

Figure 34—Mean carbon mass of live trees, snags, and down wood (coarse woody material) by forest type group on forest land in California, 2001–2005; d.b.h. = diameter at breast height; l.e.d. = large end diameter

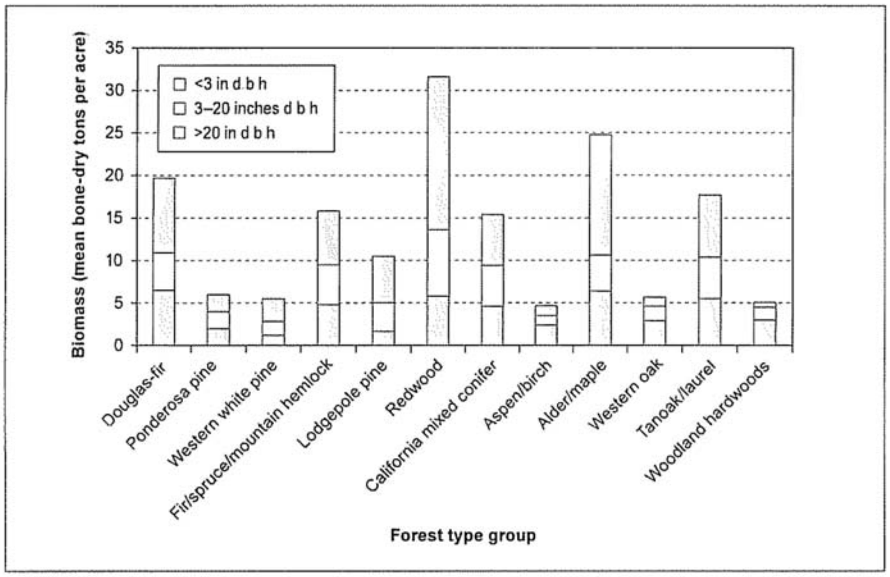

Figure 40—Mean biomass of down wood by forest type and diameter class on forest land in California, 2001–2005

alder/maple forest types, over 50 percent was contained in large-diameter logs (≥20 inches). Although large logs contain the greatest mean volume and biomass per acre statewide, they are significantly fewer in number than small logs (3 to 19 inches in diameter). We estimated an average of 7 large logs per acre and 144 small logs per acre.

Snags had a mean biomass of 6 tons per acre and a mean density of 13 snags per acre across the state. Almost 88 percent of the snag density was in snags <20 inches d b h., with just 0.2 snags per acre in the very large class (>40 inches d b h.). Softwood forest types had the most biomass and the largest proportion of large-diameter (>20 inches d.b.h.) snags (fig. 41).

Although the total amount of dead wood present in a forest fluctuates over time, the mean density of large-diameter (≥ 20 inches) snags and down logs generally increases with stand age (fig. 42), as shown below:

Stand age in years	Snags		Down wood	
	Diameter classes			
	5 to 19 in	≥ 20 in	3 to 19 in	≥ 20 in
	Mean trees/acre		*Mean logs/acre*	
1 to 50	10.4	0.9	155.0	8.0
51 to 100	11.5	1.2	148.1	5.1
101 to 150	13.4	2.4	164.7	8.0
151 to 200	13	3.6	170.6	11.6
201 to 250	6.5	3.4	121.0	9.7
251 to 300	7.4	2.9	152.8	11.4
300 plus	10.7	4.4	119.8	11.8
Total	11.4	1.7	143.0	6.4

Large snags ranged from a mean of 0.9 per acre in young stands to 4.4 per acre in stands older than 300 years. In contrast, young stands appear to start out with a higher level of large down wood, most likely remnants from a stand-initiating event such as a fire or harvest. Density of down wood differed by age class, rising and falling slightly over time and reaching a high of 11.8 logs per acre in very old stands.

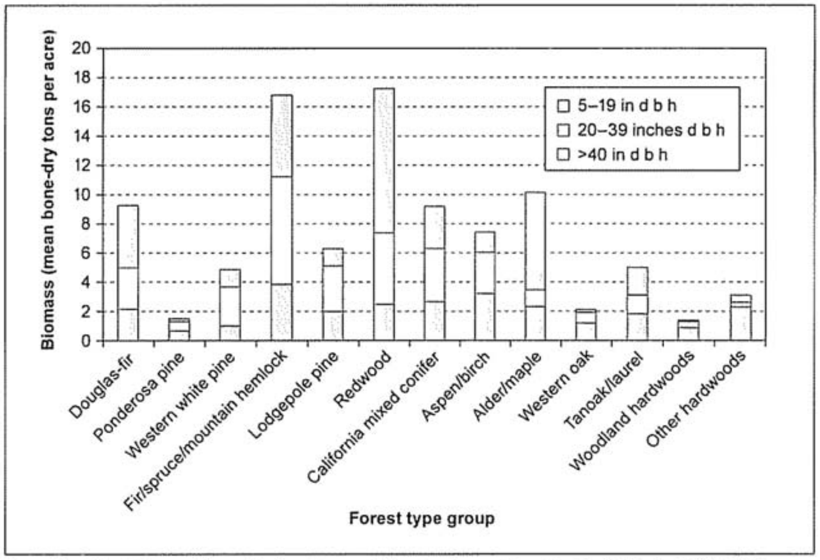

Figure 41—Mean biomass of snags by forest type and diameter class on forest land in California, 2001–2005

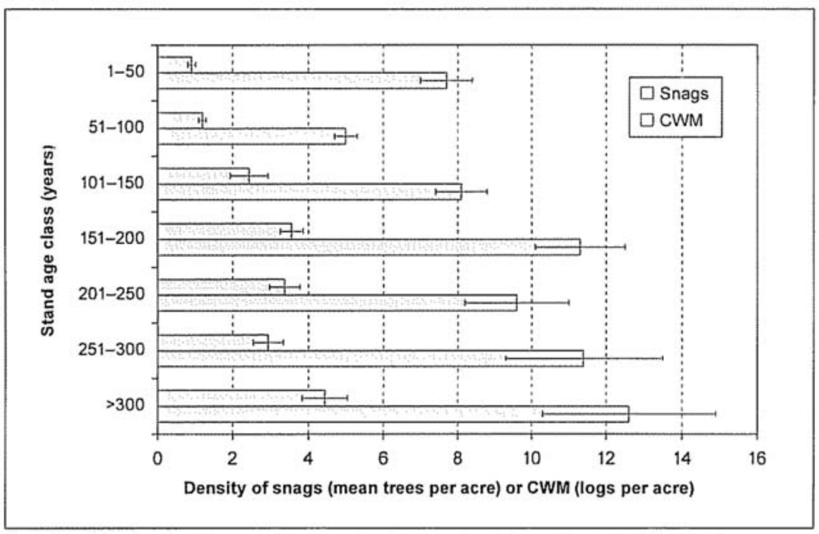

Figure 42—Mean density of down wood and snags by stand age class for large-diameter (> 20 inches) logs or snags on forest land in California, 2001–2005; CWM = coarse woody material

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Table 24—Estimated average biomass and carbon mass of live trees, snags, and down wood on forest land, by forest type group, California, 2001–2005

	Biomass							Carbon						
	Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood[a] (≥3 in l.e.d.)			Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood[a] (≥3 in l.e.d.)		
Forest type group	Mean	SE	Mean	SE	Mean	SE	TOTAL	Mean	SE	Mean	SE	Mean	SE	TOTAL
	Bone-dry tons per acre													
Softwoods:														
California mixed conifer	91 9	2 0	9 2	0 5	10 5	0 4	111 6	47 7	1 0	4 7	0 2	5 4	0 2	57 8
Douglas-fir	130 9	8 6	9 3	1 3	13 2	1 7	153 4	67 6	4 5	4 8	0 7	6 8	0 9	79 2
Fir/spruce/mountain hemlock	116 4	5 2	16 8	1 4	11 0	0 8	144 2	60 6	2 7	8 7	0 7	5 7	0 4	75 0
Lodgepole pine	60 5	4 0	6 3	0 9	8 8	1 0	75 6	31 5	2 1	3 3	0 5	4 6	0 5	39 4
Other western softwoods	15 7	1 1	1 2	0 2	2 4	0 3	19 3	8 2	0 6	0 6	0 1	1 3	0 2	10 1
Pinyon/juniper	9 9	0 7	0 9	0 2	1 2	0 2	12 0	5 1	0 4	0 5	0 1	0 6	0 1	6 2
Ponderosa pine	39 9	1 9	1 5	0 2	4 0	0 3	45 4	20 7	1 0	0 8	0 1	2 1	0 2	23 6
Redwood	250 3	33 1	17 3	3 7	25 7	5 4	293 3	129 9	17 2	9 0	1 9	13 3	2 8	152 2
Western hemlock/Sitka spruce[b]	198 4	25 7	87 5	17 1	16 5	4 2	302 4	102 7	13 5	45 5	8 9	8 6	2 2	156 8
Western white pine	33 8	6 5	4 9	1 4	4 2	1 1	42 9	17 6	3 4	2 5	0 7	2 2	0 5	22 3
Total	77 4	1 9	7 5	0 3	8 5	0 3	93 4	40 2	1 0	3 9	0 2	4 4	0 2	48 5
Hardwoods:														
Alder/maple	78 1	10 6	10 1	2 8	18 4	4 2	106 6	39 6	5 4	5 2	1 5	9 5	2 2	54 3
Aspen/birch	20 7	6 8	7 5	6 0	2 3	1 4	30 5	10 4	3 4	3 9	3 1	1 1	0 7	15 4
Elm/ash/cottonwood	55 8	16 1	1 0	0 7	1 1	0 4	57 9	27 4	7 9	0 5	0 3	0 5	0 2	28 4
Exotic hardwoods[b]	82 0	19 1	—	—	2 7	0 1	84 7	40 3	9 4	—	—	1 3	0 1	41 6
Other hardwoods	45 6	6 8	3 1	0 8	3 5	0 7	52 2	22 8	3 4	1 6	0 4	1 8	0 3	26 2
Tanoak/laurel	109 3	5 4	5 0	0 6	12 2	1 1	126 5	55 0	2 7	2 5	0 3	6 2	0 5	63 7
Western oak	42 4	1 2	2 1	0 2	2 8	0 2	47 3	21 1	0 6	1 1	0 1	1 4	0 1	23 6
Woodland hardwoods	11 4	1 2	1 4	0 3	2 1	0 4	14 9	5 8	0 6	0 7	0 2	1 1	0 2	7 6
Total	52 6	1 5	2 8	0 2	4 6	0 3	60 0	26 3	0 7	1 4	0 1	2 3	0 1	30 0
Nonstocked	1 8	0 3	8 3	2 5	2 6	0 5	12 7	0 9	0 2	4 3	1 3	1 4	0 3	6 6
All forest types	65 7	1 2	5 6	0 2	6 8	0 2	78 1	33 7	0 6	2 9	0 1	3 5	0 1	40 1

Note: Means are calculated using a ratio of means formula across plots within forest type groups; data subject to sampling error; SE = standard error; — = less than 0 05 bone-dry tons per acre were estimated; d b h = diameter at breast height; l e d = large-end diameter of the log

[a] Down wood in this table includes coarse woody material only

[b] These forest type groups are represented by <5 plots

Table 25—Estimated average biomass, volume, and density of down wood on forest land, by forest type group and diameter class, California, 2001–2005

Forest type group	Biomass: Diameter class (inches)[a] FWM <3 in Mean	SE	CWM 3 to 19 in Mean	SE	CWM ≥20 in Mean	SE	Total Mean	SE	Volume: Diameter class (inches)[a] FWM <3 in Mean	SE	CWM 3 to 19 in Mean	SE	CWM ≥20 in Mean	SE	Total Mean	SE	Density[b]: Diameter class (inches) CWM 3 to 19 in Mean	SE	CWM ≥20 in Mean	SE	Total Mean	SE
	Bone-dry tons per acre								*Cubic feet per acre*								*Logs per acre*					
Softwoods:																						
California mixed conifer	4.9	0.3	4.6	0.2	5.9	0.3	15.4	0.8	391.9	19.5	548.4	21.8	786.6	41.0	1,726.9	81.4	225.5	7.0	9.5	0.5	235.0	7.2
Douglas-fir	6.6	0.7	4.4	0.4	8.8	1.6	19.8	2.0	478.0	56.0	526.1	41.6	1,164.2	229.0	2,168.3	265.9	191.8	13.9	16.5	2.8	208.3	14.7
Fir/spruce/mountain hemlock	5.0	0.3	4.7	0.3	6.3	0.7	16.0	0.9	434.4	22.6	600.8	34.8	872.3	91.0	1,907.5	115.2	224.6	12.5	11.5	1.1	236.1	12.7
Lodgepole pine	1.8	0.2	3.3	0.5	5.5	0.7	10.6	1.1	150.5	16.8	420.3	57.3	740.3	90.6	1,311.1	142.4	109.8	12.1	9.1	1.2	118.9	12.6
Other western softwoods	1.2	0.1	1.1	0.1	1.3	0.2	3.6	0.4	83.3	7.8	123.4	14.5	179.0	35.1	385.7	56.7	49.1	4.8	3.0	0.6	52.1	5.0
Pinyon/juniper	1.3	0.1	0.9	0.1	0.3	0.1	2.5	0.2	101.4	8.7	101.1	12.4	28.7	8.6	231.2	21.1	55.0	6.3	0.7	0.2	55.7	6.4
Ponderosa pine	2.1	0.1	2.0	0.1	2.0	0.2	6.1	0.8	178.2	12.0	236.9	15.3	286.4	33.1	701.5	94.5	121.8	7.4	4.4	0.6	126.2	7.6
Redwood	6.2	1.0	7.8	0.8	18.0	5.2	32.0	5.3	63.0	87.1	952.9	93.6	2,466.9	696.3	3,482.8	703.5	307.1	35.3	27.1	4.3	334.2	35.6
Western hemlock/Sitka spruce	5.2	1.7	4.5	1.0	12.0	3.1	21.7	3.0	5.3	147.4	706.7	158.6	1,746.9	458.9	2,458.9	498.4	226.8	25.3	36.8	9.7	263.6	27.6
Western white pine	1.3	0.2	1.6	0.4	2.7	0.9	5.6	1.0	8.3	19.8	199.0	51.2	307.1	100.5	514.4	117.8	96.6	17.0	5.8	2.7	102.4	17.7
Total	4.0	0.1	3.5	0.1	5.0	0.3	12.5	0.4	326.6	10.1	429.3	12.3	667.3	35.5	1,423.2	50.6	170.8	4.1	8.5	0.4	179.3	4.2
Hardwoods:																						
Alder/maple	6.5	1.0	4.2	0.6	14.2	3.8	24.9	4.2	509.8	74.8	569.6	82.1	1,865.5	514.7	2,944.9	573.8	183.2	23.6	23.7	5.5	206.9	27.0
Aspen/birch	2.4	0.6	1.1	0.4	1.2	1.1	4.7	1.4	196.1	45.9	153.5	58.7	197.5	190.3	547.1	236.3	106.4	32.0	1.5	1.5	107.9	32.7
Elm/ash/cottonwood	4.5	0.8	1.1	0.4	—	—	5.6	0.5	330.1	32.9	156.6	53.7	—	—	486.7	81.4	78.9	27.9	—	—	78.9	27.9
Other hardwoods	4.9	1.0	2.5	0.5	1.1	0.4	8.5	1.3	314.4	71.6	188.5	36.7	128.7	40.8	631.6	112.7	95.8	23.2	2.6	1.1	98.4	23.4
Tanoak/laurel	6.1	0.4	4.9	0.3	7.3	1.0	18.3	1.3	395.3	26.3	531.1	32.0	840.1	102.8	1,766.5	124.2	202.4	12.2	12.2	1.4	214.6	12.5
Western oak	3.1	0.1	1.7	0.1	1.1	0.2	5.9	0.3	169.3	6.0	167.9	8.2	128.9	24.3	466.1	28.7	83.9	3.5	1.6	0.2	85.5	3.6
Woodland hardwoods	3.1	0.5	1.5	0.3	0.6	0.2	5.2	0.7	197.6	26.2	134.2	29.9	74.0	31.0	405.8	53.4	89.3	18.3	1.7	1.0	91.0	18.2
Total	3.7	0.1	2.3	0.1	2.3	0.2	8.3	0.3	220.2	7.8	235.2	9.0	273.7	28.1	729.1	35.1	107.2	3.7	3.8	0.3	111.0	3.8
Nonstocked	1.7	0.2	2.1	0.4	0.5	0.2	4.3	0.7	133.7	16.1	247.2	52.4	62.1	19.8	443.0	72.7	76.4	13.7	1.1	0.4	77.5	13.8
All forest types	3.8	0.1	3.0	0.1	3.8	0.2	10.6	0.3	276.5	6.6	347.0	8.1	495.2	23.5	1,118.7	32.6	143.0	2.8	6.4	0.2	149.4	2.9

Note: Means are calculated using a ratio of means formula across plots within forest type groups; data subject to sampling error; SE = standard error; — = less than 0.05 bone-dry tons per acre, 0.05 cubic feet per acre, and 0.05 logs per acre were estimated; CWM = coarse woody material; FWM = fine woody material.

[a] The diameter at the large end is used to classify CWM with decay classes of 1–4; diameter at the point of intersection with the transect is used for heavily decomposed CWM (decay class 5) and for all FWM.

[b] An estimate of pieces per acre is not possible for FWM.

Table 29—Mean cover of understory vegetation on forest land, by forest type group and life form, California, 2001–2005

	Seedlings and saplings		Shrubs		Forbs		Graminoids		All understory plants		Bare soil	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Percent					
Softwoods:												
California mixed conifer	6.3	0.2	17.6	0.6	5.2	0.2	3.6	0.2	31.0	0.7	4.7	0.2
Douglas-fir	7.7	0.8	24.4	2.0	8.9	1.1	4.8	0.9	43.4	2.4	3.5	0.6
Fir/spruce/mountain hemlock	3.5	0.3	17.2	1.3	5.8	0.5	2.9	0.3	28.0	1.4	5.6	0.5
Lodgepole pine	3.7	0.5	10.9	1.3	8.9	0.9	11.0	1.4	31.6	2.1	5.9	0.8
Other western softwoods	1.7	0.2	14.9	1.0	7.6	0.6	14.1	0.9	35.9	1.4	14.1	0.9
Pinyon/juniper	1.0	0.2	17.6	0.9	4.9	0.4	6.9	0.6	29.4	1.3	16.5	1.2
Ponderosa pine	3.0	0.3	23.3	1.2	6.0	0.4	8.5	0.7	39.0	1.3	6.0	0.5
Redwood	7.9	0.9	21.7	2.4	12.5	1.7	3.5	0.7	43.3	2.8	3.4	0.8
Western hemlock/Sitka spruce	0.7	0.3	24.6	16.5	23.4	7.4	2.5	2.8	44.0	14.3	0.2	0.1
Western white pine	10.0	3.8	18.0	4.4	8.9	2.2	5.4	1.1	39.1	6.0	12.5	3.7
Total	4.6	0.1	18.1	0.4	6.3	0.2	6.0	0.2	33.2	0.5	7.2	0.2
Hardwoods:												
Alder/maple	7.5	1.7	35.4	4.6	18.1	2.8	3.6	1.2	58.7	4.4	1.8	0.8
Aspen/birch	14.9	3.1	26.6	5.6	12.6	3.3	8.7	1.7	57.1	6.7	5.1	2.2
Elm/ash/cottonwood	2.2	1.6	51.5	8.7	2.7	1.2	25.7	10.8	69.5	9.8	1.4	0.7
Exotic hardwoods	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Other western hardwoods	5.5	0.8	20.7	1.8	7.8	0.8	15.8	2.0	47.3	2.5	9.0	1.5
Tanoak/laurel	12.1	0.8	16.7	1.3	7.2	0.7	4.0	0.8	38.2	1.7	3.0	0.4
Western oak	4.0	0.2	18.2	0.7	11.7	0.5	28.7	0.9	57.5	0.9	4.0	0.2
Total	5.5	0.2	18.7	0.6	10.8	0.4	23.1	0.8	53.7	0.8	4.2	0.2
Nonstocked	1.6	0.6	28.9	2.8	10.7	1.4	16.0	2.3	53.9	2.9	16.0	2.1
All forest types	4.9	0.1	18.6	0.3	8.2	0.2	13.1	0.3	41.9	0.4	6.2	0.2
Chaparral on national forest	0.7	0.2	61.5	1.3	5.9	0.5	6.0	0.5	72.0	1.1	9.0	0.5

Note: Data subject to sampling error; SE = standard error

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6-13 Cont'd gray emissions associated with cutting the 171 acres. Therefore, until the above issues are addressed, the DEIR fails to adequately identify, and consequently, fails to calculate, the GHG emissions associated with this Project. Moreover, the numbers that have been provided (*i.e.*, Tables 4-3 and 4-4), while deficient, nonetheless demonstrate that GHG impacts will be much greater than zero, and hence, are cumulatively significant.

III. THE DEIR MUST ANALYZE AND ADOPT ALL FEASIBLE MITIGATION MEASURES AND ALTERNATIVES TO REDUCE ITS CARBON IMPACT

6-14 In order to comply with CEQA, CAL FIRE "must determine whether any of the possible significant environmental impacts of the project will, in fact, be significant." *Protect the Historic Amador Waterways v. Amador Water Agency*, 116 Cal. App. 4th 1099, 1109 (2004). A major deficiency of the DEIR is its failure to properly acknowledge and discuss a) what will be foregone as a result of the loss of 171 acres of redwood forest, and b) what will be emitted as a result of the loss of 171 acres of redwood forest. While the DEIR does provide numbers which show that carbon sequestration will be diminished, and that there will be serious emissions as a result of the Project, the DEIR then fails to take the next logical step of avoiding and/or mitigating for this significant impact. Instead, with almost no explanation, the DEIR asserts that its GHG impacts are insignificant. As explained below, this conclusion is without merit, and therefore, the DEIR is deficient in its failure to address its significant GHG impacts.

6-15 Even by its own numbers, the DEIR shows that the Project would result in significant GHG emissions. First of all, the DEIR's numbers demonstrate that foregone sequestration will be substantial – if left alone, the forest area being proposed for conversion would sequester between 188 and 1316 *more* metric tons of carbon per year than would occur if the Project goes forward. *See* Table 4-3. Second, the DEIR notes that at least 231 metric tons of carbon would be emitted from vehicles as a result of the Project. *See* Table 4-4. Third, as the DEIR admits, the vehicle emissions figure "does not account for tractor emissions, small engine emissions (e.g., weedeaters), or the initial emissions associated with logging and conversion of the site." DEIR at 4-15. Together, this means that by the DEIR's own findings, this Project would result in substantial metric tons of carbon emissions per year. Of course, as already pointed out, the DEIR fails to account for all emissions, and fails to account for the loss of redwood forest, so the DEIR's numbers are *minimums*. Indeed, just the emissions associated with "logging and conversion of the site" would themselves be significant and yet are unaccounted for by the DEIR.

6-16 Inexplicably, though, after laying out the above numbers (and admitting that much was left out of those numbers), the DEIR asserts that "in the context of statewide, nationwide, or global emissions, and considering the carbon sequestration that would continue to occur once the vineyards are planted, the proposed project's incremental contribution … would not be cumulatively considerable. Therefore, the proposed project would have a ***less-than-significant*** impact on climate change." DEIR at 4-17 (emphasis in original). This makes no sense given that the Project will indeed lead to substantially diminished sequestration as well as greater GHG emissions than would occur absent the Project. Again, with GHG emissions, even tiny impacts are significant from a cumulative perspective, especially in light of the very serious nature of the issue – numerous sources are combining to create the problem, and while some are small and some are large, all are significant because they each further intensify the problem.

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6-17 The DEIR exacerbates its GHG shortomings by failing to explain how it determined the significance of it GHG impacts. Indeed, there is no discussion whatsoever in the DEIR of a GHG significance threshold other than the following statement:

> Currently, thresholds of significance for GHGs have not been identified by either the ARB, or the NSCAPCD. Early actions proposed by the ARB are not strictly applicable to the proposed project, and the proposed project would be subject to any applicable State regulations as they are developed.

DEIR at 4-16 – 4-17. CEQA requires agencies to explain the significance of a Project's emissions with or without established significance thresholds and this is true regardless of whether the Project would be subject to other regulations. As noted in the CAPCOA white paper on CEQA and Climate Change, "[t]he absence of a threshold does not in any way relieve agencies of their obligations to address GHG emissions from projects under CEQA." CAPCOA 2008 at 23. *See also* OPR Technical Advisory document, p. 4 ("Even in the absence of clearly defined thresholds [of significance] for GHG emissions, the law requires that such emissions from CEQA projects must be disclosed and mitigated to the extent feasible whenever the lead agency determines that the project contributes to a significant, cumulative climate change impact."). Moreover, as already discussed, projects cannot, as this DEIR attempts to do, hide behind the fact that their GHG emissions are individually small when examined "in the context of statewide, nationwide, or global emissions." On the contrary, a cumulative impacts analysis under CEQA demands that even very small impacts be considered significant, and hence, mitigated, if they are further contributing to an already serious problem as is the situation with GHGs. Again, climate change is likely *the* most pressing cumulative impacts problem of our time – if each small source was allowed to hide behind claims of "de minimis" impacts, the problem would go unsolved. This is why courts have consistently rejected the notion that the incremental impact of a project is not cumulatively significant when it is so small that it would make only a *de minimis* contribution to the problem as a whole. *See, e.g., Communities for a Better Env't v. California Resources Agency*, 103 Cal.App.4th at 117.

The California Global Warming Solutions Act of 2006 (AB 32) recognized that "global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California" and required that existing levels of greenhouse gases be reduced to 1990 levels by 2020. Health & Safety Code §§ 38501(a), 38550. AB 32 establishes that existing greenhouse gas levels are unacceptable and must be substantially reduced within a fixed timeframe. Put another way, any additional emissions that contribute to existing levels will frustrate California's ability to meet its ambitious and critical emissions reduction mandate. Consequently, only thresholds that are highly effective at reducing emissions from new projects will ensure that new projects do not have significant cumulative effects on global warming. Thus, in order to account for the fact that any additional emissions are problematic, CAL FIRE should adopt a zero significance threshold for any Project's greenhouse gas emissions. As stated in *CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act Review*, from the Governor's Office of Planning and Research:

> When assessing whether a Project's effects on climate change are cumulatively considerable, even though its GHG contribution may be individually limited, the lead

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> agency must consider the impact of the project when viewed in connection with the effects of past, current, and probable future projects . . . . Lead agencies should not dismiss a proposed project's direct and/or indirect climate change impacts without careful consideration, supported by substantial evidence. Documentation of available information and analysis should be provided for any project that may significantly contribute new GHG emissions, either individually or cumulatively, directly or indirectly (e.g., transportation impacts).

See also Communities for Better Env't v. California Resources Agency, 103 Cal. App. 4th at 120 ("the greater the existing environmental problems are, the lower the threshold for treating a project's contribution to cumulative impacts as significant."). Regardless of whether a zero threshold is adopted, the fact remains that even by its own numbers, this Project's impacts (emissions and foregone sequestration) are well above zero, and hence, while they may be small "in the context of statewide, nationwide, or global emissions," they are still cumulatively significant.[9]

6-18

The failure to recognize the cumulatively significant GHG impacts from this Project directly leads to the failure to consider feasible alternatives and mitigation measures to reduce this cumulatively significant impact. CEQA requires that agencies "mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so." Pub. Res. Code § 21002.1(b). A rigorous analysis of reasonable alternatives to the project must be analyzed to comply with this strict mandate. "Without meaningful analysis of alternatives in the EIR, neither courts nor the public can fulfill their proper roles in the CEQA process." *Laurel Heights Improvement Ass'n v. Regents of University of California*, 47 Cal.3d at 404. Moreover, "[a] potential alternative should not be excluded from consideration merely because it would impede to some degree the attainment of the project objectives, or would be more costly." *Save Round Valley Alliance v. County of Inyo*, 157 Cal. App. 4th 1437, 1456-57 (2007) (quotations omitted). An analysis of alternatives should also quantify the estimated greenhouse gas emissions resulting from each proposed alternative.

Here, the DEIR neglects to discuss even "one alternative that would ensure that the [agency] contributes to a lower-carbon future." Potential alternatives include one that would not result in

[9] At page 4-15, the DEIR asserts that "except for the low carbon sequestration estimate, the project site would continue to sequester more carbon dioxide than vineyard activities would emit. Under the worst-case scenario the project would result in net emissions of 83.6 metric tons of carbon dioxide equivalents. In comparison, California emits approximately 492 million metric tons of carbon dioxide equivalents." This assertion misses the mark entirely. First, it ignores the biggest problem associated with forest conversion – the loss of forest sequestration capacity. As explained in these comments, when diminished sequestration is properly acknowledged (especially the fact that this Project would result in the loss of redwood forest sequestration), this Project's GHG impacts are plainly significant. Second, comparing this Project's emissions to state-wide emissions tells us very little and is irrelevant. *Communities for a Better Env't v. California Resources Agency*. 103 Cal.App.4th at 117 ("The relevant issue was not the relative amount of traffic noise resulting from the project when compared to existing traffic noise, but whether any additional amount of traffic noise should be considered significant given the nature of the existing traffic noise problem."). The question here is whether the Project's GHG impacts are cumulatively significant, and as already explained, there is no question that that is the case – together, the lost sequestration and the emissions associated with clear-cutting/preparing the area for vineyard operations are well above zero.

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conversion of existing forest or would result in much less conversion.[10] A recent court decision also makes clear that just because a project proponent wishes to proceed under a certain scenario does not mean the CEQA analysis must accommodate that desire. Rather, feasible alternatives must be considered regardless of the project proponent's position on the alternatives. For example, in *Preservation Action Council v City of San Jose,* 141 Cal .App. 4th 1355 (2006), the defendant relied heavily on the real parties' project objectives in order to reject an alternative. The court found that "the project objectives in the DEIR appear unnecessarily restrictive and inflexible." *Id.* at 1360. "[T]he willingness of the applicant to accept a feasible alternative . . . is no more relevant than the financial ability of the applicant to complete the alternative. To define feasible [in such fashion] would render CEQA meaningless." *Uphold Our Heritage v. Town of Woodside,* 147 Cal. App. 4th 587, 601 (2007). This same principle was reiterated in *Save Round Valley Alliance v. County of Inyo*, 157 Cal. App. 4th at 1460, where the court found that "the willingness or unwillingness of a project proponent to accept an otherwise feasible alternative is not a relevant consideration." This was so despite the project proponent's explicit unwillingness to accept a proposed alternative. *Id.* The Court found that the alternative should have been analyzed regardless, and noted that an "applicant's feeling about an alternative cannot substitute for the required facts and independent reasoning." *Id.* at 1458, quoting *Preservation Action Council,* 141Cal. App. 4th at 1356. Thus, CAL FIRE has an obligation to assess a lower carbon alternative. This is also necessary in order to allow for informed decision-making. Consequently, thus far, the DEIR's analysis of alternatives is deficient.

In addition to thoroughly evaluating project alternatives, "the EIR must propose and describe mitigation measures that will minimize the significant environmental effects that the EIR has identified." *Napa Citizens for Honest Gov't v. Napa County Bd. of Supervisors*, 91 Cal.App.4th 342, 360 (2001). Mitigation of a project's significant impacts is one of the "most important" functions of CEQA. *Sierra Club v. Gilroy City Council*, 222 Cal.App.3d at 41. Importantly, mitigation measures must be "fully enforceable through permit conditions, agreements, or other measures" so "that feasible mitigation measures will actually be implemented as a condition of development." *Federation of Hillside & Canyon Ass'ns v. City of Los Angeles*, 83 Cal.App.4th 1252, 1261 (2000).

6-19

In sum, there is simply no escaping the need for immediate GHG reductions, and the DEIR offers no alternatives or mitigation for its substantial GHG impacts. Instead, in conclusory fashion, the DEIR simply asserts that its impacts are insignificant. A vineyard, however, as even the DEIR admits in its calculations, is far different than a forest in regard to sequestration capacity and therefore it is obvious that this Project will not only lead to significant emissions in terms of carbon lost from the cut, but will also lead to a significant loss of sequestration capacity. Therefore, until the DEIR acknowledges the significance of its GHG impacts and appropriately avoids or mitigates them, this Project will be in violation of CEQA.

[10] The DEIR does include an alternative that would result in less conversion than the proposed Project. However, there is no discussion whatsoever of how this alternative would avoid or mitigate GHG impacts. Until such a discussion is included, the DEIR's alternatives are inadequate from a GHG perspective.

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IV. THE DEIR MUST ADDRESS THE IMPACT GLOBAL WARMING WILL HAVE ON THE PROJECT

Climate change poses enormous risks to California. Scientific literature on the impact of greenhouse gas emissions on California is well developed.[11] The California Climate Change Center ("CCCC") has evaluated the present and future impacts of climate change to California and the project area in research sponsored by the California Energy Commission and the California Environmental Protection Agency (Cayan et al. 2007). The severity of the impacts facing California is directly tied to atmospheric concentrations of greenhouse gases (Cayan et al. 2007; Hayhoe et al. 2004). According to the CCCC, aggressive action to cut greenhouse gas emissions today can limit impacts, such as loss of the Sierra snow pack to 30%, while a business-as-usual approach could result in as much as a 90% loss of the snowpack by the end of the century. As aptly noted in a report commissioned by the California EPA:

> Because most global warming emissions remain in the atmosphere for decades or centuries, the choices we make today will greatly influence the climate our children and grandchildren inherit. The quality of life they experience will depend on if and how rapidly California and the rest of the world reduce greenhouse gas emissions (Cayan et al. 2007).

Some of the types of impacts to California and estimated ranges of severity – in large part dependent on the extent to which emissions are reduced – are summarized as follows:

6-20

- A 30 to 90 percent reduction of the Sierra snowpack during the next 100 years, including earlier melting and runoff.
- An increase in water temperatures at least commensurate with the increase in air temperatures.
- A 6 to 30 inch rise in sea level, before increased melt rates from the dynamical properties of ice-sheet melting are taken into account.
- An increase in the intensity of storms, the amount of precipitation and the proportion of precipitation as rain versus snow.
- Profound impacts to ecosystem and species, including changes in the timing of life events, shifts in range, and community abundance shifts. Depending on the timing and interaction of these impacts, they can be catastrophic.
- A 200 to 400 percent increase in the number of heat wave days in major urban centers.
- An increase in the number of days meteorologically conducive to ozone (O_3) formation.
- A 55 percent increase in the expected risk of wildfires (Cayan et al. 2007).

Given that California's temperatures are expected to rise "dramatically" over the course of this century (Cayan 2007), affecting snowpack and precipitation levels, and because California's

[11] Additional reports issued by California agencies are available at http://www.climatechange.ca.gov, and IPCC reports available at http://www.ipcc.ch/.

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6-20 Cont'd ecosystems depend upon relatively constant precipitation levels, and water resources are already under strain (Cayan 2007), California will face significant impacts. These impacts will affect the planned Project, as well as exacerbate its own environmental impacts. Thus, when analyzing the Project, the DEIR must take into account global warming. To ignore the impact of global warming on would significantly understate the situation. *See, e.g., Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 47 Cal.3d at 392 (EIR is intended "to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action.").

The following information provides background regarding forest carbon, explains why retaining existing forest is extremely important from a GHG perspective, and demonstrates that there are significant differences in carbon sequestration between a forest and a vineyard.

A. Carbon Forest Basics

Forests play an important role in reducing the amount of carbon dioxide in the atmosphere. During photosynthesis, trees "breathe in" carbon dioxide and "breathe out" pure oxygen. Through this process, forests remove massive amounts of carbon dioxide from the atmosphere each year.

6-21 Forest ecosystems also serve as banks that store carbon for finite periods of time; thus, in a natural state, and/or if managed well, they are carbon sinks and not sources (Tans et al. 1990). Carbon is added to the bank regularly through photosynthesis, which removes carbon dioxide from the atmosphere and stores the carbon contained therein in the organic matter of the forest.

Forest ecosystems are complex, and include not only living and dead trees but understory vegetation, and soil. Each of these elements contains carbon. For example, Turner et al. (1995) estimated that forests in the coterminous United States contain 36.7 Pg [12] of carbon with half of that in the soil, one-third in trees, 10% in woody debris, 6% in the forest floor, and 1% in the understory. The location of forest carbon is important because it helps determine how much carbon remains in storage or is lost after disturbances like logging.

B. U.S. Forests Store and Remove Carbon from the Atmosphere

Changes in land use and forestry practices can emit carbon dioxide (*e.g.*, through conversion of forest land to non-timberland use, or through logging) or can act as a sink for carbon dioxide (*e.g.*, through net additions to forest biomass). Regardless of the exact number, it is clear that if forests are protected and allowed to flourish they have the potential to store and sequester a significant amount of carbon. Evidence abounds on this topic. For example:

[12] Pg [petagram]=one billion metric tonnes=1000 x one billion kg

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- It is estimated that from 1952-1993, carbon storage in American forests increased by 38% (Birdsey et al. 1993). The authors hypothesize that this may be due to biomass accumulation in temperate forests over the time period.

- Birdsey and Heath (1995) estimated that in 1995 the United States contained 298 million hectares of forests, which stored 54.6 billion metric tons of organic carbon above and below the ground. This amounted to five percent of all the carbon stored in the world's forests.

- Pacala et al. (2001) estimated that the coterminous United States was an annual carbon sink of between 0.3 and 0.58 Pg of carbon annually, with half of the storage occurring in forest ecosystems.

- Land use, land-use change, and forestry activities in 2006, resulted in a net carbon sequestration of 883.7 Tg CO_2 e, with 745 Tg of this coming from forest land that was allowed to remain as forest land. Forests (including vegetation, soils, and harvested wood) accounted for approximately 84 percent of total 2006 net CO_2 flux (EPA 2008). Overall in 2006, these activities represent an offset of approximately 14.8 percent of total U.S. CO_2 emissions, or 12.5 percent of total greenhouse gas emissions in 2006 (EPA 2008).

- Between 1990 and 2006, total land use, land-use change, and forestry net carbon flux resulted in a 20 percent increase in CO_2 sequestration, primarily due to an increase in the rate of net carbon accumulation in forest carbon stocks, particularly in aboveground and belowground tree biomass (EPA 2008). The net forest sequestration is a result of net forest growth and increasing forest area, as well as a net accumulation of carbon stocks in harvested wood pools.

- Peters et al. (2007) concluded that North American ecosystems remove 0.65 Pg C/year, offsetting one-third of the 1.85 Pg carbon emissions. Forests account for the majority of this uptake.

C. Forest Conversion Releases Carbon Stores

Certain forest management actions, and conversion in particular, allow stored carbon to be released into the atmosphere. Thus, in addition to affecting habitat, conversion causes a withdrawal from the forest carbon bank: carbon is removed from long-term storage and released to the atmosphere, exacerbating global warming and climate change.

Evidence shows that the carbon dioxide releases from conversion can be substantial. In a letter to the California Air Resources Board regarding California Climate Action Registry Forest Protocols, Harmon (2007) wrote:

> Timber harvest, clear cutting in particular, removes more carbon from the forest than any other disturbance (including fire). The result is that harvesting forests generally reduces carbon stores and results in a net release of carbon to the atmosphere.

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Turner et al. (1995) suggest that in light of climate change and further disturbance, we need to pay close attention to forest loss due to the fact that:

> A general intensification of forest management, resulting in lower carbon storage per unit area (Cooper 1983, Dewer 1991), and a gradual increase in the harvest level (Haynes 1990), are also expected. These factors will tend to mitigate against a stable or increasing carbon sink (Turner et al. 1993). Increasing temperatures, atmospheric CO2, and nitrogen deposition could promote higher growth rates (McGuire et al. 1993), but projected climate change is also likely to produce a transient release of forest carbon because carbon sources associated with increasing disturbance rates would be greater than carbon sinks associated with land recovering from disturbance (King and Neilson 1992).

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Furthermore, over half of the carbon stored in United States forests is in the forest floor and soils (Turner et al. 1995). The carbon stored in forest soils includes two pools: mineral soils and soil organic matter (Jandl et al. 2007). Much of the carbon stored in mineral soils is considered to be quite stable, and does not generally change dramatically in response to land management activities such as logging (Kimmins 1997; Johnson 1992; Heath and Smith 2000). However, the carbon contained in soil organic matter (which supports vegetation growth) does change in response to land management and is often reduced through logging (Jandl et al 2007; Birdsey and Heath 1995; Harmon et. al. 1990). This is because harvesting removes biomass, disturbs the soil and changes the microclimate all at the same time. It is possible that post-harvest soil carbon losses may exceed carbon gains in the aboveground biomass.

For example, Birdsey and Heath (1995) created a representative model for all forest land classes in all 50 states. They highlight the relative contribution of forest floor and soil carbon to the estimated annual increases in carbon storage and state that:

> Nationally about 2/3 of the historical and projected positive flux is carbon buildup in the soil and forest floor . . . . A search of the literature indicated that a major forest disturbance such as a clearcut harvest, can increase coarse litter and oxidation of soil organic matter. The balance of these 2 processes can result in a net loss of 20% of the initial carbon over a 10-15 year period following harvest (Pastor and Post 1986, Woddwell et al. 1984).

Citing literature from geographic regions throughout the U.S. and the world, and considering many different types of tree species and communities, Jandl et al. (2007) explored the way in which forest management can affect soil carbon sequestration. The authors summarize the science showing the impact that logging can have on soil carbon:

- Other researchers report large soil C losses after harvesting. Measurement of net ecosystem C exchange showed that for at least 14 years after logging, regenerating forests remained net sources of CO2 owing to increased rates of soil respiration (Olsson et al., 1996; Schulze et al., 1999; Yanai et al., 2003). Reductions in soil C stocks over 20 years following clear cuts can range between 5 and 20 t C/ha and are therefore significant

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compared to the gain of C in biomass of the maturing forest (Pennock and van Kessel, 1997).

- In their research to develop a model to quantify carbon in various types of U.S. forests, Smith and Heath (2002) found that by reducing litter input and increasing decomposition, clear-cut logging reduces forest floor carbon considerably. Decreases of 50% of forest floor mass have been shown for the first 15 years after logging in northern hardwoods (Covington 1981). Covington (1981) states that the initial decrease in forest floor mass is due to "lower leaf and wood litter fall and to more rapid decay resulting from higher temperature, moisture content, and nutrient levels and to early successional litter being more easily decomposed."

- Because the debris left behind after logging – branches, tops, and brush – continues to decay for many years after the disturbance, recently logged sites, even those that are replanted, continue to release carbon dioxide into the atmosphere for decades (Buchmann and Schulze 1999; Bergeron et al. 2007).

- Avoiding soil disturbances is important for the formation of stable organomineral complexes which in turn are crucial elements in the process of C soil sequestration.

Studies also show that logging can remove ninety-five percent of the non-soil carbon stored in a forest ecosystem and half of this is lost to the atmosphere in the first year (Janisch and Harmon 2002). Skog and Nicholson (2000) reconstructed the fate of forest carbon in the United States from 1910 to 2000. They found that 71 % of the carbon harvested during that period was released into the atmosphere while only 17% was stored in wood products and the remaining 12% was added to landfills. As pointed out in Turner et al. (1995b):

> After a human disturbance such as a clear cut harvest, ecosystems are a source of carbon to the atmosphere because of the decomposition of large woody debris and other forms of detritus. Later in stand development, as tree bole volume rapidly accumulates, forest ecosystems are strong carbon sinks.

Mackey et al (2008) note:

> The remaining intact natural forests constitute a significant standing stock of carbon that should be protected from carbon-emitting land-use activities. There is substantial potential for carbon sequestration in forest areas that have been logged commercially, if allowed to re-grow undisturbed by further intensive human land-use activities.

Unfortunately, specific examples of the climate costs associated with clear-cutting are plentiful. Using a model that took into account the prevalence of clear-cutting practices from 1972-1991, researchers found that forests in the Pacific Northwest released 11.8×10^{12} g C/year (Cohen et al. 1996). From this finding they calculated that even though forests in this region represented only 0.25% of the 4.1 billion hectares of forest on Earth, they were the source of 1.31% of the total land-use related carbon release in the world (Cohen et al. 1996; Dixon et al. 1994). They state:

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> Although replacing older forests with more vigorous young forest can increase sequestration by live carbon pools, decomposition of the large detrital pools after harvest greatly offsets gains in biomass by living pools for an extended period of time (Cohen et al. 1996).

Moreover, a recent literature review (The Wilderness Society 2009[13]) found that only approximately 18% of original live tree volume is actually incorporated into long-lived wood products.[14] The remaining 82% waste would potentially result in emissions, as well as any portion of the wood products that are subsequently converted to emissions.

Finally, as pointed out in Noss (2001):

> Simplistic carbon accounting … ignores the tremendous releases of carbon that occur when forests are disturbed by logging and related activities such as site preparation and vegetation management (Perry 1994; Schulze et al. 2000). It ignores the fate of woody debris and soil organic carbon during forest conversion (Cooper 1983; German Advisory Council on Global Change 1998). Typically, respiration from the decomposition of dead biomass in logged forests exceeds net primary production of the regrowth (Schulze et al. 2000).

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Noss (2001) also notes that clear-cutting causes significant habitat fragmentation, which has climate impacts of its own:

> Fragmentation may threaten biodiversity during climate change through several mechanisms, most notably edge effects and isolation of habitat patches. Intact forests maintain a microclimate that is often appreciably different from that in large openings. When a forest is fragmented by logging or other disturbance, sunlight and wind penetrate from forest edges and create strong microclimatic gradients up to several hundred meters wide, although they may vary in severity and depth among regions and forest types

[13] Ingerson, A. Wood Products and Carbon Storage: Can Increased Production Help Solve the Climate Crisis? *The Wilderness Society*, April 2009

[14] From The Wilderness Society. 2009: "The U.S. Forest Service (2008) estimates logging residue at 30% of roundwood volume for the United States as a whole. State-level percentages range from 3% to 84% (U.S. Forest Service 2007).7 These percentages fail to capture the total carbon losses during logging, as reported logging residue volumes exclude roots, stumps, and small limbs.8 Including stumps and small limbs would increase logging residue volumes by an average of 14% for softwoods and 24% for hardwoods (McKeever and Falk 2004), which would increase overall national average residue to about 36%* of roundwood volume. Large roots range from 5% to 51% of total tree biomass, with a mean of 19%, in cold temperate and boreal forests in the United States (Li et al. 2003). Taking all these factors together, approximately 40%* of the original tree volume, with a range from 22%* to 59%* for individual states, might be left behind at harvest, and its stored carbon lost… "With about 36% of original standing tree volume available for processing into long-lived products, primary mill losses amount to about 4%* to 22%* (average of 13%) of the standing tree volume, leaving about 23% of the original volume to be incorporated into long-lived wood products such as lumber or panels… "Assuming that 76%* of wood volume in long-lived products is construction lumber, with the remaining 24% in furniture, cabinetry, and other products, total secondary processing and construction losses might be about 5%* of original standing tree volume. If 23% of the tree remains after primary processing, this leaves about 18% of original live tree volume actually incorporated into long-lived products."

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(Ranney et al. 1981; Franklin & Forman 1987; Chen & Franklin 1990; Laurance 1991, 2000; Chen et al. 1992; Baker & Dillon 2000). With progressive fragmentation of a landscape, the ratio of edge to interior habitat increases, until the inertia characteristic of mature forests is broken. Fragmented forests will likely demonstrate less resistance and resilience to climate change than intact forests. Another potentially serious impact of fragmentation is its likely effect on species migration. By increasing the isolation of habitats, fragmentation is expected to interfere with the ability of species to track shifting climatic conditions over space and time. Weedy species, including many exotics, with high dispersal capacities may prosper under such conditions, whereas species with poor mobility or sensitive to dispersal barriers will fare poorly.

Clearly, land management, and specifically forest management, plays a major role in the global carbon balance. How California chooses to manage its forests has a significant effect on how much carbon dioxide is released and stored. If we are to maintain public and private forests as carbon sinks, which is now more important than ever, continued cumulative disturbance from conversion must be prevented or at least reduced.

D. Conversion Eliminates a Forest's Ability To Sequester Carbon

As discussed earlier, forests are carbon "banks," storing large amounts of carbon for long periods of time. Old growth forests have an especially vast amount of live vegetation including huge trees, large downed logs, a healthy understory and a rich ground layer. Each of these elements stores considerable amounts of carbon and so it follows that ancient forests are the "banks" holding the most carbon. A report from the IPCC has echoed this sentiment pointing out that the best way to preserve the carbon stored in a forest is to preserve the forest itself: "The theoretical maximum carbon storage (saturation) in a forested landscape is attained when all stands are in old-growth state (Nabuurs et al. 2007)."

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Some industry advocates like to argue that old-growth forests are "carbon neutral" – that is, they no longer remove carbon from the atmosphere at significant rates.[15] The DEIR claims that "[c]arbon accumulation in forests and soils eventually reaches a saturation point, beyond which additional sequestration is no longer possible. This happens, for example, when trees reach maturity, or when the organic matter in soils builds up to saturation levels." Such claims are not only factually wrong – older forests continue to remove carbon from the atmosphere at considerable rates – they are also misleading in that they disregard the amount of carbon already stored in the forest ecosystem. As noted in Luyssaert et al (2008): "old-growth forests can continue to accumulate carbon, contrary to the long-standing view that they are carbon neutral." Numerous other studies have likewise shown that old-growth forests continue to sequester carbon from the atmosphere (Desai et al. 2005; Law et al. 2003; Chen et al. 2004[16]; Field and

[15] See, for example "Modern Forestry and Climate Change" by the California Forest Products Commission, available at http://www.foresthealth.org/ (last accessed June 5, 2008).

[16] Chen et al. (2005) showed old-growth Douglas fir forests as a minor source of carbon during an exceptionally dry summer, and a more substantial sink during a year of average rainfall. Thus this study likely underestimates the level of carbon removal from this forest.

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Kaduk 2004; Paw U et al. 2004; Harmon et al. 2004; Grier and Logan 1977; Knohl et al. 2003). Old-growth Douglas fir forests, for example, "show remarkable sequestration of carbon, comparable to many younger forests (Paw U et al. 2004)." As discussed in Hudiburg et al (2009):[17]

> Decrease in NPP with age was not general across ecoregions, with no marked decline in old stands (200 years old) in some ecoregions. In the absence of stand-replacing disturbance, total landscape carbon stocks could theoretically increase from 3.2 +- 0.34 Pg C to 5.9 +- 1.34 Pg C (a 46% increase) if forests were managed for maximum carbon storage.
>
> Trends in NPP with age vary among ecoregions, which suggests caution in generalizing that NPP declines in late succession. Contrary to commonly accepted patterns of biomass stabilization or decline, biomass was still increasing in stands over 300 years old in the Coast Range, the Sierra Nevada and the West Cascades, and in stands over 600 years old in the Klamath Mountains. If forests were managed for maximum carbon sequestration total carbon stocks could theoretically double in the Coast Range, West Cascades, Sierra Nevada, and East Cascades and triple in the Klamath Mountains (Fig. 8).

This is why logging, especially logging that converts forest to a non-forest use, is problematic; it prevents vast amounts of trees from getting older, and from reaching an old growth stage which science shows is best in terms of its implications for carbon uptake and climate change, not to mention overall ecological benefits.

But it is not only older trees that hold large amounts of carbon; forest floors in older forests contain significantly more carbon than forest floors of cutover forests (Lecomte et al. 2006; Fredeen et al. 2005; Harmon et al. 1990). Old forests also increase the amount of carbon that is placed into long-term storage in stable forest soils; this carbon is lost through the soil disturbance associated with logging. (Harmon et al. 1990). This can have serious implications for sequestration capabilities as we see from conclusions made by Jandl et al. (2007):

> What is beyond dispute is that the formation of a stable soil [carbon] pool requires time. Avoiding soil disturbances is important for the formation of … crucial elements in the process of [carbon] soil sequestration.

Luyssaert et al (2008) reported similar findings:

> In our model we find that old-growth forests accumulate 0.4 ±0.1 tC ha^{-1} yr^{-1} in their stem biomass and 0.7±0.2 tC ha^{-1} yr^{-1} in coarse woody debris, which implies that about 1.3 ±0.8 tC ha^{-1} yr^{-1} of the sequestered carbon is contained in roots and soil organic matter.

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[17] Hudiburg, T. Beverly Law, David P. Turner, John Campbell, Dan Donato, and Maureen Duane. 2009. Carbon dynamics of Oregon and Northern California forests and potential land-based carbon storage. *Ecological Applications* 19(1):163–180.

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6-22 Cont'd The fact that substantial carbon is found in roots and organic soil is significant given that logging, specifically clear-cutting, results in the loss of large amounts of soil and therefore, forest floor carbon. This loss is not only due to the direct impacts of logging, but also as a result of the continued erosion and soil degradation that often comes with logging. In short, conversion not only prevents trees from continuing with their carbon sequestration, it prevents the entire forest system from doing so.

E. The Rate Of Carbon Uptake By Vineyards Does Not Offset Forest Conversion

As stated in *Winrock International. Measuring and Monitoring Plans for Baseline Development and Estimation of Carbon Benefits for Change in Forest Management in Two Regions, March 2004*,[18]

> 6-23 Mature redwood stands are famous for their enormous stocks of standing biomass and represent perhaps the most massive forests, per unit area, on earth. Measurements of old-growth (>200 years) redwood stands have yielded standing carbon stocks ranging from 1,650 to 1,784 t C equivalent per ha (Hallin, 1934, Westman and Whittaker, 1975, and Fujimori, 1977). Equally impressive is the rate at which carbon is sequestered in growing redwood stands. A 100 year old redwood stand measured by Olson et al (1990) yielded 3,600 cubic meters per ha, equivalent to 648 t C per ha (at specific gravity 0.36 g oven dry biomass/cm3 for second-growth redwood (Markwardt and Wilson, 1935)), or a mean annual carbon increment of 6.48 t C per ha per year.

While this Project will be cutting young redwood forest, not old growth, the fact remains that the Project will prevent forest from growing older and attaining old growth status. Moreover, as noted above, and in the excerpts from *California's forest resources, 2001–2005: five-year Forest Inventory and Analysis report*,[19] redwoods are extremely efficient carbon sequesters, and therefore, loss of young redwood trees is problematic because it will prevent these trees from any further sequestration. Vineyards, of course, which even the numbers in the DEIR recognize, offer profoundly less carbon sequestration.[20] DEIR at 4-14. Moreover, as noted in the document cited by the DEIR, *Sources: Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture; 2005*, "conservation tillage often also involves increasing inputs, such as chemical fertilizers and pesticides, which could offset some of the environmental gains from conservation tillage." Fertilizers and pesticides have their own carbon costs which are unaccounted for in the DEIR. Thus, the numbers provided in the DEIR are very much minimums because they a) fail to address the fact that the Project is cutting highly productive redwood and Douglas fir forest, and b) fail to account for the carbon costs associated with vineyards such as pesticides and fertilizers.

[18] Accessed at http://www.energy.ca.gov/reports/CEC-500-2004-070/CEC-500-2004-070F.PDF

[19] Christensen, Glenn A.; Campbell, Sally J.; Fried, Jeremy S., tech. eds. 2008. California's forest resources, 2001–2005: five-year Forest Inventory and Analysis report. Gen. Tech. Rep. PNW-GTR-763. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 183 p.

[20] The DEIR uses conservation tillage numbers as a surrogate for vineyards, which show just 0 to 1.1 metric tons per acre per year; also, if the DEIR had properly accounted for the fact that redwoods and Douglas firs are being cut, the disparity between forest and vineyard sequestration would have been much greater.

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6-24 In sum, conversion has significant negative impacts on carbon stores. It eliminates the existing trees and the carbon stored in the rest of the forest system, and prevents the development of more forest carbon stores. These issues must be appropriately and adequately addressed if the DEIR is to meet its CEQA obligations.

CONCLUSION

6-25 The Fairfax DEIR must be revised in light of its deficiencies. Until all issues discussed above are adequately addressed and the DEIR re-circulated for comments, the proposed Project is unlawful.

Thank you for your consideration of these comments. Please contact us if you have any questions.

Sincerely,

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[21] Much of this Literature has already been submitted with previous comments and is therefore already in CAL FIRE's files.

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Letter 6: Justin Augustine – Center for Biological Diversity

Response to Comment 6-1

The comment is an introductory paragraph, and does not address the adequacy of the DEIR.

Response to Comment 6-2

Consistent with CEQA and the CEQA Guidelines, CAL FIRE has conducted extensive environmental review of the proposed project, including issues related to global climate change, and has calculated GHG emissions from the Fairfax Conversion project as part of that review. Chapter 4, *Cumulative Impacts*, of the Partially Recirculated DEIR provided additional information regarding GHG emissions calculations (see Response to Comment 6-8 below).

Response to Comment 6-3

The project EIR is consistent with all applicable requirements of CEQA, including the CEQA Guidelines as adopted by the California Resources Agency.

Response to Comment 6-4

Please see Response to Comment 6-3.

Response to Comment 6-5

The commenter notes that the project would result in the harvesting of 171 acres of existing on-site timber (now reduced to 154 acres as described in detail in the *Introduction* Chapter to this Final EIR). However, the commenter fails to acknowledge the inclusion of a 151-acre forest reserve on-site. The DEIR recognizes that forests are important for carbon sequestration. Furthermore, CAL FIRE, as lead agency for the Fairfax Conversion Project, has not been inconsistent with its approach to this project's GHG analysis in light of previous statements the agency has made. In the Fairfax Conversion DEIR, CAL FIRE has recognized the importance of forests in sequestering carbon, has analyzed the direct and indirect impacts associated with the conversion of 154 acres of timber, and has found based upon the ongoing carbon sequestration that would occur via the 151-acre forest reserve and the established vineyard, that the project's incremental contribution to the cumulative global climate change impact is less-than-significant. As such, mitigation above that which has already been included in the design of the project is not necessary.

It is important to note that CEQA does not mandate that thresholds be developed or, if developed, applied without exception in evaluating the relative significance of impacts. (CEQA Guidelines, § 15064.7 (a) [sets forth *option* of adopting significance thresholds].) The standard of significance for GHG emissions established by CAL FIRE in the DEIR is qualitative and not quantitative. The DEIR explains that this standard was applied because no other regulation/significance criteria exist that can provide more accurate analysis. (DEIR, p. 3.3-7.) The DEIR further explains that the emissions thresholds ARB has created pursuant to AB 32 currently apply only to stationary source emissions. (*Ibid*.) In addition, the DEIR explains that the current standards for reducing vehicle emissions under AB 1493 also do not provide a quantified target for GHG emission reductions for vehicles. Finally, the DEIR explains that neither ARB nor the Northern Sonoma County Air Pollution Control District (NSCAPCD), the agency with permitting authority for stationary air pollutants in the region, has identified thresholds of significance for GHGs. (DEIR, pp. 3.3-8 – 3.3-9.)

CEQA Guidelines Section 15064.4, states that, in determining the significance of greenhouse gas emissions, a "lead agency shall have the discretion to determine whether to use a quantitative approach or to "rely on a qualitative analysis or performance based standards." Given the challenges associated with determining a reasonable and proper quantitative significance criterion for GHG emissions when one does not yet fully exist, CAL FIRE exercised proper discretion (and acted in accordance with the CEQA Guidelines on GHG emissions) in utilizing a qualitative significance criterion for the current project.

Notwithstanding the lack of a governing GHG emissions threshold, as explained above, CAL FIRE, using the best available information available and acting in accordance with CEQA, established the above-referenced qualitative threshold to assess project GHG emissions. (See CEQA Guidelines, § 15064.7(a) ["[a] threshold of significance is an identifiable quantitative, *qualitative* or performance level of a particular environmental effect…"] (italics added).)

Regarding the above reference to "mitigation" that has been built into the design of the Fairfax Conversion Project, it is noteworthy that all of the applicable "Solutions" set forth in Sonoma County's *Community Climate Action Plan*[13] regarding Agriculture and Forests are being implemented by the Fairfax Conversion Project, including:

- <u>Solution #1: Improve soil and irrigation practices</u> – As described in the Project Description Chapter of the Fairfax Conversion DEIR (Chapter 2), and elsewhere in this Final EIR, the Fairfax Conversion Project would implement industry standard best management practices regarding drip irrigation and permanent cover crops, consistent with this Solution. In addition, no-till farming would be implemented for the proposed vineyard project.
- <u>Solution #2: Increase agricultural waste composting</u> - Vineyards produce little waste. Senescent leaves and canes will be mulched in place and returned to the soil, consistent with this Solution. No burning of agricultural waste would occur. Since the winery is located off-site in Napa County, winery waste (seeds and skins) are handled away from the project site. These agricultural wastes are delivered to an off-site composting facility where they are utilized by agricultural and residential users in the area.
- <u>Solution #6. Improve processing and operational efficiency of agricultural producers -</u> The proposed vineyard will not include a processing facility (winery); therefore, that aspect of Solution #6 does not apply to the project. In-vineyard operational efficiencies will be maximized consistent with industry standard best management practices. Workers will carpool to the site, as assumed and discussed in the Traffic Chapter of the DEIR (cf. Chapter 3.9 of the Fairfax Conversion DEIR). Permanent cover crops will eliminate need for tillage operations. The objective of a vineyard is to maximize return

[13] Climate Protection Campaign, *Sonoma County Community Climate Action Plan*, October 2008.

on investment by production of a premium crop in a cost-effective manner. This means that management will seek operational efficiencies (minimizing labor, equipment, water, fertilizer, canopy operations, etc. consistent with viticultural objectives) on a regular basis, consistent with the objectives of this Solution.

- Solution #7: Increase CO_2 sequestration and fixation in and around agricultural operations – As described in the Erosion Control Plan prepared for the proposed project, permanent cover crops will be planted in hillside vineyard rows, field avenues, and perimeter roads. Regarding planting trees and shrubs and restoring riparian habitat, the RDEIR notes on page 4-11 that as part of the implementation of the Timber Harvest Plan (THP), the applicant will implement a California native riparian planting plan to enhance the Patchett Creek riparian corridor, act as a filter for stormwater runoff from the proposed vineyards, and benefit biological resources along Patchett Creek. The objective of the riparian planting plan is to create a continuous riparian canopy along Patchett Creek. Species to be planted were selected based upon the species that now characterize the upper reaches of Patchett Creek on the project site. Species to be planted include interior live oak (Quercus wislizenii) and California bay (Umbellularia californica). Riparian planting will occur in gaps in the riparian canopy along Patchett Creek setbacks. In addition, there will be a 151-acre preserve area that will be managed to optimize this Solution. This forest reserve would also preserve a wildlife corridor running the length of Patchett Creek on the property. As discussed in Chapter 1, *Introduction*, of this Final EIR, the revised Vineyard Plan includes a reduced vineyard footprint of 116 acres (net). In summary, approximately 46 percent, or nearly one-half, of the project site will be preserved permanently to protect biological resources and doubly serve to ensure ongoing carbon sequestration.
- Solution #8: Restore and increase forest carbon stocks – The Fairfax Conversion Project includes a 151-acre forest reserve consistent with this Solution. By not harvesting the forest reserve, trees will be allowed to recapture the site following the previous attempts to convert the area into grazing land, orchard, and a mill site. By allowing the trees to grow un-harvested, the amount of carbon they will sequester will also increase over time. As the forest will be allowed to develop into a stand with larger trees and more volume/biomass over time, the amount of carbon sequestered will be more than if the area was subject to a periodic harvest, which could be expected if the project is not implemented. A harvested/managed stand would have smaller trees and less volume/biomass than the proposed reserve. The preserve would be managed as an "older forest" as described in this "Solution".
- Solution #10: Facilitate the increased use of conservation easements through zoning, dedication of public funds, and mitigation fees - This is an administrative procedure that is not strictly applicable to the Fairfax Conversion Project. However, as noted above, the Fairfax Conversion Project includes a 151-acre forest reserve on-site, which is consistent with this Solution.

The remaining Solutions are not applicable to the Fairfax Conversion Project, or are not desirable from a GHG emissions reduction perspective, for the following reasons.

- Solution #3: Use methane digesters to produce energy on dairies – This Solution is not applicable to vineyard settings.

- Solution #4: Build a utility scale biogas digester plant and waste collection system to produce energy - This would be a technically feasible option for consumption of vineyard waste biomass. However, the scale would be so small due to limited feedstock and limited seasonality that it would not be energy-efficient, practical, or cost-effective. This would work better in a lumber mill setting, regional agricultural area such as the Central Valley, or similar where a steady stream of materials with adequate tonnage is available for supporting the process. Solution #2 discussed above is a much more energy-efficient, cost-effective, and practical solution.
- Solution #5: Produce biodiesel from local oil production in facility co-located with biodigester in Solution #4 – This Solution is not applicable for the reasons stated above regarding Solution #4. Replacing the vineyard with oilseed crops would not be practical, energy effective, or cost effective. Oilseed crops are grown in warmer climates on larger acreages and in large-scale agricultural areas (i.e. Central Valley) where other off-site feedstock sources are available and energy-efficient cost-effective limited-distance transportation can be arranged for high-volume low value materials.
- Solution #9: Establish a minimum level for the biomass of the County's agriculture and forestland - This is an administrative procedure that is not applicable to the Fairfax Conversion Project.
- Solution #11: Adopt the Coast Forest District's Southern Subdistrict Harvest Rules - This is an administrative procedure that is not applicable to the Fairfax Conversion Project.
- Solution #12: Establish a countywide forest carbon baseline, track progress, and issue an annual report card - This is an administrative procedure that is not applicable to the Fairfax Conversion Project.

It is also important to note, as discussed more fully in Response to Comment 6-18 below, that contrary to the commenter's assertion, the DEIR evaluated at least one alternative that could have lower GHG emissions than the proposed project – the Reduced Acreage Alternative. The No Project – No Action Alternative could also be included in this category.

Response to Comment 6-6

The comment expresses concern that the DEIR does not provide sufficient information related to the loss of sequestered carbon to make an informed decision. See Response to Comment 6-8 below, which was presented in full for review and comment in the Fairfax Conversion Partially Recirculated DEIR. In addition, contrary to the comment, the DEIR recognizes the importance of the fact that 171 acres (Note: per the modified project description, the total harvest area is now 154 acres) of trees will no longer be sequestering carbon on the project site. This fact is accounted for in the GHG modeling conducted for the Fairfax Conversion Project (see Tables 4-3 and 4-7 of the *Cumulative Impacts* Chapter of the Fairfax Conversion Partially Recirculated DEIR as well as Response to Comment 6-8 of this Final EIR). The comment also raises concerns about the amount of conversion occurring in Sonoma County which are not relevant to GHG impact analysis, which is a global issue.

Response to Comment 6-7

Please see Responses to Comments 6-5, 6-6, and 6-8.

Response to Comment 6-8

The Fairfax Conversion DEIR included a detailed discussion of the project's cumulative contribution to global climate change on pages 4-13 to 4-17 of the Cumulative Impacts Chapter. This analysis was based on the best available data in publication at the time the DEIR was released for public review in June 2009. Since the release of the DEIR for review and comment, additional material has been published regarding the pertinent topics of global climate change and carbon sequestration. In addition, CAL FIRE has prepared a Greenhouse Emissions Calculator and associated user guide. Based on the additional materials published since the release of the Fairfax Conversion DEIR, including the lead agency's Greenhouse Emissions Calculator, Raney has worked with the RFP for the Fairfax Conversion project to update the Global Climate Change Impact Statement, Impact 4-3, in the DEIR. This updated climate change/GHG impact analysis for the Fairfax Conversion project has already been issued as Chapter 4, *Cumulative Impacts*, of the Partially Recirculated DEIR. The updated climate change/GHG impact analysis has been included below in full as it directly addresses the majority of the comments provided in the commenter's letter.

It is important to note that while additional material has been published on the subject of climate change and carbon sequestration since the release of the Fairfax Conversion DEIR, these topics, particularly that of the dynamics of carbon sequestration in coastal redwood forests, remains an area of scientific inquiry where little information has been published. Raney contacted several leading scientists in the field of carbon sequestration and the responses received were fairly unanimous that while studies are in process, little to no peer-reviewed data has been published on the specific topic of carbon sequestration in coastal redwood forests. For example, much of the recently published material on carbon sequestration pertains to California grasslands and tropical forests, such as the work being done by Dr. Whendee Silver of the Department of Environmental Science, Policy and Management at UC Berkeley. Other well-published scientists at UC Berkeley have done work in areas such as soil carbon dynamics, but not in the type of mixed conifer/redwood forests present on the Fairfax Conversion project site.[14] Eli A. Carlisle notes that patterns and processes involved in carbon retention in Mediterranean environments like California have received little attention.[15]

Therefore, as with the global climate change analysis included in the originally released Fairfax Conversion DEIR in June 2009, the below updated climate change and carbon sequestration analysis for the proposed project is based upon the best available published data in January 2011, which is necessarily limited in specificity as to forest type given that scant data has been published for coastal redwood forests in the area of carbon sequestration.

Impact 4-3 on pages 4-13 to 4-17 of the DEIR is revised as follows:

[14] E-mail communication with Dr. John Battles, Professor of Forest Ecology, UC Berkeley Division of Ecosystem Sciences, 5/11/2010.
[15] Eli A. Carlisle, Kerri L. Steenwerth, and David R. Smart, "Effects of Land Use on Soil Respiration: Conversion of Oak Woodlands to Vineyards," in *Journal of Environmental Quality*, 35: 1396-1401 (2006).

4-3 Cumulative contribution to Global Climate Change.

The proposed project would convert forests and grasslands to vineyards, a reservoir, corporation yard, and roads. According to the United States Environmental Protection Agency (USEPA, www.epa.gov) carbon sequestration rates vary by tree species, regional climate, topography, and management practices. In addition, soil carbon sequestration rates vary by soil type and cropping practice. In order to estimate the GHG effects of the project, CAL FIRE must analyze the difference between business as usual activities under current use for timber management and the effects of conversion of part of the site from forest to vineyard establishment plus change in management on rest of site from timber harvest to reserve.

~~The USEPA information states that reforestation of previously harvested lands results in sequestration of approximately 1.1 to 7.7 metric tons of carbon per acre annually.[i] Studies conducted at the Jackson State Forest in Mendocino County[ii] indicate that assuming the annual sequestration of approximately 2.0 metric tons of carbon per acre would be a reasonable expectation for the mixed coniferous forest located on the project site. Onsite vegetation is largely composed of second-growth forest; therefore, the reforestation sequestration rates currently apply. The USEPA information for grasslands indicates that carbon is sequestered at a rate of 0 to 1.9 tons per acre annually. Following conversion of the project site, cover cropping and "no till" agricultural practices would be implemented in the vineyard area. Conservation tillage has been shown to sequester approximately 0 to 1.1 metric tons of carbon per acre per year on croplands. As the project site would be practicing conservation "no till" agricultural practices, including cover crops, the vineyard areas should sequester carbon within or above the conservation tillage range. Furthermore, vines are woody vegetation that would also sequester carbon. As a result, both the forested areas and the vineyard areas of the project site would continue to absorb carbon from the atmosphere.~~

~~Carbon accumulation in forests and soils eventually reaches a saturation point, beyond which additional sequestration is no longer possible. This happens, for example, when trees reach maturity, or when the organic matter in soils builds up to saturation levels. Even after saturation, the trees or agricultural practices would need to be sustained to maintain the accumulated carbon and prevent subsequent losses of carbon back to the atmosphere.~~

Timber Harvest Operations

Out of a total of 324 acres, the proposed project includes the logging of an approximately 154~~171~~-acre timberland conversion area and develop~~ing~~ment of approximately 19 acres of grassland. The RPF for the project has performed detailed computations to estimate the total amount of greenhouse emissions that would result from all facets of the proposed on-site timber harvest operations. These computations were made by the RPF using CAL FIRE's recently released Greenhouse Emissions Calculator. The following section describes the methodology inherent in CAL FIRE's Greenhouse Gas Emissions

Calculator (GHG Calculator) and the project-specific data entered into the Calculator by the RPF.

Greenhouse Gas Emissions Calculator Methodology

Standing Live Carbon

In order to determine the impact of the project on net sequestration of standing conifer and hardwood timber, an analysis of potential carbon sequestration under two scenarios was conducted. The first scenario involves carbon sequestration following a reasonable prediction of sustainable forest management on the project area ("No Project – Timber Resource Management Alternative"). The second analysis involves net carbon sequestration following implementation of the proposed conversion and creation of the reserve area.

The analysis was developed utilizing the CAL FIRE GHG Calculator which can be found at:

http://www.fire.ca.gov/resource_mgt/downloads/THP_GreenhouseGasEmissions_Calculator_061110.xls

Utilizing the CAL FIRE GHG Calculator, three sets of data were developed for the project area: 1) the conversion area, 2) the reserve area, and 3) No Project – Timber Resource Management Alternative (See Appendix R). The CAL FIRE GHG Calculator takes into account estimates of species percentage, current inventory, growth rates of hardwood and conifer timber, harvest volumes, emissions associated with harvest operations (chainsaws, tractors, loaders, log trucks etc.), emissions associated with milling of forest products, emissions required for site preparation (including removal of brush and stumps), and the amount of long-term sequestration stored in the wood products produced. The CAL FIRE GHG Calculator accounts for both above and below ground carbon in timber. The estimates provided in the CAL FIRE GHG Calculator of species percentage, current inventory and growth are based on professional judgment as no timber cruise has been conducted.

The analysis shows that for the 154 acres to be converted from timberland to vineyard, there will be a net loss of 24,223 Mg of CO_2e over the 100 year analysis period.[16] The 151 acres of forestland in the reserve area will sequester 95,796 Mg of CO_2e over the 100 year analysis period. It is unclear exactly when the amount of carbon stored in this reserve area would offset the CO_2e lost from the converted area, but it most likely occurs somewhere between years 40 to 50.

[16] Metrics are as follows: Mg = one megagram or one metric ton, which is equivalent to about 2,204.6 pounds or 1.1 short tons. CO_2e is the equivalent weight of CO_2 per metric ton of carbon (C) expressed in metric tons. One metric ton of C is equivalent to approximately 3.67 metric tons of CO_2.

The “No Project – Timber Resource Management” analysis shows the amount of carbon sequestered in the 305 acres of forestland area (on the entire 324 acre property) if the conversion were not to occur and a periodic harvest be conducted as was the case in the past (i.e. business as usual). The calculations show that a sustainable harvest conducted every twenty years sequesters 52,388 Mg of CO_2e over the 100 year analysis period. Therefore, converting 154 acres of timberland while setting aside 151 acres of timberland in a reserve area, as is currently proposed, would result in an additional 19,185 Mg of CO_2e being sequestered over what would be sequestered if the current practice of a periodic harvest were to occur. Table 4-3 below shows these results in terms of Mg CO_2e and Mg C.

Table 4-3
Net Sequestration of No-Project, and Project Standing Live Carbon (> 8” DBH)

	Total Sequestration over 100 years Mg CO2e	Total Sequestration over 100 years Mg C	Annual per acre Sequestration over 100 years Mg C per Acre
151 acre Reserve Sequestration	95,796	26,126	1.730
154 acre Conversion Area Sequestration	-24,223	(6,606)	-0.429
Net Project Sequestration	71,573	19,520	
No Project – Timber Resource Management Sequestration (305 acres)	52,388	14,288	0.468
Net Difference	19,185	5,232	

Other Carbon Pools

The CAL FIRE GHG Calculator addresses sequestration for standing live carbon in trees 8” DBH and larger. The analysis of sequestration and emissions must also address soil carbon, litter and duff, lying dead wood, standing dead wood, understory (brush or grass species), and non-merchantable standing live carbon (trees less than 8 inches DBH). With the exception of soil carbon, the other carbon pools are assumed to be on average static in the No Project – Timber Resource Management Alternative, thus there is no net sequestration or emission over time.

In order to determine the complete carbon sequestration picture, these other pools must be estimated. Based on the assumptions utilized with the CAL FIRE GHG Calculator, it is possible to determine the beginning live carbon stocks for the project area. The CAL FIRE GHG Calculator indicates that there is approximately 200 Mg of CO_2e (54.5 Mg C) per acre in the current standing stock of above and below ground conifer and hardwood timber. In order to estimate the relative percentage of carbon in each carbon pool, data from the FIA database for the 2009 California inventory was consulted[17]. The relative proportion of carbon for each carbon pool for private ownerships in the redwood forest type is shown in Table 4-4 below. This table shows that soil carbon, litter and understory

[17] http://fiatools.fs.fed.us/fido/index.html

carbon pools represent approximately 15%, 16% and 0.7% of all carbon pools, respectively.

Table 4-4
Carbon Pools for the Redwood Forest Type on Private Ownerships (FIA 2009)

	Soil	Litter	Standing Dead	Lying Dead	Understory[18]	Live Trees[19]	Total
Mg C per acre	22.04	23.97	6.42	10.27	1.05	82.91	146.66
% of Total Carbon	15%	16%	4%	7%	1%	57%	100%

Using the Redwood Forest Type percent carbon estimates from Table 4-4 with the CAL FIRE GHG Calculator estimate of 54.5 Mg/ac for above and below ground live carbon for live trees >8" DBH, Table 4-5 has been constructed to estimate the carbon content of all pools for the project area.

The project carbon stocks are less than those for the average of the redwood forest type derived (Table 4-4), but the assumption is made that the relative proportion of the carbon from the FIA data would be similar to that of the project area. However, since the project area is considerably less stocked and younger on average than the average stand estimated by the FIA data, we have assumed that the standing dead and lying dead pools are 30 to 40 percent of those predicted by FIA, or 2 Mg C per acre (i.e., 0.3 * 6.42) and 4 Mg C per acre (0.4 * 10.27) respectively. The percentages of total carbon for the other pools were then adjusted slightly to account for these changes. Finally, a review of the FIA data indicates that approximately 6% of the total live tree carbon in the redwood forest type is found in trees < 8 inches DBH. Using the live tree carbon pool estimate from the CAL FIRE GHG Calculator of 54.5 Mg C per acre for trees >8" DBH, the total project live tree carbon pool is estimated at 57.98 Mg C per acre [54.5 ÷ 0.94(>8" DBH live tree carbon percentage)]. Live tree carbon <8" DBH is then estimated at 3.48 Mg C per acre (57.98 × 0.06). Based on these assumptions, the estimate of all carbon pools on the project area is shown in Table 4-5 below.

Table 4-5
Project Area Carbon Pool Estimates

	Soil	Litter	Standing Dead	Lying Dead	Understory	Live Trees <8" DBH	Live Trees >8" DBH	Total
Mg C per acre	15.41	16.76	2.00	4.00	0.69	3.48	54.50	96.84
% of Total Carbon	16%	17%	2%	4%	1%	4%	56%	100%

Note: The percentage of total carbon for each carbon pool shown in Table 4-5 differs slightly than the percentages for the average FIA data shown in Table 4-4 due to the lower estimate of standing and lying dead carbon on the project area as compared to the average FIA data.

[18] Above and below ground.
[19] Above and below ground 1" DBH and larger.

Carbon Losses

The CAL FIRE GHG Calculator estimates losses from the live tree carbon pool >8" DBH, as well as approximately 2 Mg C of carbon losses from understory vegetation (understory and live tree <8" DBH pools from Table 4-5 above) removed as a part of site preparation. The CAL FIRE GHG Calculator thus already accounts for approximately 48% of the potential losses from the understory and live tree <8" carbon pools. The impacts on the other carbon pools due to conversion from forest to vineyard must now be estimated.

Soil Carbon Losses

The impacts of vegetation manipulation on soil carbon are complex, and are the least well understood component of the carbon cycle. The following discussion provides a conservative estimate of soil carbon impacts based upon the information obtained during the literature search.

Murty et. al.[20], 2002 indicates that soil carbon losses from forest conversion to cultivated land are around 20%. Soil carbon losses are rapid initially, but reach a new equilibrium within 5-10 years. Soil carbon in the soil occurs in two forms; mineral soil carbon, and forest floor soil carbon. Forest floor soil carbon storage is more susceptible to losses from the removal of vegetation, than is soil mineral carbon. Because deep ripping is not proposed as part of this project, impacts to mineral carbon would be minimal.[21] These

[20] Murty, D. et. al., "Does conversion of forest to agricultural land change soil carbon and nitrogen? A review of the literature," *Global Change Biol.*, 8: 105-123, 2002.

[21] Deep ripping is practiced by using a ripper shank that penetrates 4-5 feet pulled by a D8 or larger tracklayer. This soil disturbing practice is not planned for the Fairfax Conversion project. It is important to note that deep ripping is not necessary for stump removal. Most stumps are small, and a typical, efficient method of removal is as follows:

- Cut the stem off 2-4 feet above the ground.
- Pull the stump and main roots using an excavator with thumb and gently shaking sideways while lifting.
- Minimum soil disturbance and maximum root removal occurs using this method.
- Larger stumps may require some digging around the base to free up the larger roots.

Shallow ripping is practiced using a smaller tractor and smaller set of ripper shanks that penetrate 18-24 inches into the ground. The tillage operation does not change the soil profile or bring material to the surface. It is used to break up any shallow hard pan to promote root penetration into the soil. In addition, rock removal will be negligible for the Fairfax Conversion project because the local Goldridge-variant sandy loam soils typically do not include rock in the profile.

Most roots in the soil profile will be in the approximate upper foot of soil. A typical method of root removal is to use a brush rake mounted on a dozer blade to selectively bring roots to the surface. The brush rake penetration depth is generally 12 inches or less, depending on the size of the dozer. A combination of mechanical raking and hand picking will result in removal of most of the objectionable residual root mass.

Normal industry-standard agricultural practices include discing a field in preparation for planting, to create a seed bed free of competing weeds. A typical disc penetrates the first 6-8 inches of topsoil during that operation.

losses in soil carbon can be mitigated through the application of conversion methods and vineyard practices as described in the summary below. For this analysis, it is estimated that 25% of the soil carbon will be lost following conversion, which amounts to a slightly higher estimate of carbon loss than would be indicated by Murty et. al.

Losses from Other Pools

It is estimated that 100% of the carbon stored in litter will be removed on the portion of the site that is converted. The practice of placing cull logs and existing lying dead wood from the conversion area within the forest reserve during the conversion process is expected to decrease the potential for carbon losses from the standing dead and lying dead pools to 30%. The understory and small live carbon pools are estimated to be completely removed with the conversion. Because the CAL FIRE GHG Calculator already accounts for 48% of the potential losses from the understory and live tree < 8" DBH pools, these pools are only reduced by 52% in Table 4-6. Table 4-6 shows the estimated reduction in carbon for all of the pools based on the above assumptions.

Table 4-6
Projected Reduction in Project Area Carbon Pools from Conversion in addition to GHG Carbon Calculator

	Soil	Litter	Standing Dead	Lying Dead	Understory	Live Trees ≤8" DBH	Total
% of Carbon Lost	25	100	30	30	52	52	
Mg C per acre Lost	3.85	16.76	0.60	1.20	0.36	1.81	24.58

Note: values calculated based on those contained in Table 4-5. For example, Soil carbon pool reduction = 15.41 Mg C per acre soil carbon x 0.25 (percent) loss = 3.85 Mg C per acre soil carbon lost.

The loss of 24.58 Mg C per acre on the conversion area equates to an annual loss of 0.246 Mg C per acre per year over the 100-year analysis period (24.58 Mg C per acre/100 years; see Table 4-7).

In addition to losses of soil carbon due to the conversion of forest to vineyard, the sequestration of carbon from forest soils in the 305 acres of forest in the business-as-usual scenario, and the 151-acre post conversion reserve area must be included. Based on the range of soil sequestration values presented in Heath et. al.[22] for various forest management activities, the current soil sequestration rate is set at 0.197 Mg C per acre per year which is the medium rate of soil sequestration for a harvest scenario which lengthens rotations (see Table 4-7). The reserve area is given a sequestration rate based

The one-time site preparation activity of shallow ripping modifies soil structure to 18-24 inches, only about 12-18 inches deeper than the final field preparation activity of discing. Once the vineyard is set up, there should be no further tillage or soil disturbing activity.

[22] Annual carbon sequestration rates for forest soils were obtained from The Potential of U.S. Forest Soils to Sequester Carbon and Mitigate the Greenhouse Effect, Chapter 23, The Potential of U.S. Forest Soils to Sequester Carbon, by Linda S. Heath, John M. Kimble, Richard A. Birdsey, and Rattan Lal, 2003.

on the high rate of sequestration due to lengthening rotations or 0.484 Mg C per acre per year (see Table 4-7).[23]

Vineyard Sequestration

Approximately ~~171~~116 acres of the 154-acre timberland conversion area would ~~then~~ be developed as a vineyard, including the cover cropped paths between the vines. ~~Implementation of the proposed project would likely reduce the carbon absorption of the project site (See Table 4-3).~~

In a study that modeled California's 15 largest agricultural counties and divided each county into three crop types (i.e., orchards vineyards, and annual crops), it is noted that in the past half century the amount of carbon released into the atmosphere through agricultural practices has decreased due to changing agricultural practices.[24] For example, improved crop varieties and industrial fertilizer have increased crop biomass and the amount of carbon returning to soils, thus increasing soil carbon stocks. Kroodsma and Field found that carbon sequestration varied significantly between crop types and perennial crops sequestered more carbon than annual crops, with vineyards sequestering 24 g $C/m^{-2}/yr^{-1}$.[25] Kroodsma and Field also note that soil carbon sequestration varied significantly between counties and soil carbon sequestration was highest in counties with a high percentage of rice and/or perennial crops, and lowest in counties with few perennial crops and a high percentage of silage crops.[26]

Using the woody material and soil carbon sequestration rates for California vineyards in Kroodsma and Field, the post-conversion annual sequestration rate for the proposed 116-acre vineyard on the Fairfax Conversion project site was estimated in Table 4-7 below. The 116-acre vineyard area has the potential to sequester carbon in woody material from the vines, as well as soil carbon.

It should be noted that an important factor when considering soil carbon dynamics is soil respiration. According to a recent UC Davis study entitled "Effects of Land Use on Soil Respiration: Conversion of Oak Woodlands to Vineyards," it is noted that soil CO_2 efflux, or "soil respiration," is one of the more important components of ecosystem C budgets.[27] Soil respiration consists of organic matter oxidation, root respiration, and

[23] Table 23.3 in Heath et al. presents sequestration rates in kilograms per hectare per year (kg/ha/yr). To convert to Mg C per acre per year, the sequestration values from Table 23.2 are divided by 2.47 acres per hectare, and then divided by 1,000 kg per Mg.
[24] David A. Kroodsma and Christopher B. Field, "Carbon Sequestration in California Agriculture, 1980-2000," in *Ecological Applications*, 16(5), 2006, pp. 1975-1985.
[25] Kroodsma and Field, 1980. Note this assumes 4 g $C/m^{-2}/yr^{-1}$ in woody material and 20 g $C/m^{-2}/yr^{-1}$ in soils.
[26] Kroodsma and Field, 1980.
[27] Eli A. Carlisle, Kerri L. Steenwerth, and David R. Smart, "Effects of Land Use on Soil Respiration: Conversion of Oak Woodlands to Vineyards," *Journal of Environmental Quality*, 35:1396–1404 (2006), 1396. The study consisted of three oak woodland and three vineyard sites with known land use histories in the Oakville Region of Napa Valley, California. The vineyard sites were formerly part of the adjacent oak woodlands before their conversion to vineyards. The vineyards were converted directly from oak woodlands 30 to 32 years ago. As noted in the Conclusion section of the study, the investigation has shown that the study oak woodland sites lose significantly more soil CO_2 than adjacent

rhizosphere respiration (i.e., microbial consumption of root exudates and contents of sloughed cells) (Hanson et al., 2001).

Grasslands

Nineteen (19) acres of grasslands are located in both the current land use and the proposed project. Thus, the project has no effect on current carbon and GHG emissions and sequestration for the grassland area.

Summary of above Pre- and Post-Project Sequestration Analysis

Table 4-7 shows the average annual sequestration for the current use, and the project over a 100-year analysis period. Losses of carbon resulting from removal of standing live biomass and cultivation of soil are shown as annualized emissions. The net result of this comparison shows that the project does not result in a net loss of carbon sequestration over the 100-year analysis period.

~~Table 4-3~~
~~Onsite Carbon Sequestration Estimates~~

~~Current Use~~	~~Acreage (ac.)~~	~~Carbon Sequestration Rates (metric tons per acre per year)~~	~~Low Estimate (metric tons of carbon)~~	~~California Estimate (metric tons of carbon)~~	~~High Estimate (metric tons of carbon)~~
~~Pre-Conversion~~					
~~Forest (Reforestation rates)~~	~~305~~	~~1.1 to 7.7 (2.0 for California Estimate)~~	~~335.5~~	~~610~~	~~2,348.5~~
~~Grassland~~	~~19~~	~~0* to 1.9 (0.02 for California Estimate)~~	~~0~~	~~0.4~~	~~36.1~~
~~Pre-Conversion Totals~~	**~~324~~**		**~~335.5~~**	**~~610.4~~**	**~~2,384.6~~**
~~Post Conversion~~					
~~Vineyard (Conservation tillage)~~	~~159~~	~~0* to 1.1 (Mid-range of 0.55 assumed for California Estimate)~~	~~0~~	~~87.5~~	~~174.9~~

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vineyards. Cultural practices such as tillage and vineyard preparation had large impacts on soil organic carbon (SOC) pools and SOC distribution through the soil profile. Soil [CO_2] and CO_2 values from this investigation have shown that the respiration sources in the soil profile change with season and depth, and that soil moisture content has a large influence on soil respiration values. The authors' estimates point to the clear need to develop a more acute understanding of the contribution of belowground production in perennial cropping systems, as well as in the perennial systems from which they were converted. While the results of the study by Carlisle et al are not directly applicable to the Fairfax Conversion project site given the site's lack of oak woodland forest type, it raises the important question which has heretofore been little studied – that is, whether or not soil respiration would be greater in mixed evergreen second growth forests, such as the Fairfax Conversion project site, as compared to an established vineyard.

~~Preserved Forest (Reforestation rates)~~	~~134~~	~~1.1 to 7.7 (2.0 for California Estimate)~~	~~147.4~~	~~268~~	~~1,031.8~~
~~Roads, ponds, etc.~~	~~31~~	~~0~~	~~0~~	~~0~~	~~0~~
~~**Post Conversion Totals**~~	~~**324**~~		~~**147.4**~~	~~**355.5**~~	~~**1,206.7**~~
~~**Net Change (decrease in carbon absorption)**~~			~~**-188.1**~~	~~**-254.9**~~	~~**-1,177.9**~~

~~*Assumes that the soil is saturated with carbon.~~

~~*Sources:*~~
~~*Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture; 2005. Accessed on www.epa.gov June 2007.*~~
~~*Winrock International. Measuring and Monitoring Plans for Baseline Development and Estimation of Carbon Benefits for Change in Forest Management in Two Regions, March 2004. Accessed at http://www.energy.ca.gov/reports/CEC-500-2004-070/CEC-500-2004-070F.PDF on March 27, 2008.*~~
~~*Applied Geosolutions, LLC and Complex Systems Research Center, University of New Hampshire. Assessing Impacts of Rangeland Management and Reforestation of Rangelands on Greenhouse Gas Emissions: A Pilot Study for Shasta County, February 2007. Accessed at http://www.energy.ca.gov/2006publications/CEC-500-2006-108/CEC-500-2006-108.PDF on March 27,2008.*~~

Table 4-7
Onsite Average Annual Net Carbon Sequestration Estimates over 100-year Analysis Period

Current Use	**Acreage (ac.)**	**Carbon Sequestration Rates (metric tons per acre per year)**	**Estimate (metric tons of carbon)**
		Pre-Conversion	
Forest			
Standing live biomass	305	0.468[1]	142.88
Forest soils	305	0.197[2]	60.09
		Pre-Conversion Totals	**202.97**
		Post Conversion (Vineyard Operation)	
Reserved Forest (Streamside corridor and reserves)			
Standing live biomass	151	1.730[1]	261.23
Forest soils	151	0.484[2]	73.08
Conversion (116 ac. vineyard, 38 ac. roads, ponds, etc.)			
Standing live biomass	154	-0.429[1]	-66.07
All other pools	154	-0.246[3]	-37.85
Vineyard			
Woody material	116	0.016[4]	1.86
Vineyard soils	116	0.081[4]	9.40
		Post Conversion Totals	**241.77**
Net Change (increase in carbon absorption)			39.11 metric tons of carbon (144 metric tons of CO_2)
Notes:			

[1] See Table 4-3 above.
[2] Annual carbon sequestration rates for forest soils were obtained from *The Potential of U.S. Forest Soils to Sequester Carbon and Mitigate the Greenhouse Effect*, Chapter 23, "The Potential of U.S. Forest Soils to Sequester Carbon," by Linda S. Heath, John M. Kimble, Richard A. Birdsey, and Rattan Lal, 2003.
[3] See Table 4-6 above.
[4] Annual carbon sequestration for vineyard woody material and soils was obtained from David Kroodsma and Christopher Field, "Carbon Sequestration in California Agriculture 1980-2000," *Ecological Applications* Vol 16, 1975-1985.

The vast majority of carbon loss would occur during the initial harvest and site preparation operations. However, as demonstrated above in Table 4-7, long-term sequestration to offset the initial spike in carbon release would occur throughout the planning period. In addition, the initial short term release of carbon would be partially addressed through the various methods/vineyard practices included in the project description (see Chapter 3 of the DEIR for more detailed information), such as:

- Utilizing chipped slash on-site will lessen the short term impact of carbon removals from the conversion area as the slash will not be burned.
- Supplementing large woody debris stocks on the reserve through to placement of cull logs and existing large downed logs from the conversion area
- Minimizing ripping (as noted above, deep ripping is not proposed)
- Planting/restoration of riparian vegetation

  As part of the implementation of the Timber Harvest Plan (THP), the applicant will implement a California native riparian planting plan to enhance the Patchett Creek riparian corridor, act as a filter for stormwater runoff from the proposed vineyards, and benefit biological resources along Patchett Creek.

  The objective of the riparian planting plan is to create a continuous riparian canopy along Patchett Creek. Species to be planted were selected based upon the species that now characterize the upper reaches of Patchett Creek on the project site. Species to be planted include interior live oak (Quercus wislizenii) and California bay (Umbellularia californica). Riparian planting will occur in gaps in the riparian canopy along Patchett Creek setbacks.

- Improved vineyard practices
- Use of vineyard cover crops

  As discussed above, the project involves the implementation of cover crops ~~and no-till practices. Furthermore, grape vines are a woody plant that would absorb carbon. At this time a numerical model foranalyzing the carbon sequestration of vineyards is not available. However, the carbon sequestration rates for the vineyard area are likely to be on the higher side of the estimates shown in Table 4-3 because carbon sequestration in woody plants such as vines would be higher than in grasses~~. More specifically, as indicated in the Erosion Control and Mitigation Plan prepared for the proposed project, hillside vineyard rows and field avenues and perimeter roads (19 acres total) will include temporary and permanent cover crops. These permanent cover crops will be native species planted prior to October 15th.

The above analysis shows that the proposed project sequesters more carbon over the 100-year analysis period than the No Project – Timber Resource Management Alternative. This is due to the inclusion of the 151-acre forest reserve. As the redwood forest type has the potential to sequester carbon over long periods of time, the forest reserve creates the potential for significant carbon sequestration. Redwood forests in the North Coast of California have the capability of sustaining volume growth and in turn sequestration of carbon until stand ages of 80 to 100 years. Recent research indicates that redwood forests can continue to sequester significant amounts of carbon well past stand ages of 100 years. This analysis conservatively excludes increases in the standing dead and lying dead pools on the 151-acre reserve over the 100-year analysis period. Although excluded from this analysis, increases in the standing dead and lying dead pools within the reserve would serve to increase the net sequestration of the project over time.

Vineyard Vehicle and Equipment Emissions

~~Logging and tilling would result in emissions of GHG through the use of tractors, logging trucks, and chainsaws. In addition, tilling and deep-ripping of the soils would release carbon currently stored in the soil.~~ Following establishment of the project, vineyard operations would require the use of tractors and automobiles both for harvesting and transportation of workers.

Vehicles

The following is a general estimate of the yearly carbon dioxide creation of the proposed project based on the average employee vehicle miles traveled per day. The employee estimates are based on six months of peak harvest season trips, and six months of off-season trips. As noted in the *Transportation and Circulation* Chapter of the DEIR, Chapter 3.9, employee trips constitute home-to-work trips, lunch trips, errands, and other business trips. Ten percent of the employees are expected to carpool from home to work, while 50 percent are anticipated to carpool for lunch. Errands and other business would be expected to generate 0.2 trips per employee. To be conservative in the traffic analysis, TJKM assumed a high percentage of car ownership among seasonal workers. Based upon an average occupancy of three employees per car for carpooling, average employee traffic is estimated at 128 trips per day. ~~Estimates are not attempted for the use of tractors, power equipment, or large trucks. However, the numbers contained in Table 4-4 are still considered to be a conservative estimate of the proposed project's vehicle carbon dioxide production as the longest potential harvest season was presumed, and seven day work weeks were used on a year round basis.~~

As also noted in the *Transportation and Circulation* Chapter of the DEIR, Chapter 3.9, grapes are usually delivered in double gondola trucks carrying 22 tons of grapes each, or on flatbed trucks carrying 11 tons of grapes each. In order to estimate the number of trucks required to deliver grapes, a truck composition of 80 percent gondola trucks and

20 percent flatbed trucks was used. These assumptions are based on TJKM's familiarity and experience in studying similar vineyard projects in the area. On the average, each truck hauling grapes would carry 19.8 tons of fruit.

Using the TJKM formula, a 137-acre vineyard could yield up to 617 tons of grapes annually. This would require about 31 (= 617/19.8) trucks to haul the grapes during the harvest season. At an average harvest rate of 30 tons per day, approximately 21 maximum working days would be needed to harvest all 617 tons of grapes. The total number of weekday truck trips for the harvest season is approximately the total number of trucks divided by the number of weekdays for the harvest, multiplied by two trips (one inbound and one outbound) per truck. The result of this equation is an average of two truck trips per day required during the harvest season. This analysis assumes a maximum of three truck trips per day during the harvest season.

As shown in Table 4-~~4~~9, the vehicle emissions generated by the proposed project would annually generate approximately ~~231~~296.8 metric tons of carbon dioxide. ~~The figure does not account for tractor emissions, small engine emissions (e.g., weedeaters), or the initial emissions associated with logging and conversion of the site.~~

During the construction phase of the vineyard the vehicle emissions would total approximately 19.7 metric tons of CO_2 (See Table 4-8(A)).

Equipment

Table 4-8(B) includes a comprehensive list of the types of motorized equipment that are anticipated to be utilized during vineyard preparation and subsequent operation and maintenance.

Reservoir Installation

Sod and topsoil would be salvaged and stockpiled in a designated work area. Grading work would be conducted by a licensed contractor hired by the owner and under the direction of the Geotechnical Engineer of record. The Geotechnical Engineer would monitor excavations and backfill and evaluate the engineering properties of the soil by compaction testing and other means deemed appropriate by the Geotechnical Engineer. The Civil Engineer responsible for the earthwork plan would provide grade staking and dimensional controls either in person or by direction of the contractor or a licensed surveyor. Earthwork would progress by excavation of embankment support keyways inspected and approved by the Geotechnical Engineer. Subdrain installation within the keyways is expected for control of any incidental shallow groundwater under the impoundment, with drainage by gravity flow to rock armored outlets. The keyway would be filled and the embankment created using compacted lifts of engineered fill under direction of the Geotechnical Engineer.

Table 4-8 A
Vineyard Development: Vehicle CO2 Generation

Season	Employees	Total Weekly Round Trips	Total Round Trips for Duration of Phase	Average Miles per Round Trip	Total Miles Traveled During Phase	Total Gallons[1]	Total CO2 (pounds)[2]
Vineyard Site Preparation (one-time occurrence)							
Reservoir Installation (4 weeks)	8 [3]	11 [3]	44	50	2200	108.4	2102.5
Vineyard Development							
4 weeks for initial grading and excavation	2	5 [4]	20	50	1000	49.3	955.7
1 week for smoothing of soil surface	2	5 [4]	5	50	250	12.3	238.9
5 weeks for vineyard trellis installation	21 [5]	35 [6]	179 [7]	50	8950	440.9	8553.2
10 weeks for vineyard irrigation installation	21 [5]	35 [6]	350 [7]	50	17500	862.1	16724.1
6 weeks for planting of vineyard	31	52	312	50	15600	768.5	14908.4
Pounds of CO2							**43482.8**
Metric Tons of CO2 ~~Per Year~~ [8]							**19.7**

[1] Overall average fuel economy for passenger vehicles of 20.3 mpg utilized (weighted by vehicle miles traveled [VMT] for passenger cars and light trucks). Per "*Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle* ," US EPA, accessed online February 15, 2011 at http://www.epa.gov/oms/climate/420f05004.htm.

[2] 19.40 pounds of CO2 per gallon of fuel per "*Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle* ," US EPA, accessed online February 15, 2011 at http://www.epa.gov/oms/climate/420f05004.htm.

[3] Employee total for Reservoir Installation comprised of the following: 2 employees max per day (assume carpool) to operate equipment; an additional 4-6 personnel (i.e., 4-6 individual vehicle trips) per week for periodic visits by engineer, consulting se

[4] One trip based on assumption that 2 employees required to operate equipment during phase would carpool each day.

[5] Number of employees includes 20 person crew and 1 supervisor.

[6] Consistent with Traffc Study prepared for the Fairfax Conversion DEIR carpool assumption is 3 persons per vehicle. Therefore, for a crew of 21, total trips per day is approximately 7. This equates to 35 round trips per week.

[7] Methodology = 35 weekly trips x 5 week phase = 175 total round trips + 4 additional round trips for miscellaneous equipment delivery and inspection.

[8] ~~Carbon generation was determined as follows (Miles per season * 366 grams per mile / 1000 grams per kilogram / 1000 kilograms per metric ton). For carbon dioxide generation - Proposed Methodology to Model Carbon Dioxide Emissions and Estimate Fuel Economy, Accessed on www.arb.ca.gov June 2007~~. Total pounds of CO2 divided by 2,205 since there are 2,205 pounds in 1 metric ton.

Table 4-8 B
Vineyard Development: Equipment CO2 Generation

Equipment Type	Number of Pieces of Equipment	Total Duration of Use (weeks at 30 hours per week)
Reservoir Installation		
Bulldozer sized D4	1	2
Bulldozer sized D8	1	2
Excavator	1	4
Earthmoving scraper of 20-30 cubic yard capacity or off-road trucks if soil is too wet	2	4
Water truck	1	4
Self-propelled compactor	2	4
4WD or crawler ag tractor with disc	1	3
Backhoe	1	4
Concrete Truck	1	1
Vineyard Development		
Equipment Type	**Number of Pieces of Equipment**	**Total Duration of Use (weeks at 40 hours per week)**
Crawler tractor (D-8 or smaller)	1	5
Water truck	1	5
Trencher (irrigation system installation)	1	10
Backhoe (drainage system installation)	3	16
Labor force ATVs, trailers	4	16
Labor force gas powered hand tools - chain saw, trench compactor, generator, string trimmers, etc.	3	16
Dump truck - rock riprap, drain rock	2	3
Bobcat or loader - rock management, supplies distribution	1	10
Post-pounding tractor (vineyard trellis and irrigation system installation)	2	8
75-hp tractor (planting of grapevines)	2	2
Metric Tons of CO_2 Per Year (includes reservoir installation and vineyard development)[1]		**1153.12**

[1] Tons of CO_2 per year for each phase of vineyard development construction calculated using the URBEMIS 9.2.4 emissions modeling program, and converted to metric tons.

Table 4-9 Vineyard Operation: Vehicle and Equipment CO2 Generation							
Vehicle Emissions: Vineyard Harvest Season (Note: Harvest will not occur for first 3 years of project's operation due to vineyard establishment)							
Employee Trips							
Season	**Employees**	**Total Daily Trips**	**Average Miles per Round Trip**	**Total Miles Per Day**	**Total Miles Traveled**	**Total Gallons**[1]	**Total CO2 (pounds)**[2]
Harvest (183 days)	72 seasonal + 6 full-time	128 (i.e., 64 round trips)	~~25~~ 50 miles	3200	585600	28847.3	559637.4
~~Off Season (182 days)~~	~~6~~	~~10 (.077 x 128)~~	~~25 miles~~				
Metric Tons of CO2 Per Year [3]							**253.8**
Gondola Trucks							
Season	**Employees**	**Total Weekly Round Trips**	**Total Round Trips for Duration of Phase**	**Average Miles per Round Trip**	**Total Miles Traveled During Phase**	**Total Gallons**[1]	**Total CO2 (pounds)**[2]
Grape Delivery (6-7 days)	N/A	10 [4]	12	200 [5]	2400	118.2	2293.6
Metric Tons of CO2 Per Year [3]							**1.0**
Equipment Emissions: Annual Operation and Maintenance							
Equipment Type			**Number of Pieces of Equipment**		**Total Duration of Use (annual in hours)**		
75 hp farm tractor			2		250		
Harvest rental tractors (35hp)			2		250		
Sump Pump Motor			1		250		
ATV			2		250		
Metric Tons of CO_2 Per Year[6]					**41.97**		
Total Vineyard Operation Vehicle and Equipment Emissions (Metric Tons of CO_2/Yr)					**296.77**		

[1] Overall average fuel economy for passenger vehicles of 20.3 mpg utilized (weighted by vehicle miles traveled [VMT] for passenger cars and light trucks). Per "*Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle* ," US EPA, accessed online February 15, 2011 at http://www.epa.gov/oms/climate/420f05004.htm.

[2] 19.40 pounds of CO2 per gallon of fuel per "*Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle* ," US EPA, accessed online February 15, 2011 at http://www.epa.gov/oms/climate/420f05004.htm.

[3] Total pounds of CO2 divided by 2,205 since there are 2,205 pounds in 1 metric ton.

[4] 10 trips based on assumption that 2 grape delivery trips would occur per day = 10 per week.

[5] Based upon Artesa Winery being located approximately 100 miles from the project site.

[6] Tons of carbon per year for equipment calculated using the URBEMIS 9.2.4 emissions modeling program, and converted to metric tons.

Sources: For employees and traffic trips - *Traffic Impact Study for Artesa Vineyards Project* , 2004.

Trenching and installation of concrete encased drain lines and overflow pipe would occur within the earthwork area at the appropriate locations and times. Fill material would be excavated from within the impoundment area. Earthwork cut and fill volumes are balanced, such that import or export of soil or bulk materials is not anticipated.

Vineyard Development

As discussed in the *Project Description* Chapter of the DEIR, Chapter 2, the applicant proposes to perform all land clearing and development activities during spring, summer, and fall months. Following subsurface preparation, organic material (e.g., roots with a one-inch or larger diameter) would be gathered by hand or mechanical means, and would be either piled and chipped or removed from the site. The soil surface would then be smoothed and/or re-contoured using tractor equipment. This operation would involve "floating" the soil with a blade to create relatively smooth fields suitable for planting. According to the applicant, the vineyard layout is designed to minimize the need for grading. Smoothing would take approximately one week and would require a crew of one to two people and the use of a crawler tractor (D-6 or smaller). A farm tractor would then disc the soil in preparation for planting. Field terrace, row, and avenue locations would be laid out following discing.

The vineyard trellises and irrigation system would be installed concurrently using post-pounding tractors, trenchers, and/or backhoes. The post-pounding tractor would place the vineyard trellis posts, and a trencher or backhoe would be used to install the irrigation pipeline trenches. These trenches would be roughly one foot wide and two feet deep, and would be backfilled after installation of the irrigation pipelines.

The rootstock chosen for planting of the vines would be drought-tolerant and provide deep rooting patterns. Planting would require a crew and a 60-hp tractor. Vineyard blocks would be pre-irrigated using the installed drip irrigation system; then holes would be dug to accommodate roots, the vines would be placed, and soil around the roots would be compacted to support the vines.

As illustrated in Table 4-8(B), the one-time vineyard development phase will generate an estimated 1,153.12 metric tons of CO_2 from equipment emissions. Therefore, the total amount of CO_2 emissions generated during the vineyard development phase is approximately 1,173 metric tons (1,153.12 Mt CO_2 for equipment and 19.7 Mt CO_2 for employee vehicles).

Vineyard Operation and Maintenance

This section pertains to the types of mechanical motorized equipment that is expected to be utilized during vineyard operation and maintenance activities, which excludes vehicle trips associated with harvest employees and grape delivery trucks; these vehicle emissions are addressed above in Table 4-9.

Vineyard Vehicle and Equipment Emissions Summary

As illustrated in Table 4-9 above, the annual CO_2 emissions in metric tons per year associated with vineyard operations, which will occur starting three years after the vineyard is planted, are 296.8 metric tons of CO_2.

In addition, while the "one-time" emission of CO_2 during the vineyard development phase will be approximately 1,173 metric tons of CO_2 (See Tables 4-8(A) and (B)), annualized over the 100-year analysis period, this amount would be equal to approximately 11.7 metric tons of CO_2 per year. In order to obtain a comprehensive picture of the project's total annual CO_2 emissions, the 11.7 metric tons per year must be combined with the projected annual operational emissions of 296.8 metric tons of CO_2. Therefore, the combined total amount of CO_2 generated annually by the project, assuming that the construction phase emissions are annualized over the 100-year analysis period, would equal approximately 308.5 metric tons of CO_2. Given the results of Table 4-7, that is, the determination that the project will sequester approximately 144 metric tons of CO_2 per year, the net amount of CO_2 expected to be generated by the project on an annual basis is 164.5 metric tons of CO_2.

Comparison of Project Climate Change Analysis to other Alternatives

Offsite Alternative

As discussed in Chapter 6, *Alternatives Analysis*, of the DEIR, the Offsite Alternative would differ from the proposed project only in the location of the conversion area. In trying to satisfy most of the important site criteria (soils, elevations, slopes, and solar aspects), the offsite location would likely be located in the area surrounding Annapolis, or south of the town along Annapolis Road.

The Fairfax Conversion project site has a set of natural features around which 151 forested acres are being set aside. These natural features include existing stream channels and unique plant and wetland habitats. Without the identification of a specific offsite alternative location, it is not possible to determine whether similar characteristics exist on other available sites in the Annapolis region that may be similarly conducive for set aside purposes. In addition, the Fairfax Conversion project site currently contains approximately 19 acres of grassland habitat that would be developed as part of the vineyard. Other available offsite locations in the vicinity meeting most of the important site criteria may be entirely forested, which would result in more timbered acres being converted as compared to the proposed project. Overall, the findings of the greenhouse gas emissions analysis for the proposed project – that the vineyard would ultimately sequester more carbon on an annual basis as compared to managing the site for periodic timber harvest – would be expected to also apply to the Offsite Alternative, unless a sufficient timber reserve area cannot be feasibly incorporated into the overall vineyard design.

Reduced Acreage Alternative

As discussed in Chapter 6, *Alternatives Analysis*, of the DEIR, the Reduced Acreage Alternative would strategically reduce project acreages in three areas to reduce impacts to adjoining properties and on-site biological resources. While the proposed project would establish reserves for biological and cultural resources, the Reduced Acreage Alternative would expand the reserves around the resources by eliminating certain vineyard units; thereby maintaining these sites in their natural state. The Reduced Acreage Alternative would reduce the overall vineyard area by 33.2 acres (24.6 percent) by eliminating Unit Areas 1(a-d), 3, and 4.

The reduction in vineyard acreage would result in the greater retention of forested acres on the project site. Incorporating a larger timber reserve in the Reduced Acreage Alternative is significant given the substantial sequestration potential identified for the reserve area in the project analysis included above (See Table 4-7). Given the larger reserve, the Reduced Acreage Alternative would be anticipated to sequester more carbon per acre annually than the proposed project. In addition, decreasing the extent of timber harvest would correspondingly reduce the initial, short-term release of carbon, which for the proposed project, is projected to be 26.58 Mg C per acre on the conversion area (See Table 4-6 above). However, it is important to remember that, for the project analysis, once the 151-acre forest reserve standing live biomass and forest soils, as well as the vineyard woody vines and soils, are taken into consideration relative to their ability to continue to sequester carbon, the project would ultimately result in an increase in carbon sequestration over existing conditions of 39.11 metric tons of carbon per year. Overall, however, the Reduced Acreage Alternative is anticipated to have fewer impacts to global climate change as compared to the proposed project.

Summary

As directed by SB97, the California Natural Resources Agency adopted Amendments to the CEQA Guidelines for greenhouse gas emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010. CEQA Guidelines section 15064.4, states that, in determining the significance of greenhouse gas emissions, a "lead agency shall have the discretion to determine whether to use a quantitative approach or to "rely on a qualitative analysis or performance based standards." Given the challenges associated with determining a reasonable and proper quantitative significance criterion for GHG emissions when one does not yet fully exist, CAL FIRE has exercised proper discretion (and acted in accordance with the CEQA Guidelines on GHG emissions) in utilizing a qualitative significance criterion for the current project.

Notwithstanding the lack of a governing GHG emissions threshold, as explained above, CAL FIRE, using the best available information available and acting in accordance with CEQA, has established the above-referenced qualitative threshold ("an action that would block implementation of an ARB established regulation to reduce GHG emissions") to assess project GHG emissions. (See CEQA Guidelines, § 15064.7(a) ["[a] threshold of significance is an identifiable quantitative, *qualitative* or performance level of a particular environmental effect…"] (italics added).)

Furthermore, OPR's Technical Advisory entitled, *CEQA and Climate Change Addressing Climate Change Through California Environmental Quality Act (CEQA) Review* acknowledges that no statewide thresholds have been established, and states that "[a]s with any environmental impact, lead agencies must determine what constitutes a significant impact….individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice." Lead agency discretion to select a proper significance threshold for assessing GHG emissions is also specifically allowed under the amended CEQA Guidelines for assessing GHG emissions that were issued by the California Natural Resources Agency.

In formulating a threshold to measure the project's GHG emissions, CAL FIRE recognizes that climate change is a global issue. The solution to global climate change is complex, requires consideration of many factors, and collaboration and cooperation on a large scale. Given the lack of a governing quantitative project-specific significance criterion for GHG emissions, CAL FIRE has properly chosen to use a qualitative significance threshold for the project.

As demonstrated in detail above, converting 154 acres of timberland while preserving 151 acres of timberland as is currently proposed would result in an additional 19,185 Mg of CO_2e being sequestered over what would be sequestered if the current practice of a periodic harvest were to occur over the 100-year analysis period. If we were to account for carbon losses from soils carbon and other pools in Table 4-6 as well, the proposed conversion is estimated to result in a loss of 24.58 Mg C per acre on the conversion area, which equates to an annual loss of 0.246 Mg C per acre per year over the 100-year analysis period (24.58 Mg C per acre/100 years; see Table 4-7). Yet, as shown in Table 4-7, once the 151-acre forest reserve standing live biomass and forest soils, as well as the vineyard woody vines and soils, are taken into consideration relative to their ability to continue to sequester carbon, the project would ultimately result in an increase in carbon sequestration over existing conditions of 39.11 metric tons of carbon per year. Finally, the analysis evaluates the total amount of CO_2 generated during all phases of vineyard development, which would generate a one-time emission of approximately 1,173 (1153.12 metric tons of CO_2 from equipment during vineyard development + 19.7 metric tons of CO_2 from vehicles during vineyard development) metric tons, or 11.7 metric tons of CO_2 on an annual basis if the construction emissions were to be annualized over the 100-year study period. This amount, in combination with the annual amount of CO_2 generated during vineyard harvest operations of 296.8 metric tons per year of CO_2 (See Table 4-9) would equal 308.5 metric tons of CO_2. As discussed above, because the project will sequester approximately 144 metric tons of CO_2 per year, the net amount of CO_2 expected to be generated by the project on an annual basis is 164.5 metric tons of CO_2, which is considered less than significant ~~Currently, the project site serves as a carbon sink for emissions generated elsewhere. Following conversion the project site would continue to sequester carbon; however, the sequestration rate would be reduced as a result of the decreased tree cover. The combination of the reduction in sequestration~~

~~and the vehicle carbon generation indicates that implementation of the proposed project would result in a scenario that falls in between the sequestration of 975.7 metric tons under the High Estimate (231 metric tons [operational emissions] – 1,206.7 metric tons [sequestration]) and a net increase in carbon of 83.6 metric tons under the Low Estimate (231 metric tons [operational emissions] – 147.4 metric tons [sequestration]) of carbon dioxide equivalents per year. Use of the California Estimate on carbon sequestration indicates that implementation of the proposed project would result in the sequestration of 124.5 metric tons of carbon dioxide equivalents (231 metric tons [emissions] – 355.5 metric tons [sequestration]). Therefore, except for the low carbon sequestration estimate, the project site would continue to sequester more carbon dioxide than vineyard activities would emit. Under the worst-case scenario the project would result in net emissions of 83.6 metric tons of carbon dioxide equivalents.~~ In comparison, California emits approximately in the context of the 492 million metric tons per year of carbon dioxide equivalents emitted in California.

~~It is also important to note that certain aspects of the project's design, as well as operational activities, would help to minimize the generation of greenhouse gases. For example, wildfires are a large source of carbon emissions and the conversion of timberland adjacent to rural residential communities, such as the proposed project, would reduce the potential for fires started in the community spreading into the nearby forests, which could result in catastrophic wildfires. To further reduce the project's potential to result in wildfires, and reduce emissions, the project would chip woody wastes from logging and vineyard trimming instead of burning, and utilize solar powered electric water pumps instead of diesel powered water pumps.~~ As is clear from the above analysis, the majority of project CO_2 emissions would be attributable to the combustion of fossil fuels in motor vehicles; however, the State has been working to adopt regulations that would reduce carbon dioxide emissions from fuel combustion state-wide. For example, the California Air Resources Board adopted the Low Carbon Fuel Standard (LCFS), which went into effect in January 2010, and among other things, promotes the use of alternative forms of fuel.[28] ~~Furthermore, t~~The proposed project would be subject to the LCFS and any additional regulations established by the ARB in response to the direction provided by AB 32. Over time the project's greenhouse gas emissions would be reduced through the implementation of the low-carbon fuel standard, as well as increased vehicle fuel efficiency.

~~In addition, as stated in the traffic report, at least ten percent of project workers are expected to carpool to the project site.~~ It is also very important to consider the current function of the project site as a carbon sink. The project site currently provides a service to the community as regards the sequestration of carbon. Implementation of the proposed project would reduce the magnitude of the service provided; however, based upon the above analysis, the project will continue to sequester carbon at a greater rate that the proposed project would generate carbon emissions.

[28] The LCFS regulation is expected to reduce greenhouse gas (GHG) emissions of the transportation sector in California by about 16 million metric tons in 2020. These reductions account for almost 10 percent of the total GHG emission reductions needed to achieve the State's mandate of reducing GHG emissions to 1990 levels by 2020 (cf. http://www.arb.ca.gov/regact/2011/lcfs11/lcfsnotice.pdf; accessed February 17, 2011).

Currently, thresholds of significance for GHGs have not been identified by either the ARB, or the NSCAPCD. Early actions proposed by the ARB[29] are not strictly applicable to the proposed project, and the proposed project would be subject to any applicable State regulations as they are developed. Furthermore, in the context of statewide, nationwide, or global emissions, and considering the carbon sequestration that would continue to occur once the vineyards are planted, the proposed project's incremental contribution to this cumulative impact would not be cumulatively considerable. Therefore, the proposed project would have a ***less-than-significant*** impact on climate change.

Mitigation Measure(s)
None required.

The above additional analysis of greenhouse emissions that would be generated by the project, and the carbon sequestration dynamics on-site pre- and post-harvest, while detailed in its evaluation of all phases of the proposed project, only serves to demonstrate on a more comprehensive level that which was originally determined in the Fairfax Conversion DEIR – that is, the Fairfax Conversion project would result in a less-than-significant impact to climate change in large part due to its careful design, including the preservation of 151 forested acres, substantial planting of native vegetation along upper Patchett Creek, use of chipping versus burning for slash materials, etc.

Response to Comment 6-9

Please see Response to Comment 6-8.

Response to Comment 6-10

The "temporal aspects" (i.e., short-term) carbon emissions associated with the proposed project are addressed in the climate change analysis included in Chapter 4, *Cumulative Impacts*, of the Partially Recirculated DEIR. Table 4-3, "Net Sequestration of No-Project, and Project Standing Live Carbon (>8" DBH)", indicates that the conversion of 154 acres of on-site timber would result in an initial release of 6,606 megagrams or metric tons of carbon. In addition, per Table 4-6, "Projected Reduction in Project Area Carbon Pools from Conversion in addition to GHG Carbon Calculator", the timber conversion would result in the release of approximately 24.58 metric tons of carbon per acre from the carbon pools other than standing live, resulting in an additional total of approximately 3,785.3 metric tons (24.58 metric tons per acre x 154 acres). Therefore, the total initial release of carbon resulting from the harvest of 154 acres of timber, as presented in the RDEIR, is approximately 10,391.3 metric tons. It is important to note that this amount is factored into the calculations and rates included in Table 4-7 of the RDEIR. Table 4-7 accounts for this initial release, but then factors in the long-term sequestration potential of the 151-acre reserve as well as the established vineyard. However, as noted on page 4-10ff of the RDEIR GHG/climate change analysis:

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[29] California Air Resources Board. Proposed Early Actions to Mitigate Climate Change in California, April 20, 2007.

The vast majority of carbon loss would occur during the initial harvest and site preparation operations. However, as demonstrated above in Table 4-7, long-term sequestration to offset the initial spike in carbon release would occur throughout the planning period. In addition, the initial short term release of carbon would be partially addressed through the various methods/vineyard practices included in the project description (see Chapter 3 of the DEIR for more detailed information), such as:

- Utilizing chipped slash on-site will lessen the short term impact of carbon removals from the conversion area as the slash will not be burned.
- Supplementing large woody debris stocks on the reserve through to placement of cull logs and existing large downed logs from the conversion area
- Minimizing ripping (as noted above, deep ripping is not proposed)
- Planting/restoration of riparian vegetation

  As part of the implementation of the Timber Harvest Plan (THP), the applicant will implement a California native riparian planting plan to enhance the Patchett Creek riparian corridor, act as a filter for stormwater runoff from the proposed vineyards, and benefit biological resources along Patchett Creek.

  The objective of the riparian planting plan is to create a continuous riparian canopy along Patchett Creek. Species to be planted were selected based upon the species that now characterize the upper reaches of Patchett Creek on the project site. Species to be planted include interior live oak (Quercus wislizenii) and California bay (Umbellularia californica). Riparian planting will occur in gaps in the riparian canopy along Patchett Creek setbacks.

- Improved vineyard practices
- Use of vineyard cover crops

  As discussed above, the project involves the implementation of cover crops. More specifically, as indicated in the Erosion Control and Mitigation Plan prepared for the proposed project, hillside vineyard rows and field avenues and perimeter roads (19 acres total) will include temporary and permanent cover crops. These permanent cover crops will be native species planted prior to October 15th.

The above analysis shows that the proposed project sequesters more carbon over the 100-year analysis period than the No Project – Timber Resource Management Alternative. This is due to the inclusion of the 151-acre forest reserve. As the redwood forest type has the potential to sequester carbon over long periods of time, the forest reserve creates the potential for significant carbon sequestration. Redwood forests in the North Coast of California have the capability of sustaining volume growth and in turn sequestration of carbon until stand ages of 80 to 100 years. Recent research indicates that redwood forests can continue to sequester significant amounts of carbon well past stand ages of 100 years. This analysis conservatively excludes increases in the standing dead and lying dead pools on the 151-acre reserve over the 100-year analysis period. Although excluded from this analysis, increases in the standing dead and lying dead pools within the reserve would serve to increase the net sequestration of the project over time.

Notwithstanding the above conclusion, the GHG analysis continues by accounting for the carbon dioxide emissions that would result from vehicles and equipment associated with vineyard development and operation. Once these emissions are factored into the analysis, the conclusion, as presented on pages 4-20 and -21 of Chapter 4 of the RDEIR is that the project would result in a net increase in the annual amount of carbon dioxide emissions generated (164.5 metric tons of CO_2) as compared to existing conditions. The RDEIR concludes that this amount is considered less than significant.

The DEIR defines a significant impact resulting from GHG emissions "as an action that would block the implementation of an ARB established regulation to reduce GHG emissions." (DEIR, p. 3.3-9.) CEQA does not mandate that thresholds be developed or, if developed, applied without exception in evaluating the relative significance of impacts. (CEQA Guidelines, § 15064.7 (a) [sets forth *option* of adopting significance thresholds].) The standard of significance for GHG emissions established by CAL FIRE in the DEIR is qualitative and not quantitative. The DEIR explains that this standard was applied because no other regulation/significance criteria exist that can provide more accurate analysis. (DEIR, p. 3.3-7.) The DEIR explains that the emissions thresholds ARB has created pursuant to AB 32 currently apply only to stationary source emissions. (*Ibid*.) In addition, the DEIR explains that the current standards for reducing vehicle emissions under AB 1493 do not provide a quantified target for GHG emission reductions for vehicles. Finally, the DEIR explains that neither ARB nor the Northern Sonoma County Air Pollution Control District (NSCAPCD), the agency with permitting authority for stationary air pollutants in the region, has identified thresholds of significance for GHGs. (DEIR, pp. 3.3-8 – 3.3-9.)

CEQA Guidelines section 15064.4, states that, in determining the significance of greenhouse gas emissions, a "lead agency shall have the discretion to determine whether to use a quantitative approach or to "rely on a qualitative analysis or performance based standards." Given the challenges associated with determining a reasonable and proper quantitative significance criterion for GHG emissions when one does not yet fully exist, CAL FIRE exercised proper discretion (and acted in accordance with the CEQA Guidelines on GHG emissions) in utilizing a qualitative significance criterion for the current project.

Notwithstanding the lack of a governing GHG emissions threshold, as explained above, CAL FIRE, using the best available information available and acting in accordance with CEQA, established the above-referenced qualitative threshold to assess project GHG emissions. (See CEQA Guidelines, § 15064.7(a) ["[a] threshold of significance is an identifiable quantitative, *qualitative* or performance level of a particular environmental effect…"] (italics added).)

As stated on page 4-21 of the Cumulative Impacts chapter of the Partially Recirculated DEIR:

> Currently, thresholds of significance for GHGs have not been identified by either the ARB, or the NSCAPCD. Early actions proposed by the ARB[10] are not strictly applicable to the proposed project, and the proposed project would be subject to any applicable State regulations as they are developed. Furthermore, in the context of statewide, nationwide, or global emissions, and considering the carbon sequestration that would continue to occur once the vineyards are planted, the proposed project's incremental contribution to this cumulative impact would not be cumulatively considerable. Therefore, the proposed project would have a ***less-than-significant*** impact on climate change.

Response to Comment 6-11

Please see Response to Comment 6-8.

Response to Comment 6-12

Please see Response to Comment 6-8.

Response to Comment 6-13

Please see Response to Comment 6-8.

Response to Comment 6-14

Please see Responses to Comments 6-5 and 6-10.

Response to Comment 6-15

Please see Response to Comment 6-8.

Response to Comment 6-16

Please see Responses to Comments 6-5 and 6-8.

Response to Comment 6-17

The standard of significance for GHG emissions established by CAL FIRE in the DEIR is qualitative and not quantitative. The DEIR does in fact define a significant impact resulting from GHG emissions "as an action that would block the implementation of an ARB established regulation to reduce GHG emissions." (DEIR, p. 3.3-9.) The DEIR explains that this standard was applied because no other regulation/significance criteria exist that can provide more accurate analysis. (DEIR, p. 3.3-7.) The DEIR explains that the emissions thresholds ARB has created pursuant to AB 32 currently apply only to stationary source emissions. (*Ibid*.) In addition, the Draft EIR explains that the current standards for reducing vehicle emissions under AB 1493 also do not provide a quantified target for GHG emission reductions for vehicles. Finally, the DEIR explains that neither ARB nor the Northern Sonoma County Air Pollution Control District

(NSCAPCD), the agency with permitting authority for stationary air pollutants in the region, has identified thresholds of significance for GHGs. (DEIR, pp. 3.3-8 – 3.3-9.)

The DEIR's GHG emissions significance criterion did not prevent CAL FIRE from conducting a thorough and accurate GHG analysis of project emissions, which has been updated in Response to Comment 6-8 of this Final EIR and also presented in the Partially Recirculated DEIR for the Fairfax Conversion Project. In accordance with the CEQA Guidelines on GHG assessment, the DEIR contains a quantitative description and estimate of the amount of GHG emissions resulting from a project. (See CEQA Guidelines, § 15064.4(a).) The DEIR assesses and analyzes carbon sequestration rates due to the conversion of forests and grasslands to vineyards and attendant uses. (*Ibid.*)

As directed by SB97, the Natural Resources Agency adopted Amendments to the CEQA Guidelines for greenhouse gas emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010. CEQA Guidelines section 15064.4, states that, in determining the significance of greenhouse gas emissions, a "lead agency shall have the discretion to determine whether to use a quantitative approach or to "rely on a qualitative analysis or performance based standards." Given the challenges associated with determining a reasonable and proper quantitative significance criterion for GHG emissions when one does not yet fully exist, CAL FIRE exercised proper discretion (and acted in accordance with the CEQA Guidelines on GHG emissions) in utilizing a qualitative criterion for the current project in order to assess the significance of the project's quantitative GHG emissions analysis.

Notwithstanding the lack of a governing GHG emissions threshold, as explained above, CAL FIRE, using the best available information available and acting in accordance with CEQA, established the above-referenced qualitative threshold to assess the significance of quantified project GHG emissions. (See CEQA Guidelines, § 15064.7(a) ["[a] threshold of significance is an identifiable quantitative, *qualitative* or performance level of a particular environmental effect…"] (italics added).)

Please also see Response to Comment 6-8.

Response to Comment 6-18

The DEIR included among the alternatives evaluated, a Reduced Acreage Alternative. This Alternative is defined on page 6-20 of the *Alternatives Analysis* chapter of the DEIR as follows:

> "…the Reduced Acreage Alternative would strategically reduce project acreages in three areas to reduce impacts to adjoining properties and on-site biological resources. While the proposed project would establish reserves for biological and cultural resources, the Reduced Acreage Alternative would expand the reserves around the resources by eliminating certain vineyard units; thereby maintaining these sites in their natural state. The Reduced Acreage Alternative would reduce the overall vineyard area by 33.2 acres (24.6 percent) by eliminating Unit Areas

> 1(a-d), 3, and 4. Unit 1 forms the northwest corner of the proposed project, Unit 3 is located in the northeast corner of the project site, and Unit 4 is located in close proximity to the archaeological sites and manzanita preserves."

The revised climate change discussion in the Cumulative Impacts chapter of the Partially Recirculated DEIR (presented in Response to Comment 6-8 above) includes an updated comparative discussion of the alternatives originally evaluated in the 2009 DEIR. Specifically, the discussion compared the differences in potential global climate change impacts between the proposed project and the alternatives. While the comparative discussions are qualitative in nature, CEQA does not require that the alternatives be evaluated at the same level of detail as that of the proposed project. Rather, per CEQA Guidelines Section 15126.6(d), "The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project." The alternatives discussion in Chapter 4, *Cumulative Impacts*, of the Partially Recirculated DEIR includes sufficient information to allow meaningful evaluation, analysis, and comparison with the proposed project. For example, regarding the Reduced Acreage Alternative and its potential climate change impacts in comparison with the proposed project, page 4-19 of the RDEIR states:

> The reduction in vineyard acreage would result in the greater retention of forested acres on the project site. Incorporating a larger timber reserve in the Reduced Acreage Alternative is significant given the substantial sequestration potential identified for the reserve area in the project analysis included above (See Table 4-7). Given the larger reserve, the Reduced Acreage Alternative would be anticipated to sequester more carbon per acre annually than the proposed project. In addition, decreasing the extent of timber harvest would correspondingly reduce the initial, short-term release of carbon, which for the proposed project, is projected to be 26.58 Mg C per acre on the conversion area (See Table 4-6 above). However, it is important to remember that, for the project analysis, once the 151-acre forest reserve standing live biomass and forest soils, as well as the vineyard woody vines and soils, are taken into consideration relative to their ability to continue to sequester carbon, the project would ultimately result in an increase in carbon sequestration over existing conditions of 39.11 metric tons of carbon per year. Overall, however, the Reduced Acreage Alternative is anticipated to have fewer impacts to global climate change as compared to the proposed project.

Therefore, contrary to the commenter's assertion, the DEIR evaluated at least one alternative that could have lower GHG emissions than the proposed project.

Response to Comment 6-19

Please see Response to Comment 6-8.

Response to Comment 6-20

The comment is narrative that does not address the adequacy of the DEIR.

Response to Comment 6-21

The comment is narrative that does not address the adequacy of the DEIR.

Response to Comment 6-22

The comment is narrative that does not address the adequacy of the DEIR.

Response to Comment 6-23

Please see Responses to Comments 6-8 and 38-8.

Response to Comment 6-24

Please see Response to Comment 6-8.

Response to Comment 6-25

Please see Response to Comment 6-8.

~~[i] *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture*; 2005. Accessed on www.epa.gov June 2007.~~

~~[ii] Winrock International. Measuring and Monitoring Plans for Baseline Development and Estimation of Carbon Benefits for Change in Forest Management in Two Regions, March 2004. Accessed at http://www.energy.ca.gov/reports/CEC-500-2004-070/CEC-500-2004-070F.PDF on March 27, 2008.~~

~~[9] Applied Geosolutions, LLC and Complex Systems Research Center, University of New Hampshire. Assessing Impacts of Rangeland Management and Reforestation of Rangelands on Greenhouse Gas Emissions: A Pilot Study for Shasta County, February 2007. Accessed at http://www.energy.ca.gov/2006publications/CEC-500-2006-108/CEC-500-2006-108.PDF on March 27,2008.~~