

Land Conservation as VMT Mitigation

A Case Study Approach in California

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Abstract

This white paper examines whether land conservation can credibly function as a vehicle miles traveled (VMT) mitigation strategy under California's SB 743 framework. Using a case study approach, the analysis evaluates six recently conserved parcels across California to assess whether conserving land in high-VMT areas can reasonably be expected to shift housing development to more VMT-efficient locations. The methodology combines parcel-level development potential, regional housing demand, availability of alternative development sites, and data on Census block group-level VMT patterns to estimate avoided VMT under multiple reallocation scenarios, while explicitly considering the risk of "leapfrog" development. Results show that land conservation can provide meaningful VMT mitigation benefits when parcels are located in high-VMT areas, there is sufficient nearby capacity to absorb comparable development in lower-VMT locations, and there is a credible threat of development absent conservation. Conversely, conservation is a weaker VMT mitigation strategy where alternative development sites are limited, where nearby areas exhibit similar or higher VMT, or where development pressure is low. The findings suggest that land conservation can be a defensible and quantifiable VMT mitigation tool in certain contexts, particularly when integrated with housing and infill policies, and provide guidance for agencies considering conservation within VMT banks, exchanges, or CEQA mitigation programs.

Introduction

This study explores the feasibility of using land conservation as a means of mitigating vehicle miles traveled (VMT) in a region. Through a case study approach focusing primarily on recently conserved parcels across California, we investigate factors such as development pressures and housing development site availability that may influence the suitability of claiming VMT reduction as a benefit of conservation.

The passage of California Senate Bill 743 (SB 743) in 2013 established VMT as the metric for evaluating the transportation impact of development or transportation infrastructure projects under the California Environmental Quality Act (CEQA).¹ SB 743 is an important component of the state's efforts to reduce greenhouse gas (GHG) emissions, the largest share of which comes from the transportation sector.² Whereas transportation impacts were previously measured according to the amount of delay experienced by vehicles, they are now measured in terms of the amount of vehicle travel anticipated by the users of the development or induced by the transportation facility. As such, the mitigation of transportation impacts has shifted from focusing on speeding up vehicle travel to reducing it altogether.

Since the implementation of SB 743 in 2020, agencies statewide have worked to align their own priorities and processes for approving development or transportation projects with the goal of reducing VMT. Many have explored establishing programs such as VMT Exchanges or VMT Banks that would allow developers or project sponsors that need to mitigate the VMT impacts of their project to fund projects in the area that can be demonstrated to reduce VMT.³

Per CEQA guidelines, all mitigation measures claiming to reduce VMT must be supported by substantial evidence.⁴ One well-established approach to reducing VMT in an area is increasing the density of land use development so people can reach more destinations while traveling less.⁵ Having more destinations nearby not only means that car trips can be shorter, but it also makes non-auto modes like walking, biking, and transit more appealing.

Identifying and conserving developable land in low-density, high-VMT areas could encourage development in denser, lower VMT areas, while achieving the goal of conserving land that is important for protection of biodiversity, habitat conservation, and nature-based climate mitigation—especially where policies exist to enable denser development. Precedent examples like the California Department of Conservation's Sustainable Agricultural Lands Conservation (SALC) Program provides grants for the protection of land for agricultural purposes and builds this assumption about shifted development demand into their application.⁶ Applicants are required to quantify the GHG benefit of conserving their parcel for agricultural purposes using a quantification methodology offered by the California Air Resources Board (CARB).⁷ One component of this GHG reduction calculation comes

¹ CEQA Guidelines, Cal. Code Regs., Title 14, Div. 6, Ch. 3, § 15000 et seq.

² [Current California GHG Emission Inventory Data | California Air Resources Board](#)

³ [Feasibility of VMT Mitigation Banks and Exchanges at the State or Regional Level](#)

⁴ [Local CEQA Mitigation Best Practices and Lessons Learned](#)

⁵ [Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity](#)

⁶ [Sustainable Agricultural Lands Conservation Program \(SALC\)](#)

⁷ [Agricultural Lands Conservation Quantitative Methodology](#)

from the VMT avoided by “shifting housing development from the easement site to urban locations in the region.”

This study considers how this assumption might apply to a broader set of conservation goals in the service of mitigating VMT for SB 743-related impact analyses, by examining the housing development context of six recently conserved parcels in California and their surrounding areas. The goal of this work is not to predict where housing development will occur, but to further define the question of where housing will be developed if not on the conserved parcels, take a case study approach to illuminate the factors at play and potential VMT benefits, and offer thoughts on areas for future work.

As this research was being conducted, California passed additional state legislation intended to encourage denser development. In June 2025, Assembly Bill 130 (AB 130)⁸ and Senate Bill 131 (SB 131)⁹ introduced CEQA exemptions for qualifying infill, multifamily, and mixed-use projects to eliminate hurdles to this kind of development. Additionally, Senate Bill 79 (SB 79)¹⁰, passed in October 2025, encourages higher-density development near transit stations by limiting local zoning restrictions in certain areas proximate to transit. SB 79 will go into effect in July 2026, and it is too early to understand the effects of AB 130 and SB 131, but they are important elements of the state policy landscape that aim to encourage development in more VMT-efficient locations.

This paper is organized as follows: the Background section describes previous work on this topic, the Methodology section outlines our analysis approach for each parcel including our methodology for quantifying the VMT mitigation potential of each parcel and its conservation co-benefits, the Case Studies explore the six parcels in turn, noting the level of suitability for conservation as VMT mitigation of each one, and the Conclusion offers takeaways from this analysis and directions for future work.

Background

This work builds off previous work by this research team and draws on one established state example of quantifying VMT avoided from conserving land.

Previous Research Effort

Fehr & Peers and The Nature Conservancy (TNC), in partnership with the Western Riverside County Conservation Authority (RCA)¹¹, completed a previous phase of this research effort in 2024. That phase established an approach for identifying candidate parcels in parts of Western Riverside County with high VMT per capita and estimating the VMT avoided via the conservation of that land. This work was performed within the context of the Western Riverside Council of Governments’ (WRCOG) effort to establish a Regional VMT Mitigation Exchange which would allow public or private sponsors of development or transportation projects with a significant VMT impact to fund eligible projects in

⁸ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202520260AB130

⁹ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202520260SB131

¹⁰ https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202520260SB79

¹¹ https://www.fehrandpeers.com/wp-content/uploads/2025/03/Land-Conservation-and-VMT-White-Paper_20240924.pdf

exchange for VMT credits. As such, the work focused on the approach and methodology for selecting and quantifying the VMT mitigation benefits of parcels as well as the administrative approach to incorporating land conservation into the WRCOG VMT Exchange.

Only parcels zoned for residential development were considered. This allowed us to justify that this land had potential to be developed for residential purposes and focus the VMT analysis on home-based VMT. We used VMT per capita estimates from WRCOG's travel demand model (RIVCOM)¹² to estimate the home-based VMT of the population that would live on each parcel if it were to be developed. The VMT per capita was applied to a population estimate derived from the allowable density per the zoning code and the average household size of the region to get an estimate of the total VMT that would be generated by the development of each parcel.

To estimate how much VMT would be avoided by conserving each parcel, we assumed that development not occurring on each parcel due to conservation would instead occur elsewhere in the region (we call this the "counterfactual development"). We examined two counterfactual scenarios for each parcel: one where the VMT per capita is at the county average, and one where it is at the average of the nearest jurisdiction.

Because of the uncertainty around how much development would occur on any given parcel, we also examined three scenarios (80%, 100%, and 120% of total allowable density) related to how much development would occur on each parcel, for a total of six scenarios per parcel. We encouraged the VMT program administrator (in this case, WRCOG) and the conservation authority (in this case, RCA) to work together to determine reasonable assumptions for any given parcel.

A primary point of stakeholder feedback throughout the work was concern around "leapfrog" development – namely, that conserving land would in fact push development further out, leading to even less efficient VMT patterns for the region. While development further out may be disincentivized by the requirement of even more VMT mitigation, it is useful to investigate this concern. The approach taken in this report attempts to define leapfrog development, outline the factors that may influence its likelihood of occurring, and examine these factors in a series of case studies.

Another topic raised by stakeholders was the question of whether land conservation was an appropriate VMT mitigation strategy for the full range of projects that may require it: local development up to community-scale development, and local streets and roads up to major interstate projects. Because VMT avoided via any given strategy is agnostic to whether the VMT mitigated is from land use development or a transportation project, the salient question becomes about *where* the newly generated VMT is compared to where the VMT is being mitigated. In most cases of land use development and local streets and roads, the VMT added is likely local enough that land conservation in the same region is a reasonable mitigation option. In the case of interstate highways, there may be concern that the VMT induced comes from too widespread an area and to mitigate it via land conservation would concentrate the VMT mitigation benefits in too small an area. Opinions on this may vary, however, and a decision in any given case would fall to the lead agency on the project.

Established Precedent

The CARB-recommended SALC methodology for estimating VMT avoided by conserving agricultural lands similarly assumes that development will occur elsewhere in the region and in fact assumes that

¹² <https://wrcog.us/320/Transportation-Modeling-Services>

VMT per capita of the development will be at the average VMT per capita for urban areas in the region.¹³ This method avoids using any spatially granular estimates for VMT per capita to account for uncertainty and the fact that building new development will likely change an area's VMT patterns, but still clearly assumes that the development no longer allowed on the conserved land occurs instead within an urban area in the region.

Thus, the SALC approach does not offer a means of accounting for the potential of leapfrog development. In the next section, we offer a more detailed explanation of our understanding of leapfrog development, the factors that influence it, and an approach to examining its likelihood.

Methodology

The case study approach taken in this work explores the VMT mitigation potential of actual conservation examples from across the state. We examine the development patterns and trends in the region, quantify the level of availability of nearby sites for housing development in more VMT-efficient areas, and take a scenario-based approach to quantify the VMT effect of conservation. Finally, we offer an assessment of the suitability of claiming VMT mitigation as a result of land conservation given the above factors and what they suggest about the likelihood of leapfrog development.

Defining “Leapfrog Development”

For the purposes of this analysis, leapfrog development is defined as development that, because it cannot happen in a given location (in this case, on parcels that have been conserved), instead occurs in an area that is further removed from commercial and job centers and as a result produces more VMT per capita than would have been produced by development on the conserved parcels. This framing may conjure an image of a single developer with plans to develop a parcel being left to find another suitable location for their development. Though this is sometimes the case, we are also speaking more broadly of the question surrounding growth patterns and the effect on the footprint of these patterns if some parcels are removed as options for development.

Some factors that contribute to where development that might have occurred on a conserved parcel would instead happen include:

- The availability of land for development near the parcel
- Overall demand for residential development in the area
- The cost of developing housing elsewhere compared with on the conserved parcel

The effect of each of these on the likelihood of leapfrog development is characterized as follows:

Developable Land Availability: If the conserved parcel is near several other parcels available to be developed, these parcels become logical alternatives to the conserved parcel as they are similarly situated relative to the jobs, commercial centers, and other features of the area that made the

¹³ In cases where the conserved site is urban there are additional considerations of housing density that still allow for VMT avoided to be calculated.

conserved parcel a desirable place to develop. If there is sufficient availability of developable land in nearby areas with more efficient VMT patterns, it becomes more likely that development would shift to these areas and conservation would have a VMT mitigating benefit. This is particularly true if the available land can accommodate development of a similar type as what would have been developed on the conserved parcel.

Demand: Like cost, demand is difficult to quantify but important to consider. If demand for development in an area is particularly low, it may not be reasonable to assume that the conserved parcel would be developed at all, and claiming VMT reduction from conservation may be dubious. If demand for development in an area is particularly high, it is possible that there is insufficient developable land available, especially in lower-VMT areas, to absorb the development that can no longer occur on the conserved parcel. Jurisdictions in California are mandated through the Housing Element process to increase housing capacity in these cases through up-zoning. Accommodating housing demand this way requires new housing developments to be, on average, denser than existing developments. It is beyond the scope of this work to quantify the likelihood of demand from a conserved parcel shifting to denser development in infill areas vs. more sprawling leapfrog development, but insufficient existing capacity makes this tradeoff more salient and likely increases the probability of leapfrog development.

Cost: Development that cannot occur on a conserved parcel can be assumed to shift somewhere else where the development economics (revenues relative to costs of development) are comparable to the conserved parcel. When considering similar types of housing development in the same market area where home prices are similar, the total cost of development will be a key factor in determining development viability. While every site and project is different, key cost factors include:

- Cost of developing utilities, roads, and other infrastructure required to serve the site
- Cost of labor and materials to improve the site and build the homes
- Cost of land acquisition and entitlement, including any cost effects of statewide legislation streamlining infill development
- Cost in the form of risk and eventual insurance requirements if there are climate-related risks (e.g. wild fires) to developing further out

In many cases, where land is available, the costs of developing housing inside cities, more proximate to existing infrastructure, will be lower than building in areas further out. This is primarily because the additional infrastructure and entitlement costs of building in these areas will often outweigh the benefits of the lower cost of more remote lands. As a general rule, it should therefore not be assumed that leapfrog development would have a cost advantage or incentive relative to areas closer to existing urban infrastructure.

The likelihood of leapfrog development also depends on many other factors that are highly contextual and difficult to characterize systematically, such as the development process and players and the politics of the region. These are difficult to examine systematically or even to know and thus are largely left out of this analysis. For that reason, our assessment does not claim to be definitive, but rather illustrative of how to use available data and context in a systematic way to characterize the likelihood of leapfrog development. If one were to apply this methodology as a VMT mitigation in practice, addressing these elements in a specific context/place would be helpful in establishing defensibility of the findings.

Case Study Approach

The six case studies presented in this report are located across the state of California, in a variety of development and conservation contexts. Case studies were selected by identifying parcels that were recently conserved (last 3 years), were zoned for housing development (with extra preference for locations with planned development), and that were in different regions and jurisdictions across the state representing a variety of development and VMT contexts. Our approach aims to use available sources to systematically characterize the development pressures and demand of each area and the availability of developable land. Our approach does not systematically consider the cost to develop in different locations within a given region, as the factors influencing this are too varied and complex, as noted above.

Case Study Structure

The case study approach considers the following factors for each conserved parcel:

- **Conservation Benefit:** The conservation benefits of each conserved parcel indicate the landcover of the parcel, the climate risk to communities if that parcel were to be developed, and the importance of the parcel for supporting high species richness, freshwater habitats, and wildlife movement. Together, these characteristics represent the benefit to both communities and biodiversity of avoiding conversion and instead conserving this land. The full list of benefits considered is shown in Table 1.
- **Development context and pressures:** This section provides information about development trends in the region and how the conserved parcel fits in spatially with these trends. Using information from relevant General or Specific Plans, and Housing Elements in particular, the development pressures of the region are characterized. The Regional Housing Needs Allocation (RHNA) for the region is used as a proxy for housing demand in the area.¹⁴
- **VMT Patterns of the area:** We use Streetlight Data from 2019 to quantify the VMT per capita of the region in general and the conserved parcel in particular, as well as nearby areas.^{15,16} We focus on residential development in this analysis, and all VMT figures represent resident home-based VMT.

¹⁴ [Regional Housing Needs Allocation \(RHNA\) | California Department of Housing and Community Development](#)

¹⁵ www.streetlightdata.com

¹⁶ The analysis relies on 2019 data rather than more recent data to capture the VMT patterns before the land was conserved. This is in line with how and when this analysis would be performed to quantify the VMT mitigation benefit of conserving a future parcel.

Table 1: Conservation Benefits

Conservation Benefit	Benefit Metric and Description	Source
Habitat*	Proportional habitat coverage of each parcel. Representation of the full diversity of habitats and species within a protected area network is critical for both biodiversity protection and resilience. Statewide, hardwood woodland and grassland are two of the most under-represented habitat types and also the most biodiverse.	CAL FIRE 2024 ¹
Connectivity Linkages (RCN)	Percent of parcel within constrained natural pathways that provide one of the last remaining movement routes for plants and animals today and/or as conditions change	Anderson et al. 2024 ²
Resilient, Biodiverse, Well-Connected landscapes (RCN)	Percent of parcel within areas where biodiversity is already thriving and where it will be most likely to be resilient to climate change	Anderson et al. 2024 ²
Priority Highway Barrier Nearby	Parcels identified (Y/N) as being nearby to a wildlife barrier recognized as a priority for remediation.	CDFW 2024 ³
Plant Richness	Ranking** (Highest, High, Moderate or Low) of average modeled plant richness, or the summed suitable habitat based on 5,221 plant species for the parcel based on statewide percentile.	Kling et al. 2019 ⁴
Rarity-weighted endemic plant richness	Ranking** (Highest, High, Moderate or Low) of average rarity-weighted modeled endemic plant richness for the parcel based on statewide percentile.	Kling et al. 2019 ⁴
Mammal Richness	Ranking** (Highest, High, Moderate or Low) of average modeled mammal richness, or the summed suitable habitat based on 181 mammal species for the parcel based on statewide percentile.	Stewart et al., 2016 ⁵
Bird Richness	Ranking** (Highest, High, Moderate or Low) of average modeled bird richness, or the summed suitable habitat based on 199 bird species for the parcel based on statewide percentile.	Veloz & Jongsomjit, 2012 ⁶
Amphibian Richness	Ranking** (Highest, High, Moderate or Low) of average modeled amphibian richness, or the number of amphibian species with suitable habitat, for the parcel based on statewide percentile.	Wright et al. 2013 ⁷
Reptile Richness	Ranking** (Highest, High, Moderate or Low) of average modeled reptile richness, or the number of amphibian species with suitable habitat, for the parcel based on statewide percentile.	Wright et al. 2013 ⁷
Critical Habitat	Parcels identified (Y/N) as critical habitat for threatened and endangered species	USFWS 2024 ⁸

Conservation Benefit	Benefit Metric and Description	Source
Wetlands	Parcels identified (Y/N) as hosting wetlands. Wetlands provide habitat, recharge groundwater, reduce flooding, provide clean drinking water, offer food and fiber, and support cultural and recreational activities. These critical habitats have been extensively converted across the state.	National Wetland Inventory, US Fish and Wildlife Service (2019) ⁹
Vernal Pools	Parcels identified (Y/N) as hosting vernal pools. Vernal pools are seasonal wetlands that are covered by shallow water for variable periods from winter to spring but may be completely dry for most of the summer and fall. They are a unique habitat for sensitive species, including many amphibians and invertebrates.	Holland 2000 ¹⁰ ; SanGIS 2014 ¹¹ ; Witham et al. 2012 ¹²
Groundwater Dependent Ecosystems	Parcels identified (Y/N) as hosting Groundwater Dependent Ecosystems (GDEs). GDEs can provide important refuge for rare and endangered species, especially in times of drought, when other habitat options are increasingly stressed by reduced water availability	Klausmeyer et al. 2018 ¹³
Farmland	Percent of parcel mapped as prime farmland, farmland of statewide or local importance, or unique farmland. Millions of people across the country benefit from California's food production. Some farmland also supports groundwater recharge and wildlife movement. California's food production contributes \$51 billion annually to the state's economy.	California Department of Conservation, Farmland Mapping and Monitoring Program 2020 ¹⁴
Grazing land	Percent of parcel with land suitable for grazing. California's rangelands are important for California's culture and economy and can support wildlife habitat and movement and carbon sequestration.	California Department of Conservation, Farmland Mapping and Monitoring Program 2020 ¹⁴
Above-ground carbon	Ranking** (Highest, High, Moderate or Low) of carbon stored in living biomass based on statewide percentiles. Trees and plants take carbon dioxide from the air and store it as carbon in tree trunks, other plant matter, and in the soils. Conversion of natural lands could release carbon stored in both above ground biomass and in the soils.	Sleeter et al. 2019 ¹⁵
Soil carbon	Ranking** (Highest, High, Moderate or Low) of carbon stored in the soils based on statewide percentiles. Trees and plants take carbon dioxide from the air and store it as carbon in tree trunks, other plant matter, and in the soils. Conversion of natural lands could release carbon stored in both above ground biomass and in the soils.	Sleeter et al. 2019 ¹⁵
Fire Hazard Severity Zone	Parcel is in a high or very high fire hazard severity zone (Y/N). Avoiding higher density development in fire risk areas keeps additional people out of harm's way and makes response easier. Natural lands can reduce ignition risk in fire-prone areas.	CAL FIRE 2024 ¹

Conservation Benefit	Benefit Metric and Description	Source
Fire Risk to Homes	Ranking* (Highest, High, Moderate or Low) of fire risk to potential homes. Avoiding higher density development in fire risk areas keeps additional people out of harm's way and makes response easier. Natural lands can reduce ignition risk in fire-prone areas.	Scott et al. 2024 ¹⁶
Wildland Urban Interface	Parcel is in the wildland-urban interface (Y/N).	USFS 2020 ¹⁷
Floodplain	Parcel is in a 1-in-100 year risk of flood zone (Y/N). Natural lands in inundation zones can reduce the velocity and intensity of flood events. Also, avoiding higher density development in flood risk areas keeps additional people out of harm's way and makes response easier.	Bates et al. 2021 ¹⁸ ; First Street Foundation 2020 ¹⁹

Notes:

*Chaparral in land cover pie charts only include shrub systems. Hardwood woodlands are categorized separately.

**Statewide rankings were classified as Low: 0–40th percentile, Moderate: 40–60th percentile, High: 60–80th percentile, and Highest as either the top 20th percentile, top 10th percentile or top 5th percentile.

Sources:

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³ California Department of Fish and Wildlife (CDFW) (2024). Wildlife Movement Barriers. <https://data-cdfw.opendata.arcgis.com/datasets/CDFW::wildlife-movement-barriers-cdfw-ds2867>

⁴ Kling, M. M., Mishler, B. D., Thornhill, A. H., Baldwin, B. G., & Ackerly, D. D. (2019). Facets of phylodiversity: evolutionary diversification, divergence and survival as conservation targets. *Philosophical Transactions of the Royal Society B*, **374**(1763), 20170397.

⁵ Stewart J.A.E, Thorne, J.H., Gogol-Prokurat, M., Osborn, S.D. (2016). A Climate Change Vulnerability Assessment for Twenty California Mammal Taxa. *California Department of Fish and Wildlife*. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=135825&inline>

⁶ Veloz, S.D. and Jongsomjit, D. (2012). California Bird Species Richness Index from Modeling Bird Distribution Responses to Climate Change. *Point Blue Conservation Science*. <http://climate.calcommons.org/dataset/14>

⁷ Wright, A.N., Hijmans, R.J., Schwartz, M.W., Shaffer, H.B. (2013). California Amphibian and Reptile Species of Future Concern: Conservation and Climate Change. *California Department of Fish and Wildlife*. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83972>

⁸ U.S. Fish and Wildlife Service (USFWS), 2024. Threatened and Endangered Species Active Critical Habitat Report. <https://ecos.fws.gov/ecp/report/critical-habitat>

⁹ U. S. Fish and Wildlife Service. (2019). National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. <http://www.fws.gov/wetlands/>

¹⁰ Holland, RF. 2000. Vernal Pools- South Coast Ranges. Biogeographic Information and Observation System (BIOS) California Department of Fish and Wildlife. <https://map.dfg.ca.gov/metadata/ds0948.html>

¹¹ SanGIS, SANDAG. 2014. Eco Vernal Pools. <https://databasin.org/datasets/00fb0e88f5e04a7ebb5f5f80bf125790/>

¹² Witham CW, Holland RF, Vollmar J. 2012. Extend Vernal Pool Distribution: Californias Great Valley, 2012 [ds1070] Biogeographic Information and Observation System (BIOS) California Department of Fish and Wildlife. <https://map.dfg.ca.gov/metadata/ds1070.html?5.61.11>

- ¹³ Klausmeyer, K., Howard, J., Keeler-Wolf, T., Davis-Fadtke, K., Hull, R., & Lyons, A. (2018). Mapping indicators of groundwater dependent ecosystems in California: Methods report. *San Francisco, California*.
- ¹⁴ California Department of Conservation, Farmland Mapping and Monitoring Program. 2020. California Important Farmland <https://gis.conservation.ca.gov/server/rest/services/DLRP>
- ¹⁵ Sleeter, B. M., Marvin, D. C., Cameron, D. R., Selmants, P. C., Westerling, A. L., Kreitler, J., Daniel, C. J., Liu, J., & Wilson, T. S. (2019). Effects of 21st-century climate, land use, and disturbances on ecosystem carbon balance in California. *Global Change Biology*, 25(10), 3334–3353.
- ¹⁶ Scott, Joe H.; Dillon, Gregory K.; Callahan, Michael N.; Jaffe, Melissa R.; Vogler, Kevin C.; Olszewski, Julia H.; Karau, Eva C.; Lazarz, Mitchell T.; Short, Karen C.; Riley, Karin L.; Finney, Mark A.; Grenfell, Isaac C. 2024. Wildfire Risk to Communities: Spatial datasets of landscape-wide wildfire risk components for the United States, Second Edition. Fort Collins, CO: Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2020-0016-2>
- ¹⁷ Radeloff VC, Helmers DP, Mockrin MH, Carlson AR, Hawbaker TJ, Martinuzzi S. 2020. Wildland-Urban Interface. USDA Forest Service. https://apps.fs.usda.gov/arcx/rest/services/EDW/EDW_WUI_2020_01/MapServer/0
- ¹⁸ Bates PD, Quinn N, Sampson C, Smith A, Wing O, Sosa J, Savage J, Olcese G, Neal J, Schumann G, Giustarini L. 2021. Combined modeling of US fluvial, pluvial, and coastal flood hazard under current and future climates. *Water Resources Research* 57(2):e2020WR028673.
- ¹⁹ First Street Foundation. (2020). First Street Foundation Flood Model Technical Methodology Document. Zenodo. <https://doi.org/10.5281/zenodo.4740762>

- **Available Locations for Housing Development:** Unless otherwise noted, the availability of land for housing development is quantified using the California Department of General Services' repository of Housing and Local Land Development Opportunities.¹⁷ Sites are considered as possible locations to absorb development that can no longer happen on the conserved parcel if they are:
 - within 10 miles of the conserved site (or 20 miles for the Orange County case study)
 - within the same county as the conserved site
 - currently vacant

These sites are also broken down into the type of housing likely to be developed there (low, medium, or high density) and mapped against the VMT patterns of the region. This is used to assess the capacity of the area to absorb housing that can no longer happen on the conserved parcels into lower VMT areas with similar housing types.

- **VMT Analysis:** To estimate the potential VMT mitigation effect of conserving the given parcel, we calculate the difference between the VMT that would have been produced by the development of the conserved site, and the VMT that would be produced by that development occurring elsewhere. To perform this calculation, we must make an assumption about the VMT patterns of the location where the reallocated development occurs, instead of on the conserved site. We explore two scenarios:
 1. The VMT per capita of the reallocated development is at the county average
 2. The VMT per capita of the reallocated development is the expected value of the VMT per capita of the nearby available housing reallocation sites

The first alternative represents a reasonable assumption if the development were to go elsewhere in the county. The second reflects knowledge of where nearby housing is available. This analysis is performed to show the daily VMT avoided, the annual VMT avoided, and the VMT avoided over a 30-year period.¹⁸

Based on these factors, an assessment of the likelihood of leapfrog development due to land conservation and a discussion of the suitability of using land conservation as VMT mitigation in that context is offered.

Limitations

This approach presents a systematic way of understanding the relative likelihood of leapfrog development in a variety of contexts. It aims to provide a general structure for thinking about this question. As such, many of the complexities of development demand are set aside.

Only residential development is considered in this approach, and the VMT per capita generated by residential development is assumed to be the same as the existing home-based VMT per capita in

¹⁷ [Housing and Local Land Development Opportunities](#)

* Statewide rankings were classified as Low: 0–40th percentile, Moderate: 40–60th percentile, High: 60–80th percentile, and Highest as either the top 20th percentile, top 10th percentile or top 5th percentile.

¹⁸ The 30-year time horizon was chosen as this is the timeframe used in the SALC methodology to calculate the total VMT effect of conserving land.

that area. This does not account for the fact that development in an area may affect the VMT per capita of that area. One of the case studies focuses on a parcel that was zoned for several land uses, but we did not assess the reallocation of non-residential uses nor the VMT implications of reallocating those uses. For assessment of more complex mixed-use reallocations, a travel model approach may be helpful to account more directly for the effect of land use changes on the VMT of an area and region.

Case Studies

Table 2 summarizes the results of the case study analysis by presenting the answer to six questions for each of the study locations:

- Is the parcel in a high VMT area, where high VMT is defined to be above the countywide average and the expected VMT of nearby housing sites? Yes, No, or Maybe¹⁹.
- What is the fire risk to homes were they to be built on this parcel? (Highest, High, Medium, Low)
- Is there available development capacity nearby for any housing type? Yes or No.
- Is there available development capacity nearby for the housing type that would have been developed on the parcel? Yes or No.
- What is the magnitude of the VMT reduction potential if the housing that would have been built on the conserved parcel instead is developed elsewhere and generates VMT at the countywide average (Scenario 1)? High/Medium/Low
- What is the magnitude of the VMT reduction potential if the housing that would have been built on the conserved parcel instead is developed elsewhere and generates VMT at the expected average value of the available housing locations (Scenario 2)? High/Medium/Low

Table 2: Case Study Summary

	Frantoio Grove	Proctor Valley	Wren’s View & Trabuco Rose	Devil Canyon	Harvey Ranch	Lewis Ranch
High VMT Area?	Yes	Yes	Yes	Yes	Maybe	Yes
Fire risk to homes on this parcel?	Low	High	Highest	Highest	High	Highest
Sufficient Housing Capacity (any type)?	Yes*	Yes	Yes*	No	Yes*	Yes

¹⁹ In the Harvey Ranch case, there are a variety of ways to interpret the data due to specific land uses within the neighboring census tracts. This is explored in more detail in that case study.

	Frantoio Grove	Proctor Valley	Wren’s View & Trabuco Rose	Devil Canyon	Harvey Ranch	Lewis Ranch
Sufficient Housing Capacity (similar type)?	Yes*	Yes	Yes*	No	Yes*	No
VMT reduction benefit (Scenario 1)	Medium	High	High	High	Low	Medium
VMT reduction benefit (Scenario 2)	Low	High	High	High	Low	Low

*Sufficient capacity is found in neighboring jurisdictions

Each set of answers yields a different discussion of the suitability of claiming VMT reduction as a benefit of land conservation. The most ideal candidates for claiming VMT mitigation as a benefit of conservation are parcels that are in a High VMT area, have sufficient nearby capacity to absorb the same type of development that would occur on the parcel, and have a high potential VMT reduction benefit. Also important is a credible threat of development – in other words, justification for the assumption that without conservation, the parcel would have likely been developed. In most of the case studies, documented plans for development provide this justification. Where there are no documented plans, housing demand in the area is used to determine the validity of this assumption. When applying this framework more broadly, it is important to consider the likelihood of development of the parcel under consideration, and include that as a metric along with the elements in Table 1—if it is unlikely to ever be developed, claims of mitigating VMT by conserving it are dubious.

In the case of Frantoio Grove, there is plenty of evidence that nearby areas can absorb housing demand shifted from these sites, but the VMT reduction benefit is more modest. In the case of Devil Canyon, it is less clear that demand would shift somewhere nearby instead of leaving the area, but the VMT of the site is so high that the potential VMT reductions are very large, and the likelihood that the demand would shift somewhere with lower VMT is also quite high. In this case, the harder question of *where* that demand shifts is more salient if one wishes to quantify the VMT reduction potential with certainty. Harvey Ranch presents an interesting case in that it is in an area with very high housing demand, but the amount of development that would have occurred is small enough that it could reasonably be absorbed by nearby jurisdictions. Also because of the relatively few units that would have been developed, the potential VMT benefits are lower. Lewis Ranch offers an example of a location where development that doesn’t occur there may just as easily occur somewhere with less VMT-efficient travel patterns as somewhere with more VMT-efficient travel patterns. The potential VMT mitigation benefits are modest anyway, suggesting this may not be a good candidate for claiming VMT mitigation as a benefit of conservation. Each of these locations is explored in depth below, illustrating various tradeoffs one must make in determining the suitability of land conservation as VMT mitigation.

Frantoio Grove

Frantoio Grove is a 95.3-acre parcel located in San Martin, an unincorporated rural community of Santa Clara County situated between the cities of Morgan Hill to the north and Gilroy to the south. San Martin features a small village center with a mix of commercial and industrial uses, surrounded predominantly by agricultural sites and large-lot, single-family homes. U.S. Route 101 runs through the center of San Martin and is the primary highway linking the Frantoio Grove site to the broader Bay Area. San Martin also features a Caltrain Station which offers commuter rail service to northern Bay Area cities.

In 2019, the County approved a 19-lot subdivision for Frantoio Grove (Record PLN19-0161: Planning Project).²⁰ Although no further planning applications were submitted, the site's zoning and applicable land use policies would have allowed for the development of up to 19 single-family dwelling homes had the site not been conserved in 2020. Adjacent to Frantoio Grove, a nearby property developed 10 homes on lots averaging 2.5 acres, illustrating the type and scale of development that likely would have occurred at Frantoio Grove. In 2023, the median home value in San Martin was \$1,493,280, indicating that the potential homes on the site would have likely been categorized as above moderate-income housing.

The site is currently home to the family-owned Frantoio Grove Olive Oil Bottling Company, featuring a grove of olive trees and a few structures. The site was permanently conserved for agricultural purposes through an Agricultural Conservation Easement (ACE) through the California Department of Conservation's Sustainable Agricultural Land Conservation Program (SALC) in 2020.²¹

Conservation Benefits

Frantoio Grove is primarily agricultural, with 100% of the property identified as farmland. The property does not contain critical habitat or rare/unique ecosystems (i.e., wetlands, vernal pools, and groundwater-dependent ecosystems). The property is located in a 1-in-100-year floodplain and could provide important flood protection benefits, as well as groundwater recharge opportunities. The land breakdown and conservation benefits of Frantoio Grove are shown in Figure 1 and Table 3, respectively.

²⁰ Accela Santa Clara County (n.d.) <https://aca-prod.accela.com/SCCGOV/Cap/CapDetail.aspx?Module=Planning&TabName=Planning&capID1=REC19&capID2=00000&capID3=003MQ&agencyCode=SCCGOV&IsToShowInspection=>

²¹ Frantoio Grove Agricultural Conservation Easement (2020). <https://www.openspaceauthority.org/whats-new/frantoio-grove-agricultural-conservation-easement>

Figure 1: Frantoio Grove Landcover

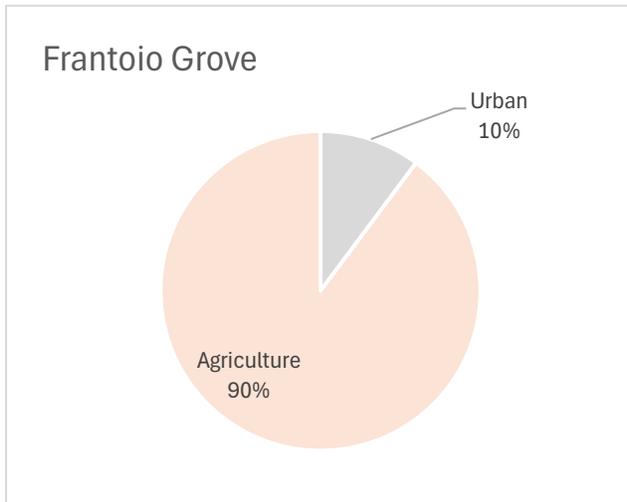


Table 3: Conservation Benefits of Frantoio Grove

Conservation Benefit	Value
Connectivity Linkages (RCN)	0
Resilient, Biodiverse, Well-Connected landscapes (RCN)	0
Priority Highway Barrier Nearby	N
Plant Richness	Low
Rarity-weighted endemic plant richness	Low
Mammal Richness	High
Bird Richness	Moderate
Amphibian Richness	Highest - top 20%
Reptile Richness	High
Critical Habitat	N
Wetlands	N
Vernal Pools	N
Groundwater Dependent Ecosystems	N
Farmland	100
Grazing land	0
Above-ground carbon	Low
Soil carbon	Low
Fire Hazard Severity Zone	N
Fire Risk to Homes	Low
Wildland Urban Interface	Y
Floodplain	Y

Development Patterns of Region

While the Frantoio Grove site is not directly adjacent to any employment hubs, the area is influenced by its proximity to Silicon Valley which dominates the north and central areas of the County.

Historically rooted in agriculture, Santa Clara County's economy has shifted toward Silicon Valley industries in recent years, drawing commuters from across the region. Santa Clara County is expected to experience significant growth by 2050, though certain areas are anticipated to see more growth than others. North County areas are projected to see a household growth of 199% and job growth of 70% by 2050, and South Santa Clara County, which includes Morgan Hill, Gilroy, and San Martin, is projected to experience a 24% increase in households and 37% job growth during this time frame.²² In 2023, the Metropolitan Planning Organization (MPO) to which Santa Clara County belongs, the Association of Bay Area Governments (ABAG) updated its RHNA methodology to no longer assign targets based on cities' Spheres of Influence (SOIs). Instead, targets are based strictly on current jurisdictional boundaries, shifting more housing responsibility to counties for their unincorporated areas.

The County's 2023 Housing Element accordingly reports a significant increase in their RHNA obligation from previous years, from 277 units in the 2015 Housing Element to 3,124 units in the 2025.²³ Despite the substantial increase in housing responsibility, County policy continues to focus growth within their Urban Service Areas (USAs).^{24,25} The County's Housing Element identifies housing opportunities primarily within unincorporated urban islands in the San Jose USA or on Stanford University's land. In areas outside of the USAs, such as San Martin, land use policies only allow low-density development along with rural, agricultural, and open space uses. This has led to a housing stock in rural communities dominated by above moderate-income, single-family homes.

VMT Patterns of the Area

According to Streetlight Data, the Census Block Group containing Frantoio Grove has a home-based VMT per capita of 32.89, which is significantly higher than the County average of 19.09, the MPO average of 19.61, and the State average of 21.32. Areas of low VMT are located primarily around more urbanized centers including Morgan Hill and Gilroy. The surrounding hillside areas radiating around these urbanized centers have higher VMT.

²² Plan Bay Area 2050 Forecasting Modeling Report (2021).

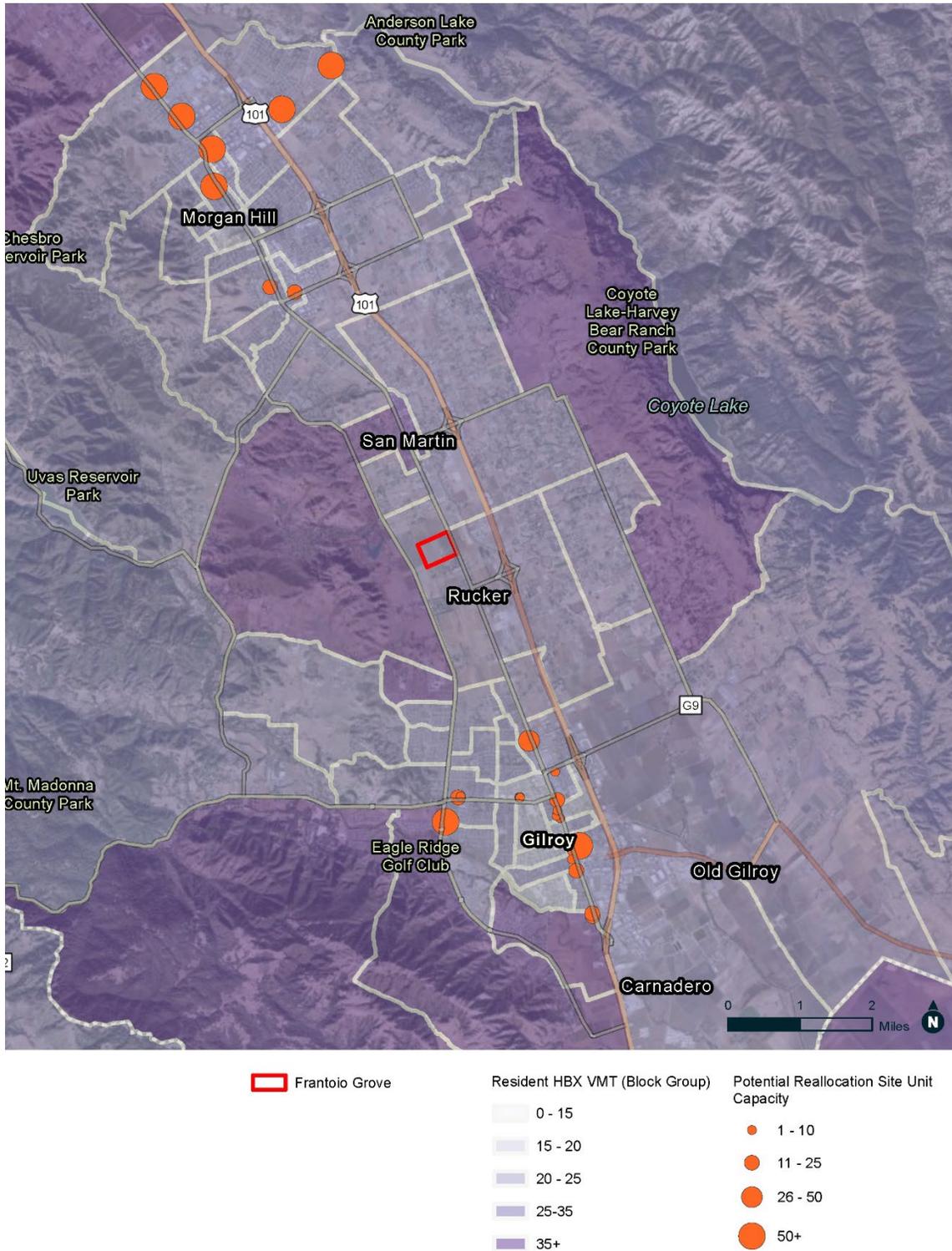
https://planbayarea.org/sites/default/files/documents/Plan_Bay_Area_2050_Forecasting_Modeling_Report_October_2021.pdf

²³ Santa Clara County Housing Element (2023). <https://files.santaclaracounty.gov/exjcpb1361/2025-01/full-heu-adopted-1.28.25.pdf?VersionId=hmZZAShxgrc81qC0khFQQTUvsiYxlpb3>

²⁴ Santa Clara County Housing Element (2023). <https://files.santaclaracounty.gov/exjcpb1361/2025-01/full-heu-adopted-1.28.25.pdf?VersionId=hmZZAShxgrc81qC0khFQQTUvsiYxlpb3>

²⁵ Since 1970, County land use policies have directed most urban development within two designated USAs: The San Jose Urban Area encompassing 13 northern cities, much of Stanford's lands, and unincorporated "urban islands," which are surrounded by incorporated cities but are still under the jurisdiction of the County and the Gilroy-Morgan Hill Urban Area comprised of two distinct areas centered around these two cities in South Santa Clara County but grouped as a single USA. San Martin is situated in between the two constituent parts of this USA.

Figure 2: Frantoio Grove VMT Patterns and Housing Sites



Available Locations for Reallocating Housing Development

Possible reallocation sites identified for Frantoio Grove are found in the nearby incorporated cities of Morgan Hill and Gilroy. Both Morgan Hill and Gilroy’s Housing Elements document a surplus in unit development capacity which could be utilized for reallocating development in Santa Clara County. Morgan Hill’s Housing Sites Inventory reports a surplus of 719 housing units, 336 of which are above moderate income, and Gilroy’s Housing Sites Inventory reports a surplus of 366 units, 250 of which are above moderate-income.^{26,27}

Table 4: Frantoio Grove Possible Reallocation Sites by Housing Type and VMT

	Housing Type	Sites	Total Units
Lower VMT	Low Density	2	405
	Medium Density	5	71
	High Density	16	724
	Total	23	1,200
Equal or Higher VMT	Low Density	3	408
	Medium Density	0	0
	High Density	2	31
	Total	5	439

Table 5. Frantoio Grove Possible Reallocation Sites by Income Category

Income Category	Units
Low-Income	696
Moderate-Income	511
Above Moderate-Income	432
Total	1,639

Limiting the viable housing reallocation sites to only those that are low density like the development at Frantoio Grove would have likely been and in areas with a lower VMT per capita, there is adequate capacity among the housing reallocation sites to absorb the 19 units intended for the Frantoio Grove site. This analysis identified two sites totaling 405 units in lower VMT areas that allow for low density development. Therefore, it can be reasonably assumed that development of the same housing type which would have occurred at Frantoio Grove could be reallocated to nearby areas with a lower household VMT per capita. Both Gilroy and Morgan Hill have enough capacity to accommodate this reallocated development and still meet their own RHNA allocations.

²⁶ City of Morgan Hill 2023–2031 Housing Element, Appendix H2: Site Inventory (2023).
<https://www.morganhill.ca.gov/DocumentCenter/View/48215/Appendix-H-2-Site-Inventory>

²⁷ City of Gilroy 2023–2031 Housing Element (2023).
<https://www.cityofgilroy.org/DocumentCenter/View/14379/Gilroy-2023-2031-Housing-Element-adopted-certified>

VMT Analysis

Table 6 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Frantoio Grove, compared to the same metrics for Alternative 1 and Alternative 2, respectively.

Table 6: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
Frantoio Grove developed	1,750	621,161	18,634,816
Alternative 1 – County Average VMT	1,016	360,534	10,816,012
Alternative 2 – Expected VMT of available housing sites	1,625	576,967	17,309,019

¹VMT was annualized by multiplying daily VMT by 355, an annualization factor derived from 2019 Streetlight data. This number was multiplied by 30 to estimate the VMT effect over 30 years. Future iterations of this work can leverage regional travel model projections to account for anticipated changes in VMT over time.

Table 7 shows the VMT *avoided* by conserving the Frantoio Grove land, by comparing the hypothetical development scenario to the two alternative hypotheses.

Alternative 1 provides greater VMT reduction benefits, as the countywide VMT per capita average is substantially lower than the average in the area surrounding Frantoio Grove. In both cases, the total VMT reduction potential is limited by the relatively small number of units that would have been developed at Frantoio Grove.

Table 7: VMT Avoided by Alternative

	Daily VMT	Annual VMT ¹	Over 30 years ¹
Alternative 1	734	260,627	7,818,804
Alternative 2	124	44,193	1,325,797

¹See note on Table 4

Suitability for Conservation as VMT Mitigation

Frantoio Grove has several characteristics that make it reasonable to assume its conservation would have VMT mitigation benefits: it is located in a high VMT area, there is sufficient nearby housing capacity to absorb development that can no longer occur at the site, and both the county in general and the locations of the nearby housing reallocation sites have on average lower VMT per capita than the Frantoio Grove site. While there are significant development pressures on the region, there is also available housing capacity, even when only looking at vacant sites and at sites that would accommodate low density homes of the type that would likely have been built at Frantoio Grove. These development pressures also increase the likelihood that this site would be developed if not conserved. However, the existence of sufficient capacity to absorb low density housing in higher VMT areas presents some concern that housing would shift to these locations instead. Furthermore, the magnitude of the potential VMT avoided is moderated by the relatively small number of units.

Proctor Valley

The Otay Village 14 and Planning Areas 16/19 site (referred to as Proctor Valley) encompasses approximately 1,284 acres in southwestern unincorporated San Diego County. Located within the Jamul-Delzura Community Plan Area (CPA), the site is surrounded by hilly wildlands and borders the City of Chula Vista to the west and the unincorporated community of Jamul to the north. The Proctor Valley site is identified within the County's Multiple Species Conservation Program (MSCP) framework, the regional effort to balance conservation with development by protecting habitats for a variety of threatened and endangered species in the region. Plans to develop Proctor Valley and the surrounding area were first proposed in 1993.²⁸ In June 2019, the County approved the development of 1,119 single family housing units including "courtyard" style homes on smaller lots, traditional homes in gated communities and larger "ranchette" style homes, all which were anticipated to be priced for moderate to above-moderate income levels.²⁹ The project would establish a 2.7-acre Village Core featuring mixed-use commercial development, a neighborhood park, an elementary school, and a public safety facility. In addition, 345.7 acres of the site would be dedicated as open space and Resource Management Planned preservation areas.³⁰

The project's approval was quickly challenged by conservation organizations and the California Attorney General in a lawsuit regarding the development's potential environmental impacts. In 2021, the San Diego Superior Court found that the County's Environmental Impact Report did not adequately disclose or analyze the increased wildfire risk of bringing over 1,000 new people into a high fire risk area, did not adequately mitigate the significant greenhouse gas emissions generated from the project, and failed to properly analyze the cumulative impacts of the Otay Ranch Project.³¹

In February 2024, the Attorney General's Office, environmental groups, and the project's developer reached a settlement agreement to resolve the litigation by conserving the entire Proctor Valley site. As part of the agreement, California purchased the land for \$60 million to ensure its long-term preservation. The acquisition was made possible through collaboration with The Nature Conservancy, California Department of Fish and Wildlife, California Wildlife Conservation Board, and the U.S. Fish and Wildlife Service.³²

In addition to the proposed Proctor Valley site, the County of San Diego has plans for three other large developments in the Otay area that propose a mix of land uses: the Otay Ranch Resort Village –

²⁸ Otay Ranch General Development Plan History (n.d.).

<https://www.chulavistaca.gov/departments/development-services/planning/otay-ranch-general-development-plan>

²⁹ County of San Diego. (2019). *Board of Supervisors approve 1,119-unit master-planned community at Otay Ranch*. County News Center. Retrieved from <https://www.countynewscenter.com/board-of-supervisors-approve-1119-master-planned-community-at-otay-ranch>

³⁰ Otay Village 14 and Planning Areas 16/19 Specific Plan Amendment (2019).

<https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/OV14Amendment/PR/00.%20%20Specific%20Plan%20Amendment%20-%20Part%201%20-%20December%202019.pdf>

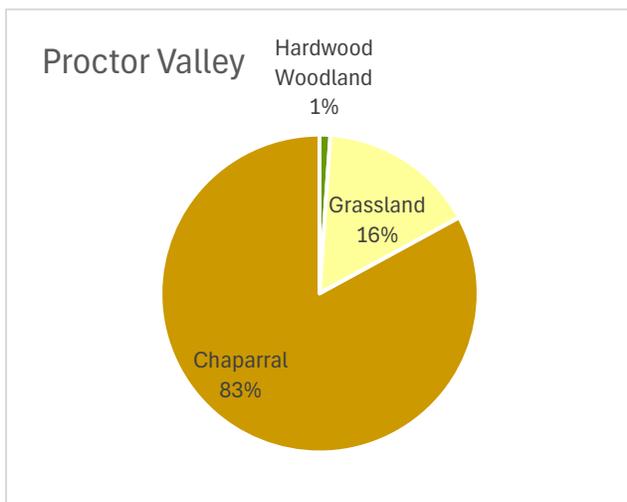
³¹ Attorney General Press Release (2024). *Attorney General Bonta Announces Permanent Conservation of San Diego Wildlands*. <https://oag.ca.gov/news/press-releases/attorney-general-bonta-announces-permanent-conservation-san-diego-wildlands>

³² Ibid.

Conservation Benefits

Almost half of the Proctor Valley property is located within a resilient and connected landscape, where biodiversity is already thriving and where it will be most likely to be resilient to climate change. It is also located near an identified priority highway barrier and can therefore provide important habitat for connectivity following development or enhancement of crossing structures. Wetlands and vernal pools are located at the property, which provide habitat for rare and endemic species, and the property contains critical habitat for threatened and endangered species. Proctor Valley has moderate to very high species richness for both plants and wildlife, ranking in the top 20% in the state for suitable habitat for mammals, birds, and reptiles, and the top 10% for plants. The property is in the WUI and a fire hazard severity zone and is in the top 20% of fire risk to homes in the state were homes to be built on the site. Currently, 9% of the property is farmland and the remaining is suitable for grazing, which can increase resilience to wildfire by reducing fuels (particularly grasses) and providing fire breaks. Chaparral is the dominant habitat type on the property, and preventing disturbance and fragmentation can further promote wildfire resilience by preventing invasive, flammable grasses from gaining a foothold. The land breakdown and conservation benefits of Proctor Valley are shown in Figure 3 and Table 8, respectively.

Figure 3: Proctor Valley Landcover



³³ Otay Ranch Resort Village FEIR (2020). <https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/OtayRanchVillage13Resort/PreBoard/DFEIR/1.0%20Project%20Description%20Location%20Environmental%20Setting.pdf>

Approved in 2020 and includes a hotel, 530 single-family homes, 1,408 multifamily units, and commercial areas.

³⁴ East Otay Mesa Specific Plan (2021). <https://www.sandiegocounty.gov/content/sdc/pds/EastOtayMesa.html>
First approved in 1993 and most recently amended in 2021, this project covers 3,013 acres with most of the land designated for industrial and business uses and the remainder for conservation and low-density housing.

³⁵ Otay 250 – Sunroad East Otay Mesa Business Park specific Plan Amendment (2018). https://www.sandiegocounty.gov/content/sdc/pds/Current_Projects/Otay-250-Sunroad.html
Also approved in 2021, the Otay 250 – Sunroad East Otay Mesa Business Park Specific Plan Amendment allows up to 3,158 homes, 78,000 square feet of commercial space, and 765,000 square feet of employment uses.

Table 8: Conservation Benefits of Proctor Valley

Conservation Benefit	Value
Connectivity Linkages (RCN)	0.30%
Resilient, Biodiverse, Well-Connected landscapes (RCN)	40%
Priority Highway Barrier Nearby	Y
Plant Richness	Highest – top 10%
Rarity-weighted endemic plant richness	High
Mammal Richness	Highest – top 20%
Bird Richness	Highest – top 20%
Amphibian Richness	Moderate
Reptile Richness	Highest – top 20%
Critical Habitat	Y
Wetlands	Y
Vernal Pools	Y
Groundwater Dependent Ecosystems	N
Farmland	9%
Grazing land	91%
Above-ground carbon	Moderate
Soil carbon	Moderate
Fire Hazard Severity Zone	Y
Fire Risk to Homes	Highest – top 20%
Wildland Urban Interface	Y
Floodplain	N

Development Patterns of the Region

San Diego County’s economy, once heavily reliant on the military and defense sectors, has diversified in recent years to include industries such as manufacturing, telecommunications, tourism, international trade, biosciences, software, and digital technology. Major employment centers—located primarily in Sorrento Valley, Kearny Mesa, and downtown San Diego areas within the incorporated city of San Diego—attract commuters from throughout the region. In contrast, the County’s unincorporated areas remain largely rural, supporting agriculture and limited employment opportunities. While most future growth is expected to occur in the western incorporated cities, the unincorporated areas are still projected to see a 26% population increase between 2018 and 2050.³⁶ San Diego County falls within the San Diego Association of Governments (SANDAG) MPO which includes 19 jurisdictions: 18 incorporated cities and the County of San Diego. Higher density development in the SANDAG region is focused throughout the coastal incorporated cities. Most housing in unincorporated areas are single family and mobile home housing types. Between 2013 and

³⁶ San Diego County Housing Element, Appendix 6–D – Review of Accomplishments During Previous Cycle (2021). <https://www.sandiegocounty.gov/content/dam/sdc/pds/gpupdate/06-Housing-Element-Appendix-6-D.pdf>

2016, 6,004 new housing unit permits were issued in unincorporated San Diego County, the majority of which are single family.³⁷ The 6th Cycle RHNA assignment for the County is 6,700 units.

Development in unincorporated San Diego County is limited by a number of environmental concerns including high to very high fire hazard severity risk zones, sensitive habitat, endangered species, and limited utility and transportation infrastructure.³⁸ The County of San Diego's General Plan has directed growth into village cores and away from eastern backcountry areas to support the County's commitment to a sustainable growth model, respecting sensitive habitats, and protecting existing community character in its rural and semi-rural communities.³⁹

VMT Patterns of the Area

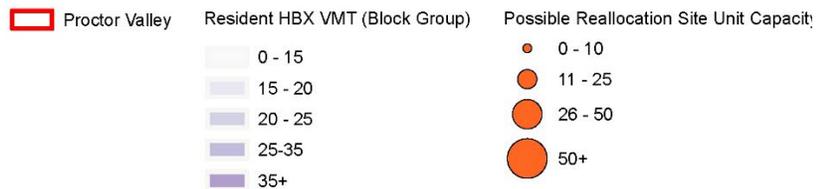
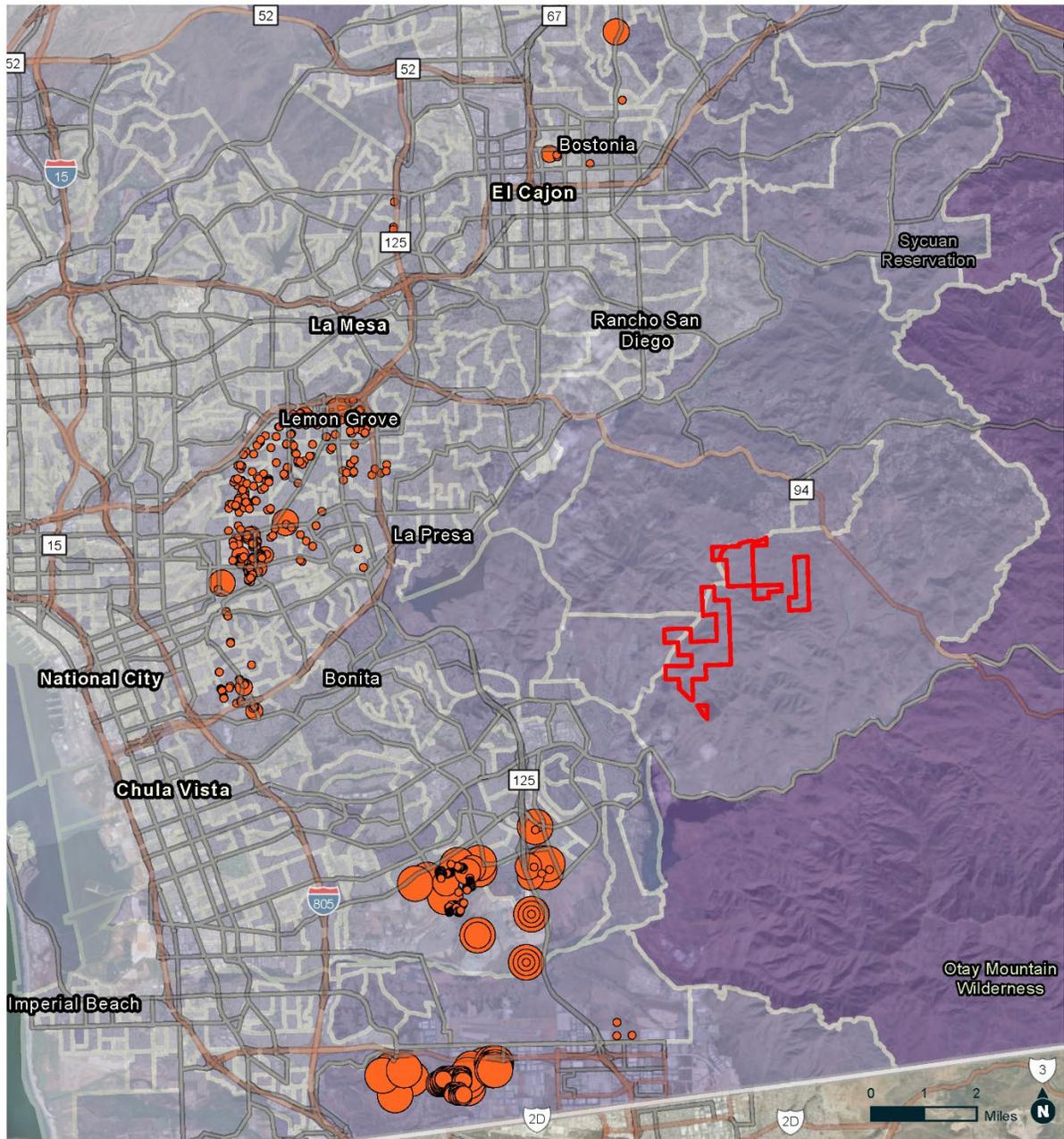
The Proctor Valley site falls within three block groups with a home-based VMT per capita of between 28.2 and 32.8, which is significantly higher than the County and MPO average of 21.35 and the state average of 21.32. Home-based VMT per capita is lower towards the incorporated areas of San Diego County to the west and higher to the east, towards the mountainous wildland unincorporated areas. Although the existing VMT patterns of the Proctor Valley site are quite large, in this case, the proposed development would include many other uses that would certainly shift the VMT patterns of the area, as it would co-locate common destinations with the housing. However, VMT could also be added as a result of people visiting the area.

³⁷ San Diego County Housing Element, Appendix 6-D – Review of Accomplishments During Previous Cycle (2021). <https://www.sandiegocounty.gov/content/dam/sdc/pds/gpupdate/06-Housing-Element-Appendix-6-D.pdf>

³⁸ San Diego County has the largest number of endangered species in any county within the continental United States, most of which are located in unincorporated areas. San Diego County Housing Element (2021).

³⁹ San Diego County General Plan (2011). <https://www.sandiegocounty.gov/content/dam/sdc/pds/gpupdate/docs/Cover-TOC-Vision-UpdateFebruary2023.pdf>

Figure 4: Proctor Valley VMT Context and Housing Sites



Available Locations for Housing Development

According to the County’s RHNA allocation for the 2021–2029 planning period, the unincorporated area of San Diego County is responsible for building 6,700 units, including:

- 1,834 Very Low-Income Units
- 992 Low-Income Units
- 1,165 Moderate-Income Units
- 2,709 Above Moderate-Income Units

The analysis identified 796 hypothetical reallocation sites that have a lower home-based VMT per capita than Proctor Valley. Possible reallocation sites for Proctor Valley were primarily found in the City of Chula Vista (413 sites), followed by the City of San Diego (281 sites), and Lemon Grove (82 sites). The cities of Chula Vista and San Diego reported a surplus of available sites upon which housing units could be built, indicating the possibility to absorb development from the now conserved Proctor Valley site.^{40,41}

Table 9. Proctor Valley Possible Reallocation Sites by Housing Type and VMT

	Housing Type	Sites	Total Units
Lower VMT	Low Density	405	5,159
	Medium Density	72	1,560
	High Density	306	6,892
	Unclear	13	482
	Total	796	14,093
Equal or Higher VMT	Low Density	0	0
	Medium Density	0	0
	High Density	0	0
	Unclear	0	0
	Total	0	0

This analysis identified 405 sites located in lower VMT areas that permit low-density development, with a total capacity of 5,159 units. As a result, it can be reasonably assumed that the same type of housing and income category that would have been developed at the Proctor Valley site could instead be accommodated in nearby areas with lower per capita household VMT. Both Chula Vista and San Diego have sufficient capacity to absorb this reallocated development while still meeting their respective RHNA obligations. An important limitation is that this analysis is limited to relocation sites for housing and does not account for the absorption of the other land uses proposed for Proctor Valley. These, if relocated as well, might affect the VMT patterns of the alternative site(s) and potentially the VMT patterns of the surrounding areas.

⁴⁰ City of Chula Vista Housing Element 2021-2029 (2021).

<https://www.chulavistaca.gov/home/showpublisheddocument/28389/638587882417630000>

The City of Chula Vista's 6th RHNA Cycle allocation was 11,105 units (2,750 very low-income, 1,777 low-income, 1,911 moderate-income, and 4,667 above moderate-income). Their housing sites inventory estimated a total development capacity of 11,828 units, 7,301 of which fall within the moderate- and above moderate-income categories, which results in a surplus of 723 units.

⁴¹ City of San Diego Housing Element 2021-2029 (2021).

https://www.sandiego.gov/sites/default/files/he_final_screen_view_june2021.pdf.

The housing sites inventory identified the capacity to construct 174,673 units of which 129,793 fall within the moderate- and above moderate- income categories.

VMT Analysis

Table 7 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Proctor Valley, compared to the same metrics for Alternative 1 and Alternative 2, respectively.

Table 10: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
VMT of Proctor Valley	98,283	34,890,426	1,046,712,768
Alternative 1 – County Average VMT	64,505	22,899,188	686,975,641
Alternative 2 – Expected VMT of available housing sites	78,554	27,886,599	836,597,970

¹ See note on Table 6

Alternative 1 provides greater avoided VMT benefits, as the countywide VMT per capita average is substantially lower than the average in the area surrounding Proctor Valley (see Table 8).

Table 11: VMT Avoided by Alternative

	Daily VMT	Annual VMT ¹	Over 30 years ¹
Alternative 1	33,778	11,991,238	359,737,127
Alternative 2	19,729	7,003,827	210,114,798

¹ See note on Table 6

Suitability for Conservation as VMT Mitigation

The Proctor Valley site is situated in a high VMT zone, and nearby reallocation areas offer sufficient housing capacity. Both the countywide average and the average VMT per capita at these alternative sites are lower than at Proctor Valley. Notably, all nearby reallocation sites have lower VMT than the Proctor Valley site, strengthening the case that its conservation would lead to avoided VMT. However, this analysis is not able to estimate the VMT effect of relocating the other uses, as it is difficult to project if they will be necessary given the dispersed demand, and no datasets exist to quantify available sites for other land uses.

Wren’s View and Trabuco Rose

Wren’s View and Trabuco Rose are two parcels in Trabuco Canyon, located in the eastern part of unincorporated Orange County in the northern foothills of the Santa Ana Mountains. Wren’s View is a 116-acre parcel and Trabuco Rose is a 396-acre parcel, both purchased by the County in 2011 and

conserved in the 2016 Orange County Transportation Authority (OCTA) Conservation Plan. Trabuco Canyon is northwest of the City of Rancho Santa Margarita and east of the cities of Mission Viejo and Lake Forest. Cleveland National Forest is also to the north of the parcels. Although Highway 241 is just south of the parcel, there is no direct connection between the highway and the parcels. There is also limited roadway connectivity to neighboring communities, with Live Oak Canyon Road/Trabuco Canyon Road serving as the primary connecting road.

Prior to Orange County's acquisition, the Wren's View and Trabuco Rose parcels were included in the County's 1991 Foothill/Trabuco Specific Plan, which proposed the development of 36 dwelling units and 118 dwelling units, respectively (despite the lack of connection to the roadway network, which might otherwise have deterred development).^{42,43} Orange County's General Plan 2015 Land Use Map also designated the areas as Rural Residential, allowing 0.025–0.5 dwelling units per acre.⁴⁴

Both Wren's View and Trabuco Rose were identified as priority conservation areas in the Orange County Transportation Authority's Freeway Environmental Mitigation Program (EMP). The preserves were purchased by Orange County in 2011 and are home to several important species, critical habitats, and wildlife movement corridors.⁴⁵ Following the 2006 passage of Measure M2 and the 2016 OCTA Conservation Plan, the parcels were finalized as priority conservation areas.^{46,47,48}

Conservation Benefits

Wren's View and Trabuco Rose contain critical habitat for threatened and endangered species, as well as wetlands and groundwater dependent ecosystems which are likely to become increasingly important as refugia habitat under future climate change. Both properties have high wildlife species richness. Suitable habitat for mammals, amphibians, and reptiles is in the top 20% for the state, while birds are in the top 5% at both properties. Trabuco Rose has higher overall plant richness, as well as rare and endemic plant richness, compared to Wren's View. Both parcels are at high risk of fire, with Trabuco Rose in the top 10% of risk to homes, were they to be built on the site, and Wren's View in the top 20%. Trabuco Rose is also located in a 1-in-100-year floodplain, which could lead to post-fire debris flows in the area. Around 20% of Trabuco Rose is hardwood woodland, although chaparral is the dominant habitat type on both parcels. Preventing disturbance and fragmentation of chaparral habitat can further promote wildfire resilience by preventing invasive, flammable grasses from gaining a foothold. The parcels already contribute to regional connectivity and developing these parcels would require constructing new roadways for access, further fragmenting the landscape. The

⁴²OC Go Wren's View Preserve

https://static1.squarespace.com/static/56c7bcb92eeb81462d105ed9/t/5aa6d29a53450ae9524f4bcc/1520882333304/OM-6501-17+Wrens+View_Fact+Sheet_C2.pdf

⁴³ OCTA Trabuco Rose Preserve

<https://static1.squarespace.com/static/56c7bcb92eeb81462d105ed9/t/5ebc2dcd76b92d4cd7a69567/1589390803830/Trabuco%2BRose%2BPreserve%2BFlyer.pdf>

⁴⁴ Orange County General Plan Land Use Designation Map (2015)

<https://ocds.ocpublicworks.com/sites/ocpwoocds/files/import/data/files/58442.pdf>

⁴⁵ Wren's View Preserve Draft Fire Management Plan (2023) <https://octa.net/pdf/WrensViewFMPFinalSigned.pdf>

⁴⁶ [Measure M2 is a 30-year, half-cent sales tax for transportation improvements in Orange County](#). M2 dedicates a portion of the freeway program revenues for the Environmental Mitigation Program (EMP), part of which is used to purchase conservation properties.

⁴⁷ Wren's View Preserve Draft Fire Management Plan (2023) <https://octa.net/pdf/WrensViewFMPFinalSigned.pdf>

⁴⁸ Trabuco Rose Preserve Draft Fire Management Plan (2023)

<https://octa.net/pdf/TrabucoRoseFMPFinalSigned.pdf>

land breakdown and conservation benefits of Wren’s View and Trabuco Rose are shown in Figure 5 and Table 12, respectively.

Figure 5: Wren’s View and Trabuco Rose Landcover

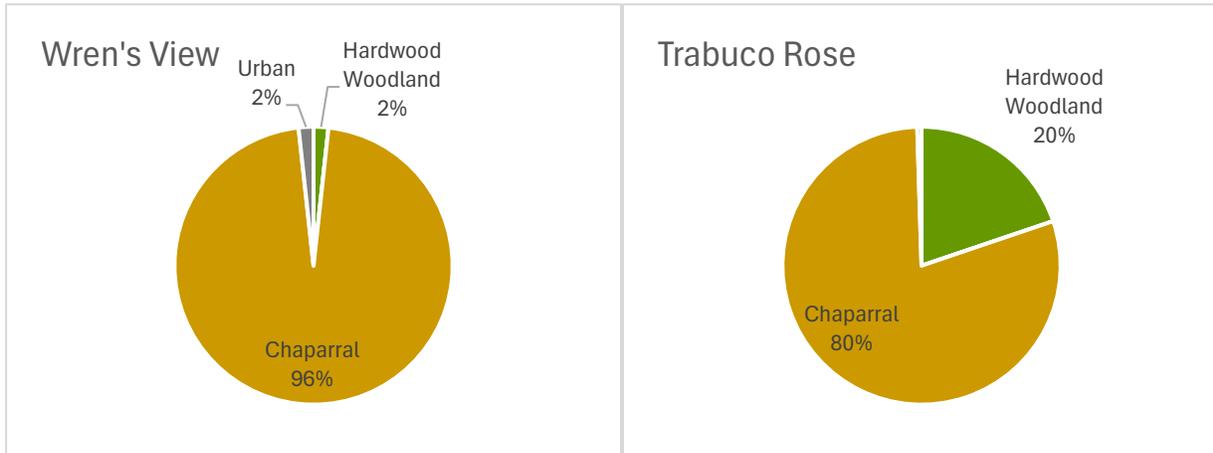


Table 12: Conservation Benefits of Wren’s View and Trabuco Rose

Conservation Benefit	Wren’s View	Trabuco Rose
Connectivity Linkages (RCN)	0	0
Resilient, Biodiverse, Well-Connected landscapes (RCN)	0	0
Priority Highway Barrier Nearby	N	N
Plant Richness	Low	Moderate
Rarity-weighted endemic plant richness	Moderate	High
Mammal Richness	Highest – top 20%	Highest – top 20%
Bird Richness	Highest – top 5%	Highest – top 5%
Amphibian Richness	Highest – top 20%	Highest – top 20%
Reptile Richness	Highest – top 20%	Highest – top 20%
Critical Habitat	Y	Y
Wetlands	Y	Y
Vernal Pools	N	N
Groundwater Dependent Ecosystems	Y	Y
Farmland	0	0
Grazing land	0	0
Above-ground carbon	Moderate	Moderate
Soil carbon	Moderate	High
Fire Hazard Severity Zone	Y	Y
Fire Risk to Homes	Highest – Top 20%	Highest – Top 10%
Wildland Urban Interface	Y	Y
Floodplain	Y	N

Development Patterns of the Region

Orange County is just over 900 square miles, and spans from the coastline to midway through the Santa Ana mountains. There are 34 cities within Orange County, several of which were incorporated in the past 50 years following significant residential development, often in the form of large-scale master planned communities adjacent to existing incorporated areas.

The Orange County Board of Supervisors has largely encouraged development in the unincorporated islands in the central and northern parts of the county, particularly those that are urbanized. The eastern part of the county where Wren's View and Trabuco Rose are located has seen slower growth than the western part, where most of the job centers, urbanized areas, and universities are.

Due to several incorporations and annexations throughout the county, a higher proportion of development will be concentrated in incorporated areas compared to previous years. Development in unincorporated areas is largely in the form of single-family detached houses, which represent three-quarters of the existing housing stock.⁴⁹

The County's most recent RHNA assignment for 2021–2029 is 10,406 units, of which the County projects it can meet 55%. The County intends to address the shortfall through rezoning areas that are suitable for residential uses or increased residential density, but are not yet zoned that way. After accounting for rezoning, the County anticipates being able to meet their RHNA allocations and have an additional surplus of housing in the low, moderate, and above-moderate income categories.⁵⁰

VMT Patterns of the Area

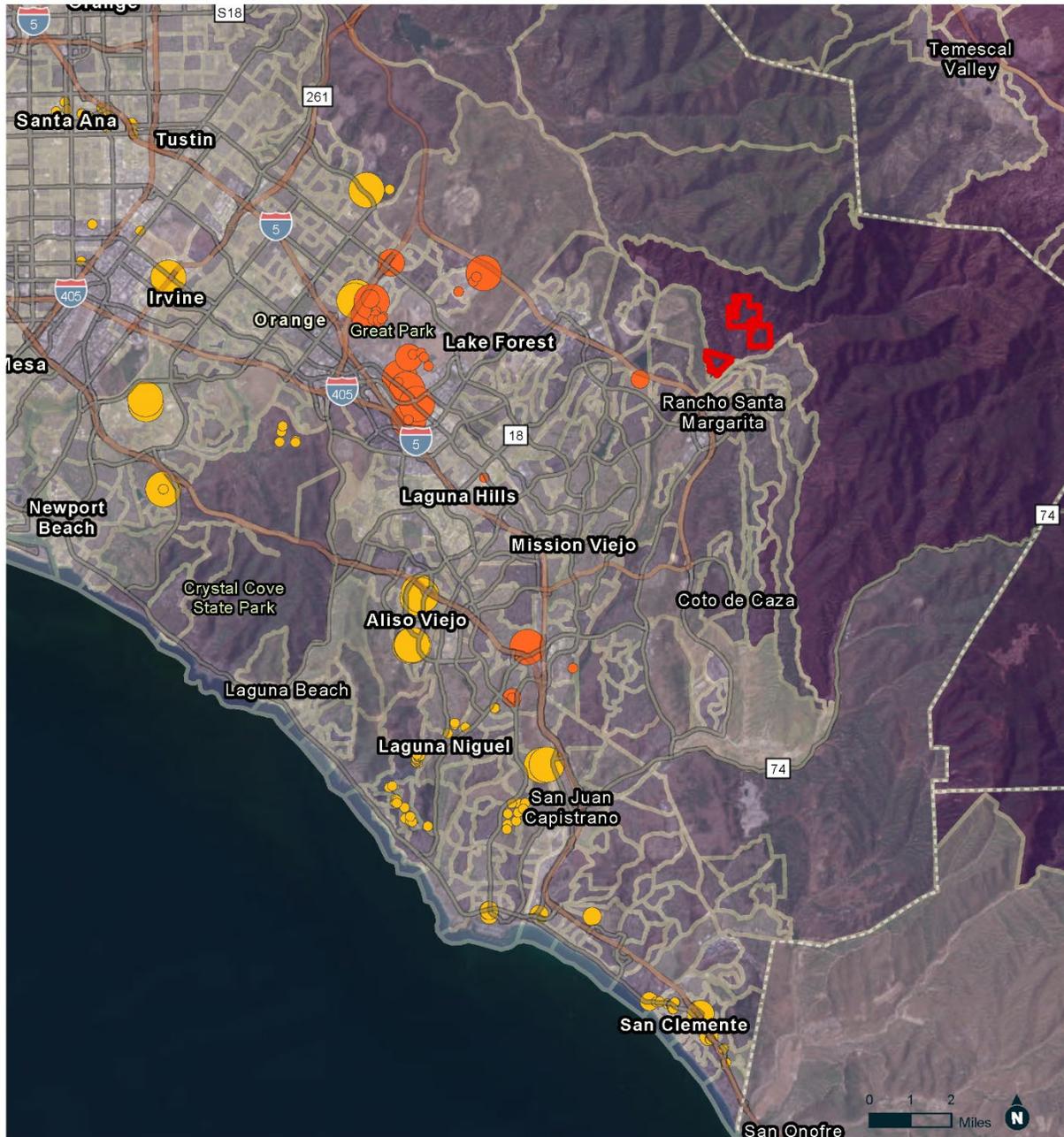
The Census Block Group containing Wren's View and Trabuco Rose has a home-based VMT per capita of 35.5, which is significantly higher than the County average of 20.49, the MPO average of 20.89, and the State average of 21.32, reflecting the distance between these parcels and major employment and commercial centers.

Wren's View and Trabuco Rose have among the highest resident home-based daily VMT in the area, with resident home-based VMT ranging from just over 20 in parts of Mission Viejo and Rancho Santa Margarita to 27–31 in Lake Forest, other parts of Mission Viejo and Rancho Santa Margarita, and other nearby unincorporated areas to the south of the site. Generally, VMT increases further northeast towards the foothills.

⁴⁹ Orange County Housing Element <https://ocds.ocpublicworks.com/sites/ocpwocds/files/2025-05/OC%20Housing%20Element%20AdoptedFeb2025.pdf>

⁵⁰ Orange County Housing Element <https://ocds.ocpublicworks.com/sites/ocpwocds/files/2025-05/OC%20Housing%20Element%20AdoptedFeb2025.pdf>

Figure 6: Wren's View and Trabuco Rose VMT Context and Housing Sites



 Wren's View & Trabuco Rose

Resident HBX VMT (Block Group)

-  0 - 15
-  15 - 20
-  20 - 25
-  25-35
-  35+

Potential Reallocation Site Unit Capacity (10 mi)

-  0 - 10
-  11 - 25
-  26 - 50
-  50+

Potential Reallocation Site Unit Capacity (20 mi)

-  0 - 10
-  11 - 25
-  26 - 50
-  50+

Available Locations for Housing Development

Due to the relative isolation of the parcels and the large amounts of protected land to the east of them, both 10- and 20-mile radii were examined for housing reallocation sites in order to capture a similar area of viable development sites compared with other parcels that are less isolated.

Table 13: Wren’s View and Trabuco Rose Possible Reallocation Sites by Housing Type and VMT

	Housing Type	Sites (10 mi)	Total Units (10 mi)	Sites (20 mi)	Total Units (20 mi)
Lower VMT	Low Density	0	0	61	578
	Medium Density	37	7,894	42	7,894
	High Density	0	0	65	3,276
	Unclear	0	0	3	618
	Total	37	7,894	168	11,748
Equal or Higher VMT	Low Density	0	0	0	0
	Medium Density	0	0	0	0
	High Density	0	0	0	0
	Unclear	0	0	0	0
	Total	0	0	0	0

All of the identified sites have VMT per capita lower than the conserved parcels. The 10-mile radius contains only sites identified for moderate density housing, introducing some possibility that the likely low-density housing that would have been built on these parcels would not relocate there. When the radius was expanded to 20 miles, however, this analysis identified 61 sites with a capacity of 578 units in lower VMT areas that would allow for the type of low-density development that would likely have occurred on the Wren’s View and Trabuco Rose parcels. Because of the increasing disconnection from existing infrastructure to the east, it is reasonable to assume that housing may be absorbed by sites to the west a little further than 10 miles removed from the parcel location.

Several of the low-density sites are located in the incorporated areas of Irvine and Laguna Niguel, both of which have enough capacity to accommodate this reallocated development and still meet their own RHNA allocations. While unincorporated Orange County technically cannot meet their RHNA allocation without rezoning, it is reasonable to assume that demand for housing in unincorporated areas could be absorbed by nearby incorporated areas.

VMT Analysis

Table 10 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Wren’s View and Trabuco Rose, compared to the same metrics for Alternative 1 and Alternative 2, respectively. Alternative 2 in this case is shown for both the 10- and 20-mile radius.

Table 11 shows the VMT *avoided* by conserving the Wren’s View and Trabuco Rose land, according to the alternative hypotheses.

All alternatives show substantial amounts of VMT avoided due to the VMT per capita of the Wren’s View and Trabuco Rose locations being particularly high. Though the lack of low-density housing sites available within 10 mile may make Alternative 2A slightly less likely to occur, the VMT of that subset of parcels is lower on average than all the sites within 20 miles, yielding slightly higher VMT avoided in Alternative 2A compared with Alternative 2B.

Table 14: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
VMT of Wren's View & Trabuco Rose	15,308	5,434,198	163,025,940
Alternative 1 – County Average VMT	8,835	3,136,527	94,095,817
Alternative 2A – Expected VMT of available housing sites (10 miles)	8,447	2,998,759	89,962,765
Alternative 2B – Expected VMT of available housing sites (20 miles)	8,753	3,107,443	93,223,284

¹ See note on Table 6

Table 15: VMT Avoided by Alternative

	Daily VMT	Annual VMT ¹	Over 30 years ¹
Alternative 1	6,472	2,297,671	68,930,123
Alternative 2A	6,860	2,435,439	73,063,175
Alternative 2B	6,554	2,326,755	69,802,656

¹ See note on Table 6

Suitability for Conservation as VMT Mitigation

These parcels have considerations representative of areas well-removed from existing infrastructure and located on the edge of large expanses of natural and protected lands: the VMT per capita is extremely high, but one may need to search a larger radius to find clear locations for housing reallocation that match the size and scale of what would have occurred on the parcels. Because of the immense natural boundary formed by the Santa Ana Mountains and the Cleveland National Forest, it is more likely that development that can’t occur on the Wren’s View and Trabuco Rose parcels relocates to more developed parts of Orange County than leapfrogging over these vast natural lands and mountains. It is also worth noting that the VMT of these parcels is so high, that even if development did relocate to Western Riverside County on the other side of the mountains, it is likely the VMT per capita there would still be lower.

As in other locations with high housing demand, unincorporated Orange County has identified a shortage of available housing sites to meet their RHNA goals. However, they have identified enough locations that can be rezoned to meet and even exceed their RHNA allocation in all income categories. The existence of only medium-density sites (rather than low-density) within the 10-mile

radius introduces some possibility that housing from Wren's View and Trabuco Rose, which would likely be low-density, would not be absorbed there. However, these density classifications represent maximum allowable density and are not iron-clad. Furthermore, encouraging higher density development is in alignment with state priorities. Therefore, it is still very possible that these sites could absorb the housing from Wren's View and Trabuco Rose.

Additionally, there is an ample supply of low-density sites when the radius is expanded to 20-miles. As mentioned above, this expanded radius is justifiable because development to the east would be extremely difficult due to the terrain and existing protected spaces. Finally, the extent to which household VMT on the Wren's View and Trabuco Rose sites is significantly higher than nearby locations and the county average indicates that VMT mitigation from conservation is very likely.

Devil Canyon

The Devil Canyon site is comprised of approximately 120 acres of wildland located in the unincorporated area of western Los Angeles County in the San Fernando Valley. The site is bordered by the Ventura/Los Angeles County border to the west, the City of Los Angeles border directly south and to the east of the site, and the Santa Susana Mountains to the north. The site falls within the San Fernando Valley Planning Area and is referred to as Twin Lakes/Oat Mountain in County planning documents. The Twin Lakes community is a rural residential area situated at the northern end of Topanga Canyon Boulevard, just north of State Route 118. Oat Mountain lies to the north and remains largely undeveloped, characterized by open space and rugged terrain above the unincorporated communities of Twin Lakes, Deer Lake Highlands, and Indian Springs.

While no developments were proposed for the Devil Canyon site, the site was zoned for Residential Planned Development (RPD)-10000-4U which would have allowed for the development of four (4) units per acre. The Devil Canyon site would therefore have allowed the development of up to 480 single family housing units.

Conservation Benefits

More than a third of Devil Canyon is a resilient and connected landscape, where biodiversity is already thriving and where it will be most likely to be resilient to climate change. It is also located near an identified priority highway barrier and can provide important habitat for connectivity. The property contains groundwater dependent ecosystems, which can further enhance climate change resilience, with high amounts of soil carbon and moderate amounts of above-ground carbon. Avoiding disturbance of these lands therefore has climate mitigation benefits from avoided emissions of these carbon pools. The property has critical habitat for threatened and endangered species and high wildlife richness, with suitable habitat in the top 20% of the state for mammals and birds. The property is in the WUI and a fire hazard severity zone and is in the top 20th percentile of fire risk to homes in the state were they to be built. Currently, the property is suitable for grazing, which can increase resilience to wildfire by reducing fuels, particularly grasses. The land breakdown and conservation benefits of Devil Canyon are shown in Figure 7 and Table 16, respectively.

Figure 7: Devil Canyon Landcover

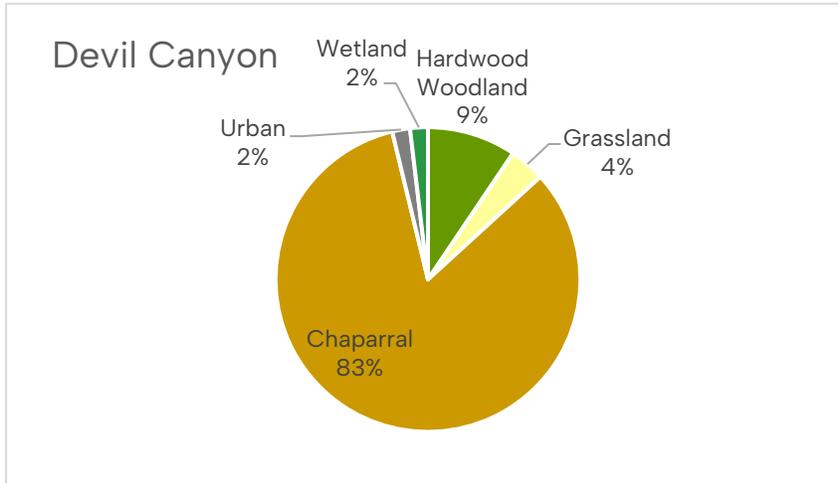


Table 16: Conservation Benefits of Devil Canyon

Conservation Benefit	Value
Connectivity Linkages (RCN)	0
Resilient, Biodiverse, Well-Connected landscapes (RCN)	34%
Priority Highway Barrier Nearby	Y
Plant Richness	Low
Rarity-weighted endemic plant richness	Moderate
Mammal Richness	Highest - top 20%
Bird Richness	High
Amphibian Richness	Highest - top 20%
Reptile Richness	High
Critical Habitat	Y
Wetlands	N
Vernal Pools	N
Groundwater Dependent Ecosystems	Y
Farmland	0
Grazing land	100%
Above-ground carbon	Moderate
Soil carbon	High
Fire Hazard Severity Zone	Y
Fire Risk to Homes	Highest - Top 20%
Wildland Urban Interface	Y
Floodplain	N

Development Patterns of the Region

The County of Los Angeles covers 4,000 square miles and is part of the Southern California Association of Governments (SCAG) MPO, which is the largest MPO in California and the country.

There are 88 incorporated cities in Los Angeles County, and unincorporated areas account for two-thirds of the County's area and one-tenth of its population.⁵¹

Los Angeles County divides its unincorporated areas into 11 Planning Areas. The Devil Canyon site is located in the San Fernando Valley Planning Area, where development is concentrated in the valley floor and framed by surrounding hillsides and mountain ranges. The San Fernando Valley's development patterns are characterized by low-density single-family neighborhoods with some clusters of multi-family housing, shopping centers, and auto-oriented commercial corridors. Along the hillsides where the Devil Canyon site is located, development is primarily made up of rural- to suburban- housing types with larger lots spread across large areas which follow the rugged topography of the area.

By 2045, the population in unincorporated Los Angeles County is projected to grow by 22%, with the number of households increasing by 42% and employment increasing by 19% between 2016 and 2045.⁵² Much of this growth will place pressure on the County's limited vacant land, particularly in communities at the urban-rural edge.

The public draft of the San Fernando Valley Area Plan reflects a desire to preserve the open space in the community of Oat Mountain, which includes Devil Canyon, though the Plan notes that much of this space is privately owned and zoned for residential development.⁵³ Existing residential development in the area is rural in character and features low-density single-family homes on large lots accessible via private winding roads that conform to the rugged topography. Oat Mountain is directly adjacent to recently developed single family homes in the Twin Lakes community to the east and the Fern Anne community to the west.

Unincorporated Los Angeles County's RHNA allocation for the 2021-2029 planning years is 90,052 units. The Housing Element notes that under current zoning, the County cannot accommodate the entirety of the RHNA obligation. The County plans to rezone sites within a handful of specific plan areas to increase allowed densities and meet their RHNA. No sites were identified to be rezoned in the San Fernando Valley Planning Area.⁵⁴

VMT Patterns of the Area

The Devil Canyon site is located between the southern base of the Santa Susana Mountains and more urban development in the San Fernando Valley area. Devil Canyon has a home-based VMT per capita of 29.04 which is higher than the county average of 18.44 and the MPO average of 20.89. VMT is generally less efficient in the mountainous and undeveloped areas near the site, but VMT efficiency improves southeast of the site towards the more developed urban areas in San Fernando Valley.

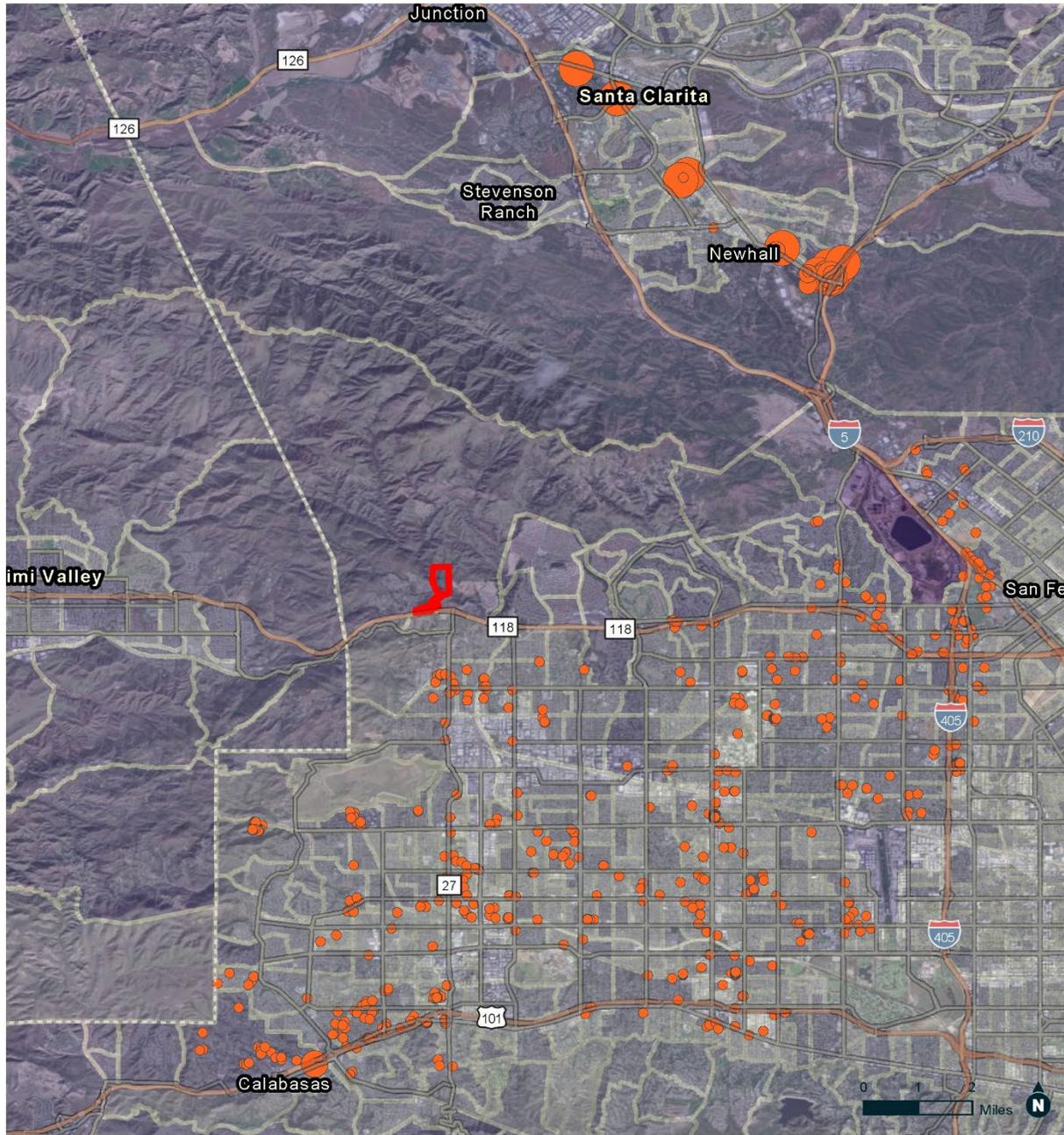
⁵¹ Unincorporated Los Angeles County (n.d.) LA County Planning. <https://planning.lacounty.gov/unincorporated-los-angeles-county/>

⁵² Los Angeles County Housing Element (2022). <https://planning.lacounty.gov/wp-content/uploads/2022/11/housing-element-20220517.pdf>

⁵³ <https://planning.lacounty.gov/long-range-planning/san-fernando-valley-area-plan/documents/>

⁵⁴ County of Los Angeles Housing Element Update (2022). <https://planning.lacounty.gov/wp-content/uploads/2022/11/housing-element-20220517.pdf>

Figure 8: Devil Canyon VMT Context and Housing Sites



 Devil Canyon

Resident HBX VMT (Block Group)

-  0 - 15
-  15 - 20
-  20 - 25
-  25 - 35
-  35 +

Potential Reallocation Site Unit Capacity

-  0 - 10
-  11 - 25
-  26 - 50
-  50 +

Available Locations for Housing Development

Table 12 shows the results of the reallocation sites analysis. This analysis identified 678 sites in areas that have a lower home-based VMT per capita than Devil Canyon. Possible reallocation sites for Devil Canyon are primarily found in the City of Los Angeles (639 sites). The remaining sites are found in the City of Santa Clarita (21 sites), Hidden Hills (17 sites), and the City of Calabasas (1 site). The City of Los Angeles reported insufficient capacity to meet their own RHNA with existing zoning but plans to meet their RHNA by increasing allowed densities at 243,254 sites throughout the City.⁵⁵ The City of Los Angeles' Rezoning Program resulted in a surplus of unit capacity, however development of these "up-zoned" units would require demolition of existing buildings. Nearby incorporated cities of Santa Clarita and Hidden Hills both reported a surplus of housing site capacity on vacant sites which could hypothetically have been used to reallocate development from the now-conserved Devil Canyon site.^{56,57} Table 13 shows the possible reallocation sites that do not fall within the City of Los Angeles. Santa Clarita is located on the north side of the Santa Susana Mountains and is characterized by large single-family neighborhoods. Hidden Hills is a smaller incorporated city located in the southwest corner of the San Fernando Valley and is primarily comprised of single-family home neighborhoods.

Table 17. Devil Canyon Possible Reallocation Sites by Housing Type and VMT (including City of Los Angeles sites)

	Housing Type	Sites (including LA)	Total Units (including LA)	Sites (excluding LA)	Total Units (excluding LA)
Lower VMT	Low Density	539	48	17	17
	Medium Density	78	572	9	551
	High Density	12	928	12	928
	Unclear	49	32	1	5
	Total	678	1,580	39	1,501
	Low Density	1	0	0	0

⁵⁵ City of Los Angeles Housing Element 2021–2029 (2022). [https://planning.lacity.gov/odocument/55fdecf6-e185-4910-b690-2df603093d76/2021-2029_Housing_Element_Book_\(Adopted\)_-Low_Res.pdf](https://planning.lacity.gov/odocument/55fdecf6-e185-4910-b690-2df603093d76/2021-2029_Housing_Element_Book_(Adopted)_-Low_Res.pdf)

The City of Los Angeles' 6th RHNA Cycle allocation was 456,643 units (1115,978 very low-income, 68,743 low-income, 75,091 moderate-income, and 196,831 above moderate-income).⁵⁵ Their housing sites inventory estimated a total development capacity of 230,947 units, which resulted in shortfall of 255,432 units. 1,432,059 unites were identified through the rezoning program and are located within Regional Centers, near public transit, along corridors, and in areas of high opportunity.

⁵⁶ City of Santa Clarita Housing Element 2021–2029 (2023). https://santaclarita.gov/planning/wp-content/uploads/sites/10/2023/11/Santa-Clarita-June-2023-Revised-Housing-Element_opt.pdf

The City of Santa Clarita's 6th RHNA Cycle allocation was 10,031 units (3,397 very low-income, 1,734 low-income, 1,672 moderate-income, and 3,228 above moderate-income).⁵⁶ Their housing sites inventory estimated a surplus of 8,183 units, 7,253 of which fall within the moderate- and above moderate-income categories.

⁵⁷ City of Hidden Hills Housing Element 2021–2029 (2021). https://hiddenhillscity.org/wp-content/uploads/Hidden-Hills-6th-HE_2023-04-30_adopted-revised-tracked-April-15-version.pdf

The City of Hidden Hill's 6th RHNA Cycle allocation was 40 units (17 very low-income, 8 low-income, 9 moderate-income, and 6 above moderate-income). The housing sites inventory identified the capacity to construct 65 units of which 35 fall within the moderate- and above moderate-income categories.

	Housing Type	Sites (including LA)	Total Units (including LA)	Sites (excluding LA)	Total Units (excluding LA)
Equal or Higher VMT	Medium Density	1	5	1	5
	High Density	0	0	0	0
	Unclear	0	0	0	0
	Total	2	5	1	5

When including sites located in the City of Los Angeles, this analysis identified 539 sites located in lower VMT areas that permit low-density development, with a total capacity of 48 units. When excluding the City of Los Angeles sites, only 17 sites are located in lower VMT areas that permit low-density development, with a total capacity of 17 units, well below the 480 that might have been developed on Devil Canyon. However, if the Devil Canyon development was intended to be higher-density housing types, there would be sufficient capacity in nearby areas that have a lower per capita household VMT. Both Santa Clarita and Hidden Hills have sufficient capacity to absorb this reallocated development while still meeting their respective RHNA obligations, however while these sites have a lower home-based VMT per capita than Devil Canyon, they are still not below the countywide average of 18.44 home-based VMT per capita.⁵⁸

This analysis is limited to sites within LA County, but the Devil Canyon site is very near to the Ventura County border, just west of which the City of Simi Valley has identified several locations available for housing redevelopment. According to their 2021-2029 Housing Element, after rezoning certain locations, the City of Simi Valley is able to meet their RHNA allocation, suggesting they may also have capacity to absorb housing demand from nearby parts of LA County. All of these sites have home-based VMT per capita levels below those of Devil Canyon.

This example speaks to the need identified by cities during their Housing Element update which would require upzoning in high demand areas in order to meet housing needs. It also demonstrates that development that shifts further away from one intended center (in this case, Los Angeles) and toward another (e.g., Santa Clarita or Simi Valley) may still produce a lower VMT per capita than a conserved location.

VMT Analysis

Table 14 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Devil Canyon, compared to the same metrics for Alternative 1 and Alternative 2, respectively. The second scenario is split into two sub-scenarios based on whether sites in the City of Los Angeles are included.⁵⁹

Table 15 shows the VMT *avoided* by conserving the Devil Canyon land, according to the alternative hypotheses.

⁵⁸ Santa Clarita home-based VMT per capita: 19.32-26.45; Hidden Hills home-based VMT per capita: 27.27.

⁵⁹ Both scenarios are limited housing sites within Los Angeles County

Alternative 1 provides greater VMT reduction benefits, as the countywide VMT per capita average is lower than the average in the area surrounding Devil Canyon.

Table 18: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
VMT of Devil Canyon	37,636	13,360,723	400,821,696
Alternative 1 – County Average VMT	23,898	8,483,875	254,516,256
Alternative 2A – Expected VMT of Available Housing Sites (Including City of Los Angeles)	27,579	9,790,502	293,715,072
Alternative 2B – Expected VMT of Available Housing Sites (Excluding City of Los Angeles)	28,214	10,015,942	300,478,248

¹See note on Table 6

Table 19: VMT Avoided by Alternative

	Daily VMT	Annual VMT ¹	Over 30 years ¹
Alternative 1	13,738	4,876,848	146,305,440
Alternative 2A	10,057	3,570,221	107,106,624
Alternative 2B	9,422	3,344,782	100,343,448

¹See note on Table 6

Suitability for Conservation as VMT Mitigation

The Devil Canyon case study illustrates the factors at play when conserving land at the outskirts of major urban centers. The housing allocations in these areas may be too high to be readily met through development of vacant, available developable land. State policy, as reflected by the housing elements themselves, encourages rezoning to accommodate projected housing needs in developed infill locations, but still poses a challenge compared to development of vacant land.

However, the available housing locations that might appear to meet the leapfrog development definition because they are beyond some geographic barrier (in this case, mountains) from the conserved parcel and its nearest job or commercial center may in fact have lower VMT per capita than the conserved parcel because they are closer to a different job and commercial center. The case for claiming VMT mitigation as a result of land conservation in such a situation is not necessarily diminished, but the question of where demand may shift becomes more nuanced.

In the case of Devil Canyon, both the City and County of Los Angeles have high pressure to build more housing, and their housing sites inventory analyses did not identify sufficient units to meet their respective RHNA without rezoning parcels to increase density and in the case of the City, demolishing existing buildings. Nearby jurisdictions such as Santa Clarita and Hidden Hills only offer sufficient housing capacity to absorb the units which could have been developed at Devil Canyon if the units were replaced with higher-density housing types.

Shifting this development to denser locations is clearly in line with state policies and goals, and a key question is whether the infill incentives are strong enough to encourage developers to consider higher density dwellings in the face of limited land. Such a question is beyond the scope of this work but if the answer can be demonstrated to be “yes,” through state or local policies, conservation may be a powerful means of VMT mitigation.

Harvey Ranch

Harvey Ranch is comprised of three parcels covering 124-acres in a hilly area east of Saint Mary’s College of California in the Town of Moraga in Contra Costa County. The parcels are in the San Francisco Bay Area, neighbored by the City of Lafayette to the north, the unincorporated community of Alamo to the east, and the unincorporated community of Canyon and the City of Oakland to the west.

Saint Mary’s College campus lies to the west, and primarily single-family residential areas border Harvey Ranch in the southwest and north. Bollinger Canyon Road runs in between the parcels with large single-family homes along the roadway.

Harvey Ranch is located in the Bollinger Canyon Study Area and has land use characteristics that make it difficult to develop including steep slopes, sensitive natural resources, “outstanding visual and aesthetic value,” high fire hazard levels, and access and infrastructure constraints.⁶⁰ The 2023 existing land use map in Moraga’s updated General Plan 2040 indicates that it was previously zoned as agriculture/rangeland before being recommended as Non-MOSO (1986 Moraga Open Space Ordinance) Open Space in the updated plan. Non-MOSO Open Space allows for residential uses and civic and recreational facilities with maximum densities of 1 unit per 5, 10, or 15 acres (equating to a maximum of 25 units), but is primarily zoned to preserve environmentally sensitive lands.

After a successful fundraising campaign in 2023 with funds from the Gordon and Berry Moore Foundation, the Town Council of Moraga, and donations from other individuals and institutions, the John Muir Land Trust was able to purchase and permanently conserve the Harvey Ranch parcels.⁶¹ Harvey Ranch is adjacent to the 15,000-acre wilderness area and Las Trampas Wilderness Regional Preserve within the San Leandro Creek Watershed that is home to several threatened and endangered species.

Conservation Benefits

More than 60% of Harvey Ranch is part of a connectivity linkage, which are routes that provide some of the last movement routes in a region or pathways for wildlife to move currently or in response to climate change. The property has critical habitat for endangered and threatened species as well as wetlands and groundwater dependent ecosystems, important habitats that can also provide refugia benefits under future climate change. Harvey Ranch has moderate to high wildlife richness and is in

⁶⁰ Bollinger Canyon Study Area Town Council Direction on General Plan Amendment and Rezoning Presentation (February 2022) <https://www.moraga.ca.us/DocumentCenter/View/6633/February-9-2022-Bollinger-Canyon-Study-Area-Town-Council-Meeting-PDF>

⁶¹ John Muir Land Trust raises \$4 million to conserve strategic acreage <https://philanthropynewsdigest.org/news/john-muir-land-trust-raises-4-million-to-conserve-strategic-acreage>

the top 20% of amphibian habitat and top 5% of birds. Although overall plant richness is low, the property is in the top 20% of the state for rare and endemic plant species. The property contains high carbon storage, both soil and above-ground. Located in the WUI, fire risk to homes at Harvey Ranch is high. Habitat at the property is split between grassland and hardwood woodland. Seventy-two percent of the property is suitable for grazing, which can promote wildfire resilience (particularly in grasslands) by reducing fuel loads of highly flammable grasses. The land breakdown and conservation benefits of Harvey Ranch are shown in Figure 9 and Table 20, respectively.

Figure 9: Harvey Ranch Landcover

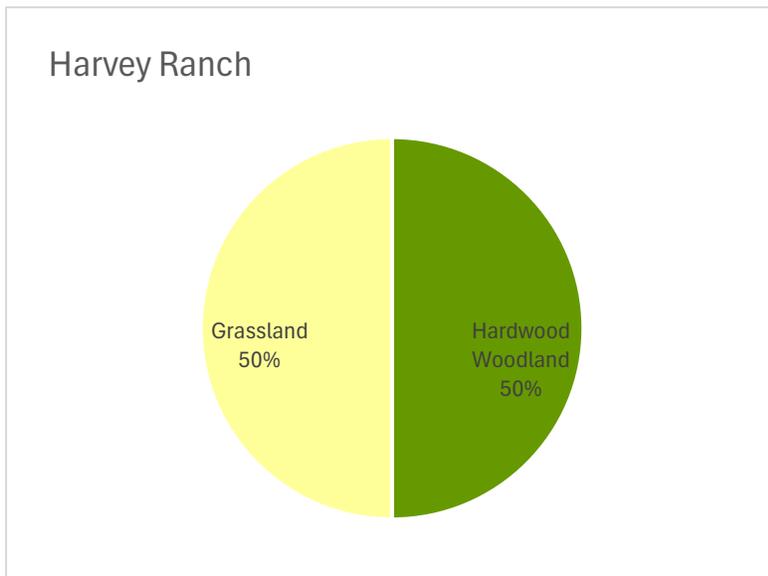


Table 20: Conservation Benefits of Harvey Ranch

Conservation Benefit	Value
Connectivity Linkages (RCN)	62%
Resilient, Biodiverse, Well-Connected landscapes (RCN)	2%
Priority Highway Barrier Nearby	N
Plant Richness	Low
Rarity-weighted endemic plant richness	Highest - top 20%
Mammal Richness	Moderate
Bird Richness	Highest - top 5%
Amphibian Richness	Highest - top 20%
Reptile Richness	Moderate
Critical Habitat	Y
Wetlands	Y
Vernal Pools	N
Groundwater Dependent Ecosystems	Y
Farmland	0
Grazing land	72%
Above-ground carbon	High
Soil carbon	High

Conservation Benefit	Value
Fire Hazard Severity Zone	N
Fire Risk to Homes	High
Wildland Urban Interface	Y
Floodplain	N

Development Patterns of the Region

Growth and development patterns in the Town of Moraga and in Contra Costa County generally mirror surrounding San Francisco Bay Area trends, with job growth outpacing available housing. The high demand and limited supply of housing has resulted in a \$950,000 increase in the median home price from 2012 to 2021 without a corresponding increase in income. As a result, low- and middle-income families, seniors, and other renters and households facing financial challenges have been forced to either move outside of Moraga to the Central Valley or combine households and live in overcrowded apartments to afford housing.⁶²

Plan Bay Area 2050 emphasizes equitable housing, in part by allowing for more affordable housing in High-Resource areas like Moraga. The Plan also encourages a greater mix of housing densities in defined Growth Geographies, particularly near existing job centers, frequent transit, locations for job growth in middle-wage industries, and areas with well-resourced schools, open space, and other resources.⁶³

The current 2023–2031 RHNA for all counties and municipalities in the Bay Area has increased by 135% from the previous 2015–2023 allocation. This increase was largely due to changes to state law and methodology as well as limited housing production. Moraga was allocated 0.25% of the region’s allocation, accounting for 1,118 units, which is substantially higher than its previous allocation of 229 units. Moraga’s allocation is proportional to the Town’s share of the regional population. The RHNA identifies the following regional housing growth needs in Moraga:

- 318 Very Low-Income units
- 183 Low-Income units
- 172 Moderate-Income units
- 445 Above Moderate-Income units

Moraga’s 2020 Annual Progress Report has shown that the Town has not reached its housing development goals in any income level except for Above Moderate-Income, despite implementing several new housing programs. However, with the additional sites identified for housing opportunity, the Town does have capacity to meet the RHNA with an additional 23% buffer for lower-income sites.

In 2021, single-family detached units represent 66.5% of homes in Moraga, followed by single family attached (townhomes) at 14.9%, and make up a higher share of housing compared to other jurisdictions in the Bay Area.

⁶² 2021–2031 Moraga Housing Element <https://www.moraga.ca.us/DocumentCenter/View/8125/2023-2031-Moraga-Housing-Element-Clean-version-PDF>

⁶³

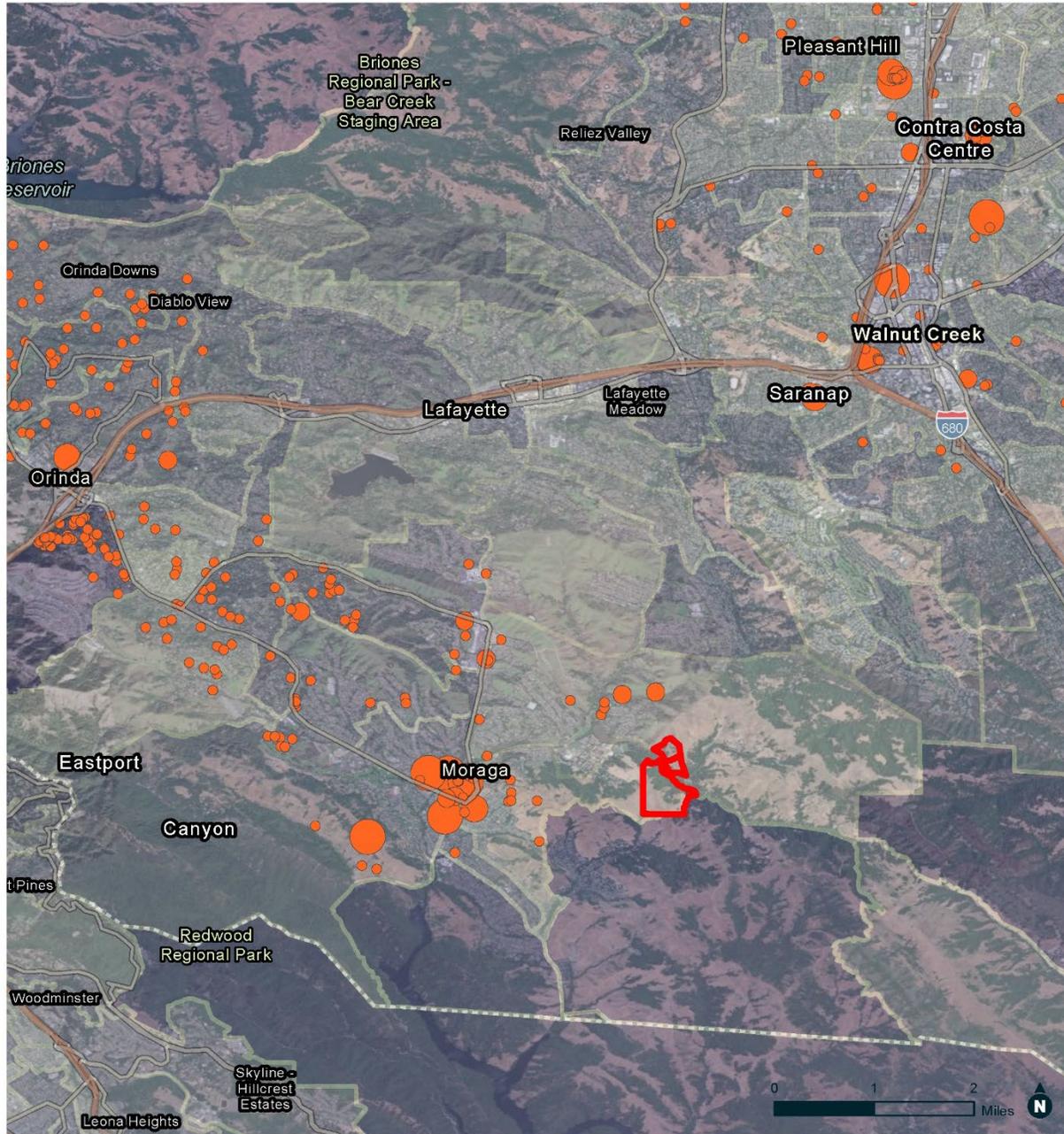
Plan Bay Area 2050 Growth Geographies https://planbayarea.org/sites/default/files/documents/2021-05/Draft_PBA2050_Growth_Geographies_May2021_0.pdf

Community engagement done for Moraga’s housing element indicates that there is a strong desire among community members to maintain Moraga’s small-town character and to direct additional housing to the two commercial districts within the city, rather than in open space and hillside locations like where the Harvey Ranch parcels are located.

VMT Patterns of the Area

Regionally, the high demand and limited availability of housing has resulted in longer commutes, increasing regional VMT. The three parcels that make up the Harvey Ranch conservation area are in different block groups with varying resident home-based VMT. The two northern parcels are in the same block group with a daily home-based VMT per capita of 18.26, most of the southwest parcel is in a block group with a home-based VMT per capita of 19.74, and the eastern corner of the parcel is in a block group with a higher home-based VMT per capita of 28.62. A combined home-based VMT of 19.94 was calculated for the parcels by taking an area-weighted average of the VMTs for the Census block groups overlapping the parcel. The combined VMT is lower than the County average of 23.3 and State average of 21.32, but slightly higher than the MPO average of 19.61.

Figure 10: Harvey Ranch VMT Context and Housing Sites



 Harvey Ranch

Resident HBX VMT (Block Group)

-  0 - 15
-  15 - 20
-  20 - 25
-  25-35
-  35+

Potential Reallocation Site Unit Capacity

-  0 - 10
-  11 - 25
-  26 - 50
-  50+

Available Locations for Housing Development

Harvey Ranch, had it not been conserved, would have allowed for the development of up to 25 dwelling units per the Non-MOSO Open Space zoning. When the parcel was officially conserved in 2023, the median household value was \$1.6 million in Moraga and \$830,000 in Contra Costa County.^{64,65} Residential development approved for construction in Moraga during this time period included exclusively moderate and above moderate-income units.

Table 21: Harvey Ranch Possible Reallocation Sites by Housing Type and VMT

	Housing Type	Sites	Total Units
Lower VMT	Low Density	17	75
	Medium Density	7	46
	High Density	10	467
	Unclear	6	18
	Total	40	606
Equal or Higher VMT	Low Density	368	1,381
	Medium Density	19	423
	High Density	49	1,584
	Unclear	5	276
	Total	441	3,664

This analysis identified 40 sites in lower VMT areas totaling 606 units. If we assume Harvey Ranch would be a low-density development and limit our consideration to only locations intended for low density housing, there are 17 sites in lower VMT areas totaling 75 units. Some of these sites are in Moraga, while others are in the neighboring jurisdictions of Orinda, Pleasant Hill, and Walnut Creek. These jurisdictions have indicated in their housing elements that they have sufficient capacity to meet their RHNA allocations. Despite more housing pressure than in most other case studies, this analysis does suggest that the 25 units that might have been built on Harvey Ranch could reasonably be absorbed by nearby available housing sites with more efficient VMT patterns, but far more sites with less efficient VMT patterns also exist nearby.

VMT Analysis

The block groups that encompass Saint Mary’s College of California, including those that overlap with the Harvey Ranch Parcels, have some of the lowest home-based VMT in the immediate region. The low VMT in the block group that includes the College is likely driven by the College itself and the associated vehicle patterns of a college area. This low VMT is likely not reflective of the VMT of the surrounding low-density development within the block group nor the VMT of a new low-density development like what might have occurred at Harvey Ranch. Similar patterns of low VMT areas encompassing a college campus adjacent to high VMT areas characterized by low-density residential development can be seen around other universities like Pepperdine in Malibu and California State

⁶⁴ [U.S. Census](#)

⁶⁵ [U.S. Census](#)

University San Marcos. Notably, VMT is higher in the block groups neighboring the Saint Mary’s College block groups, which contain mostly single-family homes. In order to separate the influence of the College on the parcel’s estimated VMT, the VMT of the Harvey Ranch Parcels has been calculated using the VMT of an adjacent block group with similar development patterns in addition to the standard weighted average VMT methodology, both described below.

Since the Harvey Ranch site includes portions of different block groups that have different home-based VMT estimates, the area-weighted home-based VMT average, “Weighted Average VMT,” was used to estimate the home-based VMT of Harvey Ranch. The result was 19.94 which is less than the county and state average, but higher than the MPO average. To account for the effect of Saint Mary’s College of California’s on the VMT of block groups that overlap with Harvey Ranch, an additional VMT mitigation estimate, “Modified VMT,” was calculated. For this calculation, the VMT of an adjacent block group that also contains low density residential development was used.

Table 17 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Harvey Ranch, compared to the same metrics for Alternative 1 and Alternative 2, respectively.

Table 18 shows the VMT *avoided* by conserving the Harvey Ranch, according to two alternative hypotheses for each of the VMT calculation approaches.

In the Weighted Average scenario, neither alternative provides avoided VMT benefits. However, in the Modified VMT scenario, which removes the influence of the College, both alternatives result in avoided VMT benefits from conservation. This demonstrates the necessity of understanding the data used for any VMT analysis and illustrates how different data sources or approaches may yield very different results.

Table 22: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
Weighted Average VMT of Harvey Ranch	1,346	477,786	14,333,569
Modified VMT of Harvey Ranch	1,932	685,807	20,574,203
Alternative 1 – County Average VMT	1,573	558,326	16,749,788
Alternative 2 – Expected VMT of available housing sites	1,370	486,439	14,593,163

¹ See note on Table 6

Table 23: VMT Avoided by Alternative

Scenario		Daily VMT	Annual VMT ¹	Over 30 years ¹
Weighted Average VMT	Alternative 1	(227)	(80,541)	(2,416,218)
	Alternative 2	(24)	(8,653)	(259,593)
Modified VMT	Alternative 1	359	127,481	3,824,415
	Alternative 2	562	199,368	5,981,040

¹ See note on Table 6

Suitability for Conservation as VMT Mitigation

The Harvey Ranch parcels are in a high-resource area in a region with high housing demand, making it appealing to developers. However, zoning would have only allowed a maximum of 25 units, which would not have significantly affected housing availability and could be absorbed by other sites. Depending on the approach used to estimate the VMT per capita of residents of a developed Harvey Ranch, the site could either be deemed a good or poor candidate for claiming VMT mitigation from conservation.

If estimating Harvey Ranch's VMT patterns using the weighted average approach, there are more limited sites available in lower VMT areas to absorb the housing. In this case, conservation may not lead to VMT reductions absent ways to enforce or negotiate the location of that development specifically in those sites in lower-VMT areas. However, the lower VMT of the Harvey Ranch area can likely be attributed to the College, and the VMT of a development at Harvey Ranch would more likely mirror the higher VMT of adjacent block groups with similar low-density residences. When this modified VMT is applied, the conservation of Harvey Ranch would have avoided VMT benefits. Limitations in the scale of VMT data complicates VMT estimation for conservation sites like Harvey Ranch, where other land uses such as universities obscure the VMT of nearby low-density residences in the same block group. Additional data and analysis may be required to determine the potential for avoiding VMT from conserving sites where this may be the case.

In either case, this site is in a location with particularly high demand for housing, making conservation of land potentially available for housing a more sensitive topic than in other locations. This high level of demand also provides evidence that Harvey Ranch is under threat of development despite no plans having been officially submitted or approved and suggests that housing will be developed elsewhere in the area if it cannot be developed on this site. Depending on the approach to calculating VMT per capita on the Harvey Ranch site, it may be the case that the majority of housing reallocation sites have higher VMT per capita than Harvey Ranch, and development that can't happen on the conserved parcel would end up somewhere with less efficient VMT patterns. Absent policy explicitly directing growth to more VMT-efficient areas or widespread consensus that the "modified VMT" estimate above is valid, Harvey Ranch is unlikely to be a good candidate for VMT mitigation as conservation.

Lewis Ranch

The Lewis Ranch site encompasses 972 acres in northwestern El Dorado County, directly south of the unincorporated community of Greenwood and situated between Coloma, Georgetown, and Auburn. This area of the county remains largely undeveloped, characterized by rugged hills, agricultural land, and extensive wildlands. Greenwood Creek and two tributary streams traverse the property, supporting a diverse range of habitats, including blue oak woodland, grassland, and mixed conifer-hardwood forest. The ranch is generally bounded by State Highway 193 to the north, Greenwood Road to the east, Black Rock Creek to the west, and Marshall Road to the south.

Lewis Ranch served as a cattle ranch for the past 60 years before it was conserved in 2022. The American River Conservancy purchased the land to permanently protect the site from subdivision and development.⁶⁶

Although no development projects were formally proposed for the site, its zoning established a limited potential for residential use. The majority of the property is designated Rural Lands (RL-20), permitting one dwelling unit per 20 acres, while a smaller portion on the northeastern side is zoned Rural Lands (RL-10), allowing one unit per 10 acres. Under these designations, the site could theoretically accommodate up to 48 dwelling units. However, this would require significant investment in new infrastructure, including internal roadways and extensions of water, wastewater, and utility services.

Conservation Benefits

Lewis Ranch has high connectivity, with 21% of the property part of a resilient, biodiverse, and well-connected landscape and 70% identified as a linkage, which represents some of the last remaining movement routes within a region or areas for wildlife to move in response to climate change. The property contains important habitat including wetlands and groundwater dependent ecosystems and has moderate to high species richness for both plants and wildlife. Rare and endemic plant richness ranks in the top 20% across the state. The dominant habitat types at Lewis Ranch are hardwood forests and woodlands, which make up over 80% of the property. The property is at risk of both fire and flood. Located in the WUI and a fire hazard severity zone, fire risk to homes is in the top 20% in the state were homes to be built there. Located in a 1-in-100-year floodplain, the property could also experience post-fire debris flows. Grazing can promote fire resilience by reducing fuel loads, and 89% of Lewis Ranch is suitable for grazing. The property has high carbon storage, both soil and above-ground and avoiding conversion on these lands could therefore have climate mitigation benefits from avoiding emitting carbon from these stored pools. The land breakdown and conservation benefits of Lewis Ranch are shown in Figure 11 and Table 24, respectively.

⁶⁶ American River Conservancy (2022). *American River Conservancy protects Greenwood Creek area.* https://www.mtdemocrat.com/news/american-river-conservancy-protects-greenwood-creek-area/article_1de02b1b-4ac5-52de-896e-722cd04d5fba.html

Figure 11: Lewis Canyon Landcover

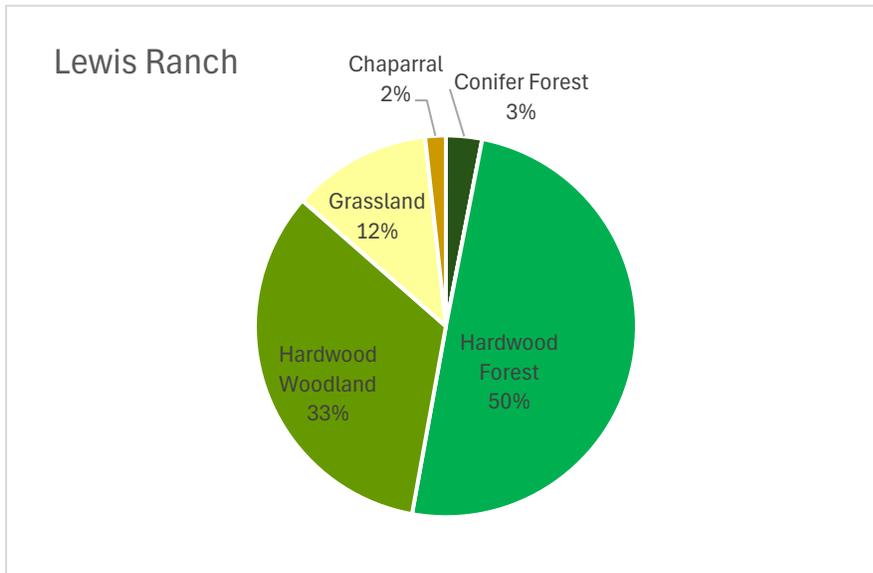


Table 24: Conservation Benefits of Lewis Ranch

Conservation Benefit	Value
Connectivity Linkages (RCN)	70%
Resilient, Biodiverse, Well-Connected landscapes (RCN)	21%
Priority Highway Barrier Nearby	N
Plant Richness	High
Rarity-weighted endemic plant richness	Highest - top 20%
Mammal Richness	Moderate
Bird Richness	High
Amphibian Richness	High
Reptile Richness	Moderate
Critical Habitat	N
Wetlands	Y
Vernal Pools	N
Groundwater Dependent Ecosystems	Y
Farmland	10%
Grazing land	89%
Above-ground carbon	High
Soil carbon	High
Fire Hazard Severity Zone	Y
Fire Risk to Homes	Highest - top 20%
Wildland Urban Interface	Y
Floodplain	Y

Development Patterns of the Region

El Dorado County covers an area of 1,805 square miles, much of which is undeveloped rolling hills and mountainous terrain. El Dorado County is divided into two subregions; the northeast corner of the County is in the “Lake Tahoe Basin” subregion, while the remainder of the County is in the “Western Slope” subregion.⁶⁷ There are two incorporated municipalities within El Dorado County: the City of Lake Tahoe located in the Lake Tahoe Basin subregion accounts for 10.9% of residents, and Placerville located in the Western Slope subregion accounts for 5.6% of residents.⁶⁸ The Western Slope subregion is the larger of the two subregions and development patterns are characterized by urban-like development in the foothills and large lot, low density residential development in the rural areas. Most of the County’s residents live outside the incorporated areas.

The County’s largest employment sector is Educational Services, Health Care, and Social Assistance, though tourism plays a large role in the County’s economy. Major tourism centers are located in Apple Hill outside of Placerville and the Tahoe Basin. These areas have a high concentration of higher-end housing, so despite being closer to job centers, most employees of these industries live in more affordable areas and commute farther to work. The County’s Housing Element notes that the population is expected to increase by 8.8% between 2020 and 2030, and The County has introduced policies to incentivize development of affordable housing and encourage infill development in these areas.

Development in El Dorado County is constrained by a deliberate blend of land use policy, physical geography, and landownership patterns. The County’s General Plan directs higher-intensity development toward designated Community Regions and Rural Centers, where public facilities and infrastructure are generally more available.

Beyond policy, topographic conditions present significant challenges to development. Much of the county consists of rugged, mountainous terrain with moderate to steep slopes, limiting the amount of land that is physically suitable for building. Other physical features limiting growth include rivers, streams, and other water bodies which are subject to state and federal regulation, as well as high or very high fire hazard risk areas. Additionally, over half of the County’s land area is commercial forest land owned by the federal government which removes significant portions of the county from private development potential.⁶⁹

El Dorado County anticipates an 8.8% growth in population between 2020 and 2030, most of which will likely occur in the Western Slope subregion. The County’s 6th Cycle RHNA for 2021–2029 is divided into the two subregions mentioned previously with the Western Slope subregion receiving a larger portion of units. The County’s RHNA includes:

- 1,441 Very Low-Income units (1,350 in Western Slope, 91 in Tahoe Basin)
- 868 Low-Income units (813 in Western Slope, 55 in Tahoe Basin)
- 903 Moderate-Income units (849 in Western Slope, 63 in Tahoe Basin)

⁶⁷ El Dorado County: About Us (n.d.). <https://www.eldoradocounty.ca.gov/County-Government/About-Us>

⁶⁸ El Dorado County Profile & Demographics FY 2024–2025 (2024). <https://www.eldoradocounty.ca.gov/files/assets/county/v/2/documents/government/cao/2024-2025-budget/edc-profile-demographic-data-fy-2024-25.pdf>

⁶⁹ El Dorado County Housing Element (2021). https://www.eldoradocounty.ca.gov/files/assets/county/v/1/documents/land-use/planning-amp-zoning/adopted-general-plan/final-2021-2029-housing-element_bos-adoption-3-22-22.pdf

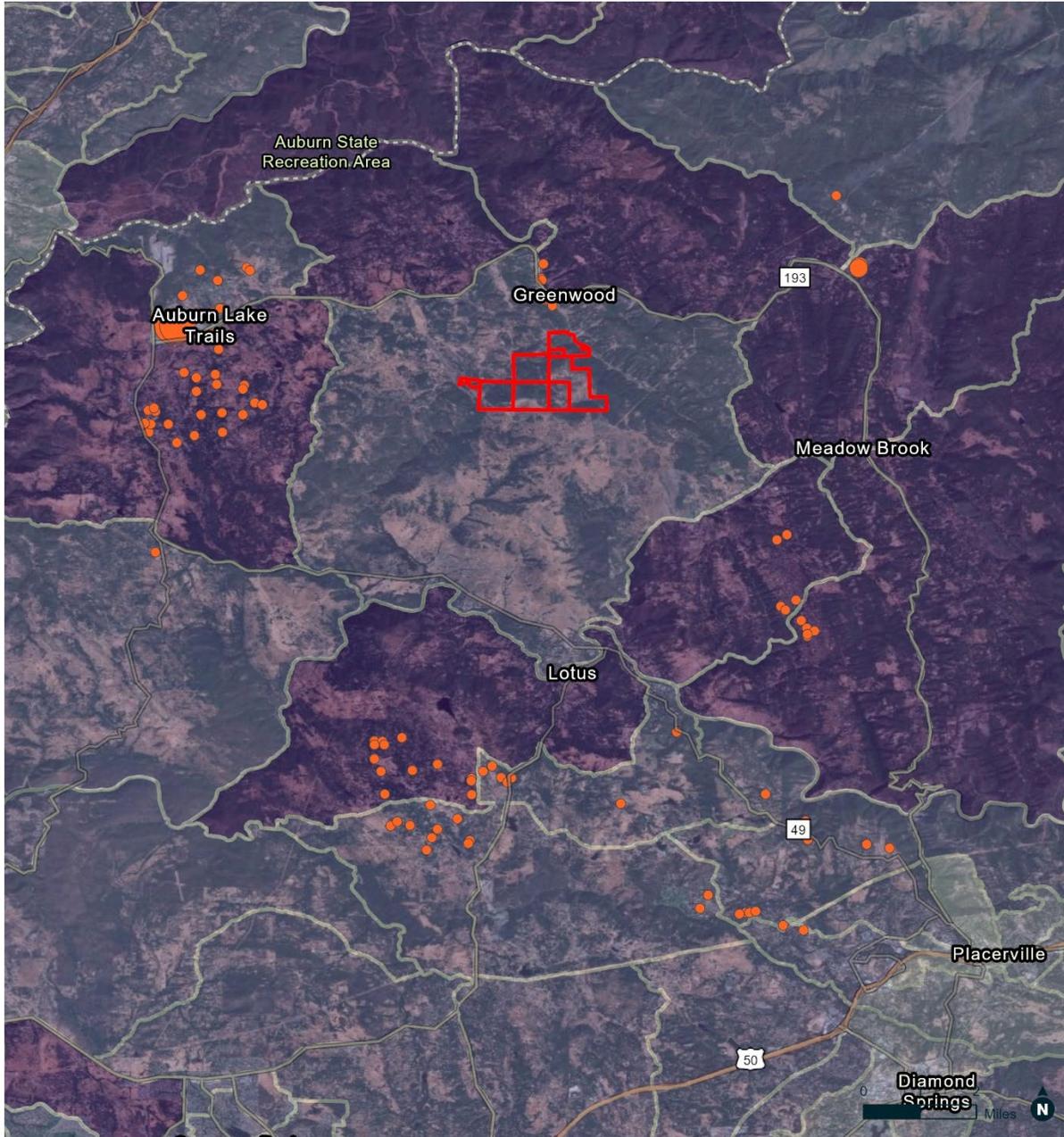
- 2,141 Above Moderate-Income units (1,991 in Western Slope, 150 in Tahoe Basin)

The County identified an adequate number of sites to meet their RHNA including a surplus of 1,183 units.

VMT Patterns of the Area

The rural and mountainous areas of El Dorado County are less VMT efficient than areas closer to the Community Regions and the southwestern portions of the county where jobs and housing are concentrated. The home-based VMT per capita of Lewis Ranch is 34.92 which is higher than the County average of 27.2, the MPO average of 23.38, and the state average of 21.32, which reflects the rural and isolated nature of the site between major employment centers.

Figure 12: Lewis Ranch VMT Context and Housing Sites



Lewis Ranch

Resident HBX VMT (Block Group)

- 0 - 15
- 15 - 20
- 20 - 25
- 25-35
- 35+

Potential Reallocation Site Unit Capacity (10 mi)

- 1 - 10
- 11 - 25
- 26 - 50
- 50+

Available Locations for Housing Development

The database used to identify possible alternative housing sites for the other case studies did not have any data available for El Dorado County at time of analysis. Instead, sites were identified by joining the APNs from El Dorado County’s Housing Sites Inventory to a spatial parcel database layer available through El Dorado County’s ArcGIS online data portal.⁷⁰

Table 25. Lewis Ranch Possible Reallocation Sites by Housing Type and VMT

	Housing Type	Sites	Total Units
Lower VMT	Low Density	19	19
	Medium Density	16	16
	High Density	9	192
	Total	44	227
Equal or Higher VMT	Low Density	28	28
	Medium Density	32	32
	High Density	3	31
	Total	63	91

If not conserved, the site would have allowed the development of 48 single family dwellings. This analysis identified 227 units at 44 sites in lower VMT areas within 10 miles. However, only 35 of those units are zoned for low or medium density. Meanwhile, within 10 miles there are 91 units at 63 sites where VMT per capita is equal to or higher than at the Lewis Ranch site, 60 units of which are at low- or moderate-density. In other words, there is more capacity for low- and medium-density development in areas with higher VMT when compared with Lewis Ranch than areas with lower VMT. This suggests that housing not developed at the Lewis Ranch site has a relatively high likelihood of instead being developed somewhere with higher VMT per capita.

VMT Analysis

Table 20 shows the daily, annual, and 30-year total home-based VMT associated with the hypothetical development of Lewis Ranch, compared to the same metrics for Alternative 1 and Alternative 2, respectively.

Table 21 shows the VMT *avoided* by conserving the Lewis Ranch land, according to the alternative hypotheses.

Both scenarios show VMT mitigation potential, though the VMT mitigation benefits of Alternative 2 in particular are quite low.

⁷⁰ <https://gis.eldoradocounty.ca.gov/mapping/rest/services/Property/Parcels/FeatureServer/0>

Table 26: Total VMT by Scenario, Timeframe

Scenario	Daily VMT	Annual VMT ¹	Over 30 years ¹
VMT of Lewis Ranch	4,023	1,428,088	42,842,650
Alternative 1 – County Average VMT	3,143	1,115,643	33,469,286
Alternative 2 – Expected VMT of available housing sites	3,756	1,333,516	40,005,490

¹ See note on Table 6

Table 27: VMT Avoided by Alternative

	Daily VMT	Annual VMT ¹	Over 30 years ¹
Alternative 1	880	312,445	9,373,363
Alternative 2	266	94,572	2,837,160

¹ See note on Table 6

Suitability for Conservation as VMT Mitigation

Lewis Ranch is not a particularly good candidate for claiming VMT mitigation as a benefit of conservation. The data on available housing sites makes it difficult to assert with any certainty that development would instead occur in a lower VMT area. Additionally, the VMT benefits, if they were to occur, are estimated to be quite modest. Furthermore, at Lewis Ranch more so than the other case studies examined, there are reasons to question whether the site would be developed absent conservation. Due to its isolation and the infrastructure investment that would be needed to accompany any building on the site, the threat of development may be lower than in locations with greater housing demand. How to establish the likelihood of development and its effect on any VMT mitigation that can be claimed via conservation is an open question.

Conclusion

Through these case studies we have identified several characteristics of parcels that make them more likely to be candidates for claiming VMT avoidance through conservation:

- Candidate conservation parcel:
 - Is within a very high VMT area
 - Has a credible development threat
- Nearby developable land:
 - Has adequate housing capacity
 - Is zoned for a similar housing type (e.g. low density)
 - Is in lower VMT areas

In evaluating the case studies to develop these criteria, we have also illustrated methods for assessing the possibility that a conserved parcel would avoid VMT. The approach presented here can be replicated by project sponsors seeking VMT mitigation through conservation of nearby land. Emerging VMT banks, exchanges, and other programs can further elaborate on these mechanisms and establish standard practices for project sponsors to evaluate parcels for conservation in order to demonstrate that it meets CEQA expectations for defensibility and enforceability. This white paper also presents a quantification methodology to calculate avoided VMT, which could also be locally customized and adopted by a VMT bank, exchange, or program manager.

The question of where housing demand goes when one parcel is removed from the development pipeline is a complex one, especially in an area of high housing need. Several of the case studies included here demonstrate that upzoning would be needed to meet the housing demands of areas near the case study parcels, but that sufficient upzoning could accommodate housing demand in such a way that realized even more VMT benefits, because high VMT areas would not be developed and VMT in low VMT areas would decrease even more due to their densification. Other case study parcels demonstrate more clearly that, if conserved, reallocated housing would be likely to occur in more VMT-efficient areas simply because most of the nearby available areas for development have lower per capita VMT patterns than the conserved parcel.

The latter offers the clearest case for claiming VMT avoidance through land conservation because there are clear existing alternatives for where to develop that have more VMT-efficient travel patterns. The former highlights the tension between the potential of land conservation as VMT mitigation, and the necessity of understanding what factors effectively encourage infill, denser development. The uncertainty around using land conservation as a VMT mitigation strategy comes from the fact that just because it is possible to develop in lower VMT areas does not mean it is easier or more profitable or more desirable to do so. Ensuring that it is comparably easy and affordable to develop in lower VMT areas is one of California's statewide goals, but considerable variation remains as to where this can be achieved and where this goal may be positively influenced by conservation. Additionally, it is too early to observe the effects of recent state legislation streamlining infill development and high-density development near transit on overall VMT patterns.

Future work in this area should explore the effects of statewide policy on where housing development is occurring: is development shifting towards lower VMT areas? Does this mean that conserving land is likely to lead to development in these lower VMT areas, or does it suggest the conserved land might not have been developed to start with due to the high VMT patterns of the area and resulting mitigation requirements? Another area for exploration is the time horizon of avoided VMT from land conservation: when can we assume the demand has shifted and been realized elsewhere? In the intervening time between parcel conservation and reallocation or development shift, the avoided VMT is greater than the "net avoided" calculation approach presented herein; should a project sponsor accrue avoided VMT credit faster in the near-term, and slower in the long-term? Finally, how might land conservation as a practical VMT mitigation strategy apply differently to development projects, which have a clear connection between the actions resulting in VMT effects and VMT mitigations (reallocation of housing from high-VMT to low-VMT areas through conservation) compared to transportation projects, which have a somewhat less direct connection between the actions resulting in VMT effects and VMT mitigations (construction of roadways intended to serve latent demand for vehicle travel or enable more vehicle travel to happen, and reducing the need for vehicle travel by reallocating development to low-VMT areas)?

As the state continues to explore ways to encourage VMT reduction, more efficient land development patterns, and the preservation of open space, conservation seems likely to play a role.