ORO VERDE
FIRE PROTECTION PLAN
Project No. PDS2014-TM-5583
Environmental Log No. PDS2014-ER-14-08-005
APN No. 241-140-02

Prepared for:

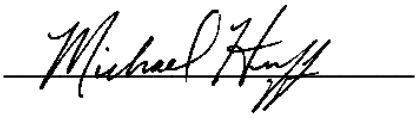
County of San Diego
Planning and Development Services
5510 Overland Avenue
San Diego, California 92123

On behalf of Applicant:

Wohlford Land Co., LLC
P.O. Box 5005 #17
Rancho Santa Fe, California 92067
Contact: Elizabeth Wohlford

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024

Preparer's Signature: 

APRIL 2017

Printed on 30% post-consumer recycled material.

TABLE OF CONTENTS

Section **Page No.**

TABLE OF CONTENTS (Continued)

Page No.

APPENDICES

FIGURES

TABLES

EXECUTIVE SUMMARY

The Oro Verde project is a proposed private residential development located on one parcel encompassing 51.2 acres within unincorporated San Diego County, California. The project is a Tentative Map (TM) proposal to subdivide the property into ten single family residential lots and one remainder open space parcel. The project is located north of Highway 78, generally, 1.5 miles east of Escondido, 3.0 miles east of Interstate 15, and roughly half mile northwest San Pasqual Valley. The entrance to nine of the ten residential lots on the Oro Verde project site will be located in the southern portion, off Diamond Ranch Road. The other residential lot (Lot #8) will be accessed via a private driveway off Vista Lucia. The proposed development will include:

- A total of ten single-family home lots
- Residential streets, driveways, fire hydrants, and associated infrastructure
- Primary ingress/egress for 9 of 10 lots off of Diamond Ranch Road and San Pasqual Valley Road with secondary ingress/egress off Oro Verde
- Primary ingress/egress for Lot #8 off of Vista Lucia to Oro Verde Road
- Fuel Modification adjacent lots next to open space areas and avocado orchards and along roadside edges where lot fuel modification is not present

The Oro Verde property lies within an area statutorily designated a State Responsibility Area (SRA) "Moderate to High Fire Hazard Severity Zones," by CAL FIRE. Fire hazard designations are based on topography, vegetation, and weather, amongst other factors with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and wildland urban interface (WUI) locations. The nearest open space areas that include very high fire hazard severity designation occur north, northwest, and east of the site towards the Valley Center and Ramona areas.

The site is surrounded on two sides by existing semi-rural neighborhoods, and to the south and east by avocado orchards. The site is currently undeveloped, disturbed and dominated by active agricultural activities. Most of the slopes and hillsides on the project site are currently under agriculture use for avocado groves. The terrain on, and within the vicinity of the project, is characterized by gentle to moderately steep slopes with the steepest gradients reaching 30%. The area, like all of San Diego County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, however, considering the site's terrain and vegetation, would be expected to result in primarily a low- to moderate-intensity wildfire.

Based upon field investigations, the Project site contains disturbed Oak Riparian Forest (dORF) in the southwest corner of the property that has been classified as County Resources Protection Ordinance (RPO) wetlands. This dORF area will have a 50-foot wide RPO buffer zone along its eastern boundary next to the FMZs. The project site is within the Rincon Del Diablo Municipal

Water District which provides fire protection via contract with the Escondido Fire Department (EFD). The EFD operates at least two fire stations that could respond to an incident on the site under 7.5 minutes travel time. In addition, automatic/mutual aid agreements are in place with neighboring fire agencies to augment response, especially at the fringe area of EFD's jurisdiction.

The project will be constructed to the ignition resistant code requirements of the County Consolidated Fire Code and the County Building Code. Construction shall include enhanced ignition resistant features, automatic interior sprinklers, appropriate fire flow and water capacity, roads, and supporting infrastructure, and fuel modification areas, as well as measures above and beyond the requirements where they are expected to compensate for modified fuel management areas. The identified non-conformities related to fuel modification are provided alternative materials and/or methods for consistency with the currently adopted codes/requirements and the secondary access achievable road widths are discussed in detail.

1 INTRODUCTION

This Fire Protection Plan (FPP) has been prepared for the proposed Oro Verde project in unincorporated San Diego County, California. The purpose of the FPP is to assess the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those impacts. As part of the assessment, this plan has considered the fire risk presented by the site including: property location and topography, geology (soils and slopes), combustible vegetation (fuel types), climatic conditions, fire history and the proposed land use and configuration. This FPP addresses water supply, access (including secondary access), structural ignitability and ignition resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies fuel modification/management zones and recommends the types and methods of treatment that will protect this project and its essential infrastructure. The FPP recommends measures that property owners will take to reduce the probability of structural ignition throughout the project.

The FPP is consistent with the San Diego County Consolidated Fire Code. Furthermore, it is consistent with the California Code of Regulations Titles 14 and 24 and State Fire and Building Codes (2013). The purpose of this plan is to generate and memorialize the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), namely the EFD. Requirements are based on site-specific characteristics and incorporate input from the project landowner (Wohlford Land Company, LLC), project planners, engineers, and architects.

1.1 Project Summary

1.1.1 Location

The Oro Verde project is located within an unincorporated portion of eastern Escondido in the San Diego County North Metro Community Planning Area (Figure 1), which is generally 1.5 miles east of Escondido city limits, 3.0 miles east of Interstate 15, and roughly half mile northwest San Pasqual Valley. More specifically, the project site is located at 2000 Oro Verde Road on an eastern slope of a ridgeline that runs north and south between San Pasqual Valley and Bear Valley. The southern portion of the project site is also 2/10 mile north of the intersection of San Pasqual Valley Road and Highway 78.

The project site is located in Sections 19 of Township 12 South, Range 1 West on the U.S. Geographical Survey (USGS), 7.5-minute Escondido quadrangle map. The Oro Verde project is located on the following Assessor Parcel Number: 241-140-02. The property lies within the State Responsibility Area (SRA), Moderate to High Fire Hazard Severity Zones, as statutorily designated by the Escondido Fire Department in cooperation with CAL FIRE (CAL FIRE 2013).

The areas to the north, northwest, and east of the project site are designated Very High Fire Hazard Severity Zones.

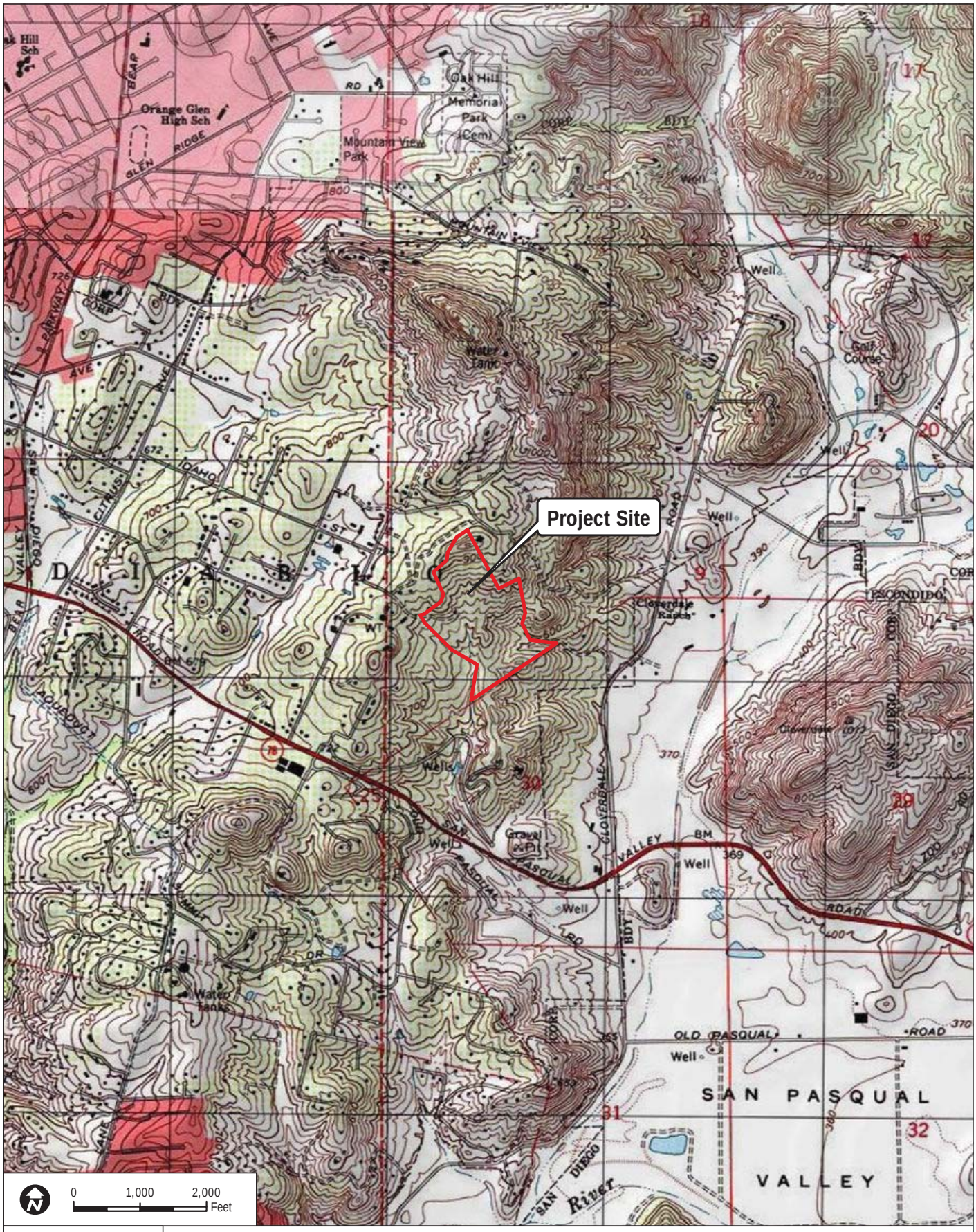
1.1.2 Project Description

The Oro Verde project includes a tentative map proposal of a single 51.2 acre parcel (APN No. 241-140-02-00). The proposal includes subdividing the parcel into ten residential lots, with an additional remainder parcel that is currently graded for a single family development. The proposed lots range in size from 2.0 acres to 8.6 acres. Development of the ten lots would involve balanced cut and fill of 26,000 cubic yards of material. Figure 2 provides project location and layout.

The property will be fully subdivided with no common areas. Road and driveways will be private and will be maintained by a home owners association (HOA). The main access point to the site is provided through Diamond Ranch Road in the southwestern most point of the project site. This private road connects to Old Pasqual Road, a public right-of-way directly connected to SR-78. Secondary access to the site is provided via an improved Oro Verde Road, a private road that connects to the northwestern corner of the project site. The owner has been asked to expand the pavement within the existing private road easement and travel way. Access to Lot #8 will be provided via a private driveway off of Vista Lucia, which connects to Oro Verde Road.

Approximately 0.97 acres of the project site is designated as an open space easement that has been granted to the County of San Diego. The existing site consists of an active avocado grove on an eastern hillside. The project site is subject to the General Plan Regional Category Semi Rural, Land Use Designation (SR-2) Semi Rural Residential. Zoning for the site is A70, Limited, Agricultural Designation with 1-acre minimum lot size. Lot sizes for the project range from 2 to 6.5 acres with most of the lot retained as avocado groves. Avocado trees may remain on-site after grading, and if so, will be maintained in perpetuity by future property owners as a part of each individual lot. This FPP includes language that will be integrated into the HOA CC&R's that will require any trees that decline and die to be removed.

Appendix A provides photographs of the site in its current, undeveloped condition as well as the off-site land uses.



DUDEK

SOURCE: USGS 7.5-Minute Series Escondido Quadrangle.

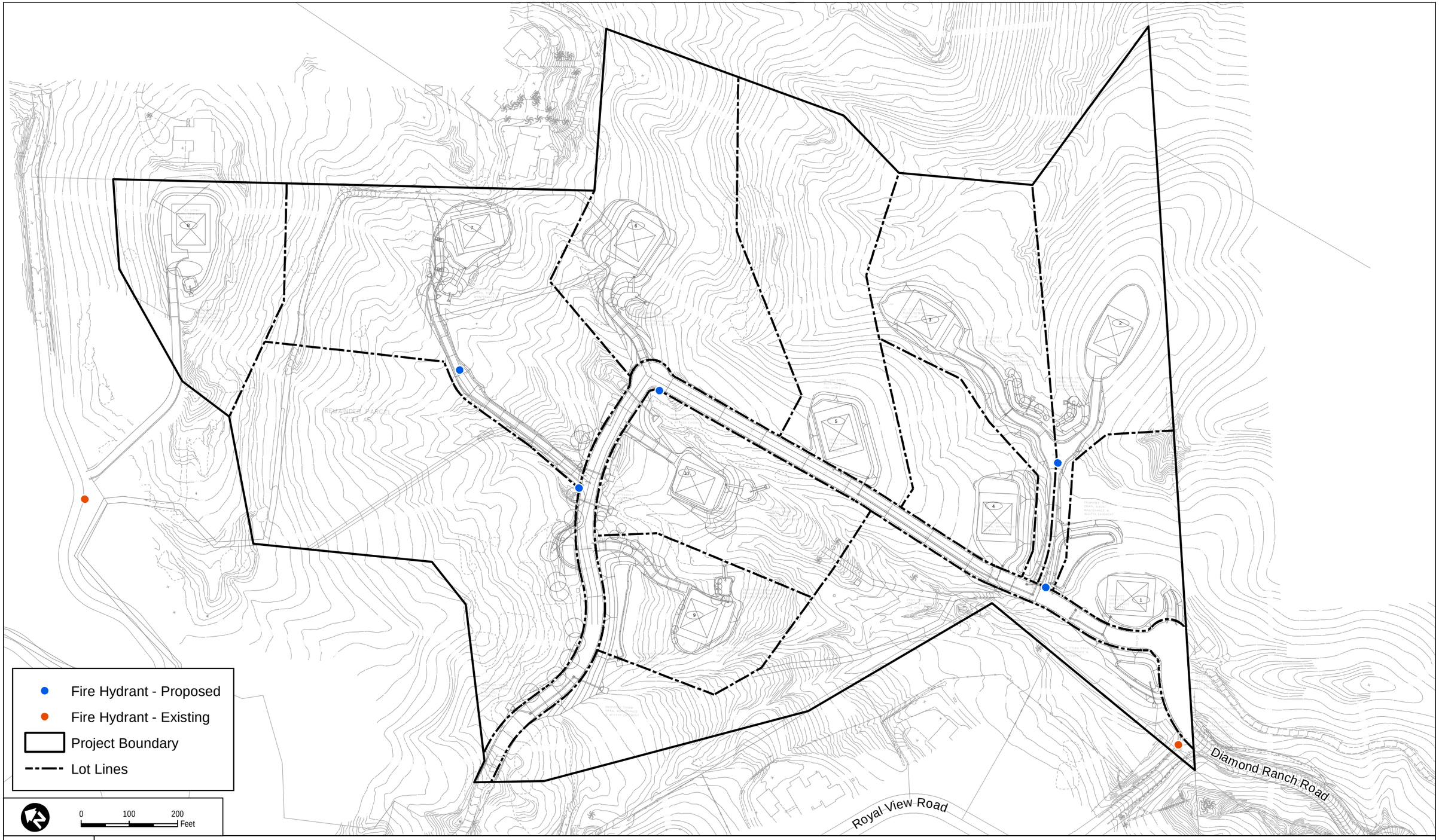
FIGURE 1

Vicinity Map

8128

Oro Verde - Fire Protection Plan

INTENTIONALLY LEFT BLANK



DUDEK

SOURCE: Hunsaker & Associates 2014

FIGURE 2

Site Plan

8128

Oro Verde - Fire Protection Plan

INTENTIONALLY LEFT BLANK

1.1.3 Environmental Setting

Dudek conducted a site evaluation on January 24, 2014. The site inspection included:

- Topography evaluation
- Vegetation/fuel assessments
- Existing infrastructure evaluations
- Documentation of the existing condition
- Off-site, adjacent property fuel and topography conditions
- Surrounding land use confirmations
- Necessary fire behavior modeling data collection

1.1.3.1 Topography

The Oro Verde project site consists of gentle to moderately steep slopes and hillsides sloping generally south from a ridgeline that runs north and south between San Pasqual Valley and Bear Valley. The slopes and hillsides on most of the project site support active avocado groves. Avocado orchards also extend northward, eastward, and southward beyond the property boundary for approximately 1/2 mile with wildland fuels (chaparral), semi-rural residential communities, and more agriculture beyond that. Several small drainages with running water from intensive, grove irrigation occur on the project site (Dudek 2013). The largest drainage is located in the southwest corner of the property and drains south towards Diamond Ranch Road. This drainage which consists of disturbed oak riparian forest (dORF) is classified as RPO wetlands based on its vegetation and water flow. The dORF area will have a 50 feet wide RPO buffer zone delineated along its eastern boundary and facing the proposed development. Much of the site is traversable on dirt roads that provide access to the avocado groves. Elevations on the site range from approximately 570 feet above mean sea level (amsl) in the southeast portion of the property to 980 feet amsl on the hilltop in the northern corner.

The avocado operation is the primary influence on vegetation that occurs on site. Absent the grove, the site's soils would influence the type of vegetation that establishes and thrives. Four soil types occur within the site: VSE_2 (Vista coarse sandy loam, 15–30% slopes, eroded), VSD (Vista coarse sandy loam, 9–15% slopes), FaC (Fallbrook sandy loam, 5–9% slopes), and RaC (Ramona sandy loam, 5–9% slopes). These soil series consist of shallow to moderately deep sandy or silt loams. The vegetation on the project site is chiefly avocado groves (Bowman 1973).

1.1.3.2 Fuels

Vegetative fuels on site are characteristic of an agricultural/avocado growing operation surrounded on three sides by semi-urban, disturbed sites. Based on the project's biological letter report (Dudek Bio Res Memo 2013), there are a total of six vegetation communities and land cover types within the Project site boundaries, including developed, disturbed habitat, disturbed oak riparian forest, herbaceous wetland, orchard, and ornamental (Figure 3). Of the six vegetation communities and land cover types that occur on site, two (orchard and disturbed Oak Riparian Forest) were used to model potential fire behavior. Additionally, two ground cover types (ornamental vegetation and coastal sage scrub) that border the proposed development were also evaluated for wildfire behavior. The following descriptions provide an overview of the ground cover types and are a component for determining the associated fuel model used in fire behavior modeling.

Developed

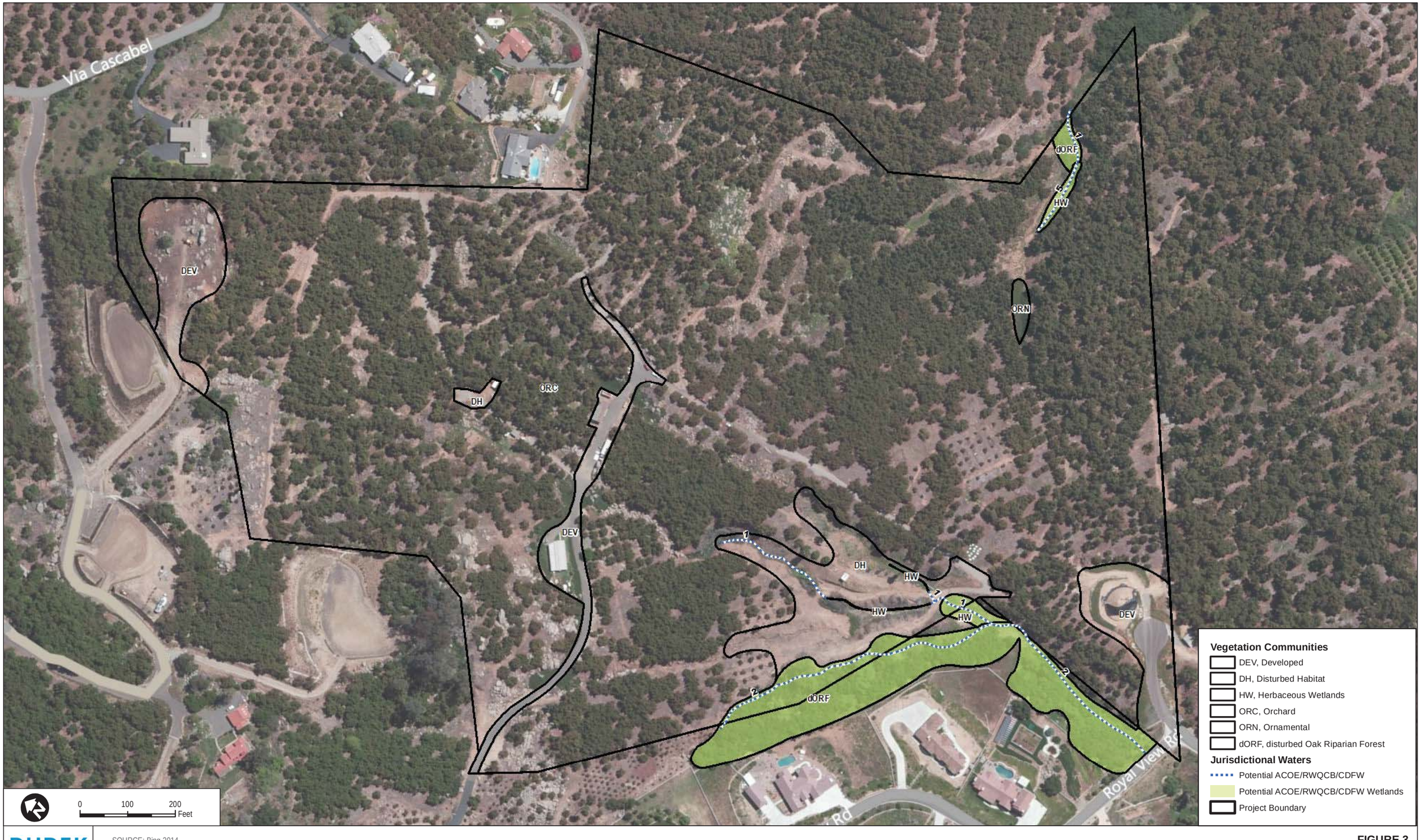
Developed land consists of buildings, structures, gravel or paved roads, and maintained areas. Developed areas do not support native vegetation. Within the Project Area, developed includes paved roads and structures associated with avocado agriculture. Developed areas also include the pads and areas that were approved for development under prior discretionary actions. A total of 1.9 acres of developed land occurs on site.

Disturbed Habitat

Disturbed habitat refers to areas that are not developed, yet lack vegetation, and generally are the result of severe or repeated mechanical perturbation (Holland 1986). Disturbed habitat within the Project Area is dominated by doveweed (*Croton setiger*) and bare ground. Disturbed habitat occurs on 3.2 acres within the eastern region of the Project Area and is adjacent to herbaceous wetlands.

Disturbed Oak Riparian Forest

According to Holland (1986), coast live oak riparian woodland is an open to locally dense evergreen sclerophyllous riparian woodland dominated by a single evergreen species: coast live oak (*Quercus agrifolia*). The shrub layer is poorly developed, but may include tarragon (*Artemisia douglasiana*), toyon (*Heteromeles arbutifolia*), pink honeysuckle (*Lonicera hispidula*), or Mexican elderberry (*Sambucus mexicana*). The herb component more richly developed than other riparian communities (Holland 1986).



DUDEK

SOURCE: Bing 2014

FIGURE 3

Vegetation Map

8128

Oro Verde - Fire Protection Plan

INTENTIONALLY LEFT BLANK

A disturbed form of this vegetation community is found within the Project Area on 2.5 acres, and is dominated by coast live oak, giant reed (*Arundo donax*), eucalyptus (*Eucalyptus* sp.), peppertrees (*Schinus molle, S. terebrinthus*), canyon live oak (*Quercus chrysolepis*), castorbean (*Ricinuns commnis*), Goodding's willow (*Salix gooddingii*), and Washington fan palm (*Washingtonia robusta*). Disturbed oak riparian forest occurs along the eastern boundary and in the southwest corner.

Herbaceous Wetland

Although not recognized by Holland (1986), herbaceous wetland is an herbaceous vegetation community that is frequently flooded and results in the accumulation of rich and peaty soils. This vegetation community is generally dominated by tall perennial, emergent monocots such as southern cattail (*Typha domingensis*) and tule (*Scirpus* sp.).

Within the Project Area, herbaceous wetland is dominated by mat amaranth (*Amaranthus blitoides*), southern cattail, palm (*Washingtonia* sp.), tamarisk (*Tamarix* sp.), tall flatsedge (*Cyperus eragrostis*), Malabar sprangletop (*Leptochloa fusca*), and barnyardgrass (*Echinochloa crus-galli*). The total area of herbaceous wetland in the project area is approximately 0.2 acre.

Orchard

Although not recognized by Holland (1986), the orchard land cover type is characterized by various plantings of fruit and other edible plant species that are planted for food production. Within the Project Area, areas mapped as orchard are dominated by avocados and occupy a majority of the Project Area. Orchards on this site includes well-maintained, avocado groves that are dominated by avocado trees (*Persea americana*). A 4-inch-deep leaf layer occurs predominately underneath the dense, canopies of the trees. Fires typically run through the surface litter and not through the tree canopy, because avocados are regularly pruned and kept hydrated. The total area of avocado groves is 45.5 acres.

Diegan Coastal Sage Scrub (Off Site)

Diegan coastal sage scrub is one of the two major shrub types that occur in San Diego County. This habitat type occupies xeric sites characterized by shallow soils. Diegan coastal sage scrub is dominated by subshrubs whose leaves abscise during drought. The Diegan coastal sage scrub on site contains California sagebrush (*Artemisia californica*), buckwheat (*Eriogonum fasciculatum*), and doveweed. Small patches (less than 2 acres) of Diegan coastal sage scrub occurs on vacant property adjacent to residential neighborhoods and drainages bordering on the west and southwest side of the project site.

Ornamental Vegetation (Off Site)

Southern California's climate is capable of supporting many types of ornamental landscape plant material (evergreen and deciduous). There is diversity in terms of structure, height, and density of these plants. The ornamental landscape exists because of humans, and in most cases it is dependent upon humans to be irrigated and maintained. An ornamental landscape will commonly blend into native habitat. This vegetation type is usually planned and regularly maintained (pruned, watered, and removal of dead plants). However, not all ornamental landscapes are considered fire safe. For example, a landscape that is poorly maintained, or is planted too densely may be compromised, and therefore, become more flammable. This vegetation type occurs as front or back yards around the homes in the north, west, and south of the project site.

1.1.3.3 Fuel Model Assignments

The area proposed for development will be converted to roads, structures, and landscape vegetation following project completion. Vegetative fuels within proposed fuel modification zones will be converted from existing fuels to maintained, irrigated landscape plantings and not including highly flammable plants. Table 1 provides a summary of the vegetation and fuel types observed on- and off-site, as well as corresponding fuel model assignments. Figure 3 presents vegetation distribution within and surrounding the proposed development. Appendix A provides photographs of the site and its vegetative fuels.

Table 1
Observed On-and Off-Site Vegetative Fuels used for Fire Modeling

Vegetation Type	Location	Fuel Model Assignment
Avocado Orchards	Slopes and hillsides on most of project site and bordering property on north, east, and south sides.	9
Diegan Coastal Sage Scrub	Vacant properties and drainages to the west and southwest of project site	Sh2
Disturbed Oak Riparian Forest	Drainages in the west and southwest.	10
Ornamental Vegetation	Adjacent to project site along western, southern, and eastern boundaries of site.	10

1.1.3.4 Fuel Loads

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in Chapter 3 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (leaf size, branching patterns),

and overall fuel loading. For example, the native shrub species that compose the sage scrub plant communities on site are considered to exhibit higher potential hazard based on such criteria.

The importance of vegetative cover on fire suppression efforts is its role in affecting fire behavior. For example, while fires burning in grasslands may exhibit lower flame lengths than those burning in sage scrub fuels, fire spread rates in grasslands are often much more rapid than those in other vegetation types.

1.1.3.5 Fire History

Fire history is an important component of a Project FPP. Fire history information can provide an understanding of fire frequency, fire type, most vulnerable project areas, and significant ignition sources, amongst others. Fire frequency, behavior, and ignition sources are important for fire response and planning purposes. One important use for this information is as a tool for pre-planning. It is advantageous to know which areas may have burned recently and, therefore, may provide a tactical defense position, what type of fire burned on the site, and how a fire may spread. According to available data from CAL FIRE's Fire and Resource Assessment Program (CAL FIRE 2014), numerous fires have burned in the vicinity of the project site since the beginning of the historical fire data record (Appendix B). These fires, occurring in 1912, 1914, 1919, 1938, 1946, 1952, 1955, 1967, 1972, 1974, 1975, 1979, 1980 1987, 1988, 1989, 1993, 1997, 2003, 2004, and 2007 burned within 3 miles of the project site. The 1974 fire (unnamed) burned 67 acres outside the project area near its southeast corner. The 2007 Witch Fire, which burned approximately 1 mile to the south of the project site, was the most recent, and largest wildfire in the vicinity of the project, with a total burned area of over 160,000 acres.

Based on an analysis of this fire history data set, specifically the years in which the fires burned, the average interval between wildfires burning within a 3-mile radius of the project site was calculated to be 4.1 years with intervals ranging between 0 (multiple fires in the same year) and 19 years. Based on this analysis, the area is expected to be subject to regular, wide-spread wildfire, but may include smaller fires during typical weather conditions and has the potential for larger wildfires during extreme weather conditions. Based on fire history, wildfire risk for the project site is associated primarily with a Santa Ana wind-driven wildfire burning or spotting onto the site from the east, although a fire approaching from the west during more typical on-shore weather patterns is possible.

1.1.3.6 Climate

North San Diego County and the project area are influenced by the Pacific Ocean and are frequently under the influence of a seasonal, migratory subtropical high pressure cell known as the "Pacific High." Wet winters and dry summers with mild seasonal changes characterize the

Southern California climate. This climate pattern is occasionally interrupted by extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds. The average high temperature for the project area is approximately 70°F, with daily highs in the summer and early fall months (July–October) exceeding 95°F. Precipitation typically occurs between December and March.

The prevailing wind pattern is from the west (on-shore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea) and at night winds are from the northeast (land), averaging 2 miles per hour (mph). During the summer season, the diurnal winds may average slightly higher (approximately 16 mph) than the winds during the winter season due to greater pressure gradient forces. Surface winds can also be influenced locally by topography and slope variations. The highest wind velocities are associated with downslope, canyon, and Santa Ana winds.

Typically the highest fire danger is produced by the high-pressure systems that occur in the Great Basin, which result in the Santa Ana winds of Southern California. Sustained wind speeds recorded during recent major fires in San Diego County exceeded 30 mph and may exceed 50 mph during extreme conditions. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis during late summer and early fall. Santa Ana winds are warm winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of canyons and dissipate as they spread across valley floors. Santa Ana winds generally coincide with the regional drought period and the period of highest fire danger. The Oro Verde site is affected by strong winds, such as Santa Ana's.

1.1.3.7 Current Land Use

The site is characterized by active agriculture, and is nearly completely disturbed by human activities. The site's slopes and hillsides are well-maintained avocado groves and are subject to frequent irrigation. The non-native grasses within the disturbed areas adjacent to RPO wetlands are cut annually. On-site roads provide access to orchards, staged agricultural materials, and bee hives. Existing power lines traverse across the hillsides to the north, west and east of the property.

1.1.3.8 Proposed Land Use

The project, as proposed, will include:

- 10 single family residential lots
- 1 open space lot
- Streets, fire hydrants, and associated infrastructure

- Secondary ingress/egress route for nine of ten lots through existing, private drive "A" off Oro Verde Road
- Primary access road to nine of ten lots extending from Hwy 78 to Diamond Ranch Road into the property
- Primary access road to Lot #8 via a private driveway off of Vista Lucia, which connects to Oro Verde Road

The proposed land use improvements described above would be completed according to the San Diego County Consolidated Fire Code and the County Building Code in effect at the time of building plan submittal and would include ignition-resistive construction, interior sprinklers, required fire flow, and a designated fuel modification area, among other requirements as described further in this FPP.

INTENTIONALLY LEFT BLANK

2 DETERMINATION OF PROJECT EFFECTS

FPPs provide an evaluation of the adverse environmental effects a proposed project may have from wildland fire. The FPP must provide mitigation for identified impacts to ensure that development projects do not unnecessarily expose people or structures to a significant loss, injury or death involving wildland fires. Significance is determined by answering the following guidelines:

Would the project expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

The wildland fire risk in the vicinity of the Project site has been analyzed and it has been determined that wildfires may occur in wildland areas to the east and south of the project site as well as potentially in the preserved on-site fuels, but would not be significantly increased in frequency, duration, or size with the construction of the Project. The Project would include maintenance of the avocado groves that currently exist and/or conversion of these areas to maintained urban development with designated landscaping and fuel modification areas.

The types of potential ignition sources that currently exist in the area include vehicle and roadway, electrical transmission line, and machinery associated with agricultural operations and off-site residential neighborhoods. The project would introduce potential ignition sources, but would also include conversion of fuels to lower flammability landscape and include better access throughout the site, managed and maintained landscapes, more eyes and ears on the ground, and generally a reduction in the receptiveness of the areas landscape to ignition. Fires from off-site would not have continuous fuels across this site and would therefore be expected to burn around and/or over the site via spotting. Preserved, Avocado Orchards that are either on-site or adjacent to the project site are typically well-maintained and hydrated. However, the leaf litter fuels can ignite and burn during extreme conditions. Burning vegetation embers may land on Project structures, but are not likely to result in ignition based on ember decay rates and the types of non-combustible and ignition resistant materials that will be used on site.

The Project would comply with applicable fire and building codes and would include a layered fire protection system designed to current codes and inclusive of site-specific measures that will result in a Project that is less susceptible to wildfire than surrounding landscapes and that would facilitate fire fighter and medical aid response.

Would the project result in inadequate emergency access?

The Project includes fire access throughout the development and is consistent with the County Consolidated Fire Code. Fire apparatus access throughout the development (for nine

of ten lots) will include 24-foot-wide roads (Private Drive "A"). Access to Lot #8 will be provided from an existing 24 foot wide road (Vista Lucia). The driveway from the property to Vista Lucia will be graded to 24 feet width and improved to 20 feet wide with asphalt concrete pavement over approved base. Existing pavement may remain where the road conforms with vertical and horizontal design criteria (County Private Road Standards). Fire access on the Project site will be improved from its current condition, which provides only limited access on dirt/gravel roads. The on-site roadways include dead ends that are inclusive of cul-de-sacs or fire apparatus turnarounds meeting County and EFD requirements. In addition, access is provided at a remote location from the primary access, and strategically enabling faster access for responders from Fire Stations 2 and 4, which are roughly four miles from this site via Oro Verde Road, which will be improved from its current condition. Roads will conform with surface, width, turning radius, and vertical clearance Code requirements for access, with an exception for an existing portion of Oro Verde Road which has an existing road easement width of 20 feet. An exception to Private Road Standards will need to be approved by the County and the EFD to allow for a reduction of the improvements within this section of Oro Verde Rd., which will include a minimum 18.5 feet width with transitions to 24 feet, as discussed in detail in this FPP. Therefore, access is considered to meet the intent of the code and provide an improvement to current conditions for neighboring property owners.

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance service ratios, response times or other performance objectives for fire protection?

The Project is projected to add an estimated fewer than three calls per year to the Escondido Fire Department's existing call load. This estimate is a conservative estimate in that it uses San Diego County wide data, which incorporates call volumes from typically higher volume areas than would be expected from this site. The primary response (first in) would be provided by Station 4. The addition of 3 calls per year to an urban fire station that currently responds to approximately 80 calls per month is considered insignificant and will not require the construction of additional Fire Station facilities based on that increase alone. For perspective, urban fire stations that respond to five calls per day are considered average and 10 calls per day would be considered a busy station. A portion of the project's parcel tax revenue will be allocated to fire protection, which can be used to maintain current levels of protection without impacting existing citizens.

Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

The project will be served by the City of Escondido and sufficient water supplies will be available to serve the project from existing entitlements and resources. The City requires new development to meet a 2500 gpm fire flow with pressures in the development to remain above 20 psi when meeting the fire requirements. One hydrant adjacent to Lot 7 is calculated by the project's hydrological engineer to flow at less than 2,500 gpm based on the current water supply system. There may be an interim period where one hydrant will be able to produce 1,500 gpm at 15 psi or 1,000 gpm at 20 psi and the sprinkler system to one structure (Lot 7) will require a supplemental pump and backup power source. This condition may not be required, depending on the timing of a new reservoir (not related to this project) that will increase pressures throughout the site, but specifically will mitigate for Lot 7 and result in its compliance with requirements absent the supplemental pump.

The measures described in the responses to these significance questions are provided more detail in the following sections.

INTENTIONALLY LEFT BLANK

3 ANTICIPATED FIRE BEHAVIOR

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected on this site given characteristic site features such as topography, vegetation, and weather. Results are provided below and a more detailed presentation of the modeling inputs and results is provided in Appendix C.

3.1.1 Fuel Models

Fuel Models are simply tools to help fire experts realistically estimate fire behavior for a vegetation type. Fuel models are selected by their vegetation type; fuel stratum most likely to carry the fire; and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that surround the proposed development. The vegetation types are represented primarily by four fuel models as shown in Table 2. Other fuel models may exist, but not at quantities that significantly influence fire behavior in and around the proposed development. Fuel models were selected from *Standard Fire Behavior Fuel Models: a Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* (Scott and Burgan 2005).

3.1.2 Fuel Model Output Results

Focused fire behavior modeling utilizing BehavePlus 5.0.5 was conducted for the project site. A more detailed discussion of the BehavePlus analysis, including weather input variables, is presented in Appendix C Fuel model typing was completed in the field concurrent with site hazard evaluations. Based on field analysis, four different fire scenarios were evaluated for the Oro Verde project site.

- **Scenario 1:** Summer fire weather with on-shore winds and fire burning in downslope on the hillsides covered with ornamental vegetation and oak riparian forest that is a natural buffer adjacent to proposed development areas in the western portion of the project site
- **Scenario 2:** Summer fire weather with on-shore winds and fire burning upslope in adjacent ornamental vegetation and small patches of Sage scrub west and southwest of the project boundary.
- **Scenario 3:** Peak fire weather with off-shore, Santa Ana winds and fire burning upslope on the hillsides covered with avocado and citrus orchards in southern portion of proposed development.
- **Scenario 4:** Peak fire weather with off-shore, Santa Ana winds and fire burning upslope on the hillsides covered with avocado and citrus orchards along eastern and northeastern boundary of proposed development.

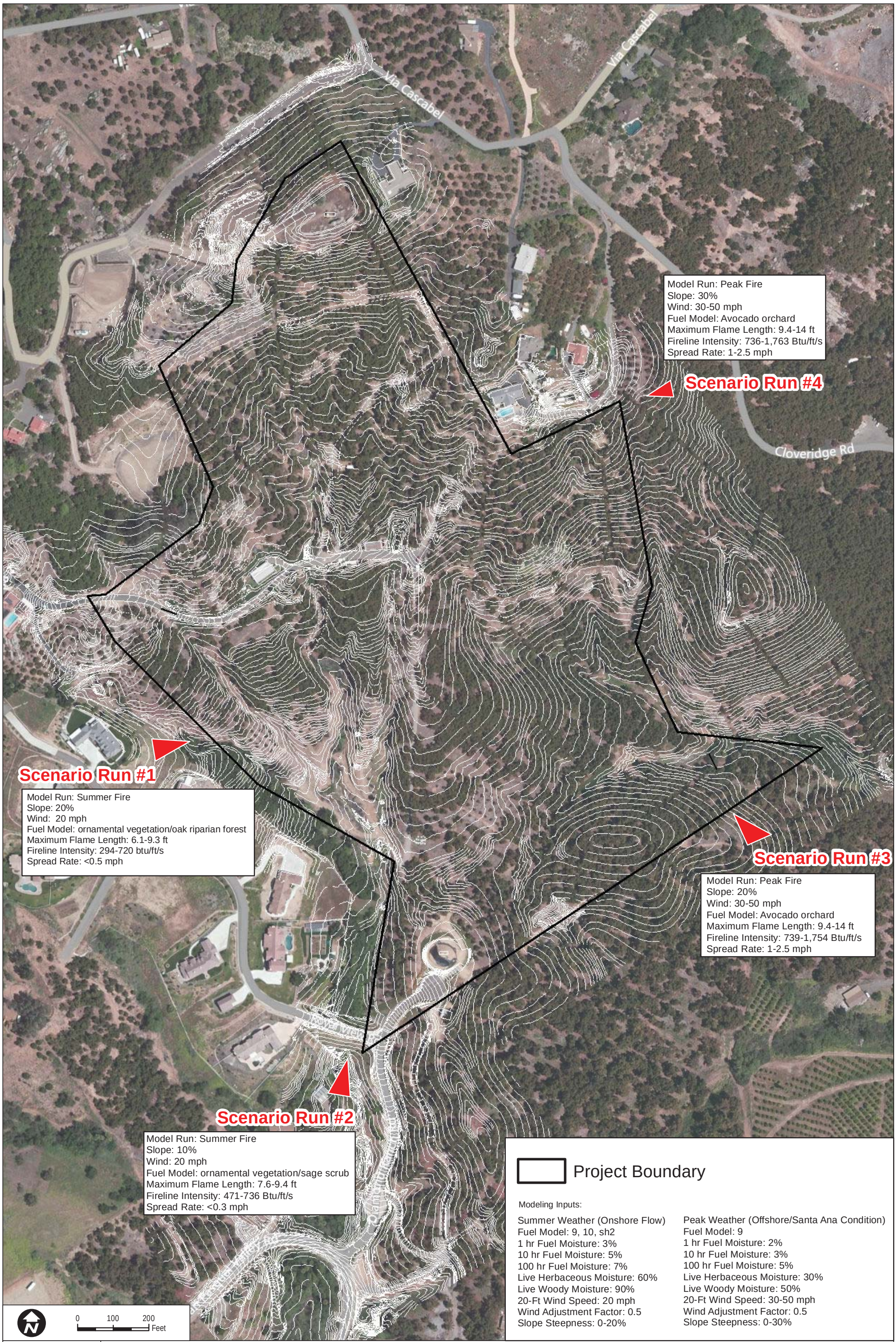
The unique terrain and fuel models used for BehavePlus modeling for the Oro Verde project site are presented in Table 2. Locations of BehavePlus model runs are presented graphically in Figure 4. Based on the BehavePlus analysis, worst-case fire behavior is expected in extreme wind-driven fires (represented by Scenarios 3 and 4) from the east of the proposed development area. Under such conditions, expected surface flame lengths reach 14 feet during peak weather conditions with wind speeds of 40+ mph. Under this scenario, fireline intensities can reach 1,763 BTU/feet/second with moderate spread rates of 2.5 mph. This scenario is considered a rare occurrence based on the lack of recorded wildfires in the area, the heavy shading under the avocado canopies, the minimal leaf litter underneath the citrus canopies, and the post-project construction conversion of available vegetative and other fuels to lower flammability urban landscapes. Fires burning from the southwest or west of the proposed development area and pushed by on-shore winds (summer weather) exhibit less severe fire behavior, with flame lengths reaching nine feet, fireline intensities reaching 720 BTU/feet/second and a spread rate reaching less than 0.5 mph. The results from all BehavePlus fire behavior modeling scenarios are presented in Table 3.

Table 2
Oro Verde Fire Behavior Model Variables

Scenario	Weather	Fuel Model(s)	Slope	Aspect
1	Summer (On-shore)	Ornamental vegetation/Oak Riparian Forest (9,10)	20%	East
2	Summer (On-shore)	Ornamental vegetation/Sage Scrub (10,sh2)	10%	South/Flat
3	Peak (Santa Ana)	Orchards (9)	20%	South
4	Peak (Santa Ana)	Orchards (9)	30%	South/East

Table 3
Oro Verde BehavePlus Fire Behavior Model Results

Scenarios	Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Surface Rate of Spread (mph)
1 (Summer fire in ornamental vegetation/oak riparian forest fuels; 20% slope; 20 mph winds; downslope)	6.1 to 9.3	294 to 720	< 0.5
2 (Summer fire in ornamental vegetation/Sage scrub fuels; 10% slope; 20 mph winds; upslope)	7.6 to 9.4	471 to 736	< 0.3
3 (Peak fire in avocado orchard fuels; 20% slope; 30–50 mph winds; upslope)	9.4 to 14	739 to 1,754	1 to 2.5
4 (Peak fire in avocado orchard fuels; 30% slope; 30–50 mph winds; upslope)	9.4 to 14	736 to 1,763	1 to 2.5



DUDEK

SOURCE: Bing 2014

FIGURE 4

Fire Behave Analysis Map

8128

Oro Verde - Fire Protection Plan

INTENTIONALLY LEFT BLANK

The results presented in Table 3 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

3.2 On-Site Risk Assessment

Given the lack of wildfire history on the site, the history of wildfire in the vicinity of the site, combined with the post-project vegetation conversion, potential ignition sources, and anticipated fire behavior, the project is not expected to be vulnerable to recurring wildfire ignition and spread, but may be subject to nearby wildfire that could, under worst-case conditions, spread into the Avocado groves or from burning embers landing in receptive, ornamental landscape fuels. Fire is not expected to have readily ignitable fuels in the post-project landscape. Should the avocado orchards or ornamental vegetation ignite, it would be expected to burn in a spotty manner due to the presence of heavy shading and hydrated fuels.

INTENTIONALLY LEFT BLANK

4 ANALYSIS OF PROJECT EFFECTS

4.1 Adequate Emergency Services

4.1.1 Emergency Response

The project site is located within Rincon Del Diablo Municipal Water District which provides fire protection via contract with the Escondido Fire Department (EFD). EFD Station 4, staffed 24/7 with career firefighters, would provide initial response. Station 4 is located at 3301 Bear Valley Parkway, approximately 4.3 miles, southwest, from the site. The station is staffed by three captains, three engineers, three firefighters and paramedics, for a total staffing of nine positions (covering 3 shifts). It is equipped with one Type 1 engine and one Type 3 brush engine. EFD Station 4 is approximately 4 miles to most of the site and the emergency vehicles can respond within seven minutes travel time.

Within the area's emergency services system, fire and emergency medical services are provided by Fire Departments (Escondido Fire Department), or Fire Protection Districts, County Service Areas (CSA) and CAL FIRE. Generally, each agency is responsible for structural fire protection and wildland fire protection within their area of responsibility. However, mutual aid agreements enable non-lead fire agencies to respond to fire emergencies outside their district boundaries. In the project area, fire agencies cooperate on a statewide master mutual aid agreement for wildland fires and there are mutual aid agreements in place with neighboring fire agencies (north zone agencies) and typically include interdependencies that exist among the region's fire protection agencies for structural and medical responses, but are primarily associated with the peripheral "edges" of each agency's boundary. These agreements are voluntary, as no local governmental agency can exert authority over another.

With 7 stations and a service area of 50 square miles and roughly 117 full time safety staff, the EFD is well equipped for the type of responses it routinely responds to within its jurisdiction and which would be generated by the Oro Verde project.

4.1.1.1 Emergency Service Level

Using San Diego County and City of Escondido fire agencies' calculated 82 annual calls per 1,000 population, the project's estimated 37 residents (calculated based on 3.12 persons per dwelling; SANDAG 2013), would generate up to three calls per year (roughly 1 call per month), most of which would be expected to be medical-related calls, consistent with typical emergency call statistics. These estimates are likely overly conservative due to the per capita call factors, which are based on an average of all demographics and sociological populations, including dense, urban areas which, on average, result in higher call volumes. A development, like Oro Verde, would typically include a demographic that results in fewer calls, per capita, resulting in an overly conservative estimate.

Service level requirements are not expected to be significantly impacted with the increase of less than three calls per year for a station (EFD Station 4) that currently responds to roughly 3 calls per day (averaging 912 calls per year, 76 calls per month, 19 calls per week) in its primary service area. For reference, a station that responds to 5 calls per day in an urban setting is considered average and 10 calls per day is considered busy. Therefore, the project is not expected to cause a decline in the emergency response times. EFD responds to roughly 13,000 calls per year from its 7 stations. Additional response, rounding out the effective firefighting force (the manpower needed to effectively fight a structure fire and/or respond to serious medical emergency) would be provided by Stations 1, 2, 5,and 7.

4.1.2 Emergency Response and Service

4.1.2.1 Emergency Response

EFD provides initial response to the project site. The EFD operates several Fire Stations that could respond to an incident at the Oro Verde site, although primary response would be from Station 2 or 4 (2 is closer, but modeling indicates Station 4 may arrive faster). The City of Escondido's Quality of Life Standard is to response to all priority Level One or Emergency type calls within 7 minutes and 30 seconds, a total of 90% of the time. In 2012, EFD's response time for all stations was 6 minutes and 32 seconds for all urgent calls. Response to the project from nearby fire stations will be well below the response time standard for first arriving. Response from Station 4 is calculated at roughly 7 minutes to most of the site. The full effective firefighting force is estimated to arrive within 8 minutes. Therefore, the project complies with the City's response time standards. Further, the requirements described in this FPP are intended to aid firefighting personnel and minimize the demand placed on the existing emergency service system.

Table 4 presents a summary of the location, equipment, staffing levels, maximum travel distance, and travel time for the EFD stations responding to the project. Travel distances are derived from SANGIS Geographic Information System (GIS) road data while travel times are calculated using response speeds of 35 mph, consistent with nationally recognized NFPA 1710 and Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard and do not include turnout time.

Table 4
Escondido Fire Department Responding Stations Summary

Station	Location	Equipment	Staffing	Maximum Travel Distance*	Travel Time**
Station 1	310 North Quince Escondido, California 92029	Paramedic Engine Truck Company Brush Engine Ambulance	27	4.9 miles	9 minutes

Table 4
Escondido Fire Department Responding Stations Summary

Station	Location	Equipment	Staffing	Maximum Travel Distance*	Travel Time**
Station 2	421 North Midway Escondido, California 92029	Type 1 Engine Brush Engine Ambulance	9	4.1miles	7 minutes
Station 4	3301 Bear Valley Parkway Escondido, California 92029	Type 1 Engine Brush Engine	9	4.3miles	7.4 minutes
Station 5	2319 Felicita Road Escondido, California 92029	Type 1 Engine Brush Engine Ambulance (June 2013)	15	4.7 miles	8.1 minutes
Station 7	1220 North Ash Escondido, California 92029	Type 1 Engine Ambulance	9	4.9 miles.	8.4 minutes

* Distance measured to most remote portion of site from access point at Diamond Ranch Road and San Pasqual Valley Road (Hwy 78)
** Assumes travel to the primary project's north end, a 35 mph travel speed, and does not include turnout time

Based on the Oro Verde site location in relation to existing EFD stations, travel time to the site for the first responding engine from Station 4 to the most remote area of the project is within 7.0 minutes. Secondary response would arrive in approximately 8 minutes from Stations 1, 2, 5, and 7. All response calculations are based on an average response speed of 35 mph, consistent with nationally recognized NFPA 1710. Based on these calculations, emergencies within the project can be responded to by EFD's first arriving unit (average maximum initial response of no more than 7 1/2 minutes, 90% of calls in accordance with the City's standard).

The San Diego County General Plan utilizes a 5 minute response time goal for urban areas and up to a 20 minute or more response time for rural areas. The 5 minutes is for travel time and is based on the time typically involved in a room fire reaching the point of "flashover" where control is very difficult and the critical time following a heart attack or stroke for medical intervention. From a fire perspective, the ignition resistant features and interior sprinklers provided the project's residences will effectively minimize fires and extend the occurrence of flashover. Sprinklers have proven very effective at limiting interior fires to the room of origin, and by doing so, extending the time needed for firefighter intervention. There is no mitigation for medical emergencies in this area. The number of calls projected from the project and the total time over the 5 minute travel time (no more than 2 minutes) are not anticipated to reduce the EFD's overall call response averages over time. The project includes two acre lots or larger and is arguably within a semi-rural area where longer response times are expected. In this case, a 10 minute response time is likely the anticipation and the project is well within this timeframe.

4.2 Fire Safety Requirements-Buildings, Infrastructure and Defensible Space

The County Consolidated Fire Code and the County Building Code govern the building, infrastructure, and defensible space requirements detailed in this FPP. The project will meet or exceed applicable codes or will provide alternative materials and/or methods. The following summaries highlight important fire protection features. All underground utilities, hydrants, water mains, curbs, gutters, and sidewalks will be installed and the drive surface shall be approved prior to combustibles being brought on site.

4.2.1 Fire Access

4.2.1.1 Primary

The primary project access for nine of ten lots on the Oro Verde project site will be via Diamond Ranch Road, which connects to San Pasqual Valley Road, a public road off Highway 78. Diamond Ranch Road is a 24 feet wide, private road. Parking will not be allowed on either side of the road. Access to Lot #8 will be via a minimum 20-foot-wide (asphalt concrete pavement) driveway from the property to Vista Lucia, an existing 24-foot-wide road.

4.2.1.2 Secondary

The Oro Verde project includes secondary access for nine of ten lots (Lots #1-7, 9, and 10). For these nine lots, access from Private Drive "A" to private Oro Verde Road would serve as the secondary access road that connects with the public Oro Verde Road to the west of the project. Most of the existing private Oro Verde Road pavement is currently less than 20 feet wide, ranging between 14 feet and 16 feet and provides primary access for existing Oro Verde Road residences. The existing easement width is 20 feet. The Code standard roadway improvement is 24 feet wide travel lanes over a 28 foot graded area with provisions that allow a 20 foot minimum access with the approval of the local fire official and the County Director or Public Works. The existing private road pavement will be widened to the extents possible within the easement, including the relocation of an existing hydrant and blow off valve to provide 20 feet paved width with a minimum of 18.5 feet width and transitions to 24 feet. . The applicant is currently in process with regard to providing consistency with the San Diego County Private Road Standards via the filing of a request for Exception to Road Standards. This road would be available to the project's residents and fire personnel and be capable of supporting the imposed loads of responding fire apparatus (up to 75,000 pounds). Parking vehicles on both sides of the road will not be allowed. The road would not be gated and would enable traffic both ways, unobstructed.

4.2.1.3 Entrances

Access gates, if installed within the project, will comply with EFD requirements. Gates on private roads will comply with EFD standards for electric gates including an emergency key-operated switch overriding all command functions and opening the gate. Gate setbacks from roadway and other code requirements will be required.

4.2.1.4 Dead Ends

All project roads will meet EFD and County standards regarding dead end roads. Private residential driveways more than 150 feet in length will have a County-approved hammerhead for turning around emergency vehicles. There are no cul-de-sacs proposed for this project.

4.2.1.5 Width and Turning Radius

All proposed internal private streets will have a minimum paved width of 24 feet. No parking is allowed on either side of the street. Proposed driveways within the project are a minimum 16 feet in width. Turning radius for fire apparatus access roads will be 28 feet as measured on the inside edge of the improved width.

4.2.1.6 Grade

The gradient for a fire apparatus access roadway shall not exceed 15.0% (SDCCFC Sec 503.2.7). The fire code official may allow roadway grades up to 20.0% provided that the roadway surface conforms to section 503.2.3. The fire code official may require additional mitigation measures where appropriate. The angle of departure and angle of approach of a fire access roadway shall not exceed 7 degrees (12%) or as approved by the fire code official.

4.2.1.7 Surface

All fire access and vehicle roadways will be of asphaltic concrete, except as noted for grades exceeding 15%, and designed and maintained to support the imposed loads of fire apparatus (not less than 75,000 pounds) that may respond, including Type I engines and Type III engines. Access roads shall be completed and paved prior to issuance of building permits and prior to combustible construction occurring.

4.2.1.8 Identification

Identification of roads and structures will comply with County and EFD Codes Section 505.1, as follows:

- All structures shall have a permanently posted address, which shall be legible from the street. If it is not legible from the street, an address shall also be posted at street

entrance to driveway and shall be visible from both directions of travel. Numbers shall be 4 inches high with 0.5-inch stroke, and located 6–8 feet above ground level. Numbers will contrast with background.

4.2.1.9 Response Map Updates

Per SDCCFD (Sec. 505.5), the project will provide map updates in a format compatible with current EFD mapping services and shall be charged a reasonable fee for updating all response maps. At a minimum, the map updates shall be provided in PDF or a CAD format approved by the FAHJ.

4.2.1.10 Gates

Access gates will comply with SDCCFC (Sec 503.6):

- An automatic gate across a fire access roadway or driveway shall be equipped with an approved emergency key-operated switch overriding all command functions and opening the gate.
- A gate accessing more than four residences or residential lots or a gate accessing hazardous institutional, educational or assembly occupancy group structure, shall also be equipped with an approved emergency traffic control activating strobe light sensor or other device approved by the fire code official, which will activate the gate on the approach of emergency apparatus.
- An automatic gate shall be provided with a battery back-up or manual mechanical disconnect in case of power failure.
- An automatic gate shall meet fire department policies deemed necessary by the fire code official for rapid, reliable access.
- When required by the fire code official, an automatic gate in existence at the time of adoption of this chapter is required to install an approved emergency key-operated switch or other mechanism approved by the fire code official, at an approved location, which overrides all command functions and opens the gate. A property owner shall comply with this requirement within 90 days of receiving written notice to comply.
- Where this section requires an approved key-operated switch, it may be dual keyed or equipped with dual switches provided to facilitate access by law enforcement personnel.
- All gates providing access from a road to a driveway shall be located a minimum of 30 feet from the nearest edge of the roadway and shall be at least two feet wider than the width of the traffic lane(s) serving the gate.

Electric gate openers, where provided, shall be listed in accordance with UL 325. Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.4.2.2

4.3 Water

Water service for the Oro Verde project will be provided by City of Escondido. The Escondido Fire Department requires new development to meet 2,500 gpm fire flow (SDCCFC Sec. 507.3) and remain above 20 psi when meeting the fire requirements. As planned, the project meets fire flows except as calculated for one hydrant near Lot 7. This hydrant is calculated to flow 1,500 gpm at 15 psi and would require a pump with back-up power to meet the requirement. However, planned upgrades to the water supply system (Reed Reservoir) will result in the ability to meet 2,500 gpm at 20 psi for all hydrants and pressures for sprinkler systems within structures will meet code. If this upgrade does not occur prior to the structures being built, then the pump and backup power supply will be required for Lot 7. Please refer to the project's Water System Analysis (Dexter Wilson 2015) for more details.

4.3.1 Hydrants

Hydrants shall be located along fire access roadways as determined by the EFD Fire Marshal to meet operational needs, at intersections, at the beginning radius of cul-de-sacs, and at a code exceeding 350 feet (on-center) spacing of fire access roadways, pursuant to the County Consolidated Fire Code. Hydrants will be consistent with EFD Design Standards (507.5.1.1.3). Figure 2 indicates proposed hydrant locations which are strategically located within 350 feet of all structures.

A three-foot clear space (free of ornamental landscaping and retaining walls) shall be maintained around the circumference of all fire hydrants. Hydrants will be in place and serviceable prior to delivery of combustible materials to the site.

4.4 Pre-Construction Requirements

Prior to combustible materials' presence on the site, utilities shall be in place, fire hydrants operational, an approved all-weather roadway in place, and fuel modification zones established and approved.

4.5 Ignition Resistant Construction and Fire Protection Systems

All new structures will be constructed to County Consolidated Fire Code standards. Each of the proposed buildings will comply with the ignition-resistant construction standards of the County Building Code. These requirements address roofs, eaves, exterior walls, vents, appendages, windows, and doors and result in hardened structures that have been proven to

perform at high levels (resist ignition) during the typically short duration of exposure to burning vegetation from wildfires.

There are two primary concerns for structure ignition: 1) radiant and/or convective heat and 2) burning embers (NFPA 1144 2008, Ventura County Fire Protection District 2011, IBHS 2008, and others). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the WUI built to these codes have proven to be very ignition resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the Chapter 7A exterior fire ratings for walls, windows and doors. Additionally, provisions for modified fuel areas separating wildland fuels from structures have reduced the number of fuel-related structure losses. As such, most of the primary components of the layered fire protection system provided the Oro Verde project are required by County and State codes but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of required interior sprinklers (required in the 2010 Building/Fire Code update), of extinguishing interior fires, should embers succeed in entering a structure (such as through a window inadvertently left open). Even though these measures are now required by the latest Building and Fire Codes, at one time, they were used as mitigation measures for buildings in WUI areas, because they were known to reduce structure vulnerability to wildfire. These measures performed so well, they were adopted into the code. The following project features are required for new development in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions as well as providing adequate access by emergency responders:

1. Application of Chapter 7A, ignition resistant building requirements
2. Minimum 1-hour rated exterior walls and doors
3. Multi- pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257 or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2
4. Ember resistant vents (recommend BrandGuard or similar vents)
5. Interior fire sprinklers to code for all occupancies
6. Modern infrastructure, access roads, and water delivery system.

4.5.1 Fire Sprinklers

All structures will be provided interior fire sprinklers. Automatic internal fire sprinklers shall be in accordance with National Fire Protection Association (NFPA) 13-D. All habitable structures and garages will be provided interior residential fire sprinklers per County Consolidated Fire Code requirements.

4.5.2 Structure Setbacks from Top of Slope

Section 4907.1.3 of the County Consolidated Fire Code requires single story structures (12 foot plate height) to be set back from top of slope a minimum of 15 feet and two story structures a minimum of 30 feet. These measurements are based on a 2 to 1 slope. The project will meet this code requirement for every lot. A series of retaining walls have been designed to extend the pad sizes to allow achievement of this requirement.

4.6 Defensible Space and Vegetation Management

4.6.1 Fuel Modification

Fuel modification zones are designed to gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of the wildland–urban interface (WUI) exposed structures. Because this site will utilize ignition resistant construction techniques and materials, the proposed fuel modification areas are anticipated to provide adequate set back from naturally occurring fuels.

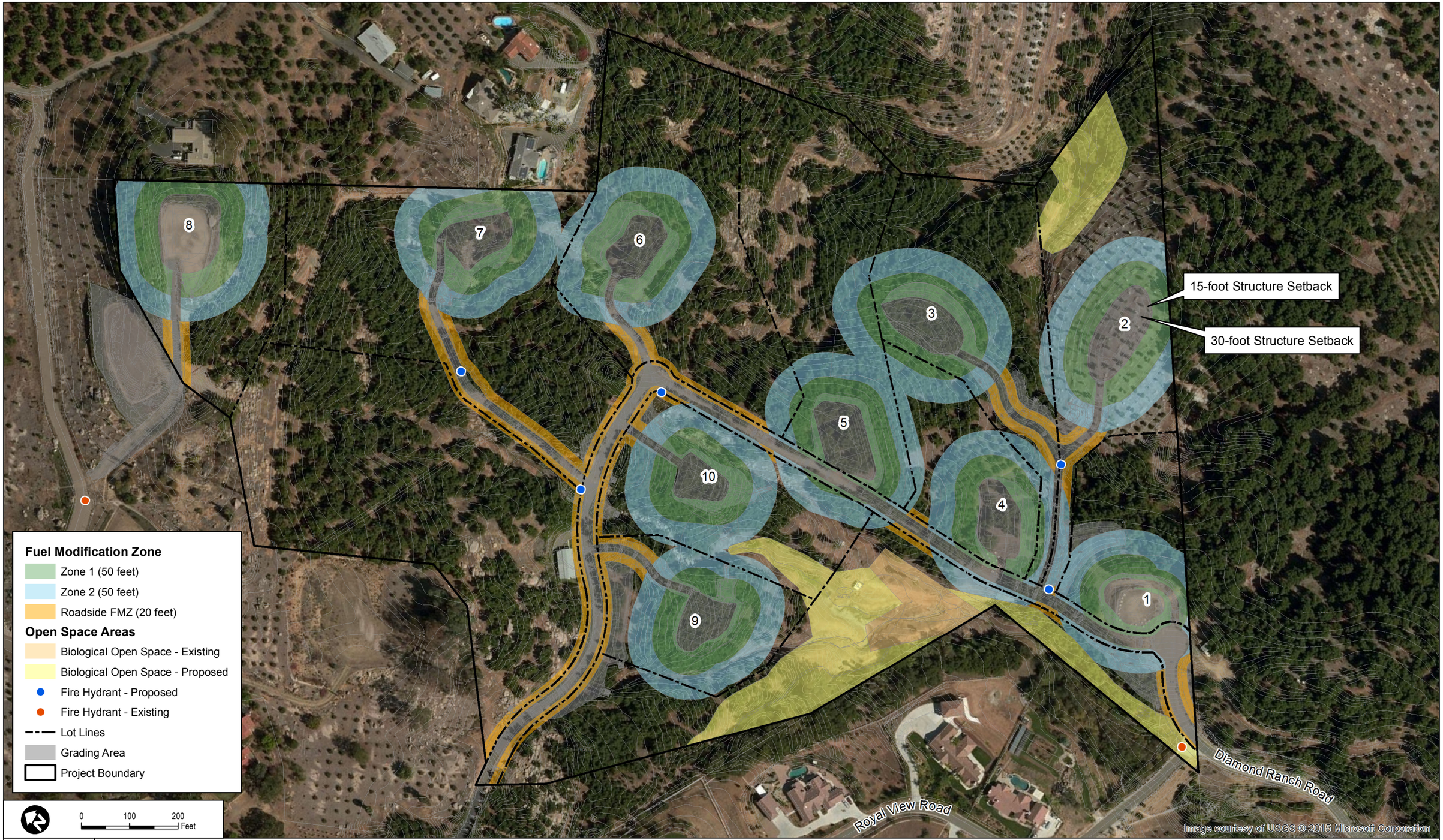
4.6.1.1 Fuel Modification Zone Requirements

The County Consolidated Fire Code (Section 4907- Defensible Space) requires that fuel modification zones be provided around every building that is designed primarily for human habitation or use and buildings designed specifically to house farm animals. Decks, sheds, gazebos, freestanding open-sided shade covers and similar accessory structures less than 250 square feet and 30 feet or more from a dwelling, and fences more than 5 feet from a dwelling, are not considered structures for the establishment of a fuel modification zone. Fuel modification zones for perimeter on the project site shall comply with the following:

Residence Fuel Modification Zones

1. The area within 50 feet of a building or structure shall be cleared of vegetation that is not fire resistant and re-planted with fire-resistant plants. In the area between 50–100 feet from a building (where applicable), all dead and dying vegetation shall be removed. Native vegetation may remain in this area provided that the vegetation is modified so that combustible vegetation does not occupy more than 50% of the square footage of this area. Weeds and annual grasses are to be mowed to a height of 4–6 inches. Any chipping that is done on site should be spread not to exceed 6 inches in height. Trees may remain in both areas provided that the horizontal distance between crowns of adjacent trees and crowns of trees and structures is not less than 10 feet.

2. When a building or structure in a hazardous fire area is setback less than 100 feet from the property line, the person owning or occupying the building or structure shall meet the requirements in subsection (1) above, to the extent possible, in the area between the building or structure and the property line.
3. The building official and the FAHJ may provide lists of prohibited and recommended plants. This FPP includes a proposed list of prohibited plants (Appendix D).
4. The fuel modification zone will be located entirely on the Oro Verde property, where possible. In some locations, required fuel modification zone may be reduced as allowed in subsection (2) above or increased as required by a fire protection plan. Where necessary, this FPP provides for alternative materials and methods of structure hardening to achieve equivalent protection as the full fuel modification zone or an off-site easement will be obtained from an adjoining landowner.
5. When the subject property contains an area designated to protect biological or other sensitive habitat or resource, no building or other structure requiring a fuel modification zone shall be located so as to extend the fuel modification zone into a protected area.
6. The Oro Verde project is surrounded on one side by urbanized (rural residential) land uses. There are no shrub-dominated wildland areas immediately adjacent the site and all on-site fuels will be converted to urbanized, maintained landscapes except for the avocado groves that will be retained throughout the property. Avocado groves will be maintained as described in the Avocado Grove Management Section, below. Fuel modification areas will occur along roadways where maintained landscapes are not adjacent, between lots and in locations where biologically sensitive habitats do not occur (Figure 5). Residence Fuel Modification/Brush Management Zones will range between roughly 25 and 100 feet of modified fuel areas. The project will be less prone to wildfires post-project than in its current condition.



DUDEK

8128

SOURCE: Hunsaker & Associates 2014; Dudek 2014

FIGURE 5

Fuel Modification Zones

Oro Verde - Fire Protection Plan

INTENTIONALLY LEFT BLANK

Oro Verde Fuel Modification Zones

Lots 1 and 2

As depicted in Figure 5, Lots 1 and 2 are located along the southern boundary of the project to the east of Diamond Ranch Road and proposed private drive "A". Both building pads and FMZ areas are adjacent to avocado orchards on two to three sides. The 100 feet FMZ for Lot 1 will be outside the 50 feet wide buffer for the RPO wetlands to the southwest. The FMZs for Lot 1 may need to be adjusted in the field once the pad is constructed. Lots 1 and 2 should receive 100 feet of fuel modification on all sides, except where the property boundary occurs within the FMZ. Based on site plans and FMZ extending off-site, Lots 1 and 2 are constrained to roughly 35 (Lot #2) to 50 (Lot #1) feet of achievable fuel modification on their south or east end of the pad. As proposed, these lots would require either an off-site easement or a variance on EFD's 100-foot, two zone standard fuel modification area and would be provided additional fire protection features as mentioned in Chapter 5.0 that would be determined to provide at least functional equivalency as 100 feet.

Lot 6

Lot 6 is located along the northern project boundary adjacent to a single family residence that is landscaped up to the border of both properties. This lot will have 100 feet of fuel modification on site, with the exception of one very small area that is reduced to 90 feet. In this area, the remaining 10 feet of fuel modification is represented by the neighboring property's irrigated, landscaped area.

Lot 7

Lot 7 is located along the northeastern corner of the project adjacent to a single family residence that is landscaped up to the border of both properties. This lot will have no less than 45 feet of fuel modification on site with the remaining 55 feet represented by the neighboring property's irrigated, landscaped area.

Lot 8

Lot 8 is located in the northernmost corner of the project adjacent to a single family residence to the northeast that is landscaped up to the border. Along this northeast boundary, this lot will have 25 feet of fuel modification on site with the remaining 75 to 100 feet represented by the neighboring property's irrigated, landscaped area. To the northwest, up to 85 feet of fuel modification area is achievable. As proposed, this lot would require either an off-site easement or a variance on EFD's 100-foot, two zone standard fuel modification area and would be provided additional fire protection features as mentioned in Chapter 5.0 that would be determined to provide at least functional equivalency as 100 feet.

Lots 3, 5, 9, and 10

These lots include back or side yards adjacent to private roads or avocado groves, and are provided 100 feet of fuel modification to the structures. Fuel modification will consist of a 50-foot irrigated zone and a 50-foot thinning zone per EFD FMZ standards. All FMZs are within the boundary of the project site.

Lot 4

The pad and FMZ for Lot 4 is located along private drive "A" and is surrounded on three sides by orchards and the remaining side by the 50 feet wide RPO wetlands buffer. This lot will receive 100 feet of fuel modification outside of the 50-foot RPO wetlands buffer in all locations, expect one small section where achievable fuel modification outside of the RPO wetlands buffer measures 87 feet.

Roadway Fuel Modification Zones

Roadway fuel modification is addressed by the County Consolidated Fire Code. The FAHJ may require a property owner or HOA to modify combustible vegetation in the area within 20 feet from each side of the driveway or a public or private road adjacent to their property to establish a fuel modification zone. The FAHJ has the right to enter private property to insure the fuel modification zone requirements are met. The Code allows an exception to reduce the width of the fuel modification zone if it will not impair access. On the Oro Verde site, roadside fuel modification will range from 10 to 20 feet wide, larger where roads front private lots and front yard landscaping provides the equivalent of fuel modification zone.

Special Fuel Management Issues

Trees may be planted within fuel management zones as long as they conform to the SDCCFC. Roadside tree planting is acceptable, as long as they meet the following restrictions:

- Crowns of mature trees located within defensible space shall maintain a minimum horizontal clearance of 10 feet for fire resistant trees. No non-fire resistive trees will be allowed.
- Mature trees shall be pruned to remove limbs one-third the height or 6 feet, whichever is less, above the ground surface adjacent to the trees.
- Dead wood and litter shall be regularly removed from trees.
- Ornamental trees shall be limited to groupings of 2–3 trees with canopies for each grouping separated horizontally as described in Table 5.

Table 5
Distance Between Tree Canopies by Percent Slope

Percent of Slope	Required Distances Between Edge of Mature Tree Canopies[1]
0 to 20	10 feet
21 to 40	20 feet
41+	30 feet

[1] Determined from canopy dimensions as described in Sunset Western Garden Book (Current Edition)

Vegetation Management

The following requirements are provided for fuel modification zones. These zones are presented graphically in Figure 5. Each zone would include permanent field markers or a masonry wall at the property line to delineate the zones, aiding ongoing maintenance activities that will occur on site. All fuel modification zones shall be maintained by the homeowner or Homeowners Association in perpetuity.

Plants used in the fuel modification areas or landscapes will include drought-tolerant, fire resistive trees, shrubs, and groundcovers. Per SDCCFC, all plant materials used shall be from the Wildland/Urban Interface Development Standards plant palette. The intent of the plant list is to provide examples of plants that are less prone to ignite or spread flames to other vegetation and combustible structures during a wildfire. The addition of plant material to the approved list will be at the discretion of EFD. Landscape plans shall be in accordance with the following criteria:

1. All fire resistive trees (i.e., trees on the approved-City plant list) shall be planted and maintained at a minimum of 10 feet from the mature tree's drip line to any combustible structure. All non-fire resistive tree species, including conifers, pepper trees, and acacia species shall be planted and maintained so that the mature tree's drip line at maturity is a minimum 30 feet from any combustible structure.
2. For streetscape plantings, fire resistive trees can be planted 10 feet from edge of curb to center of tree trunk. Care should be given to the type of tree selected, that it will not encroach into the roadway, or produce a closed canopy effect.
3. Limit planting of large unbroken masses especially trees and large shrubs. Groups should be two to three trees maximum, with mature foliage of any group separated horizontally by at least 10 feet, if planted on less than 20% slope, and 20 feet, if planted on greater than 20% slope.
4. If shrubs are located underneath a tree's drip line, the lowest branch should be at least three times as high as the understory shrubs or 10 feet, whichever is greater.

5. Existing mature trees can be pruned 10 feet away from roof, eave, or exterior siding, depending on the tree's physical or flammable characteristics and the building construction features.
6. All tree branches shall be removed within 10 feet of a fireplace chimney or outdoor barbecue.

Avocado Grove Management

The project includes the retention of the existing avocado groves throughout the property. Avocado groves are not only susceptible to damage from wildfires, but the leaf litter when ignited can spread a fire through the grove into adjacent structures. The avocado grove management will consist of the following fire preventative measures:

1. All groves will be kept in a healthy state. Tree canopies will have no dead branches or foliage. Dead and/or downed trees shall be removed by homeowner or HOA to abate the fire hazard within a 30 day time period. The grove will be kept cleaned of combustible debris and flammable brush, excluding leaf litter.
2. At least a 10-foot wide firebreak will be cleared around the perimeter of the grove as defensible space between the homes and the orchard.
3. The irrigation system shall be activated in the orchard to prevent a fire from spreading into an orchard or starting spot fires in the interior of the orchard. For best results, the irrigation system should be turned on well ahead of the arrival of a wildfire to ensure the leaf litter is thoroughly soaked.
4. Should a majority of the avocado grove decline due to changing watering applications, disease or insects, or other uncontrollable factors, homeowner or HOA shall replace them with healthy trees or convert the grove to extended landscape and/or thinning zones, consistent with EFD requirements.

Pre-Construction Requirements

- Perimeter fuel modification areas must be implemented and approved by the EFD prior to combustible materials being brought on site.
- Existing flammable vegetation shall be removed on vacant lots prior to commencement of construction and non-native fuels within the riparian corridor will be removed prior to bringing combustible construction materials on site.
- Dead fuel, ladder fuel (fuel which can spread fire from ground to trees), and downed fuel shall be removed and trees/shrubs shall be properly limbed, pruned, and spaced per this plan.

Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical or chemical.

The plants included in the Prohibited Plant List (Appendix D) are unacceptable from a fire safety standpoint, and shall not be planted on the site unless otherwise approved by the EFD.

Vegetation Management Compliance Schedule

All fuel modification area vegetation management shall be completed annually by May 15 of each year and more often as needed for fire safety, as determined by the EFD. The project HOA shall be responsible for all vegetation management throughout the common areas of the project site, in compliance with the requirements detailed herein and EFD requirements. The project HOA shall be responsible for ensuring long-term funding and ongoing compliance with all provisions of this FPP, including vegetation planting, fuel modification, vegetation management, and maintenance requirements throughout the private portions of the Oro Verde site.

INTENTIONALLY LEFT BLANK

5 ALTERNATIVE MATERIALS AND METHODS FOR NON-CONFORMING FUEL MODIFICATION

As previously mentioned, due to site constraints, it is not feasible to achieve the standard FMZ width for lots 1, 2, and 4. As such, this FPP incorporates additional analysis and measures that will be implemented to compensate for potential fire related threats. These measures are customized for this site based on the analysis results and focus on providing functional equivalency as an EFD-defined, full fuel modification zone.

Note: Lots 6, 7, and 8 have reduced on-site fuel modification, additional fire protection measures are not required since the adjacent property owners have landscaped up to the adjoining boundary providing at least 100 feet of managed landscape fuels.

A 35 to 50-foot setback is less than typically required from wildland fuels including chaparral and other potentially fire prone orchards. Standard fuel modification zones are 100 feet in many jurisdictions (or to property line – PRC 4291). However, 100 feet is typically required where a true wildland urban interface exists. The avocado groves/oak riparian forest on or near the property include dense avocado/oak canopy with leaf litter or low-growing understory vegetation. These types of fuels can ignite and burn completely during extreme weather conditions. However, they are expected to burn in a spotty manner due to the presence of heavy shading and hydrated fuels.

As experienced in numerous wildfires, including the most recent fire storms in San Diego County (2003 and 2007), homes in the WUI are potential fuel. The distance between the wildland fire that is consuming wildland fuel and the home ("urban fuel") is the primary factor for structure ignition (not including burning embers). The closer a fire is to a structure, the higher the level of heat exposure (Cohen 2000). However, studies indicate that given certain assumptions (e.g., 10 meters of low fuel landscape, no open windows), wildfire does not spread to homes unless the fuel and heat requirements (of the home) are sufficient for ignition and continued combustion (Cohen 1995, Alexander et al. 1998). Construction materials and methods can prevent or minimize ignitions. Similar case studies indicate that with nonflammable roofs and vegetation modification from 10–18 meters (roughly 32–60 feet) in southern California fires, 85–95% of the homes survived (Howard et al. 1973, Foote and Gilless 1996). Similarly, San Diego County after fire assessments indicate strongly that the building codes are working in preventing home loss: of 15,000 structures within the 2003 fire perimeter, 17% (1,050) were damaged or destroyed. However, of the 400 structures built to the 2001 codes (the most recent at the time), only 4% (16) were damaged or destroyed. Further, of the 8,300 homes that were within the 2007 fire perimeter, 17%t were damaged or destroyed. A much smaller percentage (3%) of the 789 homes that were built to 2001 codes were impacted and an even smaller percentage (2%) of the 1,218 structures built to the 2004 Codes were impacted (IBHS 2008). Damage to the

structures built to the latest codes is likely from flammable landscape plantings or objects next to structures or open windows or doors (Hunter 2007).

These results support Cohen's (2000) findings that if a community's homes have a sufficiently low home ignitability (i.e., 2011 County Consolidated Code and Building Code), the community can survive exposure to wildfire without major fire destruction. This provides the option of mitigating the wildland fire threat to homes/structures at the residential location without extensive wildland fuel reduction. Cohen's (1995) studies suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid SIAM results indicate that a 20-foot high flame has minimal radiant heat to ignite a structure (bare wood) beyond 33 feet (horizontal distance). Whereas, a 70-foot-high flame may require about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). This study utilized bare wood, which is more combustible than the ignition resistant exterior walls for structures built today. Fire behavior modeling conducted for this project indicates that fires in the orchards would result in roughly 14-foot flame lengths under peak weather conditions. Extreme conditions may result in crown fire, where tree crowns burn and create more intense fire and longer flame lengths. Fire during extreme conditions would be less likely to affect residents of this community because it is anticipated that they would be evacuated well before wildland fire from the east or south encroached upon this urban area of Escondido.

As indicated in this report, the FMZs and additional fire protection measures proposed for Lots 1, 2, and 4 provide equivalent wildfire buffer, but are not standard zones. Rather, they are based on a variety of analysis criteria including predicted flame length, fire intensity (Btu), site topography and vegetation, extreme and typical weather, position of structures on pads, position of roadways, adjacent fuels, fire history, current vs. proposed land use, neighboring communities relative to the proposed project, and type of construction. The fire intensity research conducted by Cohen (1995), Cohen and Butler (1996), and Cohen and Saveland (1997) and Tran et al. (1992) supports the fuel modification alternatives proposed for this project.

The specific lots that are affected by this analysis are those that cannot provide at least 100 feet of structural setback from jurisdictional waters or off-site fuel beds. The following additional measures will be implemented to "mitigate" potential structure fire exposure. These measures are customized for this site, its unique topographical and vegetative conditions, and focus on providing functional equivalency.

Heat Deflecting Walls at Top of Slope

Example heat deflecting wall

Elevated lots/pads adjacent to FMZ and open space provide an opportunity to place heat-deflecting landscape view walls of masonry construction with fire-rated glazing that are six feet in height (roughly lower two feet masonry construction and upper three feet dual pane, one pane tempered glazing or equivalent and meeting Chapter 7A and/or EFD approval). The view walls will be incorporated at top of slope/edge of lot for Lots where appropriate structure setbacks are not achievable. The landscape walls provide a vertical, non-combustible surface in the line of heat, fumes, and flame travel up the slope. Once these fire byproducts intersect the wall, they are deflected upward or, in the case where lighter fuels are encountered, they are quickly consumed, heat and flame are absorbed or deflected by the wall, and the fuel burns out within a short (30 second–2 minute) time frame (Quarles and Beall 2002). Walls like these have proven to deflect heat and airborne embers and are consistent with NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire – 2008 Edition, Section 5.1.3.3 and A.5.1.3.3 and International Urban Wildland Interface Code (ICC 2012). NFPA 1144, A.5.1.3.3 states: "Noncombustible walls and barriers are effective for deflecting radiant heat and windblown embers from structures."

Code-Exceeding Window Upgrade

Exterior Windows

A potentially vulnerable structure component with regard to radiant or convective heat exposure is a structure's windows. A concern for structures on the southern and western sides of the Lots 1, 2, and 4 is the exterior glazing that could be subject to radiant or convective heat from a wildland fire and whether provision for a narrower fuel modification zone (35 to 50 feet) is adequate. To address this issue, it is worthwhile to examine the structure ignitability modeling, independent ignition experiments, and case studies that support fuel treatments as low as roughly 34 feet from structures, and compare them with the Oro Verde project. Cohen's (1995) structure ignitability model (SIAM) assesses ignitability of bare wood when exposed to a continuous heat source. The model assumes a worst-case condition of a constant 1700 degrees (F). A constant, maximum heat source is typically not the case during a wildfire due to the movement of a fire, non-uniform vegetation distribution, and the lack of a uniform, constant flame front. Further, a flame temperature of 1700 degrees (F) is likely higher than would be experienced by the fuels adjacent this site, but is a valid temperature for testing, as Pyne et al. (1996) confirms that flaming combustion typically occurs in wildland fuels between flame temperatures of 1,466 to 2,186 degrees (F). For comparison, Dennison (2006) studied the heat signatures from a Southern

California wildfire that was burning oak woodlands, dense chaparral, sparse chaparral, and grasslands. Results from this study indicate that the maximum temperature commonly observed was 2,200 degrees (F) and associated with the dense, higher fuel load oak and chaparral vegetation, while cooler (980–1340 degrees (F)) and smaller fires were associated with the mixed chaparral and grasslands. The analysis conducted for this report indicates that the structure setbacks only 5–15% less than the typical requirement, is adequate for separating the structures from the short-duration heat and flame associated with a fire burning toward the community in the fuels that occur adjacent this portion of the development. The typical duration of large flames from burning vegetation is on the order of 1 minute and up to several minutes for larger fuels at a specific location (Cohen 1995; Butler et al. 2004, Ramsay and Rudolph 2003, Cohen and Quarles 2011). Tests of various glazing products indicate that single pane, tempered glass failure may occur between 120–185 seconds from exposure (University of California 2011; Manzello et al. 2007) but those tests include direct and constant heating that would not be experienced during a wildfire near Lots 1, 2, and 4. Depending on the heat applied and the type of glass used in the various studies, the cracking/failure time varied. However, given the short duration of maximum heat (likely 60–90 seconds for the largest shrubs or avocado leaf litter), the loss of heat over distance (35 feet minimum), and the fire-rated minimum 20-minute glazing specified for this project, the heat experienced by the windows from the wildland fire is not expected to be enough (in temperature or duration) to cause window failure. Quarles et al. (2010) provides strong endorsement for tempered (toughened) glass performance. His research and tests conclude that multi-pane (2–3 panes) with at least one pane tempered is well-suited for wildfire exposures. He indicates that tempered glass is at least four times stronger and much more resistant to thermal exposures than normal annealed glass. The use of code required dual pane, one pane tempered glass provides several benefits, with thermal exposure performance the most important for this study. This project would utilize dual pane, both panes tempered to increase the thermal and overall strength of the exposed windows on the Lots 1, 2, and 4 structures.

Additional Structure Protection Measures for Lots 1 and 2

The following additional measures will be implemented to "mitigate" the non-conforming FMZs for Lots 1 and 2, if the applicant cannot obtain off-site thinning easements with the adjoining property owner(s). Because the full 100 feet is not achievable for the entire lot, additional fire protection is proposed for these structures on Lots 1 and 2. These measures are customized for this site, its unique topographical and vegetative conditions, and focus on providing functional equivalency as a full fuel modification zone.

Heat-deflecting landscape view walls of masonry construction with fire-rated glazing that are six feet in height (roughly lower two to three feet masonry construction and upper three to four feet dual pane, one pane tempered glazing or equivalent non-combustible wall construction meeting Chapter 7A and/or EFD approval, will be incorporated along the southern boundary of the lots.

The landscape walls provide a vertical, non-combustible surface in the line of heat, fumes, and flame that travel up the slope. Once these fire byproducts intersect the wall, they are deflected upward or, in the case where fuels are lighter, like this project site, the fuels are quickly consumed, heat and flame are absorbed or deflected by the wall, and the fuel burns out within a short (30 second–2 minute) time frame (Quarles and Beall 2002). Vegetation located from the retaining wall to the structure will be limited to irrigated, low volume plantings that will not readily facilitate fire spread. Walls like these have proven to deflect heat and airborne embers and are consistent with NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire – 2013 Edition, Section 5.1.3.3 and A.5.1.3.3 and International Urban Wildland Interface Code (ICC 2012). NFPA 1144, A.5.1.3.3 states: "Noncombustible walls and barriers are effective for deflecting radiant heat and windblown embers from structures." These walls and barriers are usually constructed of noncombustible materials (concrete block, bricks, stone, stucco) or earth with emergency access openings built around a development where 30 feet (9 meters) of defensible space is not available.

It is understood that the County or EFD may require additional measures based on a structure's proximity to fuels and the fuel loads represented by those areas. This FPP is provided to assist the EFD with determinations of any additional measures. The information provided herein supports the ability of the proposed structures and FMZs to withstand the predicted short duration, low to moderate intensity wildfire and ember shower that would be expected from wildfire burning in the vicinity of the site or within the site's landscape.

INTENTIONALLY LEFT BLANK

6 CONCLUSION

This FPP is submitted in support of an application for project entitlement of the Oro Verde development project. It is submitted in compliance with requirements of County Consolidated Fire Code and the County Building Code. The requirements in this document meet fire safety, building design elements, fuel management/modification, and landscaping recommendations of the County. Where the project does not strictly comply with the Code, such as with some fuel modification zone widths, alternative materials and methods have been proposed that provide functional equivalency as the code intent.

Fire and Building Codes and other local, county, and state regulations in effect at the time of each building permit application supersede these recommendations unless the FPP recommendation is more restrictive.

The recommendations provided in this FPP have been designed specifically for the proposed construction of structures adjacent the avocado groves and Wildland Urban Interface (WUI) zone at the Oro Verde project site. The project site's fire protection system includes a redundant layering of protection methods that have been shown through post-fire damage assessments to reduce risk of structural ignition and compensate for fuel modification area reductions.

Modern infrastructure will be provided along with implementation of the latest ignition resistant construction methods and materials. Further, all structures are required to include interior sprinklers consistent with County Consolidated Fire Code. Fuel modification will occur on exposed edges and adjacent biological preserve areas of the project site. Maintenance includes removing all dead and dying materials and maintaining appropriate horizontal and vertical spacing. In addition, plants that establish or are introduced to the fuel modification zone that are not on the approved plant list will be removed.

Ultimately, it is the intent of this FPP to guide, through code and other project specific requirements, the construction of structures that are defensible from wildfire and, in turn, do not represent significant threat of ignition source for the adjacent native habitat. It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and mitigating actions identified in this report are designed to reduce the likelihood that fire would impinge upon the proposed structures. There are no guarantees that fire will not occur in the area or that fire will not damage property or cause harm to persons or their property. Implementation of the required enhanced construction features provided by the applicable codes and the mitigating fuel modification requirements provided in this FPP will accomplish the goal of this FPP to assist firefighters in their efforts to defend these structures and reduce the risk associated with this project's WUI location. For maximum benefit, the developer, contractors, engineers, and architects are responsible for proper implementation of the concepts and

requirements set forth in this report. Homeowners are responsible to maintain their structures and lots as required by this report, the applicable Fire Code and the EFD.

Although the proposed development and landscape will be significantly improved in terms of ignition resistance, it should not be considered a shelter-in-place community. It is recommended that the homeowners or other occupants who may reside within the Oro Verde neighborhood adopt a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go[1]"stance on evacuation. Accordingly, occupants should evacuate the residence and the area as soon as they receive notice to evacuate, or sooner, if they feel threatened by wildfire or structure fire in a nearby residence. Fire is a dynamic and somewhat unpredictable occurrence and it is important for residents to educate themselves on practices that will improve their home survivability and their personal safety.

[1] International Fire Chiefs Association "Ready, Set, Go" website link: http://wildlandfirersg.org/

7 REFERENCES

Bowman, R. 1973. Soil Survey of the San Diego Area. USDA in cooperation with the USDI, UC Agricultural Experiment Station, Bureau of Indian Affairs, Department of the Navy, and the U.S. Marine Corps.

Butler, B.W., J. Cohen, D.J. Latham, R.D. Schuette, P. Spoko, K.S. Shannon, D. Jimenez, and L.S. Bradshaw. 2004. Measurements of radiant emissive power and temperatures in crown fires. Canadian Journal of Forest Research. 34:1577–1587.

CAL FIRE. 2013. Fire and Resource Assessment Program. California Department of Forestry and Fire. Website access via http://frap.cdf.ca.gov/data/frapgismaps/select.asp?theme=5.

Cohen, Jack D. 1995. Structure ignition assessment model (SIAM). In: Weise, D.R.; Martin, R.E., technical coordinators. Proceedings of the Biswell symposium: fire issues and solutions in urban interface and wildland ecosystems. 1994 February 15–17; Walnut Creek, CA. Gen. Tech. Rep. PSW-GTR-158. Albany, California: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 85–92.

Cohen, J.D. 2000. Preventing disaster: home ignitability in the wildland-urban interface. Journal of Forestry 98(3): 15–21.

Cohen, J.D. and Butler, B.W. [In press]. 1996. Modeling potential ignitions from flame radiation exposure with implications for wildland/urban interface fire management. In: Proceedings of the 13th conference on fire and forest meteorology. October 27–31; Lorne, Victoria, Australia. Fairfield, Washington: International Association of Wildland Fire.

Cohen, J.D. and Saveland, J. 1997. Structure Ignition Assessment Can Help Reduce Fire Damages in the W-UI. Fire Management Notes 57(4): 19–23.

Cohen, Jack and Steve Quarles. 2011. Structure Ignition Assessment Model; The Origins and Basis of SIAM. From presentation at the 2011 NFPA Wildland Fire - Backyard and Beyond Conference in October 2011.

Dudek. 2013. Biological Resources Memorandum. Oro Verde Jurisdictional Evaluation. October 22, 2013.

Dennison, Phillip, Kraivut Charoensiri Dar A. Roberts, Seth H. Peterson, and Robert O. Green. 2006. Wildfire Temperature and Land Cover Modeling Using Hyperspectral Data. Center for Natural & Technological Hazards, University of Utah, University of California Santa Barbara and Jet Propulsion Laboratory. 36 pp.

Foote, Ethan I.D.; Gilless, J. Keith. 1996. Structural survival. In: Slaughter, Rodney, ed. California's I-zone. Sacramento, California: CFESTES; 112–121.

Holland, R. 1986. Preliminary list of terrestrial natural communities of California. Department of Fish and Game, Sacramento, California.

Howard, Ronald A.; North, D. Warner; Offensend, Fred L.; Smart, Charles N. 1973. Decision analysis of fire protection strategy for the Santa Monica mountains: an initial assessment. Menlo Park, CA: Stanford Research Institute. 159 p.

Hunter, Cliff. 2007. Personal communication with Rancho Santa Fe Fire Protection District Fire Marshal following after-fire loss assessments.

Institute for Business and Home Safety (IBHS). 2008. Megafires: The Case for Mitigation. 48 pp.

Manzello, Samuel, R. Gann, S. Kukuck, K. Prasad, and W. Jones. 2007. An Experimental Determination of a Real Fire Performance of a Non-Load Bearing Glass Wall Assembly. National Institute of Standards and Technology. 13 pp.

NFPA 1144. Standard for Reducing Structure Ignition Hazards from Wildland Fire. 2013. Technical Committee on Forest and Rural Fire Protection. Issued by the Standards Council on August 9, 2012, with an effective date of August 29 2012. Approved as an American National Standard on August 29, 2012.

Pyne, Stephen, Patricia Andrews, Richard Laven. 1996. Introduction to Wildland Fire, Second Edition. Chapter 1, Section 4. Pg. 21.

Quarles, S.L. and F.C. Beall. 2002. Testing protocols and fire tests in support of the performance-based codes. In 'Proceedings of the California 2001Wildfire Conference: 10Years after the 1991 East Bay Hills Fire', 10–12 October 2001, Oakland, California. University of California, Forest Products Laboratory, Technical Report 35.01.462, pp. 64–73. Richmond, California.

Quarles, Stephen, Yana Valachovic, Gary Nakamura, Glenn Nader, and Michael De Lasaux. 2010. Home Survival in Wildfire Prone Areas – Building Materials and Design Considerations. 22 pp.

Ramsay, Caird and Lisle Rudolph. 2003. Landscaping and Building Design for Bushfire Areas. Chapter 2.

SANDAG. 2013. San Diego Association of Governments. Average persons per dwelling unit statistics. Website access: http://www.sandag.org/.

Scott, Joe H. and Robert E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Tran, H.C.; Cohen, J.D; Chase, R.A. 1992. Modeling ignition of structures in wildland/urban interface fires. In: Proceedings of the 1st international fire and materials conference; 1992 September 24–25; Arlington, Virginia. London, United Kingdom: Inter Science Communications Limited; 253–262.

University of California Agriculture and Natural Resources. 2011. Web Site: Builders Wildfire Mitigation Guide. http://firecenter.berkeley.edu/bwmg/windows-1.html

Ventura County Fire Protection District. 2011. Ventura Unit Strategic Fire Plan.

INTENTIONALLY LEFT BLANK

8 LIST OF PREPARERS

Project Manager/Lead Fire Protection Planner

Michael Huff
Fire Protection Planner; San Diego County California Environmental Quality Act Consultant List
Dudek

Fire Protection Planner, Fire Behavior Modeling

Michael Scott
Urban Forester
Dudek

INTENTIONALLY LEFT BLANK

APPENDIX A

Oro Verde Photograph Log

APPENDIX A
Oro Verde Photograph Log

	
1. View of gated entrance at Diamond Ranch Road that goes to property and residential community.	2. Photo looking at edge of avocado orchard in southern portion of project site near Diamond Ranch Road cul-de-sac.
	
3. View of 4 inches deep leaf litter underneath tree canopies	4. Photo taken inside interior of property. Avocado grove is adjacent to wetlands and non-native grasses in center of photo.

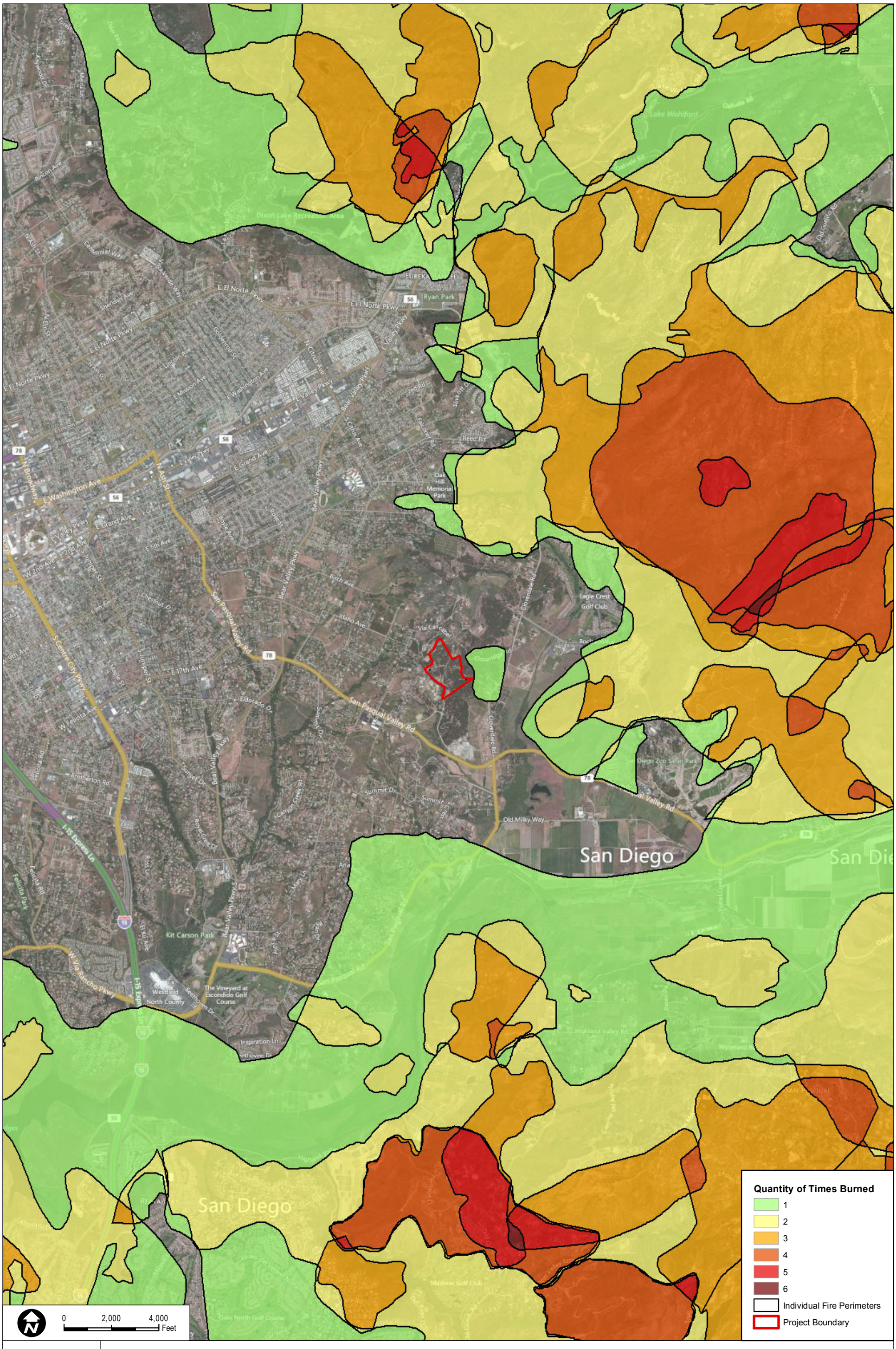
	
5. Photo shows fuel types south of project site in San Pasqual Valley.	6. View of land uses south of project site. Note sand and gravel quarry in center of photo with semi-rural residential on the hillsides.
	
7. View of avocado and citrus groves on south and east sides of property.	8. View of fire corridor, drainage with non-maintained ornamentals and sage scrub southwest of project site.

	
9. View of Royal View residential community on west side of project.	10. Photograph of Coast Live oak riparian forest along western boundary of property that abuts Royal View neighborhood.
	
11. Oak riparian forest also consists of willows with a leaf litter understory.	12. Semi-rural residential and avocado groves are located adjacent to the northern border of the property.

INTENTIONALLY LEFT BLANK

APPENDIX B

Fire History Exhibit



DUDEK

SOURCE: Bing Maps 2014, CAL FIRE 2014

APPENDIX B

Fire History Map

8128

Oro Verde - Fire Protection Plan

APPENDIX C

BehavePlus Fire Behavior Analysis

APPENDIX C
BehavePlus Fire Behavior Analysis

BEHAVEPLUS FIRE BEHAVIOR MODELING

Fire behavior modeling includes a high level of analysis and information detail to arrive at reasonably accurate representations of how wildfire would move through available fuels on a given site. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, the BehavePlus 5.0.5 fire behavior modeling system was applied using predominant fuel characteristics, slope percentages, and extreme weather variables for the site.

Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information.

To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.
- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

Although BehavePlus has some limitations, it can still provide valuable fire behavior predictions which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass,

shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

The seven fuel characteristics help define the 13 standard fire behavior fuel models (Anderson 1982) and the more recent custom fuel models developed for southern California (Weise and Regelbrugge 1997). According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom southern California fuel models:

- Grasses Fuel Models 1 through 3
- Brush Fuel Models 4 through 7, SCAL 14 through 18
- Timber Fuel Models 8 through 10
- Logging Slash Fuel Models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models (Scott and Burgan 2005) developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

- Non-Burnable Models NB1, NB2, NB3, NB8, NB9
- Grass Models GR1 through GR9
- Grass-shrub Models GS1 through GS4
- Shrub Models SH1 through SH9
- Timber-understory Models TU1 through TU5
- Timber litter Models TL1 through TL9
- Slash blowdown Models SB1 through SB4

BEHAVEPLUS FIRE BEHAVIOR MODELING INPUTS

Vegetation/Fuels

To support the fire behavior modeling efforts conducted for this Fire Protection Plan, fuel models were identified for four key locations in order to represent multiple wildfire scenarios on or adjacent to the project site. While vegetation types other than the selected five are located on site, the selected areas represent the most likely wildfire threat for the proposed project. Table 1 summarizes fuel model assignments by modeling scenario.

Table 1
BehavePlus Fine Dead Fuel Moisture Calculation

Scenario	Vegetation Type	Fuel Model
1	Ornamental Vegetation/Oak Riparian Forest	9,10
2	Ornamental Vegetation/Sage Scrub	10,sh2
3	Avocado Orchards	9
4	Avocado Orchards	9

Weather

Fire behavior modeling conducted in support of this FPP utilized the guidelines and standards presented by the County of San Diego, Department of Planning and Land Use[1]. These guidelines identify acceptable fire weather inputs for extreme fire conditions during summer months and Santa Ana fire weather patterns. The County analyzed and processed fire weather from Remote Automated Weather Stations (RAWS) between April 15 to December 31 in order to represent the general limits of the fire season. Data provided by the County's analysis included temperature, relative humidity, and sustained wind speed and is categorized by weather zone, including Maritime, Coastal, Transitional, Interior, and Desert.

To evaluate potential fire behavior for the project site, Dudek utilized the BehavePlus (v. 5.0.5) fire behavior modeling software package to determine fuel moisture values and expected fire behavior for the site. The temperature, relative humidity, and wind speed data for the Transitional[2] weather zone were utilized for this FPP based on the project location. Reference fuel moistures were calculated in BehavePlus and were based on site-specific topographic data inputs. Fire behavior for the site was calculated in five different locations using worst-case fuels and topography (steepest slopes). Two of the modeling scenarios analyzed potential fire behavior

[1] County of San Diego Report Format and Content Requirements – Wildland Fire and Fire Protection (August 31, 2010). On-line at http://www.sdcounty.ca.gov/dplu/docs/Fire-Report-Format.pdf

[2] http://mappingsandiego.com/viewMap.html

along the southern and western edge (Scenarios 1 and 2) during summer fire weather conditions. The other two modeling scenarios (Scenarios 3 and 4) analyzed potential fire behavior along the eastern and southeastern edge of the development during Peak weather conditions. Table 2 summarizes the fuel moisture calculations utilized for this FPP.

Table 2
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Summer Weather	Peak Weather
Dry Bulb Temperature	90 -109 deg. F	90 -109 deg. F
Relative Humidity	10 - 14 %	5 - 9 %
Reference Fuel Moisture	2 %	1 %
Month	Feb Mar Apr Aug Sept Oct	Feb Mar Apr Aug Sept Oct
Time of Day	12:00 - 13:59	12:00 - 13:59
Elevation Difference	Level (within 1,000 ft.)	Level (within 1,000 ft.)
Slope	0-20%	0-30%
Aspect	South/East	East/Northeast
Fuel Shading	Exposed (< and > 50% shading)	Exposed (< and > 50% shading)
Fuel Moisture Correction	1 %	1 %
Fine Dead Fuel Moisture	3 %	2 %

Topography

The topography of the site is discussed in greater detail in the FPP. Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or down hill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values for this site were measured from site topographic maps and are presented in units of percent.

The modeling locations were adjacent to proposed development areas on the site with slope measurements ranging from relatively flat to 30%. Scenarios to the east and southeast were selected based on the strong likelihood of fire approaching from the both directions during a Santa Ana wind-driven fire event. Scenarios on the west and south were selected to evaluate fire behavior potential during a summer fire occurring during typical on-shore wind flow patterns. The fire behavior modeling input variables for the project site are presented in Table 3. Locations for each modeling run are presented graphically in Figure 4 of the FPP.

Table 3
BehavePlus Fire Behavior Modeling Inputs

Variable	Summer Weather (Onshore Flow)	Peak Weather (offshore/ Santa Ana Condition)
Fuel Model	9, 10, sh2	9
1h Moisture	3%	2%
10h Moisture	5%	3%
100h Moisture	7%	5%
Live Herbaceous Moisture	60%	30%
Live Woody Moisture	90%	50%
20-foot Wind Speed (upslope/downslope)	20 mph	30 to 50 mph
Wind Adjustment Factor	0.5	0.5
Slope Steepness	0-20%	0-30%

BEHAVEPLUS FIRE BEHAVIOR MODELING RESULTS

Three fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the project site, and include flame length (feet), rate of spread (mph), and fireline intensity (BTU/feet/second). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2004). It is a somewhat subjective and non-scientific measure of fire behavior, but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1983). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts. The information in Table 4 presents an interpretation of these fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Table 5, as well as in Table 3 of the FPP. Additionally, identification of modeling run locations is presented graphically in Figure 4 of the FPP.

Table 4
Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.

Table 4
Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
4 to 8 feet	100-500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11 feet	500-1000 BTU/ft/s	Fires may present serious control problems -- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: BehavePlus 5.0.5 fire behavior modeling program (Andrews, Bevins, and Seli 2004)

Table 5
BehavePlus Fire Behavior Modeling Results

Scenarios	Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Surface Rate of Spread (mph)
1. Summer fire in ornamental vegetation/oak riparian forest fuels; 20% slope; 20mph winds; downslope	6.1 to 9.3	294 to 720	< 0.5
2. Summer fire in ornamental vegetation/ Sage scrub fuels; 10% slope; 20 mph winds; upslope	7.6 to 9.4	471 to 736	< 0.3
3. Peak fire in Avocado orchard fuels; 20% slope; 30-50 mph winds; upslope	9.4 to 14	739 to 1,754	1 to 2.5
4. Peak fire in Avocado Orchard fuels; 30% slope; 30-50 mph winds; upslope	9.4 to 14	736 to 1,763	1 to 2.5

REFERENCES

Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service Gen. Tech. Report INT-122. Intermountain Forest and Range Experiment Station, Ogden, Utah.

Andrews, Patricia L., Collin D. Bevins, and Robert C. Seli. 2004. BehavePlus fire modeling system, version 3.0: User's Guide. Gen. Tech. Rep. RMRS-GTR-106 Ogden, Utah: Department of Agriculture, Forest Service, Rocky Mountain Research Station. 132p.

Rothermel, R.C. 1983. How to Predict the Spread and Intensity of Forest and Range Fires. USDA Forest Service Gen. Tech. Report INT-143. Intermountain Forest and Range Experiment, Ogden, Utah.

Scott, Joe H. and Robert E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Weise, D.R. and J. Regelbrugge. 1997. Recent chaparral fuel modeling efforts. Prescribed Fire and Effects Research Unit, Riverside Fire Laboratory, Pacific Southwest Research Station. 5p.

INTENTIONALLY LEFT BLANK

APPENDIX D

Prohibited Plant List

APPENDIX D
Prohibited Plant List

Botanical Name	Common Name
Trees	
Abies species	Fir
Acacia species (numerous)	Acacia
Agonis juniperina	Juniper Myrtle
Araucaria species (A. heterophylla, A. araucana, A. bidwillii)	Araucaria (Norfolk Island Pine, Monkey Puzzle Tree, Bunya Bunya)
Callistemon species (C. citrinus, C. rosea, C. viminalis)	Bottlebrush (Lemon, Rose, Weeiping)
Calocedrus decurrens	Incense Cedar
Casuarina cunninghamiana	River She-Oak
Cedrus species (C. atlantica, C. deodara)	Cedar (Atlas, Deodar)
Chamaecyparis species (numerous)	False Cypress
Cinnamomum camphora	Camphor
Cryptomeria japonica	Japanese Cryptomeria
Cupressocyparis leylandii	Leyland Cypress
Cupressus species (C. fobesii, C. glabra, C. sempervirens,)	Cypress (Tecate, Arizona, Italian, others)
Eucalyptus species (numerous)	Eucalyptus
Juniperus species (numerous)	Juniper
Larix species (L. decidua, L. occidentalis, L. kaempferi)	Larch (European, Japanese, Western)
Leptospermum species (L. laevigatum, L. petersonii)	Tea Tree (Austrailian, Tea)
Lithocarpus densiflorus	Tan Oak
Melaleuca species (M. linariifolia, M. nesophylla, M. quinqenervia)	Melaleuca (Flaxleaf, Pink, Cajeput Tree)
Olea europea	Olive
Picea (numerous)	Spruce
Palm species (numerous)	Palm
Pinus species (P. brutia, P. canariensis, P. eldarica, P. halopensis, P. pinea, P. radiate, numerous others)	Pine (Calabrian, Canary Island, Mondell, Aleppo, Italian Stone, Monterey)
Platycladus orientalis	Oriental arborvitae
Podocarpus species (P. gracilior, P. macrophyllus, P. latifolius)	Fern Pine (Fern, Yew, Podocarpus)
Pseudotsuga menziesii	Douglas Fir
Schinus species (S. molle, S. terebenthifolius)	Pepper (California and Brazilian)
Tamarix species (T. Africana, T. apylla, T. chinensis, T. parviflora)	Tamarix (Tamarisk, Athel Tree, Salt Cedar, Tamarisk)
Taxodium species (T. ascendens, T. distichum, T. mucronatum)	Cypress (Pond, Bald, Monarch, Montezuma)
Taxus species (T. baccata, T. brevifolia, T. cuspidata)	Yew (English, Western, Japanese)
Thuja species (*T. occidentalis, T. plicata)*	Arborvitae/Red Cedar
Tsuga species (T. heterophylla, T. mertensiana)	Hemlock (Western, Mountain)
Groundcovers, Shrubs and Vines	
Acacia species	Acacia
Adenostoma fasciculatum	Chamise
Adenostoma sparsifolium	Red Shanks

APPENDIX D (Continued)

Botanical Name	Common Name
Agropyron repens	Quackgrass
Anthemis cotula	Mayweed
Arbutus menziesii	Madrone
Arctostaphylos species	Manzanita
Arundo donax	Giant Reed
Artemesia species (A. abrotanium, A. absinthium, A. californica, A. caucasia, A. dracunulus, A. tridentate, A. pynocephala)	Sagebrush (Southernwood, Wormwood, California, Silver, True tarrangon, Big, Sandhill)
Atriplex species (numerous)	Saltbush
Auena fatua	Wild Oat
Baccharis pilularis	Coyote Bush
Bambusa species	Bamboo
Bougainvillea species	Bougainvillea
Brassica species (B. campestris, B. nigra, B. rapa)	Mustard (Field, Black, Yellow)
Bromus rubens	Foxtail, Red brome
Cardera draba	Noary Cress
Carpobrotus species	Ice Plant, Hottentot Fig
Castanopsis chrysophylla	Giant Chinkapin
Cirsium vulgare	Wild Artichoke
Conyza bonariensis	Horseweed
Coprosma pumila	Prostrate Coprosma
Cortaderia selloana	Pampas Grass
Cytisus scoparius	Scotch Broom
Dodonea viscose	Hopseed Bush
Eriodyctyon californicum	Yerba Santa
Eriogonum species (E. fasciculatum)	Buckwheat (California)
Fremontodendron species	Flannel Bush
Hedera species (H. canariensis, H. helix)	Ivy (Algerian, English)
Heterotheca grandiflora	Telegraph Plant
Hordeum leporinum	Wild barley
Juniperus species	Juniper
Lactuca serriola	Prickly Lettuce
Larix species (numerous)	Larch
Larrea tridentata	Creosote bush
Lolium multiflorum	Ryegrass
Lonicera japonica	Japanese Honeysuckle
Mahonia species	Mahonia
Mimulus aurantiacus	Sticky Monkeyflower
Miscanthus species	Eulalie Grass
Muehlenbergia species	Deer Grass
Nicotania species (N. bigelevil, N. glauca)	Tobacco (Indian, Tree)
Pennisetum setaceum	Fountain Grass
Perronskia Atriplicifloria	Russian Sage

Botanical Name	Common Name
Phoradendrom species	Mistletoe
Pickeringia montana	Chaparral Pea
Rhus species (R. diversiloba, R. laurina, R. lentii)	Sumac (Poison oak, Laurel, Pink Flowering)
Ricinus communis	Castor Bean
Rosmarinus species	Rosemary
Salvia species (numerous)	Sage
Sacsola austails	Russian Thistle
Solanium Xantii	Purple Nightshade (toxic)
Sylibum marianum	Milk Thistle
Thuja species	Arborvitae
Urtica urens	Burning Nettle
Vinca major	Periwnkle
Rhus lentii	Pink Flowering Sumac

Notes:

1 For the purpose of using this list as a guide in selecting plant material, it is stipulated that all plant material will burn under various conditions.
2 The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
3 All vegetation used in Vegetation Management Zones and elsewhere in this development shall be subject to approval of the Fire Marshal.
4 Additional plants that are considered undesirable due to their invasiveness nature are detailed on the California Invasive Plant Council's Web site at www.cal-ipc.org/ip/inventory/index.php.
5 Landscape architects may submit proposals for use of certain vegetation on a project specific basis. They shall also submit justifications as to the fire resistivity of the proposed vegetation.

INTENTIONALLY LEFT BLANK