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**DRAFT FIRE PROTECTION PLAN**  
**Renaissance Ranch Commerce Center Specific Plan**  
**County of Riverside**

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**MARCH 2021**

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# Table of Contents

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<b><u>SECTION</u></b>	<b><u>PAGE NO.</u></b>
<b>EXECUTIVE SUMMARY .....</b>	<b>IV</b>
<b>1 INTRODUCTION .....</b>	<b>1</b>
1.1 Applicable Codes/Existing Regulations.....	1
1.2 Project Summary .....	2
1.2.1 Project Overview .....	2
1.2.2 Location.....	2
1.2.3 Existing Land Use.....	2
1.2.4 Project Description .....	3
<b>2 PROJECT SITE RISK ANALYSIS .....</b>	<b>8</b>
2.1 Field Assessment .....	8
2.2 Project Site Characteristics and Fire Environment .....	8
2.2.1 Topography.....	8
2.2.2 Climate .....	9
2.2.3 Vegetation .....	9
2.2.4 Fire History .....	<b>Error! Bookmark not defined.</b>
<b>3 ANTICIPATED FIRE BEHAVIOR .....</b>	<b>12</b>
3.1 Fire Behavior Modeling .....	12
3.2 Fire Behavior Modeling Analysis.....	12
3.3 Fire Behavior Summary.....	14
3.3.1 Existing Condition .....	<b>Error! Bookmark not defined.</b>
3.3.2 Post-development Condition .....	<b>Error! Bookmark not defined.</b>
3.4 Project Area Fire Risk Assessment.....	14
<b>4 EMERGENCY RESPONSE AND SERVICE.....</b>	<b>18</b>
4.1 Emergency Response.....	18
4.2 Estimated Calls and Demand for Service from the Project .....	19
<b>5 FIRE SAFETY REQUIREMENTS-INFRASTRUCTURE, BUILDING IGNITION RESISTANCE, AND DEFENSIBLE SPACE .....</b>	<b>21</b>
5.1 Roads .....	21
5.1.1 Access.....	21
5.1.2 Maximum Dead-End Road (cul-de-sac) Length.....	21
5.1.3 Gates .....	22
5.1.4 Driveways .....	22
5.1.5 Premises Identification.....	23

5.1.6	Ongoing Infrastructure Maintenance.....	23
5.1.7	Pre-Construction Requirements.....	23
5.2	Ignition Resistant Construction and Fire Protection Systems .....	23
5.3	Fire Protection Systems .....	24
5.3.1	Water Supply .....	24
5.3.2	Hydrants .....	24
5.3.3	Fire Sprinklers.....	24
5.4	Defensible Space and Vegetation Management.....	24
5.4.1	Defensible Space.....	24
5.4.2	Fuel Modification Zone Requirements .....	24
5.4.3	Vegetation Management Maintenance .....	30
5.4.5	Prohibited Plants.....	31
5.4.6	Construction Phase Vegetation Management .....	31
<b>6</b>	<b>WILDFIRE EDUCATION PROGRAM.....</b>	<b>33</b>
<b>7</b>	<b>CONCLUSION .....</b>	<b>35</b>
<b>8</b>	<b>LIST OF PREPARERS .....</b>	<b>37</b>
<b>9</b>	<b>REFERENCES (INCLUDING REFERENCES FROM APPENDICES).....</b>	<b>39</b>

**APPENDICES**

A	Representative Site Photographs
B	Project Vicinity Fire History Map
C	BehavePlus Fire Behavior Analysis
D	Ignition-Resistant Construction Requirements
E	Prohibited Plant List

**FIGURES**

1	Project Location .....	5
2	Project Land Use Plan.....	7
3	BehavePlus Fire Analysis Map .....	16
4	Fuel Modification Zones .....	28

**TABLES**

1	Fuel Model Characteristics.....	12
2	BehavePlus Modeling Results for Existing Conditions.....	13
3	BehavePlus Modeling Results for Post-Project Conditions .....	18
4	Closest Responding RCFD Fire Stations Summary .....	18
5	Land Use Classification Information with Staffing/Time Response Standards .....	19

FIRE PROTECTION PLAN  
RENAISSANCE RANCH COMMERCE CENTER SPECIFIC PLAN

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6 Calculated Call Volume (Conceptual Based on 2,514 Persons)..... 20  
7 Building the Require Enhanced Wall Construction.....26



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# Executive Summary

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This Fire Protection Plan (FPP) has been prepared for Renaissance Ranch Commerce Center Specific Plan (Project) located in the western portion of the unincorporated area in the County of Riverside, California. This FPP evaluates and identifies the potential fire risk associated with the Project's land uses and identifies requirements for water supply, fuel modification and defensible space, access, building ignition and fire resistance, and fire protection systems, among other pertinent fire protection criteria. The purpose of this plan is to generate and memorialize the fire safety requirements and standards of the Riverside County Fire Department (RCFD) along with Project-specific measures based on the Project site, its intended use, and its fire environment.

This document provides analysis of the Project site's fire environment and its potential impact on the Project as well as the Project's potential impact on the existing fire protection service. Requirements and recommendations herein are based on Project site-specific fire environment analysis and Project characteristics and incorporates area fire planning documents, Project site risk analysis, and standard principles of fire protection planning.

As determined during the analysis of the Project site and its fire environment, the Renaissance Ranch Commerce Center Specific Plan Project site, in its current condition, may include characteristics that, under favorable weather conditions, could have the potential to facilitate fire spread. Under extreme conditions, wind-driven wildfires from the nearby Lake Matthews-Estelle Mountain Reserve and undeveloped land could cast embers onto the property. Once built, the Project's on-site fire potential will be much lower than its current condition due to conversion of wildland fuels to building footprints, parking areas, managed landscapes, fuel modification areas, improved accessibility for fire personnel, and structures built to the latest ignition and ember resistant fire codes.

It is important to note that the fire safety requirements that will be implemented on the Project site, including ignition resistant construction standards, along with requirements for water supply, fire apparatus access, fuel modification and defensible space, interior fire sprinklers and five minute or less fire response travel times were integrated into the code requirements and internal guidelines based on results of post-fire assessments, similar to the After Action Reports that are now prepared after large fire events. When it became clear that specifics of how structures were built, how fire and embers contributed to ignition of structures, what effects fuel modification had on structure ignition, how fast firefighters could respond, and how much (and how reliable) water was available, were critically important to structure survivability, the Fire and Building codes were revised appropriately. Riverside County now boast some of the most restrictive codes for building within Wildland Urban Interface (WUI) areas that focus on preventing structure ignition from heat, flame, and burning embers.

The developed portion of this property is proposed for improvements that include construction of a total target building space of 2,519,946 square feet and establishes: light Industrial uses on approximately 97.2 acres with a target of 2,117,017 square feet of building space, business Park uses on 18.0 acres with a target of 402,929 square feet of building space. The entire Project site has been designed with fire protection as a key objective. The Project site improvements are designed to facilitate emergency apparatus and personnel access throughout the Project site. Driveway and road improvements with fire apparatus turnarounds provide access to the sides of every building. Water availability and flow will be consistent with requirements including fire flow and hydrant distribution required by local and state codes. These features along with the ignition resistance of all buildings, the interior sprinklers, and the pre-planning, training and awareness will assist responding firefighters through prevention, protection and suppression capabilities.

As detailed in this FPP, the Project site's fire protection systems will include a redundant layering of protection methods that have proven to reduce overall fire risk. The requirements and recommendations included herein are performance based and Project site-specific, considering the Project's unique characteristics rather than a prescriptive, one-size-fits-all approach. The fire protection systems are designed to increase occupant and building safety, reduce the fire risk on the Project site, to minimize risks associated with typical uses, and aid the responding firefighters during an emergency. No singular measure is intended to be relied upon for the Project site's fire protection, but rather, a system of fire protection measures, methods, and features combine to result in enhanced fire safety, reduced fire potential, and improved safety in the development.

Early evacuation for any type of wildfire emergency at the Project is the preferred method of providing for occupant and business safety, consistent with the Owner's and RCFD current approach for evacuation. As such, the Project's Owner and Property Management Company will formally adopt, practice, and implement a "Ready, Set, Go!" (Riverside County Fire Department 2020) approach to Project site evacuation. The "Ready, Set, Go!" concept is widely known and encouraged by the state of California and most fire agencies, including; Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing potential for errors, maintaining the Project site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and Project site uses during periods of fire weather extremes.

Based on the results of this FPP's analysis and findings, the following FPP implementation measures will be provided by Renaissance Ranch Commerce Center Specific Plan Project as part of the proposed development plan. These measures are discussed in more detail throughout this FPP.

1. Project buildings will be constructed of ignition resistant<sup>1</sup> construction materials and include automatic fire sprinkler systems based on the latest adopted Building and Fire Codes for occupancy types.
2. Fuel Modification will be provided around the perimeter of all buildings, as required by RCFD and will be 100 feet wide.
3. Landscape plantings will not utilize prohibited plants that have been found to be highly flammable.
4. Fire apparatus access roads (i.e., public and private streets) will be provided throughout the light industrial and commercial development and will vary in width and configuration, but will all provide at least the minimum required unobstructed travel lanes, lengths, turnouts, turnarounds, and clearances required by applicable codes. Primary access and internal circulation will comply with the requirements of the RCFD.
5. Buildings will be equipped with automatic commercial fire sprinkler systems meeting RCFD requirements.
6. Water capacity and delivery provide for a reliable water source for operations and during emergencies requiring extended fire flow.
7. The Property Owner's or Property Management Company, will provide business owners informational brochures at time of occupancy, which will include an outreach and educational role to ensure fire safety measures detailed in this FPP have been implemented and development-wide "Ready, Set, Go!" plans prepared.

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<sup>1</sup> A type of building material that resists ignition or sustained flaming combustion sufficiently to reduce losses from wildland-urban interface conflagrations under worst-case weather and fuel conditions with wildfire exposure of burning embers and small flames, as prescribed in CBC, Chapter 7A and State Fire Marshal Standard 12-7A-5, Ignition-Resistant Materials.

# 1 Introduction

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This Fire Protection Plan (FPP) has been prepared for the Renaissance Ranch Commerce Center Specific Plan Project (Project) in the western portion of Riverside County (County), California, and within the City of Lake Elsinore Sphere of Influence (SOI). 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. Additionally, this plan generates and memorializes the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), which is the Riverside County Fire Department (RCFD). Requirements and recommendations are based on Project site-specific characteristics and incorporate input from the Project applicant and the FAHJ.

As part of the assessment, the plan has considered the property location, topography, surrounding combustible vegetation (fuel types), climatic conditions, and fire history. The plan addresses water supply, access, structural ignitability and fire resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect one or more at-risk communities and essential infrastructures. The following tasks were performed toward completion of this plan:

- Gather Project site specific climate, terrain, and fuel data;
- Collect Project site photographs;
- Process and analyze the data using the latest GIS technology;
- Predict fire behavior using scientifically based fire behavior models, comparisons with actual wildfires in similar terrain and fuels, and experienced judgment;
- Analyze and guide design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the Project and the Project site; and
- Prepare this FPP detailing how fire risk will be mitigated through a system of fuel modification, structural ignition resistance enhancements, and fire protection delivery system upgrades.

Field observations were utilized to augment existing digital Project site data in generating the fire behavior models and formulating the recommendations presented in this FPP. Refer to Appendix A for Project site photographs of existing conditions.

## 1.1 Applicable Codes/Existing Regulations

This FPP demonstrates that Renaissance Ranch Commerce Center Specific Plan Project will comply with applicable portions of Riverside County Fire Department, Fire Prevention Standards and County Ordinances No. 460 and No. 787-8. The Project will also be consistent with the 2019 edition of the California Building Code (CBC), Chapter 7A; 2019 edition of the California Fire Code (CFC), Chapter 49; and the 2018 edition of the International Fire Code (IFC) as adopted and amended by RCFD. Additionally, RCFD references Fire Prevention Standards for informational purposes in clarifying and interpreting provisions of the CFC, National Fire Protection Association (NFPA) and California Public Resources Code (PRC). Chapter 7A of the CBC focuses primarily on preventing ember penetration into buildings, a leading cause of structure loss from wildfires.

Thus, it is an important component of the requirements of this FPP given the Project's wildland-urban interface (WUI) location is primarily in an area statutorily designated as a Very High Fire Hazard Severity Zone (VHFHSZ) state responsibility area (SRA) by California Department of Forestry and Fire Protection (CAL FIRE) (FRAP 2007). The designations of Fire Hazards are based on topography, vegetation, and weather, amongst other factors with more hazardous sites, which include steep terrain, un-maintained fuels/vegetation, and WUI locations. As described in this FPP, the Project will meet all applicable fire and building code requirements for building in these higher fire hazard areas, or meet the intent of the code through the application of Project site-specific fire protection measures. These codes have been developed through decades of after fire structure save and loss evaluations to determine what causes building loss during wildfires. The resulting fire codes now focus on mitigating former structural vulnerabilities through construction techniques and materials so that the buildings are resistant to ignitions from direct flames, heat, and embers, as indicated in the 2019 California Building Code (Chapter 7A, Section 701A Scope, Purpose and Application).

## 1.2 Project Summary

### 1.2.1 Project Overview

The Project provides for a business park on approximately 18-acres in the northwest portion of the Project site, light industrial uses on approximately 97.2 acres in the central portion of the Project site, two areas of open space conservation to the west and south of the central portion of the Project site totaling approximately 11.5 acres, and two areas of open space – conservation habitat, which includes approximately 25.3 acres on the eastern portion of the Project site and 1.8 acres centrally located on the northern parcel boundary. The Project site is approximately 156.7 acres (See Project Description, below).

### 1.2.2 Location

The 156.7-gross-acre Project site is located in the Elsinore Area Plan of unincorporated Riverside County and within the City of Lake Elsinore Sphere of Influence. The Project site is approximately 1.25-mile west of the northwestern boundary City of Lake Elsinore, approximately 4.9 miles north of Lake Elsinore, approximately 6.75 miles south-southeast of the City of Corona. (Figure 1, Project Location Map). More specific, the Project site is located, immediately south of Interstate-15 (I-15) and immediately east of the community of Horsethief Canyon Ranch. The Project site is situated within Section 17 of Township 5 South, and Range 5 West on the Alberhill, California, United States Geological Survey (USGS), 7.5-minute topographic map.

The Renaissance Ranch Commerce Center Specific Plan Project site is located on the following Riverside County Assessors Parcel book pages in Book 393: Pages 120, 150, 180, 250, 260, 270, 280, 290 and 300.

### 1.2.3 Existing Land Use

The Project site is currently undeveloped land that has been subject to disturbances from various sources including off-road vehicles and isolated trash dumping. The Project area is primarily vegetated with non-native grasses and sage scrub, with scattered native chaparral shrubs, and riparian vegetation in some of the stream channels. Several dirt roads and trails were observed throughout the Project site along with evidence of past agricultural and homestead uses. The Project site's terrain is generally flat with several deeply-eroded, seasonal

stream channels/washes draining toward the north to Temescal Creek, and a series of bluffs/cutbanks overlooking the I-15 Freeway.

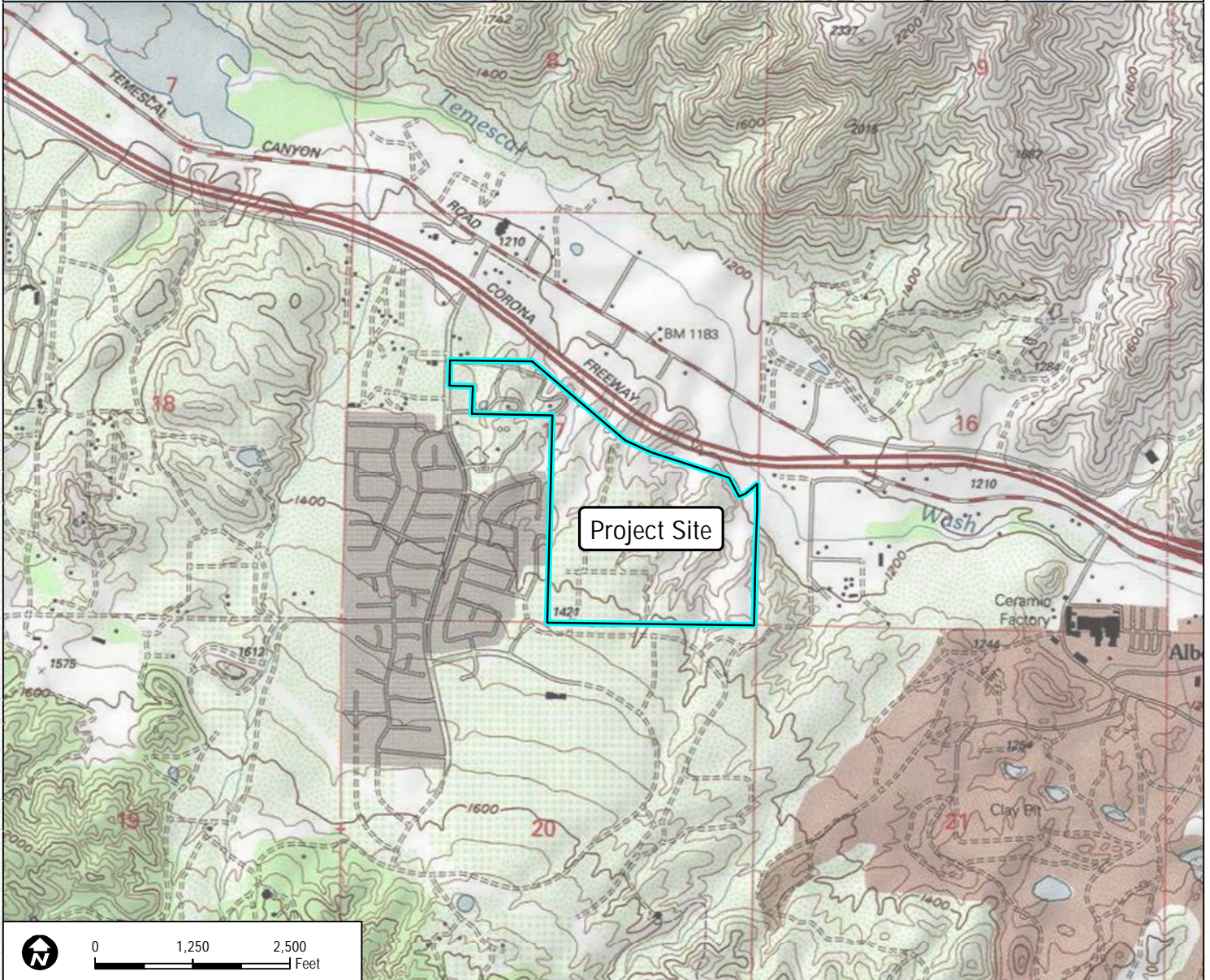
Surrounding land uses that lie adjacent to the Project site include the Horsetheif Canyon Ranch Specific Plan (SP 152A3) to the west and south, undeveloped land and sparse commercial and industrial uses to the east, and Interstate 15 (I-15) immediately north.

## 1.2.4 Project Description

The Renaissance Ranch Commerce Center Specific Plan Project proposes development of approximately 157.1 acres for a light industrial mixed-use development (Figure 2, Land Use Plan). The Renaissance Ranch Commerce Center Specific Plan provides for a total target building space of 2,519,946 square feet and establishes: Light Industrial uses on approximately 97.2 acres with a target of 2,117,017 square feet of building space, Business Park uses on 18.0 acres with a target of 402,929 square feet of building space; 11.4 acres of Open Space-Conservation, and 27.1 acres of Open Space-Conservation Habitat. Circulation improvements with the development comprise the remaining 3.3 acres of the Renaissance Ranch Commerce Center Specific Plan Project. Horsetheif Canyon Road in the northwest corner of the Project site and Bolo Court in the southeast corner of the Project site provide primary local access to the Commerce Center and serve as important components of the area's local circulation system.

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SOURCE: USGS 7.5 Minute Series, Alberhill Quadrangle  
Township 5 South, Range 5 West, Section 17

**DUDEK**




FIGURE 1  
Project Location  
Renaissance Ranch FPP

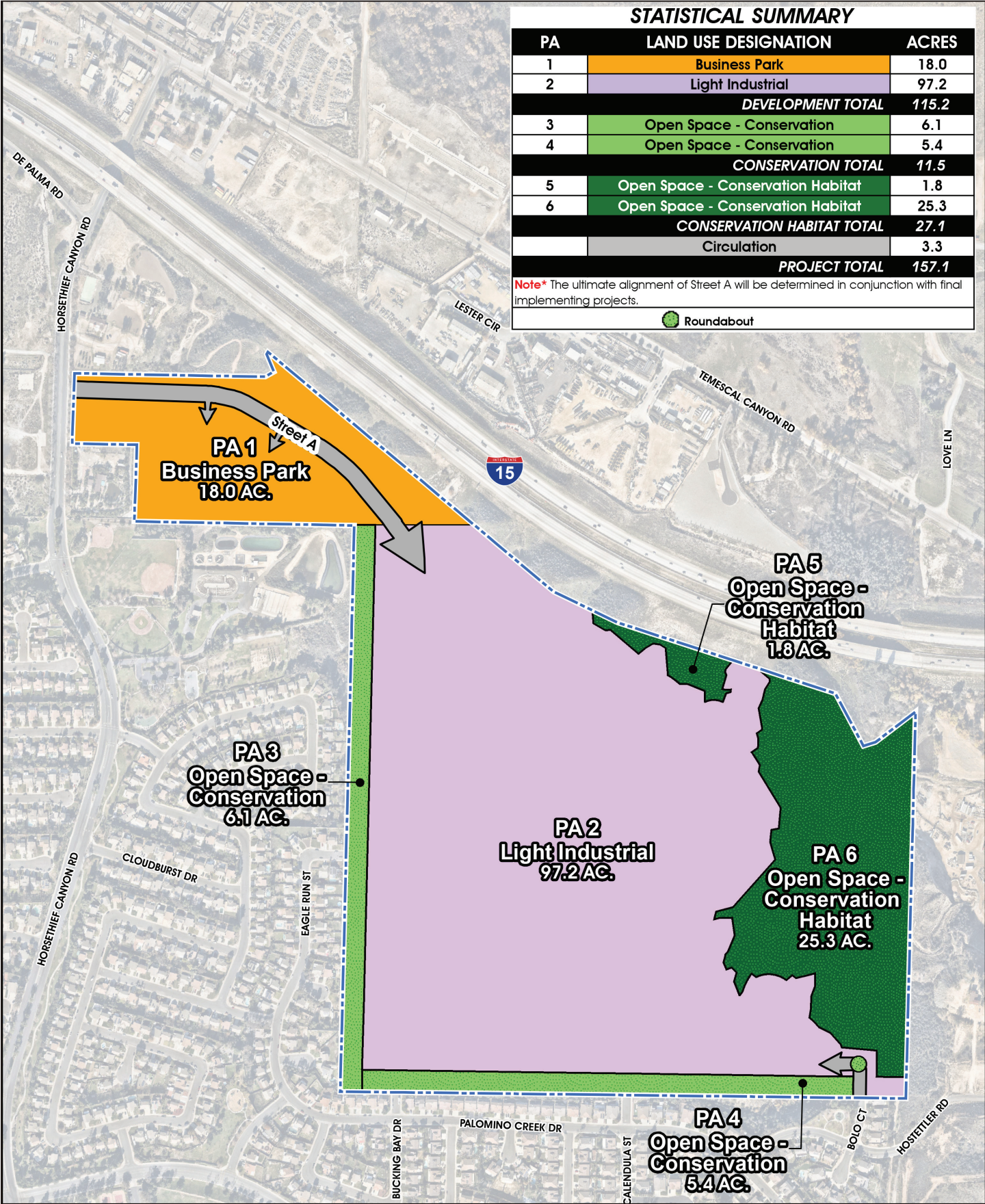
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STATISTICAL SUMMARY		
PA	LAND USE DESIGNATION	ACRES
1	Business Park	18.0
2	Light Industrial	97.2
DEVELOPMENT TOTAL		115.2
3	Open Space - Conservation	6.1
4	Open Space - Conservation	5.4
CONSERVATION TOTAL		11.5
5	Open Space - Conservation Habitat	1.8
6	Open Space - Conservation Habitat	25.3
CONSERVATION HABITAT TOTAL		27.1
Circulation		3.3
PROJECT TOTAL		157.1

**Note\*** The ultimate alignment of Street A will be determined in conjunction with final implementing projects.

 Roundabout



SOURCE: T & B PLANNING 2020

FIGURE 2

Land Use Plan

Renaissance Ranch FPP

# 2 Project Site Risk Analysis

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## 2.1 Field Assessment

A field assessment of Renaissance Ranch Commerce Center Specific Plan Project area was conducted on August 4, 2020 in order to confirm/acquire Project site information, document existing Project site conditions, and to determine potential actions for addressing the protection of the Project's structures. While on site, Dudek's Fire Planner assessed the area's topography, natural vegetation and fuel loading, surrounding land use and general susceptibility to wildfire. Among the field tasks that were completed are:

- Vegetation estimates and mapping refinements
- Fuel load analysis
- Topographic features documentation
- Photograph documentation
- Confirmation/verification of hazard assumptions
- Ingress/egress documentation.
- Nearby Fire Station reconnaissance

Field observations were utilized to augment existing Project site data in generating the fire behavior models and formulating the recommendations detailed in this report.

## 2.2 Project Site Characteristics and Fire Environment

Fire environments are dynamic systems and include many types of environmental factors and Project site characteristics. Fires can occur in any environment where conditions are conducive to ignition and fire movement. Areas of naturally vegetated open space are typically comprised of conditions that may be favorable to wildfire spread. The three major components of fire environment are topography, climate, and vegetation (fuels). The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Structure ignition depends on a variety of factors and can be prevented through a layered system of protective features including fire resistive landscapes directly adjacent the structure(s), application of known ignition resistive materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent the Project site is necessary to understand the potential for fire within and around the Project site.

The following sections discuss the Project site's characteristics, local climate, and fire history within and surrounding the Project site. The Renaissance Ranch Commerce Center Specific Plan Project is similar concerning topography, vegetative cover, and proximity to adjacent residential areas, available access, and planned use. The following sections discuss the characteristics of the Project site at a regional scale. The intent of evaluating conditions at this macro-scale is providing a better understanding of the regional fire environment, which is not constrained by property boundary delineations.



## 2.2.1 Topography

Topography influences fire risk by affecting fire spread rates. Typically, steep terrain results in faster fire spread up-slope and slower fire spread down-slope in the absence of wind. Flat terrain tends to have little effect on fire spread, resulting in fires that are driven by wind. The Project site is situated on a mesa-like flat area with several deeply-eroded, seasonal stream channels/washes draining toward the north, with a series of bluffs/cutbanks overlooking the I-15 Freeway. The stream channels train to Temescal Creek and eventually to the Santa Ana River. The elevations on the Project site vary across the site from approximately 1180 feet above mean sea level (amsl) along the northeastern Project site boundary to approximately 1420 feet amsl along the southwestern portion of the Project site.

## 2.2.2 Climate

Throughout southern California, and specifically at the Project site, climate has a large influence on fire risk. The climate of Riverside County is typical of a Mediterranean area, with warm, dry summers and cold, wet winters. Temperatures average (average annual) around 61° F and reach up to 100° F. Precipitation has been averaging less than 16 inches and typically occurs between December and March. The prevailing wind is an on-shore flow between 7 and 11 mph from the Pacific Ocean.

Fires can be a significant issue during summer and fall, before the rainy period, especially during dry Santa Ana wind events. The seasonal Santa Ana winds can be particularly strong in the Project area as warm and dry air is channeled through the San Gorgonio Pass from the dry, desert land to the east. Although Santa Ana events can occur anytime of the year, they generally occur during the autumn months, although the last few years have resulted in spring (April - May) and summer events. Santa Ana winds may gust up to 75 miles per hour (mph) or higher. This phenomenon markedly increases the wildfire danger and intensity in the Project area by drying out and preheating vegetation (fuel moisture of less than 5% for 1-hour fuels is possible) as well as accelerating oxygen supply, and thereby, making possible the burning of fuels that otherwise might not burn under cooler, moister conditions.

## 2.2.3 Vegetation

### 2.2.3.1 Fuels (Vegetation)

The Project property and surrounding areas primarily support sage scrub plant community, non-native grasslands and disturbed habitat. Vegetation types were derived from an on-site field assessment of the Project site. The vegetation cover types were assigned corresponding fuel models for use during site fire behavior modeling, described further in Section 3.0 below.

### 2.2.3.2 Vegetation Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Section 3.0 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 (bark thickness, leaf

size, branching patterns), and overall fuel loading. For example, non-native grass dominated plant communities become seasonally prone to ignition and produce lower intensity, higher spread rate fires. In comparison, sage scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels.

As described, vegetation plays a significant role in fire behavior, and is an important component to the fire behavior models discussed in this report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In summary, high frequency fires tend to convert shrublands to grasslands or maintain grasslands, while fire exclusion tends to convert grasslands to shrublands, over time. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (fire, or grading) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed fuel modification zones on the Project site. The fuel modification zones on the Project site will consist of paved areas and irrigated and maintained landscapes as well as thinned native fuel zones that will be subject to regular “disturbance” in the form of maintenance and will not be allowed to accumulate excessive biomass (live or dead) over time, which results in reduced fire ignition, spread rates, and intensity. Conditions adjacent the Project’s footprint (outside the fuel modification zones), where the wildfire threat will exist post-development, are classified as low to medium fuel loads due to the dominance of sage scrub-grass fuels.

## 2.2.4 Fire History

Fire history is an important component of an FPP. Fire history data provides valuable information regarding fire spread, fire frequency, most vulnerable areas, and significant ignition sources, amongst others. In turn, this understanding of why fires occur in an area and how they typically spread can then be used for pre-planning and designing defensible communities.

Fire history represented in this FPP uses the Fire and Resource Assessment Program (FRAP) database. FRAP summarizes fire perimeter data dating to the late 1800s, but which is incomplete due to the fact that it only includes fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the Project area, which indicates whether they may be possible in the future.

Appendix B – Project Vicinity Fire History exhibit, presents a graphical view of the Project area’s recorded fire history. As presented in the exhibit, there have been 73 fires recorded since 1913 by CALFIRE in the FRAP database (FRAP 2019)<sup>2</sup> in the vicinity of the Project, including two fires on-site both in the southern portion of the Project site. These fires, occurring in 1913 (x2), 1915 (x2), 1917 (x2), 1922, 1923 (x2), 1925, 1930, 1938 (x2), 1942 (x2), 1944, 1945 (x2), 1954, 1956, 1957, 1958, 1959, 1962, 1965, 1966, 1967, 1968 (x3), 1976, 1977, 1978 (x3), 1979, 1980 (x2), 1981 (x5), 1982, 1985 (x2), 1986, 1987 (x2), 1988 (x3), 1991, 1995 (x2), 1996,

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<sup>2</sup> Based on polygon GIS data from CAL FIRE’s FRAP, which includes data from CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies. The data set is a comprehensive fire perimeter GIS layer for public and private lands throughout the state and covers fires 10 acres and greater between 1878–2019.

1997, 1998 (x2), 1999, 2002, 2003, 2004, 2007 (x2), 2008, 2011, 2012 (x2), 2015, 2017, 2018, 2019, burned within a five mile radius of the Project Area. The two fires that have burned onto a portion of the Project site occurred in 1923 and 1967. Based on an analysis of the CAL FIRE FRAP fire history data set, specifically the years in which the fires burned, the average interval between wildfires in the area (includes areas up to roughly 5 miles from the Project site) was calculated to be one year with intervals ranging between zero and nine years. Based on this analysis, it is expected that wildfire that could impact the Project may occur, if weather conditions coincide, roughly every year with the realistic possibility of shorter or longer interval occurrences, as observed in the fire history records.

# 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 adjacent to the Project site given characteristic site features such as topography, vegetation, and weather. Dudek utilized BehavePlus software package version 5.5 (Andrews, Bevins, and Seli 2008) to analyze potential fire behavior for the northern, eastern, southern, and western edges of the Project site, with assumptions made for the pre- and post-Project slope and fuel conditions. Results are provided below and a more detailed presentation of the BehavePlus analysis, including fuel moisture and weather input variables, is provided in Appendix C.

## 3.2 Fire Behavior Modeling Analysis

An analysis utilizing the BehavePlus software package was conducted to evaluate fire behavior variables and to objectively predict flame lengths, intensities, and spread rates for four modeling scenarios. These fire scenarios incorporated observed fuel types representing the dominant on-site and off-site vegetation on vacant land to the north, east, south and west, in addition to slope gradients, and wind and fuel moisture values for both the 50th percentile weather (summer, on-shore winds) and the 97th percentile weather (fall, off-shore winds). Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent to the Project site.

Vegetation types, which were derived from available resource materials and confirmed during the field assessment for the Project site, were classified into a fuel model. 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. 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). Fuel models were also assigned to the perimeter fuel management areas to illustrate post-Project fire behavior changes. Based on the anticipated pre- and post-Project vegetation conditions, three different fuel models were used in the fire behavior modeling effort presented herein. Fuel model attributes are summarized in Table 1.

**Table 1. Fuel Model Characteristics**

Fuel Model Assignment	Description	Tons/acre, Btu/lb.	Fuel Bed Depth (Feet)
8	Fuel Modification Zone 1 – irrigated, landscapes	5.0 tons/acre; 8,000 Btu/lb.	<0.5
Gr4	Moderate Load, Dry Climate Grass	0.4 tons/acre; 8,000 Btu/lb.	<2.0 ft.
SH5	Dry Climate Shrub (sage scrub)	6.4 tons/acre; 8,000 Btu/lb.	<6.0 ft.

The results of fire behavior modeling analysis for pre- and post-Project conditions are presented in Tables 2 and 3, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 3, Fire Behavior Analysis Map.

**Table 2. BehavePlus Modeling Results for Existing Conditions**

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph <sup>2</sup> )	Spotting Distance <sup>3</sup> (miles)
<b>Scenario 1: sage scrub, 20% uphill slope, 40 mph high wind speed from NE</b>				
Fuel Model Sh5	42.7	19,905	6.0	2.0
<b>Scenario 2: sage scrub, 5% uphill slope, 40 mph high wind speeds from E</b>				
Fuel Model Sh5	42.5	19,662	6.0	2.0
<b>Scenario 3: sage scrub, 20% downhill to 20% uphill slopes, 20 mph sustained winds from W</b>				
Fuel Model Sh5	17.7	2,936	1.2	0.7
<b>Scenario 4: grasslands, 3% downhill slope, 20 mph sustained winds from NW</b>				
Fuel Model Gr4	13.3	1,582	2.2	0.6

Notes: 1. Spotting distance from a wind driven surface fire.

**Table 3. BehavePlus Modeling Results for Post-Project Conditions**

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph <sup>2</sup> )	Spotting Distance <sup>2</sup> (miles)
<b>Scenario 1: Irrigated manufactured slope-roadway-landscaping, 20% uphill slope, 40 mph high wind speed from NE</b>				
Irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<b>Scenario 2: Fuel modification-roadway-irrigated landscaping, 20% uphill slope, 40 mph high wind speed from E</b>				
Disturbed/Irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<b>Scenario 3: Fuel modification-irrigated manufactured slope-parking lot, 20% uphill slope to level, 20 mph sustained winds from W</b>				
Disturbed/pavement (FM8)	1.6	16	0.1	0.1
<b>Scenario 4: Irrigated landscaping/pavement, 3% downhill slope, 20 mph sustained winds from NW</b>				
Irrigated landscaping/pavement (FM8)	1.6	15	0.1	0.1

The results presented in Tables 2 and 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, but the models provide a worst-case wildfire behavior condition as part of a conservative approach. 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 would be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

## 3.3 Fire Behavior Summary

### 3.3.1 Existing Condition

As presented in the Fire Modeling Analysis Map (Figure 3), wildfire behavior in sage scrub, modeled as Sh5, and annual grasslands, modeled as Gr4, varies based on timing of fire (refer to Table 2, Fire Behavior Results for Existing Conditions). A worst-case fire under gusty Santa Ana winds and low fuel moistures is expected to be fast moving between 6.0 (sage scrub fuel type) and 10.0 mph (grass fuel type). Flame length values with intense radiant heat would range between 13.3 feet to 42.7 feet for grass and sage scrub fuels burning, respectively, in specific portions adjacent to the property. Spotting is projected to occur up to nearly 0.7 miles during a fire influenced by onshore winds and nearly 2.0 miles during a fire fanned by offshore, gusty winds.

### 3.3.2 Post-development Condition

As presented in Table 3, Fire Behavior Results for Existing Conditions, Dudek conducted modeling of the Project site for post-development fuel recommendations for the Project. The fuel modification area includes paved streets, parking lots and irrigated landscaping on the periphery of the proposed business park and light industrial development. For modeling the post-development condition, fuel model assignments were re-classified for the fuel modification area as Fuel Model 8. Fuel model assignments for all other areas remained the same as those classified for the existing condition.

As depicted, the fire intensity and flame lengths in untreated, open space areas would remain the same. Conversely, the fuel modification area experienced a significant reduction in flame length and intensity. The flames predicted during pre-development modeling during extreme weather conditions are reduced to less than 3.0 feet tall at the outer edges of the development due to the lack of comutable material present and the higher live and dead fuel moisture content for the irrigated landscaping.

## 3.4 Project Area Fire Risk Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of grasslands and shrublands. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that 1) native landscapes, from forest to grasslands, become highly flammable each fall and 2) the climate of southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a six-month drought period each year. Based on this research, the anticipated growing population of western Riverside County WUI areas, and the regions fire history, it can be anticipated that periodic wildfires may start on, burn onto, or spot into the Project site. The most common type of fire anticipated in the vicinity of the Project Area is a wind-driven fire from the north/northeast moving through the annual grasses and sage scrub shrubs found in the Lake Mathews Estelle Mountain Reserve north of the Project.



Therefore, it will be critical that the latest fire protection technologies, developed through intensive research and real world wildfire observations and findings by fire professionals, for both ignition resistant construction and for creating defensible space in the ever-expanding WUI areas, are implemented and enforced. The Project, once developed, would not facilitate wildfire spread and would reduce projected flame lengths to levels that would be manageable by firefighting resources for protecting the Project site's structures, especially given the ignition resistance of the structures and the planned ongoing maintenance of the entire Project site landscape.



### Fire Behavior Modeling Results for Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
<i>Scenario 1: sage scrub, 20% uphill slope, 40 mph high wind speed from NE</i>				
Fuel Model Sh5	42.7	19,905	6.0	2.0
<i>Scenario 2: Sage scrub, 5% uphill slope, 40 mph high wind speeds from E</i>				
Fuel Model Sh5	42.5	19,662	6.0	2.0
<i>Scenario 3: sage scrub, 20% downhill to 20% uphill slopes, 20 mph sustained winds from W</i>				
Fuel Model Sh5	17.7	2,936	1.2	0.7
<i>Scenario 4: grasslands, 3% downhill slope, 20 mph sustained winds from NW</i>				
Fuel Model Gr4	13.3	1,582	2.2	0.6

**Notes:**

- 1. Spotting distance from a wind driven surface fire.

### Fire Behavior Modeling Results for Post-Project Conditions

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
<i>Scenario 1: Irrigated manufactured slope-roadway-landscaping, 20% uphill slope, 40 mph high wind speed from NE</i>				
Irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<i>Scenario 2: Fuel modification-roadway-irrigated landscaping, 20% uphill slope, 40 mph high wind speed from E</i>				
Disturbed/irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<i>Scenario 3: Fuel modification-irrigated manufactured slope-parking lot, 20% uphill slope to level, 20 mph sustained winds from W</i>				
Disturbed/pavement (FM8)	1.6	16	0.1	0.1
<i>Scenario 4: Irrigated landscaping/pavement, 3% downhill slope, 20 mph sustained winds from NW</i>				
Irrigated landscaping/pavement (FM8)	1.6	15	0.1	0.1

 Project Boundary



Path: Z:\p\m\128240\MAP\DOC\DOCUMENT\FPP\FPP\FIG 3 BehavePlus Analysis Map.mxd

SOURCE: AERIAL-BING MAPPING SERVICE

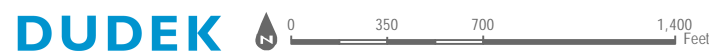


FIGURE 3  
BehavePlus Analysis Map  
Renaissance Ranch FPP



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# 4 Emergency Response And Service

## 4.1 Emergency Response

The Project site is located within Riverside County Fire Department (RCFD) response area. Table 4 presents a summary of the location, equipment, staffing levels, maximum travel distance, and travel time for the two closest, existing RCFD stations responding to the Project. Travel distances are derived from Google road data while travel times are calculated applying the nationally recognized Insurance Services Office (ISO) Public Protection Classification Program’s Response Time Standard formula ( $T=0.65 + 1.7 D$ , where T= time and D = distance). The ISO response travel time formula discounts speed for intersections, vehicle deceleration and acceleration, and does not include turnout time.

**Table 4. Closest Responding RCFD Fire Stations Summary**

Station No.	Location	Equipment	Staffing*	Maximum Travel Distance**	Travel Time**
64	25310 Campbell Ranch Rd, Corona, CA 92883	Engine	3	3.3 mi.	6 min. 16 sec.
85	29405 Grand Ave, Lake Elsinore, CA 92530	Engine	3	6.5 mi.	11 min. 42 sec.

\* Staffing levels per shift

\*\* Assumes travel distance and time to the furthest point within the Project site.

Riverside County Fire Station 64, staffed 24/7 with career firefighters, would provide initial response. Station 64 is located northwest of the Project site, adjacent to the Sycamore Creek community, at 25310 Campbell Ranch Rd in Corona. Station 64 is staffed by RCFD with one captain, one engineer, one firefighter per 24-hour shift and is equipped with one engine. A private ambulance is also located at Station 64. Station 64 will be capable of responding within 4.39 minutes to the proposed northern entrance of the Renaissance Ranch Commerce Center Specific Plan and 6.26 minutes to the most southernly portion of the Project site. Secondary response would be provided from RCFD Station 85, which is located southeast of the Project site at 29405 Grand Ave in Lake Elsinore, and can respond within 9.83 minutes to the southern entrance and up to 11.7 minutes to the northwestern portion of the Project site. Station 85 staffs three on-duty, 24-hours per day and houses an Engine.

Within the area’s emergency services system, fire and emergency medical services are also provided by other Riverside County Fire Stations. 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 under a statewide master mutual aid agreement for wildland fires. There are also mutual aid agreements in place with neighboring fire 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.

On March 7, 2017, the Riverside County Board of Supervisors (Board) received and filed RCFD’s “Alternative Staffing Model Recommendation.” The Alternative Staffing Model Recommendation was fiscally driven and developed by RCFD due to funding difficulties to retain 3-person engine companies. The RCFD FY 17-18 Service

Alternatives report, dated March 7, 2017, recommends the following response times based on four Board Approved Land Use Classifications as described in Table 5:

**Table 5. Land Use Classification Information with Staffing/Time Response Standards**

Land Classification	Population Density	Fire Staffing Characteristics	Response Time
HEAVY URBAN	>700 per square mile	Land use includes large commercial and industrial complexes, large business parks, high-rise and wide rise community centers and high-density residential dwelling units of 10 to 20 units per acre.	5:00 minutes, 90% of the time
URBAN	>500 per square mile	Land use includes large commercial and industrial complexes, large business parks, high-rise and wide rise community centers and high-density residential dwelling units of 8 to 20 units per acre.	6:30 minutes, 90% of the time
RURAL	100 to 500 per square mile	Light industrial zones, small community centers and residential dwelling unit density of 2 to 8 units per acre.	10:30 minutes, 90% of the time
OUTLYING	<100 per square mile	Areas of rural mountain and desert, agricultural uses, small scale commercial, industrial and manufacturing, service commercial, medium industrial and low density residential dwelling units; 1 dwelling unit per acre to 1 dwelling unit per 5 acres.	17:30 minutes, 90% of the time

**Source:** Riverside County Fire Department FY 17-18 Service Alternatives. March 7, 2017.

A majority of the area surrounding the Project site is designated medium density residential<sup>3</sup>, which is defined as 2-5 units per dwelling acre. Further, the Project proposes a small business park and light industrial uses; therefore, the Project area would be classified as "Rural" with a 10.5-minute first-in fire engine response time, as defined in Table 5 above. As previously mentioned, response to the Project site from the closest existing Fire Station (Station 64) would achieve a 4.39 minute travel time to the entrance of the Renaissance Ranch Commerce Center Specific Plan and approximately 6.26 minutes to the most southerly portion of the Project site. Therefore, the Project's calculated response time would achieve faster times than the requirement for "Rural" areas.

## 4.2 Estimated Calls and Demand for Service from the Project

The following estimated annual emergency call volume generated by the Project (Commercial-Industrial products) is based upon per capita data for 2019 from RCFD calls within their jurisdiction<sup>4</sup>.

- Total population<sup>5</sup> served by : 49,999

<sup>3</sup> Elsinore Area Plan, 2020. [https://planning.rctlma.org/Portals/14/genplan/2020/ap/ELAP\\_08042020.pdf](https://planning.rctlma.org/Portals/14/genplan/2020/ap/ELAP_08042020.pdf)

<sup>4</sup> 2017 Riverside County Fire Department Annual Report.

<sup>5</sup> Elsinore Area Plan, 2020. [https://planning.rctlma.org/Portals/14/genplan/2020/ap/ELAP\\_08042020.pdf](https://planning.rctlma.org/Portals/14/genplan/2020/ap/ELAP_08042020.pdf)

- Total annual calls: 5,868, per capita call generation: 0.117
- Total annual fire calls (Commercial, Residential, Multi-Family, Vehicle, Wildland, Other; 2.88% of total calls): 169, per capita call generation: 0.003
- Total annual Emergency Medical Services (73.90% of total calls): 4,337, per capita call generation: 0.086
- Total other calls (Rescue, Traffic Collisions, Hazardous Materials, Public Service, etc.; 23.21% of total calls): 1,362, per capita call generation: 0.027

Using the data above, the estimated annual emergency call volume for the Project site was calculated. In order to provide this conceptual estimate, Dudek made assumptions regarding industrial/mixed-use populations within Renaissance Ranch Commerce Center Specific Plan Project. The commercial population is based on a conservative total<sup>6</sup> of 3,649 occupants for all buildings and areas within this type of development. The on-site population for each building and areas of use within the building will vary based on occupancy classification and use. The number may likely be up to two-thirds lower than the estimate (3,649) provided, due to employee shift work, estimated transient population and operating hours of individual businesses. Based on this information, the total maximum estimated total population (which includes employees and transient use) of the Project site, is projected to be 1,217 persons (total occupant load for all buildings). Based on this population estimate, the calculated call volumes by type of call are provided in Table 6.

**Table 6. Calculated Call Volume (Conceptual Based on 1,217 Persons)**

Type of Call	Per Capita Call Generation Factor	Number of Estimated Annual Calls
Total Other Calls	0.027	331217
Total Fires	0.003	4
Total EMS Calls	0.086	105
Total Calls	0.117	143

As mentioned, the new industrial/mixed-use development will increase the call volume at a rate of a conservatively calculated (the actual number of calls may be lower than this estimate) up to 143 calls per year (2.75 calls per week or 11 calls per month). Fire Stations 64 and 85 combined emergency responses in 2017<sup>7</sup> totaled 2,772 calls per year (8 calls per day, or approximately 4 calls per day per station). The level of service demand for the Project raises overall call volume, but is not anticipated to impact the existing fire stations to a point that they cannot meet the demand. For perspective, five calls per day are typical in an urban or suburban area. A busy fire station company would be one with 10 to 15 or more calls per day. When Renaissance Ranch Commerce Center Specific Plan Project site is built out, Fire Station 64 could potentially respond to an additional 3 calls per week, although the number will likely be lower than that based on the conservative nature of the population and calls per capita data used in this estimate.

<sup>6</sup> Based on an average of 2,200 industrial square feet per employee (2.1 mil sf) and 150 commercial square feet per employee (402,929 sf))

<sup>7</sup> 2016 TriData Report, Riverside County Fire Department, Table 21

# 5 Fire Safety Requirements- Infrastructure, Building Ignition Resistance, And Defensible Space

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The RCFD Fire Code and 2019 CFC and 2019 CBC (adopted by reference with several modifications) governs the building, infrastructure, and defensible space requirements detailed in this FPP. The Project will meet applicable codes or will provide alternative materials and/or methods, if warranted. The following summaries highlight important fire protection features.

Prior to bringing combustible materials onto the Project site, utilities shall be in place, fire hydrants operational, an approved all-weather roadway, or an approved road surface alternative in place, and interim fuel modification zones established and approved.

A response map update, including roads and fire hydrant locations, in a format compatible with current RCFD mapping shall be provided to Riverside County Fire Department (CAL Fire).

## 5.1 Roads

### 5.1.1 Access

Project Site access, including road widths and connectivity, will comply with the requirements of the Road Circulation and Design Guidelines and will include:

- All roads comply with access road standards of not less than 24 feet, unobstructed width and are capable of supporting an imposed load of at least 75,000 pounds.
- Interior circulation streets and parking lot roadways that are considered roadways for traffic flow through the Project Site will meet fire department access requirements when serving the proposed structures.
- Renaissance Ranch Road will be constructed to minimum 24-foot, unobstructed widths and shall be improved with aggregate cement or asphalt paving materials.
- Private or public streets that provide fire apparatus access to buildings three stories or more in height shall be improved to 30 feet unobstructed width.
- Private and public streets for each phase shall meet all Project approved fire code requirements, paving, and fuel management prior to combustible materials being brought to the Project site.
- Vertical clearance of vegetation (lowest-hanging tree limbs), along roadways will be maintained at clearances of 13 feet, 6 inches to allow fire apparatus passage.
- Cul-de-sacs and fire apparatus turnarounds will meet requirements and RCFD Fire Prevention Standards.
- Any roads that have traffic lights shall have approved traffic pre-emption devices (Opticom) compatible with devices on the Fire Apparatus.

- Roadways and/or driveways will provide fire department access to within 150 feet of all portions of the exterior walls of the first floor of each structure.
- Roadway design features (e.g., speed bumps, humps, speed control dips, planters, and fountains) that could interfere with emergency apparatus response speeds and required unobstructed access road widths will not be installed or allowed to remain on roadways.
- Access roads shall be completed and paved prior to issuance of building permits and prior to the occurrence of combustible construction.
- Developer will provide information illustrating the new roads, in a format acceptable to the RCFD for updating of Fire Department response maps.

### 5.1.2 Maximum Dead-End Road (cul-de-sac) Length

- Each planning area varies in the number of ingress/egress roads or streets. Dead end streets no longer than 350 feet shall have approved provisions for fire apparatus turnaround or cul-de-sac. Cul-de-sac streets may exceed 350 feet, but not 600 feet in length with provisions for appropriate mitigations to the approval of the Fire Marshal or Fire Chief.
- Fire apparatus turnarounds to include turning radius of a minimum 45 feet, measured to inside edge of improved width (RCFD Fire Prevention Standard).

### 5.1.3 Gates

Gates on private roads are permitted, but subject to Fire Code requirements and standards, including:

- Gates shall be equipped with conforming sensors for detecting emergency vehicle “opticom” strobe lights from any direction of approach, if required.
- All entrance gates will be equipped with a key switch, which overrides all command functions and opens the gate.
- Gate activation devices will be equipped with a battery backup or manual mechanical disconnect in case of power failure.
- Further, gates will be:
  - Minimum 20 feet wide of clearance for one-way traffic when fully open at entrance.
  - Minimum of two feet wider than road width at exit.
  - Constructed from non-combustible or exterior fire-rated treated wood materials.
  - Inclusive of provisions for manual operation from both sides, if power fails. Gates will have the capability of manual activation from the development side or a vehicle (including a vehicle detection loop).

### 5.1.4 Driveways

Any structure that is 150 feet or more from a common street in the development shall have a paved fire apparatus access roads meeting the following specifications:

- Grades 15% or less with surfacing and sub-base consistent with Riverside CFC.



## 5.1.5 Premises Identification

Identification of roads and structures will comply with RCFD Fire Prevention Standards, as follows:

- All commercial/industrial structures required to be identified by street address numbers at the structure. Numbers to be minimum 8 inches high with 1-inch stroke, visible from the street. Numbers will contrast with background and shall be electrically illuminated during the hours of darkness where building setbacks exceed 100 feet from the street or would otherwise be obstructed; numbers shall be displayed at the property entrance. Numbers will contrast with background.
- Multiple structures located off common driveways or roadways will include posting addresses on structures and on the entrance to individual driveway/road or at the entrance to the common driveway/road for faster emergency response.
- Proposed private and public streets within the development will be named, with the proper signage installed at intersections to satisfaction of the Department of Public Works.
- Streets will have street names posted on non-combustible street signposts. Letters/numbers will be per RCFD standards.
- Temporary street signs shall be installed on all street corners within Renaissance Ranch Commerce Center Specific Plan Project prior to the placing of combustible materials on the Project site. Permanent signs shall be installed prior to occupancy of buildings.

## 5.1.6 Ongoing Infrastructure Maintenance

Renaissance Ranch Commerce Center Specific Plan Project Owner/Property Management Company shall be responsible for long term funding and maintenance of internal private roads.

## 5.1.7 Pre-Construction Requirements

Prior to bringing lumber or combustible materials onto the Project site, site improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established. These features will be approved by the fire department their designee prior to combustibles being brought on-site.

## 5.2 Ignition Resistant Construction and Fire Protection Systems

All new structures within the Renaissance Ranch Commerce Center Specific Plan Project site will be constructed to Fire Code standards. Each of the proposed buildings will comply with the enhanced ignition-resistant construction standards of the 2019 CBC (Chapter 7A). 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. Appendix D provides a summary of the requirements for ignition resistant construction.

While these standards will provide a high level of protection to structures in this development, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

## 5.3 Fire Protection Systems

### 5.3.1 Water Supply

Water service for Renaissance Ranch Commerce Center Specific Plan Project site will be provided by Elsinore Valley Municipal Water District (EVMWD). All water storage and hydrant locations, mains, and water pressures would be designed to fully comply with Riverside County Fire Code Fire Flow Requirements. As detailed in the County Fire Code Section 8.32.050 and California Fire Code Section 903.2, all structures are required to have NFPA 13 property protection internal fire sprinklers. Therefore, water supply must meet a four-hour fire flow requirement.

### 5.3.2 Hydrants

Fire Hydrants shall be located along fire access roadways and adjacent to each structure, as determined by the RCFD Fire Marshal and current fire code requirements to meet operational needs. Fire Hydrants will be consistent with applicable Design Standards.

### 5.3.3 Fire Sprinklers

All structures, of any occupancy type, will be protected by an automatic, internal fire sprinkler system. Fire sprinklers systems shall be in accordance with RCFD, and National Fire Protection Association (NFPA) Standards 13. Fire sprinkler plans for each structure will be submitted and reviewed by RCFD for compliance with the applicable fire and life safety regulations, codes, and ordinances as well as the RCFD Fire Prevention Standards for fire protection systems.

## 5.4 Defensible Space and Vegetation Management

### 5.4.1 Defensible Space

WUI fire protection requires a systems approach, which includes the components of infrastructure and water, structural safeguards (addressed in the FPP), and adequate defensible space setbacks. This section provides defensible space details for Renaissance Ranch Commerce Center Specific Plan Project.

### 5.4.2 Fuel Modification Zone Requirements

A fuel modification zone (FMZ) is a strip of land where combustible vegetation has been removed and/or modified and partially or totally replaced with more adequately spaced, drought-tolerant, fire resistant plants in order to provide a reasonable level of protection to structures from wildland fire. A typical landscape/fuel modification installation for Renaissance Ranch Commerce Center Specific Plan Project consists of a 100-foot wide fuel management zone from each structure extending outwards towards undeveloped areas.

Cohen (1995) performed structure ignition fire research studies that suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid Structure

Ignition Assessment Modeling 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 requires about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). For this fire study example, bare wood was used, which is more combustible unlike the fire rated split face concrete masonry unit (CMU) and textured insulated metal panel exterior wall designs to be implemented on the Costco Warehouse building. For the Project, assuming 45-foot flame lengths, reduced fuel modification zones are justifiable for limited areas.

Based on the Project's site plan, the majority of the Project site achieves 100 feet or more of on-site FMZ, which consists of asphalt roadways and parking stalls, and a fully irrigated landscape with RCFD approved plant species.

**Commercial Planning Area.** In the Project's current configuration, the commercial planning area is in the northwest portion of the Project site and includes six proposed buildings with different occupancies as well as a future gas station or retail site. The north and northeast side of this planning area is buffered by the proposed Renaissance Ranch Road, a X-foot wide street, and the I-15 approximately 320 feet beyond Renaissance Ranch Road and achieves the full 100-foot FMZ. To the south of the southern side of this planning area is existing development, which includes Horsetheif Canyon Park, water facility, and residential uses associated with the Horsetheif Canyon community. A portion of the southern boundary of this planning area does not meet the full 100-foot FMZ, with the FMZ ranging from 89 feet to 100 feet. The reduced FMZ along the southern boundary specifically impacts Building 5 and Building 6, which should be constructed with enhanced exterior wall construction for walls facing the south, southeast or southwest. The west of the western side of this planning area is a residential unit and vacant land. A portion of the western boundary of this planning area does not meet the full 100-foot FMZ, with the FMZ ranging from 84-feet to 100-feet. The reduced FMZ along the western boundary specifically impacts Building 1 and Building 2, which should be constructed with enhanced exterior wall construction for walls facing west.

**Industrial Planning Area.** In the Project's current configuration, the industrial planning area covers a majority of the Project site, is situated southeast of the Commercial planning area, and has three proposed buildings with different occupancies. To the north and northeast of this planning area is I-15, which is approximately 300 feet beyond Building 2. The full 100-foot FMZ is not achievable to the northwest of Building 2 in this planning area, and Building 2 should be constructed with enhanced exterior wall construction for the wall facing east. West of this planning area is open space associated with the Project as well as vacant land beyond the Project's eastern boundary. The full 100-foot FMZ is achievable on all sides of Building 3 and Building 4. The south and western portions of this planning area are buffered by Renaissance Ranch Road. Beyond Renaissance Ranch Road to the south and west are residential units associated with the Horetheif Canyon community.

The final FMZ map is presented graphically for Renaissance Ranch Commerce Center Specific Plan Project in Figure 4. Vegetation management will also be implemented as an interim FMZ throughout the construction phases for each structure as there may be a period as long as one or more years where developing phases are exposed on multiple sides to wildland fuels. FMZs will be implemented according to the following requirements for the entire Project.

If the Project site plan is approved in a different configuration than what has been evaluated in this FPP, any area achieving less than 100 feet FMZ, the proposed building construction design features consisting of fire rated split face CMU and textured insulated metal panel exterior walls along the exposed side of each building, an National Fire Protection Association (NFPA) 13 Commercial Fire Sprinkler System, and fire rated exterior doors (including

rated roll-up doors), along with asphalt roadways and parking, and a fully irrigated landscape, would provide adequate separation and radiant heat protection from a wildfire.

#### 5.4.2.1 Fuel Modification Zone Reduction Justifications

An important component of a fire protection system for the Project is the provision for ignition-resistant construction and modified vegetation buffers. The Fire and Building codes, structure ignition resistance requirements will enable the structures to withstand the type of wildfire that may occur in the fuels outside the development footprint. Fire behavior modeling, as previously presented, was used to predict flame lengths and was not intended to determine sufficient fuel modification zone widths. However, the results of the fire modeling provide important fire behavior projections, which is key supporting information for determining buffer widths that would minimize structure ignition and provide “defensible space” for firefighters. Based upon Dudek’s analysis of the Project, the enhanced building features and commercial interior fire sprinkler system augment the potentially reduced FMZ for the Project. The combination of these fire prevention measures provided as a functional safety equivalency of a 100-foot fuel modification zone. In addition to the above mentioned design features, Dudek recommends the following additional fire protection enhancement be required to provide further justification for the potentially reduced FMZ:

- Exposed walls that will not meet the minimum 100-foot fuel modification requirement, represented in Table 7 below, shall be provided enhanced exterior wall construction. Walls shall be a minimum one-hour rated construction (or greater rating); with no openings, (windows or doors) unless openings are approved by RCFD. If exterior openings are provided in the west wall, exterior fire sprinklers are recommended.

**Table 7. Buildings the Require Enhanced Wall Construction**

Building	Wall(s)
<b>Commercial Planning Area</b>	
1	Southern and western facing
2	Western facing
5	Southern, southwestern and southeastern facing
6	Southern facing
<b>Industrial Planning Area</b>	
2	Eastern facing

#### 5.4.2.2 Zone 1 and 2 – Paved/Irrigated Zone (0-50 feet wide)

An important component of a fire protection system is the provision for ignition resistant hardscapes and landscapes, and modified vegetation buffers. Fuel Modification Zones (FMZs) are designed to provide buffers that 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 WUI exposed structures. All structures on the Project site will be highly ignition resistant based on required construction design, materials, and methods. Based on the modeled flame lengths for the Project, flame lengths under extreme wind weather conditions for the Project site may reach three feet or taller.

The Fuel Modification Plan (Appendix E) illustrates the 100-foot FMZ Plan proposed for the Project site, including a 50-foot wide paved/irrigated Zone 1 extending out 50 feet from the proposed structures out and a 50-foot wide paved/irrigated Zone 2 extending 50 feet beyond Zone 1 (50 to 100 feet). For those areas where the full 100 feet can not be met, the reduced FMZ is justified by the minimal width of exposure, low fuel loads, low calculated flame lengths, and the type of construction proposed. Regardless, regular fuel maintenance areas is proposed in the affected areas for additional protection.

FMZ includes the following key components:

- All trees shall be planted and maintained at a minimum of 10 feet from the tree's drip line to any combustible structure
- Tree spacing of a minimum 10 feet between canopies
- Mature trees shall be limbed to eight feet or three times the height of understory plants to prevent ladder fuels, whichever is greater. No tree limb encroachment within 10 feet of a structure or chimney, including outside barbecues or fireplaces
- Tree maintenance includes limbing-up (canopy raising) six feet or one-third the height of the tree
- Maintenance including ongoing removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying plantings, maintenance of the programming and functionality of the irrigation system, regular trimming to prevent ladder fuels .
- A minimum of 36 inches wide pathway with unobstructed vertical clearance around the exterior of each structure (360°) provided for firefighter access (2019 CFC, Section 503.1.1). Within this clearance area, landscape such as low ground covers and shrubs are permitted so long as their placement and mature height do not impede firefighter access, consistent with purpose of this guideline.
- Trees and tree form shrub species that naturally grow to heights that exceed two feet shall be vertically pruned to prevent ladder fuels.
- Grasses shall be cut to four inches in height. Native grasses can be cut after going to seed
- Ground covers within first three feet from structure restricted to non-flammable materials, including stone, rock, concrete, bare soil, or other. Combustible ground covers, such as mulch or wood chips, are prohibited adjacent to structures with an exterior stucco wall and weep screed.

#### 5.4.2.3 Enhanced Zone (beyond 100 feet wide)

The Enhanced Zone includes the proposed paved, hardscape, and irrigated landscape area that extends beyond the 100-foot wide FMZ. This zone provides additional fire protection benefits, though is not required based on the fire behavior calculations provided in Section 3.



Project Site

Building

Pavement

Fuel Modification Zones

Zone 1 (irrigated 0-50')

Zone 2 (thinned 50'-100')

Reciprocal Fuel Modification



Path: Z:\Projects\128240\MAP\DOC\DOCUMENT\FPP\Fig 4 Fuel Modification Plan West Site Access.mxd

SOURCE: AERIAL-BING MAPPING SERVICE



FIGURE 4  
Fuel Modification Plan  
Renaissance Ranch FPP



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### 5.4.3 Vegetation Management Maintenance

Vegetation management, i.e., assessment of fuel modification zone condition and removal of dead and dying and undesirable species; as well as thinning as necessary to maintain specified plant spacing and fuel densities, shall be completed annually by May 1 of each year and more often as needed for fire safety, as determined by the during the interim period where FMZ is maintained on- or off-site. The interim period vegetation management will be funded by Renaissance Ranch Commerce Center Specific Plan and shall be conducted by their contractor. The Renaissance Ranch Commerce Center Specific Plan Project shall be responsible for all vegetation management throughout the mixed-use development, in compliance with the Project FPP that is consistent with requirements.

The permanent FMZ required for the Renaissance Ranch Commerce Center Specific Plan Project will be maintained by the developer who will be responsible for FMZ vegetation management once the Project is built out and the adjacent areas are developed. The Owner or Property Manager will be responsible for streetscape and public area vegetation management in perpetuity.

On-going/as-needed fuel modification zone maintenance during the interim period while the Renaissance Ranch Commerce Center Specific Plan Project is built out and adjacent parcels are developed, which may be one or more years, will include necessary measures for consistency with the FPP, including:

- Regular Maintenance of dedicated Open Space.
- Removal or thinning of undesirable combustible vegetation and replacement of dead or dying landscaping.
- Maintaining ground cover at a height not to exceed 18 inches. Annual grasses and weeds shall be maintained at a height not to exceed three inches.
- Removing accumulated plant litter and dead wood. Debris and trimmings produced by thinning and pruning should be removed from the Project site or chipped and evenly dispersed in the same area to a maximum depth of four-inches.
- Maintaining manual and automatic irrigation systems for operational integrity and programming. Effectiveness should be regularly evaluated to avoid over or under-watering.
- Complying with these FPP requirements on a year-round basis. Annual inspections are conducted following the natural drying of grasses and fine fuels, between the months of May and June, depending on precipitation during the winter and spring months.

### 5.4.4 Environmentally Sensitive Areas/Open Space

Once the FMZs are in place, there will not be a need to expand them as they have been planned to meet the fire code. However, if unforeseen circumstances were to arise that required hazard reduction within an area considered environmentally sensitive or part of the Multispecies Conservation Plan, it may require approval from the County and the appropriate resource agencies (California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) prior to any vegetation management activities occurring within those areas.



### 5.4.5 Prohibited Plants

Certain plants are considered prohibited in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustion) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the Prohibited Plant List (Appendix F) are unacceptable from a fire safety standpoint, and will not be planted on the Project site or allowed to establish opportunistically within fuel modification zones or landscaped areas.

### 5.4.6 Construction Phase Vegetation Management

Vegetation management requirements shall be implemented at commencement and throughout the construction phase. Vegetation management shall be performed pursuant to the FAHJ on all building locations prior to the start of work and prior to any import of combustible construction materials. Adequate fuel breaks shall be created around all grading, site work, and other construction activities in areas where there is flammable vegetation.

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# 6 Wildfire Education Program

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The business owners of the Renaissance Ranch Commerce Center Specific Plan Project will be provided a proactive educational component disclosing the potential wildfire risk and this report's requirements. This educational information must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go<sup>8</sup>" stance on evacuation.

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<sup>8</sup> <https://www.Perris.org/DocumentCenter/View/2143/Personal-Wildfire-Action-Plan>

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# 7 Conclusion

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This FPP for The Renaissance Ranch Commerce Center Specific Plan Project documents how the Project conforms with required fire and building codes. It also provides guidance for vegetation maintenance for the proposed FMZs and landscaped areas on the Project site. The requirements and recommendations provided in this FPP have been designed specifically for the Renaissance Ranch Commerce Center Specific Plan Project. This analysis and its fire protection justifications are supported by fire science research, results from previous wildfire incidents, and fire agencies that have approved these concepts. The Project design features, asphalt roads and parking stalls, and a fully irrigated landscape, along with the additional required fire protection measure for certain structures that may have a reduce FMZ would provide a level of safety equal to a 100-foot wide FMZ.

Ultimately, it is the intent of this FPP to guide the fire protection efforts for the Renaissance Ranch Commerce Center Specific Plan Project in a comprehensive manner. Implementation of the measures detailed in this FPP will reduce the risk of wildfire at the Project site and will improve the ability of firefighters to fight fires on the properties and protect property and neighboring resources, irrespective of the cause or location of ignition.

It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and minimizing actions identified in this report are designed to reduce the likelihood that fire will impinge upon Renaissance Ranch Commerce Center Specific Plan Project assets or threaten its occupants or visitors. Additionally, 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 fuel modification requirements provided in this FPP will reduce the Project site's vulnerability to wildfire. It will also help accomplish the goal of this FPP to assist firefighters in their efforts to defend structures.

It is recommended that Renaissance Ranch Commerce Center Specific Plan Project maintain 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!" stance on evacuation. The Project is not to be considered a shelter-in-place development. However, the fire agencies and/or law enforcement officials may, during an emergency, as they would for any new development providing the layers of fire protection as Renaissance Ranch Commerce Center Specific Plan Project, determine that it is safer to temporarily refuge employees or visitors on the Project site. When an evacuation is ordered, it will occur according to pre-established evacuation decision points or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors. Fire is a dynamic and somewhat unpredictable occurrence and it is important for anyone living at the WUI to educate themselves on practices that will improve safety.

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# 8 List of Preparers

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## **Project Manager**

Michael Huff  
Senior Fire Protection Planner  
Dudek

## **Fire Protection Plan Preparer**

Lisa Maier  
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## **Fire Protection Plan Preparer/Fire Behavior Modeling**

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## **Computer Aided Design/Drafting**

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# APPENDIX A

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## Representative Site Photographs

# Renaissance Ranch Project

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REPRESENTATIVE SITE PHOTOGRAPHS

PHOTOS COLLECTED AUGUST 4, 2020



# Renaissance Ranch Project

## Photograph Log

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**Photograph 1.** View looking southeast of on-site vegetation from the northwest portion of the Project site.



**Photograph 2.** View looking south of on-site vegetation from the northwest portion of the Project site.



# Renaissance Ranch Project

## Photograph Log

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**Photograph 3.** View looking southeast toward the I-15 of grasslands and scattered scrub vegetation on eastern portion of the Project site.



**Photograph 4.** View looking south of on-site riparian vegetation from the eastern portion Project site.



# Renaissance Ranch Project

## Photograph Log

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**Photograph 5.** View looking west of on-site vegetation in dry stream channel from the eastern portion of the Project site.



**Photograph 6.** View looking east along the northern property boundary from the northwestern Project area.



# Renaissance Ranch Project

## Photograph Log

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**Photograph 7.** View looking east along the northern fuel break and on-site vegetation from the northwestern project corner.



**Photograph 8.** View of the fuel break and on-site vegetation looking south along the western Project boundary.



# Renaissance Ranch Project

## Photograph Log

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**Photograph 9.** View looking south of the on-site drainage and vegetation from the central portion of the western Project boundary.



**Photograph 10.** View looking east of on-site vegetation from the central portion of the western Project boundary.



# Renaissance Ranch Project

## Photograph Log

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**Photograph 11.** View looking east of on-site vegetation and dry stream channel from the central portion of the western Project boundary.



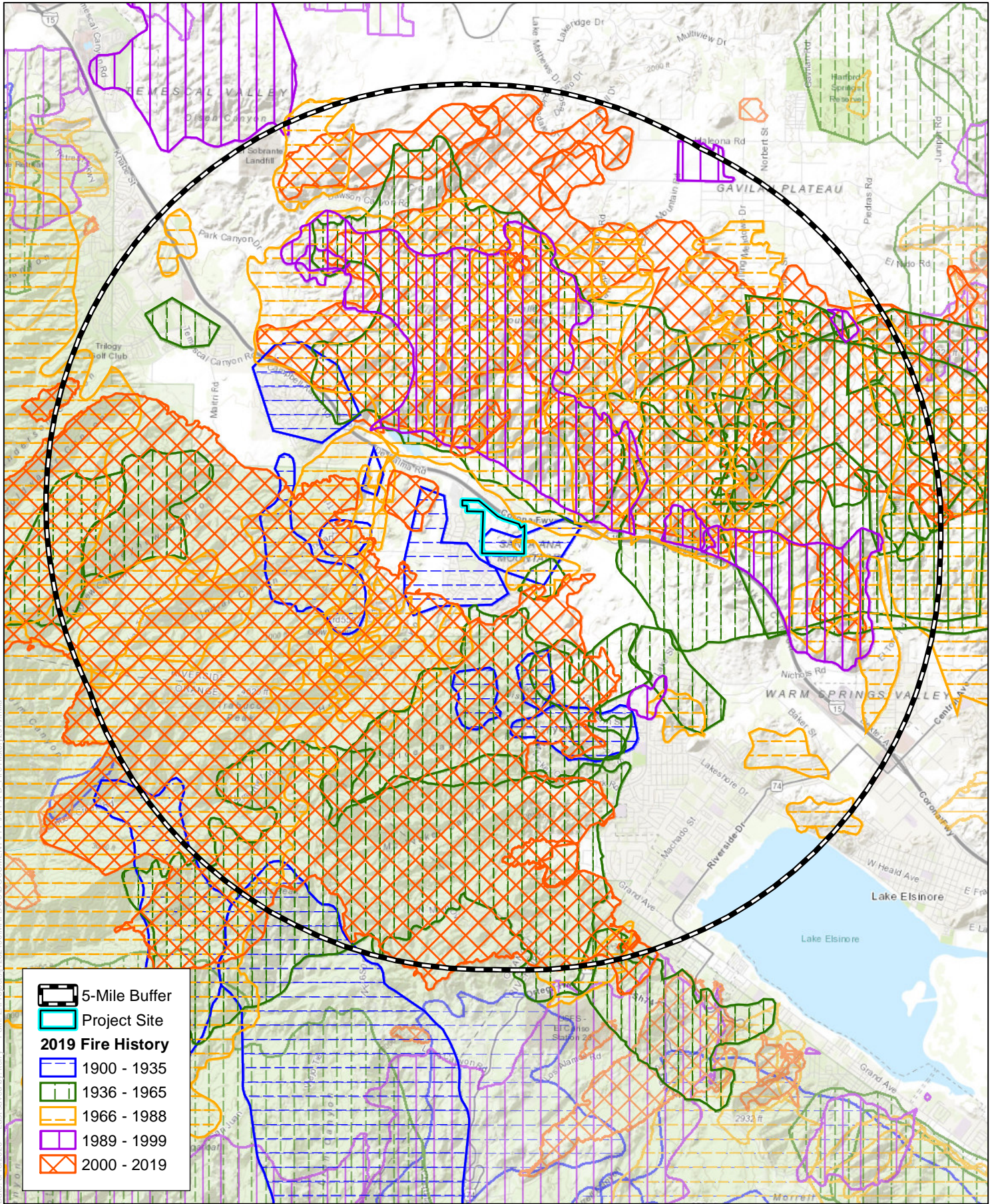
**Photograph 12.** View looking north of adjacent land and on-site vegetation from the southwest portion of the Project site.

# APPENDIX B








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Renaissance Ranch Commerce Center Specific Plan  
Project Vicinity Fire History Map





Path: Z:\Projects\19292019\MapDocs\GULF\GULF\_FPPA\FPPA\_Appx\_B\_Fire\_History\_2019.mxd

	5-Mile Buffer
	Project Site
<b>2019 Fire History</b>	
	1900 - 1935
	1936 - 1965
	1966 - 1988
	1989 - 1999
	2000 - 2019

SOURCE: AERIAL- BING MAPPING SERVICE; FIRE DATA-CALFIRE 2019

**DUDEK**  0 1 2 Miles



# APPENDIX C

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## BehavePlus Fire Behavior Analysis

# APPENDIX C

## Fire Behavior Technical Report

### Renaissance Ranch Project

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## 1 FIRE BEHAVIOR MODELING HISTORY

Fire behavior modeling has been used by researchers for approximately 50+ years to predict how a fire will move through a given landscape (Linn 2003). The models have had varied complexities and applications throughout the years. One model has become the most widely used for predicting fire behavior on a given landscape. That model, known as “BEHAVE,” was developed by the U. S. Government (USDA Forest Service, Rocky Mountain Research Station) and has been in use since 1984. Since that time, it has undergone continued research, improvements, and refinement. The current version, BehavePlus, V6, includes the latest updates incorporating years of research and testing. Numerous studies have been completed testing the validity of the fire behavior models’ ability to predict fire behavior given site specific inputs. One of the most successful ways the model has been improved has been through post-wildfire modeling (Brown 1972, Lawson 1972, Sneeuwjagt and Frandsen 1977, Andrews 1980, Brown 1982, Rothermel and Rinehart 1983, Bushey 1985, McAlpine and Xanthopoulos 1989, Grabner, et. al. 1994, Marsden-Smedley and Catchpole 1995, Grabner 1996, Alexander 1998, Grabner et al. 2001, Arca et al. 2005). In this type of study, BehavePlus is used to model fire behavior based on pre-fire conditions in an area that recently burned. Real-world fire behavior, documented during the wildfire, can then be compared to the prediction results of BehavePlus and refinements to the fuel models incorporated, retested, and so on.

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. Predicting wildland fire behavior is not an exact science. As such, the minute-by-minute movement of a fire will probably never be predictable, especially when considering the variable state of weather and the fact that weather conditions are typically estimated from forecasts made many hours before a fire. Nevertheless, field-tested and experienced judgment in assessing the fire environment, coupled with a systematic method of calculating fire behavior yields surprisingly accurate results. To be used effectively, the basic assumptions and limitations of fire behavior modeling applications must be understood.

1. 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 the dead fuels less than 0.25 inches 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.



## **APPENDIX C**

### **Fire Behavior Technical Report Renaissance Ranch Project**

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2. 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.
3. Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, creating their own weather, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
4. Fourth, fire behavior computer modeling systems are not intended for determining sufficient fuel modification zone/defensible space 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 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 in a particular landscape. The type and quantity will depend upon soil, climate, geographic features, and fire history. 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.

## **2 MODELING INPUTS**

### **2.1 Fuel model descriptions**

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 for fire behavior modeling (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 modeling efforts. 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:

## **APPENDIX C**

### **Fire Behavior Technical Report Renaissance Ranch Project**

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- 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 the BehavePlus modeling system. These new models attempt to improve the accuracy of the 13 standard 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 40 new 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.

## **2.2 Fuel model selection**

For the Renaissance Ranch Project BehavePlus analyses, fuel model assignments were based on observed field conditions. As is customary for this type of analysis, the terrain and fuels (on and off site) directly adjacent to the proposed development and fuel modification zones (FMZ) are used for determining flame lengths and fire spread. It is these fuels that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement. Fuel beds, including ornamental landscaping, agriculture, disturbed land, modified vegetation (mowed and trampled), non-native grasslands, forbs, sage scrub, and sparse native shrubs and trees, were observed on and adjacent to the proposed development. These fuel types can produce flying embers that may affect the project, but defenses have been built into the structures to prevent ember penetration. Table C-1 provides a description of the two primary fuel models observed in the vicinity of the site that were subsequently used in the analysis for this project. Modeled areas include the non-native grasslands (Fuel Model Gr4) and

**APPENDIX C**  
**Fire Behavior Technical Report**  
**Renaissance Ranch Project**

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sage scrub (Fuel Model Sh5), which were found on and adjacent to the property. Dudek also conducted modeling of the site for post-development recommendations for this project (refer to Table C-2 for post-development fuel model descriptions). Fuel modification includes paved parking lots, paved streets and irrigated landscaping on the periphery of the Project as well as maintenance of annual grasses within 20 feet of the Project perimeter on an as needed basis where applicable. For modeling the post-development condition, fuel model assignments were re-classified from Gr4 and Sh5 to Fuel Model 8.

**Table C-1. Existing Fuel Model Characteristics**

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr4	Moderate Load, Dry Climate Grass	Represents grasses on and adjacent to the property.	<2.0 ft.
Sh5	High Load Dry Climate Shrub	Sage scrub occurs on and adjacent to the property.	<6.0 ft.

**Table C-2. Post-development Fuel Model Characteristics**

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
8	Compact litter	Irrigated landscapes and parking areas in proposed development.	<0.5 ft.

## 2.3 Weather

To evaluate different scenarios, analyses were conducted for both the 50th percentile weather (summer, on-shore winds) and the 97th percentile weather (fall, off-shore winds) conditions. Fuel moisture and wind speed information data was incorporated into the BehavePlus modeling runs. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table C-3 summarizes the weather and wind input variables used in the BehavePlus modeling efforts.

# APPENDIX C

## Fire Behavior Technical Report

### Renaissance Ranch Project

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**Table C-3. Fuel Moisture and Wind Inputs**

Variable	Summer Weather Condition (50 <sup>th</sup> Percentile)	Peak Weather Condition (97 <sup>th</sup> Percentile)
1h Moisture	5%	1%
10h Moisture	6%	2%
100h Moisture	12%	6%
Live Herbaceous Moisture	48%	30%
Live Woody Moisture	96%	50%
20-foot Wind Speed (mph)	20	40
BehavePlus Wind Adjustment Factor	0.4	0.4

## 2.4 Slope

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 downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. For the BehavePlus analysis, slope values were determined by field observation at the locations for each modeling scenario, and ranged in value between 1 to 30 percent (steeper slopes in the drainages). Slope gradients for landscaped areas are assumed to be relatively flat (3%).

## 3 BEHAVEPLUS ANALYSIS

To objectively predict flame lengths, intensities, and spread rates, the BehavePlus V6 fire behavior modeling system (Andrews, Bevins, and Seli 2004) was used in four modeling scenarios and incorporated observed fuel types representing the dominant on-site and off-site vegetation, slope gradients, and wind and fuel moisture values. Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent to the site. The results of fire behavior modeling analysis for pre- and post-development conditions are presented in Tables C-4 and C-5, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 3, BehavePlus Fire Behavior Analysis Map exhibit in the Project's FPP.

## APPENDIX C

### Fire Behavior Technical Report Renaissance Ranch Project

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Fire Scenario locations and descriptions:

- Scenario 1. Fire flaming front approaching from the northeast around the vicinity of I-15 the existing sage scrub vegetation (Fuel Model SH5) adjacent to and on the northern portion of the project, with strong northeastern Santa Ana winds. Post-development includes the irrigated manufactured slopes, paved parking area and irrigated landscaping (Fuel Model 8).
- Scenario 2. Fire flaming front approaching from the east towards the eastern side of the project, through the existing sage scrub vegetation (Fuel Model SH5), with strong northeastern Santa Ana winds. Post-development includes the irrigated manufactured slopes, paved parking area and irrigated landscaping (Fuel Model 8).
- Scenario 3. Fire flaming front approaching from the west towards the western side of the project, entering the site through the sage scrub vegetation (SH5), with moderate westerly onshore winds. Post-development includes grassland (GR4), irrigated manufactured slopes, paved parking area and irrigated landscaping (Fuel Model 8).
- Scenario 4. Fire flaming front approaching from the west-northwest, through grassland (GR4) (offsite) approaching the western project boundary, with moderate westerly onshore winds. Post-development includes irrigated manufactured slopes, paved parking area and irrigated landscaping (Fuel Model 8).

**Table C-4. Fire Behavior Modeling Results for Existing Conditions**

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
<i>Scenario 1: sage scrub, 20% uphill slope, 40 mph high wind speed from NE</i>				
Fuel Model Sh5	42.7	19,905	6.0	2.0
<i>Scenario 2: Sage scrub, 5% uphill slope, 40 mph high wind speeds from E</i>				
Fuel Model Sh5	42.5	19,662	6.0	2.0
<i>Scenario 3: sage scrub, 20% downhill to 20% uphill slopes, 20 mph sustained winds from W</i>				
Fuel Model Sh5	17.7	2,936	1.2	0.7
<i>Scenario 4: grasslands, 3% downhill slope, 20 mph sustained winds from NW</i>				
Fuel Model Gr4	13.3	1,582	2.2	0.6

**Notes:**

1. Spotting distance from a wind driven surface fire.

## APPENDIX C

### Fire Behavior Technical Report Renaissance Ranch Project

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**Table C-5. Fire Behavior Modeling Results for Post-Project Conditions**

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
<i>Scenario 1: Irrigated manufactured slope-roadway-landscaping, 20% uphill slope, 40 mph high wind speed from NE</i>				
Irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<i>Scenario 2: Fuel modification-roadway-irrigated landscaping, 20% uphill slope, 40 mph high wind speed from E</i>				
Disturbed/Irrigated landscaping/pavement (FM8)	3.0	62	0.2	0.3
<i>Scenario 3: Fuel modification-irrigated manufactured slope-parking lot, 20% uphill slope to level, 20 mph sustained winds from W</i>				
Disturbed/pavement (FM8)	1.6	16	0.1	0.1
<i>Scenario 4: Irrigated landscaping/pavement, 3% downhill slope, 20 mph sustained winds from NW</i>				
Irrigated landscaping/pavement (FM8)	1.6	15	0.1	0.1

As presented in Table C-4, wildfire behavior in sage scrub, presented as a Fuel Model Sh5, represents the most extreme conditions, varying with different wind speeds. In this case, flame lengths can be expected to reach up to approximately 42.7 feet with 40 mph winds (extreme fire weather conditions) and 17.7 feet with 20 mph wind speeds (onshore winds). Spread rates for sage scrub fuel beds range from 1.2 mph (summer onshore winds) to 6.0 mph (extreme offshore winds). Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.6 miles to 2.0 miles. In comparison, a grass fuel type could generate flame lengths up to 13.3 feet high with a spread rate of 2.2 mph with an onshore wind condition. The fire could potentially be spotting for a distance of 0.6 miles.

As presented in Table C-5, Dudek conducted modeling of the site for post-development fuel recommendations for this project. Fuel modification includes paved parking lots, paved streets and irrigated landscaping on the periphery of the Project as well as maintenance of annual grasses within 20 feet of the Project perimeter on an as needed basis where applicable. For modeling the post-development condition, fuel model assignments were re-classified for the irrigated landscaping (Fuel Model 8). Fuel model assignments for all other areas remained the same as those classified for the existing condition. As depicted, the fire intensity and flame lengths in untreated, biological open space areas would remain the same. Conversely, the FMZ areas experience a significant reduction in flame length and intensity. The 42.7-foot (sage scrub fuel bed) and 13.3-foot (grass fuel bed) tall flames predicted during pre-development modeling during extreme weather conditions are reduced to less than 3.0 feet tall at the outer edges of the development due to the higher live and dead fuel moisture contents.

It should be noted that the results presented in Tables C-4 and C-5 depict values based on inputs to the BehavePlus software. Changes in slope, weather, or pockets of different fuel types are not



## APPENDIX C

### Fire Behavior Technical Report Renaissance Ranch Project

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accounted for in this analysis, but models provide a worst-case wildfire condition as part of a conservative approach. Further, this modeling analysis assumes a correlation between the project site vegetation and fuel model characteristics. 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.

The information in Table C-6 pertains to interpretation of flame length and fireline intensity as it relates to fire suppression efforts. Based on the post-development calculated flame lengths of under 3.0 feet tall, fire fighters should be able to conduct a direct attack on the fire.

**Table C-6. 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.
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.

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## APPENDIX C

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## APPENDIX C

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**APPENDIX C**  
**Fire Behavior Technical Report**  
**Renaissance Ranch Project**

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# APPENDIX D

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## Ignition-Resistant Construction Requirements

The following are the requirements for ignition resistant construction under Chapter 7A of the California Building Code (CBC). In addition, exterior building construction including roofs, eaves, exterior walls, doors, windows, decks, and other attachments must meet the most current CBC Chapter 7A ignition resistance requirements at the time of building permit application.

1. All structures to be built with a Class A roof assembly, including a Class A roof covering. Roofs shall have a roofing assembly installed in accordance with its listing and the manufacturer's installation instructions.
2. Where the roof profile allows a space between the roof covering and roof decking, the spaces shall be constructed to prevent the intrusion of flames and embers, be fire stopped with approved materials or have one layer of minimum 72 pound mineral-surfaced non-perforated cap sheet complying with ASTM D 3909 installed over the combustible decking. However, openings on barrel tiles or similar roof coverings, must be fire stopped (bird stopped) with approved materials to prevent the accumulation of debris, bird nests, etc. between the tiles and decking material.
3. When provided, exposed valley flashings shall be not less than 0.019-inch (No. 26 galvanized sheet gage) corrosion-resistant metal installed over a minimum 36-inch-wide underlayment consisting of one layer of minimum 72 pound mineral-surfaced non-perforated cap sheet complying with ASTM D 3909 running the full length of the valley.
4. All rain gutters, down spouts and gutter hardware shall be constructed from metal or other non-combustible material to prevent wildfire ignition along eave assemblies.
5. All chimney, flue or stovepipe openings attached to a fireplace, stove, or other solid or liquid fuel burning equipment or device shall be equipped with an approved spark arrester. An approved spark arrester is defined as a device intended to prevent sparks from escaping into the atmosphere and constructed of nonflammable materials, having a 12-gauge minimum thicknesses with openings no greater than 1/2 inch, or other alternative material the AHJ determines to provide equal or better protection. It shall be installed to be visible for the purposes of inspection and maintenance.
6. The exterior surface materials shall be non-combustible, including hard or ignition resistant, such as stucco. In all construction, exterior walls shall extend from the top of the foundation to the roof and terminate at 2-inch nominal solid blocking between rafters at all roof overhangs, or in the case of enclosed eaves, terminate at the enclosure.
7. All eaves, fascias, and soffits to be enclosed (boxed) with non-combustible materials. This shall apply to the entire perimeter of each structure. Eaves of heavy timber construction are not required to be enclosed as long as attic venting is not installed in the eaves. For the purposes of this section, heavy timber construction shall consist of a minimum of 4"x 6" rafter tails.
8. Paper-faced insulation shall be prohibited in attics or ventilated spaces.
9. Automatic interior fire sprinklers for commercial buildings shall be installed according to the National Fire Protection Association (NFPA) 13 requirements.
10. Roof vents, dormer vents, gable vents, foundation ventilation openings, ventilation openings in vertical walls, or other similar ventilation openings shall be louvered and covered with 1/16-inch, noncombustible, corrosion-resistant metal mesh or other approved material that offers equivalent protection.
11. Attic or foundation ventilation louvers or ventilation openings in vertical walls shall not exceed 144 square inches per opening and shall be covered with 1/16" inch mesh corrosion-resistant metal screen or other approved material that offers equivalent protection. Ventilation louvers and openings may be incorporated as part of access assemblies.



12. No attic ventilation openings or ventilation louvers shall be permitted in soffits, in eave overhangs, between rafters at eaves, or in other overhanging areas.
13. All fences and gate assemblies (fences, gates, and fence posts) attached or within five feet of a structure shall be of non-combustible material or pressure-treated exterior fire-retardant wood.
14. All projections (exterior balconies, decks, patio covers, unenclosed roofs and floors, and similar architectural appendages and projections) or structures less than five feet from a building shall be of non-combustible material, one-hour fire resistive construction on the underside, heavy timber construction, pressure-treated exterior fire- retardant wood or ignition resistant construction. When such appendages and projections are attached to exterior fire- resistive walls, they shall be constructed to maintain same fire-resistant standards as the exterior walls of the structure.
15. Accessory structures attached to buildings with habitable spaces and projections shall be in accordance with Chapter 7A of the CBC.
16. Detached accessory structures located less than 50 feet from a building containing habitable space shall be constructed in accordance with Chapter 7A of the CBC.
  - **Exception:** *Accessory structures less than 120 square feet in floor area located at least 30 feet from a building containing a habitable space.*
17. Exterior doors shall be approved non-combustible construction, solid core wood and shall conform to the performance requirements of standard SFM 12-7A-1 or shall be of approved noncombustible construction, or solid core wood having stiles and rails not less than 1<sup>3</sup>/<sub>8</sub> inches thick with interior field panel thickness no less than 1<sup>1</sup>/<sub>4</sub> inches thick, or shall have a fire-resistance rating of not less than 20 minutes when tested according to National Fire Protection Association (NFPA) 252.
18. All glass or other transparent, translucent or opaque glazing materials, that is used in exterior windows, including skylights, or exterior glazed door assemblies shall be constructed of multipane glazing with one tempered pane meeting the requirements of Section 2406 (2016 CBC) Safety Glazing. .
19. Vinyl window assemblies are deemed acceptable if the windows have the following characteristics:
  - Frame and sash are comprised of vinyl material with welded corners
  - Metal reinforcements in the interlock area
  - Glazed with insulating glass, annealed or tempered (one layer of which must be tempered glass).
  - Frame and sash profiles are certified in AAMA Lineal Certification Program.
  - Certified and labeled to ANSI/AAMA/NWDA 101/LS2-97 for Structural Requirements.

# APPENDIX E

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## Prohibited Plant List

APPENDIX E  
 FUEL MODIFICATION ZONE PROHIBITED PLANTS LIST

Botanical Name	Common Name	Comment*
<b>Trees</b>		
<i>Abies</i> species	Fir	F
<i>Agonis juniperina</i>	Juniper Myrtle	F
<i>Casuarina cunninghamiana</i>	River She-Oak	F
<i>Chamaecyparis</i> species (numerous)	False Cypress	F
<i>Cryptomeria japonica</i>	Japanese Cryptomeria	F
<i>Cupressocyparis leylandii</i>	Leyland Cypress	F
<i>Cupressus</i> species ( <i>C. fobesii</i> , <i>C. glabra</i> , <i>C. sempervirens</i> ,)	Cypress (Tecate, Arizona, Italian, others)	F
<i>Eucalyptus</i> species (numerous)	Eucalyptus	F, I
<i>Juniperus</i> species (numerous)	Juniper	F
<i>Lithocarpus densiflorus</i>	Tan Oak	F
<i>Melaleuca</i> species ( <i>M. linariifolia</i> , <i>M. nesophila</i> , <i>M. quinquenervia</i> )	Melaleuca (Flaxleaf, Pink, Cajeput Tree)	F, I
<i>Picea</i> (numerous)	Spruce	F
<i>Palm</i> species (numerous)	Palm	F, I
<i>Pinus</i> species ( <i>P. brutia</i> , <i>P. canariensis</i> , <i>P. b. eldarica</i> , <i>P. halepensis</i> , <i>P. pinea</i> , <i>P. radiata</i> , numerous others)	Pine (Calabrian, Canary Island, Mondell, Aleppo, Italian Stone, Monterey)	F
<i>Platycladus orientalis</i>	Oriental arborvitae	F
<i>Pseudotsuga menziesii</i>	Douglas Fir	F
<i>Tamarix</i> species ( <i>T. africana</i> , <i>T. aphylla</i> , <i>T. chinensis</i> , <i>T. parviflora</i> )	Tamarix (Tamarisk, Athel Tree, Salt Cedar, Tamarisk)	F, I
<i>Taxodium</i> species ( <i>T. ascendens</i> , <i>T. distichum</i> , <i>T. mucronatum</i> )	Cypress (Pond, Bald, Monarch, Montezuma)	F
<i>Taxus</i> species ( <i>T. baccata</i> , <i>T. brevifolia</i> , <i>T. cuspidata</i> )	Yew (English, Western, Japanese)	F
<i>Thuja</i> species ( <i>T. occidentalis</i> , <i>T. plicata</i> )	Arborvitae/Red Cedar	F
<b>Groundcovers, Shrubs &amp; Vines</b>		
<i>Acacia</i> species	Acacia	F, I
<i>Adenostoma fasciculatum</i>	Chamise	F
<i>Adenostoma sparsifolium</i>	Red Shanks	F
<i>Agropyron repens</i>	Quackgrass	F, I
<i>Anthemis cotula</i>	Mayweed	F, I
<i>Arctostaphylos</i> species	Manzanita	F
<i>Arundo donax</i>	Giant Reed	F, I
<i>Artemisia</i> species ( <i>A. abrotanum</i> , <i>A. absinthium</i> , <i>A. californica</i> , <i>A. caucasica</i> , <i>A. dracunculus</i> , <i>A. tridentata</i> , <i>A. pynoccephala</i> )	Sagebrush (Southernwood, Wormwood, California, Silver, True tarragon, Big, Sandhill)	F
<i>Atriplex</i> species (numerous)	Saltbush	F, I
<i>Avena fatua</i>	Wild Oat	F
<i>Baccharis pilularis</i>	Coyote Bush	F
<i>Bambusa</i> species	Bamboo	F, I
<i>Bougainvillea</i> species	Bougainvillea	F, I
<i>Brassica</i> species ( <i>B. campestris</i> , <i>B. nigra</i> , <i>B. rapa</i> )	Mustard (Field, Black, Yellow)	F, I

APPENDIX E  
 FUEL MODIFICATION ZONE PROHIBITED PLANTS LIST

Botanical Name	Common Name	Comment*
<i>Bromus rubens</i>	Foxtail, Red brome	F, I
<i>Castanopsis chrysophylla</i>	Giant Chinquapin	F
<i>Cardaria draba</i>	Hoary Cress	I
<i>Cirsium vulgare</i>	Wild Artichoke	F,I
<i>Conyza bonariensis</i>	Horseweed	F
<i>Coprosma pumila</i>	Prostrate Coprosma	F
<i>Cortaderia selloana</i>	Pampas Grass	F, I
<i>Cytisus scoparius</i>	Scotch Broom	F, I
<i>Eriogonum</i> species ( <i>E. fasciculatum</i> )	Buckwheat (California)	F
<i>Fremontodendron</i> species	Flannel Bush	F
<i>Heterotheca grandiflora</i>	Telegraph Plant	F
<i>Hordeum leporinum</i>	Wild barley	F, I
<i>Juniperus</i> species	Juniper	F
<i>Lactuca serriola</i>	Prickly Lettuce	I
<i>Larrea tridentata</i>	Creosote bush	F
<i>Lolium multiflorum</i>	Ryegrass	F, I
<i>Lonicera japonica</i>	Japanese Honeysuckle	F
<i>Mimulus aurantiacus</i>	Sticky Monkeyflower	F
<i>Miscanthus</i> species	Eulalie Grass	F
<i>Muhlenbergia</i> species	Deer Grass	F
<i>Nicotiana</i> species ( <i>N. bigelovii</i> , <i>N. glauca</i> )	Tobacco (Indian, Tree)	F, I
<i>Pennisetum setaceum</i>	Fountain Grass	F, I
<i>Perovskia atroplicifolia</i>	Russian Sage	F
<i>Phoradendron</i> species	Mistletoe	F
<i>Pickeringia montana</i>	Chaparral Pea	F
<i>Rhus</i> ( <i>R. diversiloba</i> , <i>R. laurina</i> , <i>R. lentii</i> )	Sumac (Poison oak, Laurel, Pink Flowering)	F
<i>Ricinus communis</i>	Castor Bean	F, I
<i>Rhus Lentii</i>	Pink Flowering Sumac	F
<i>Salvia</i> species (numerous)	Sage	F, I
<i>Salsola australis</i>	Russian Thistle	F, I
<i>Solanum Xantii</i>	Purple Nightshade (toxic)	I
<i>Silybum marianum</i>	Milk Thistle	F, I
<i>Thuja</i> species	Arborvitae	F
<i>Urtica urens</i>	Burning Nettle	F

\*F = flammable, I = Invasive

**Notes:**

- Plants on this list that are considered invasive are a partial list of commonly found plants. There are many other plants considered invasive that should not be planted in a fuel modification zone and they can be found on The California Invasive Plant Council's Website [www.cal-ipc.org/ip/inventory/index.php](http://www.cal-ipc.org/ip/inventory/index.php). Other plants not considered invasive at this time may be determined to be invasive after further study.
- 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.
- The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
- All vegetation used in Fuel Modification Zones and elsewhere in this development shall be subject to approval of the Fire Code Official.
- 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.