Fire Protection Plan

Oak Valley North
County of Riverside

FEBRUARY 2024

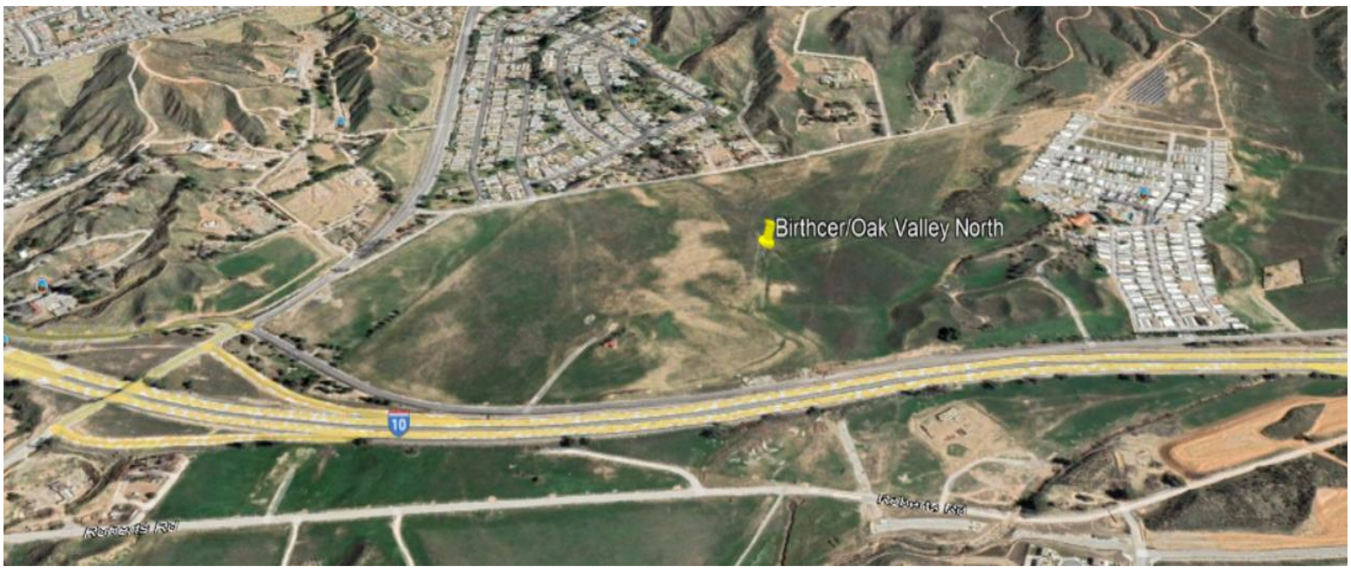

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Table of Contents

SECTION **PAGE NO.**

TABLES

EXHIBITS

FIGURES

APPENDICES

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Executive Summary

This Fire Protection Plan (FPP) has been prepared for the Oak Valley North Project (Project) located in the City of Calimesa in the county of Riverside. 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, including a conceptual development plan for the Project site described below. The purpose of this plan is to generate and memorialize the fire safety requirements and standards of the Calimesa Fire Department (CFD) along with Project-specific design features and implementation measures based on the Project site, its intended use, and its fire environment, including both the conceptual land use plan and any modifications to buildings permitted pursuant to the Specific Plan.

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, 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 nearby undeveloped land could cast embers onto the property. Once the Project is built, the Project's on-site fire potential will be much lower than its current condition due to conversion of wildland fuels to buildings, 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 boasts 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 982,232 square feet of warehouse and offices, two trailer lots, internal and public roadways, and either one church or 223 multifamily residential building on 110.2 gross acres. 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 site'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 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 site is the preferred method of providing for occupant and business safety, consistent with the Owner's and Calimesa Fire Department's (CFD's) current approach for evacuation. As such, the Project's Owner and Property Management Company will formally adopt, practice, and implement a "Ready, Set, Go!" (CFD 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, and includes pre-planning for emergencies, including wildfire emergencies; focusing 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 Oak Valley North Project as part of the proposed development plan. These measures are discussed in more detail throughout this FPP.

The following measures shall be established to the satisfaction of the City for each Planning Area prior and as a condition to issuance of a building permit for any building on that Planning Area.

1. Project buildings will be constructed of ignition-resistant[1] 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 as needed around the perimeter of each building within the Project site as required by CFD and will be a minimum of 100 feet wide. In the Project's present configuration, the 100-foot FMZ is achievable around all proposed buildings.
3. For any Planning Area in which the square footage or footprint of a proposed building has been modified from that described in this fire protection plan, the applicant shall submit and the CFD shall have approved the revised fire protection plan for the Planning Area, consistent with Item 2 above.
4. Landscape plantings will not utilize prohibited plants that have been found to be highly flammable.
5. Fire apparatus access roads (i.e., public and private streets) will be provided throughout the 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 CFD.
6. Buildings will be equipped with automatic commercial fire sprinkler systems meeting CFD requirements.
7. The Project shall demonstrate provision of water capacity and delivery to ensure a reliable water source for operations and during emergencies which may require extended fire flow.

[1] 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.

8. Should future iterations of the Project's site plan result in buildings that do not achieve a minimum of 100 feet of defensible space, then alternative materials and methods may be proposed to provide the functional equivalency of a full 100 feet of defensible space. Alternative materials and methods will be to the satisfaction of the CFD and may include structural hardening enhancements or landscape features, like non-combustible walls.

The following measures shall be established in the CC&Rs for the Project and implemented by the Property Management Company. Annual maintenance should occur before May 1st of each year and inspected by CFD or an approved third party.

1. On-going maintenance of all fuel modification will be managed by Owner's, Property Management Company, or another approved entity, at least annually or as needed.
2. The Property Owners 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 prepare development-wide "Ready, Set, Go!" plans.

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1 Introduction

This FPP has been prepared for the proposed Project in Calimesa, California, in the County of Riverside. 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, including a conceptual development plan for the Project site described below. The purpose of this plan is to generate and memorialize the fire safety requirements and standards of the CFD along with Project-specific design features and implementation measures based on the Project site, its intended use, and its fire environment, including both the conceptual land use plan and any modifications to buildings permitted pursuant to the Specific Plan

As part of the assessment, the plan has considered the property location, topography, surrounding combustible vegetation (fuel types), climatic conditions, and fire history for the Project site and the surrounding area. 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 for the Project site and to address potential fire impacts to the surrounding area. The plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect structures and essential infrastructures within the Project site. 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 potential fire risk posed by the construction and operation of the Project to the Project site and surrounding area
- Prepare this FPP detailing how fire risk will be mitigated on the Project site and in the surrounding area 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 Oak Valley North Project will comply with applicable portions of CFD Fire Prevention Standards. The Project will also be consistent with the 2022 edition of the California Building Code (CBC), Chapter 7A; 2022 edition of the California Fire Code (CFC); or applicable code as adopted and amended by CFD and the City of Calimesa at the time of construction. Additionally, CFD 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). The Project will also comply with Chapter 7A of the CBC which focuses primarily on preventing ember penetration into buildings, a leading cause of structure loss from wildfires.

Compliance with the above building and fire code requirements is an important component of the requirements of this FPP given the Project's wildland-urban interface (WUI) location currently spans an area statutorily designated as a Very High Fire Hazard Severity Zone (VHFHSZ), local responsibility area (LRA) by California Department of Forestry and Fire Protection (CAL FIRE), see Figure 1 (FRAP 2008).

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 damage or destruction 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 2022 California Building Code (Chapter 7A, Section 701A Scope, Purpose and Application).

1.2 Project Summary

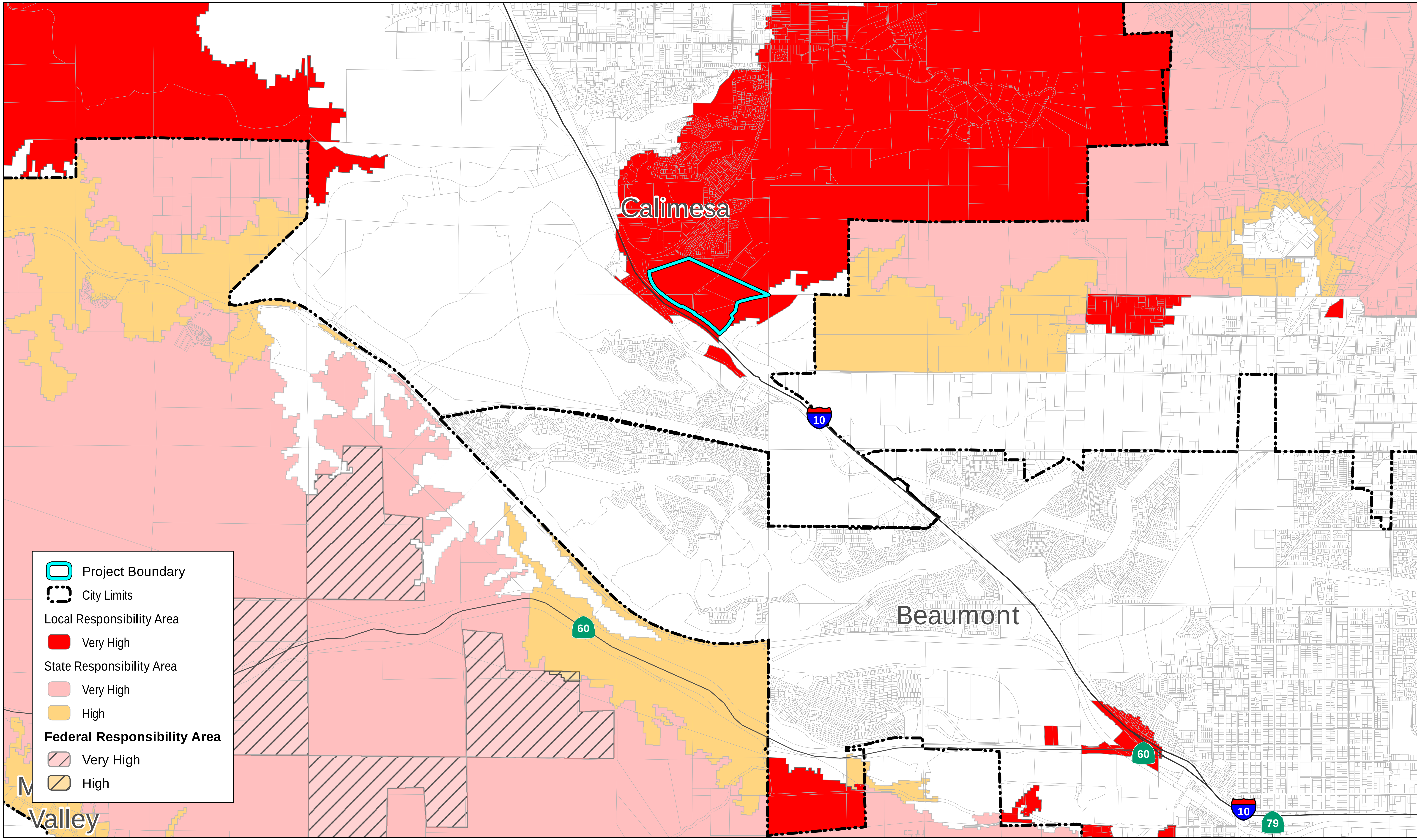
1.2.1 Project Overview

The Project provides for a logistical industrial center, trailer parking and either a church or 223-unit multifamily residential building, on approximately 110.2 acres (See Project Description, below).

1.2.2 Location

The 110.2-acre Project site is in the City of Calimesa in Riverside County. The Project site is in the southern portion of the City of Calimesa (Figure 2, Project Location Map). More specifically, the Project site is located northeast of Interstate 10 (I-10) (though setback from I-10 by a frontage road called Calimesa Boulevard), southeast of Singleton Road (though set back from Singleton Road by a vacant parcel), southwest of Beckwith Avenue, and northwest of the Rancho Calimesa Mobile Home Park. The Project site is situated within Section 24 and 25 of Township 2 South, and Range 2 West on the El Casco, California, U.S. Geological Survey (USGS), 7.5-minute topographic map.

The Oak Valley North Project site is located on the following Riverside County Assessor's Parcels: 413-260-018, 431-260-025, 413-280-016, 413-280-018, 413-280-021, 413-280-030, 413-280-036, 413-280-037, and 413-280-043.



Document Path: Z:\Projects\j1557100\MAPDOC\DOCUMENT\Fire\FPP\Fig 1 Current CALFIRE Fire Hazard Severity Zone.mxd

SOURCE: PARCELS- RIVERSIDE COUNTY GIS; FIRE DATA- CALFIRE

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0 2,000 4,000 Feet

FIGURE 1

Current CAL FIRE Fire Hazard Severity Zones

Fire Protection Plan for the Oak Valley North Project

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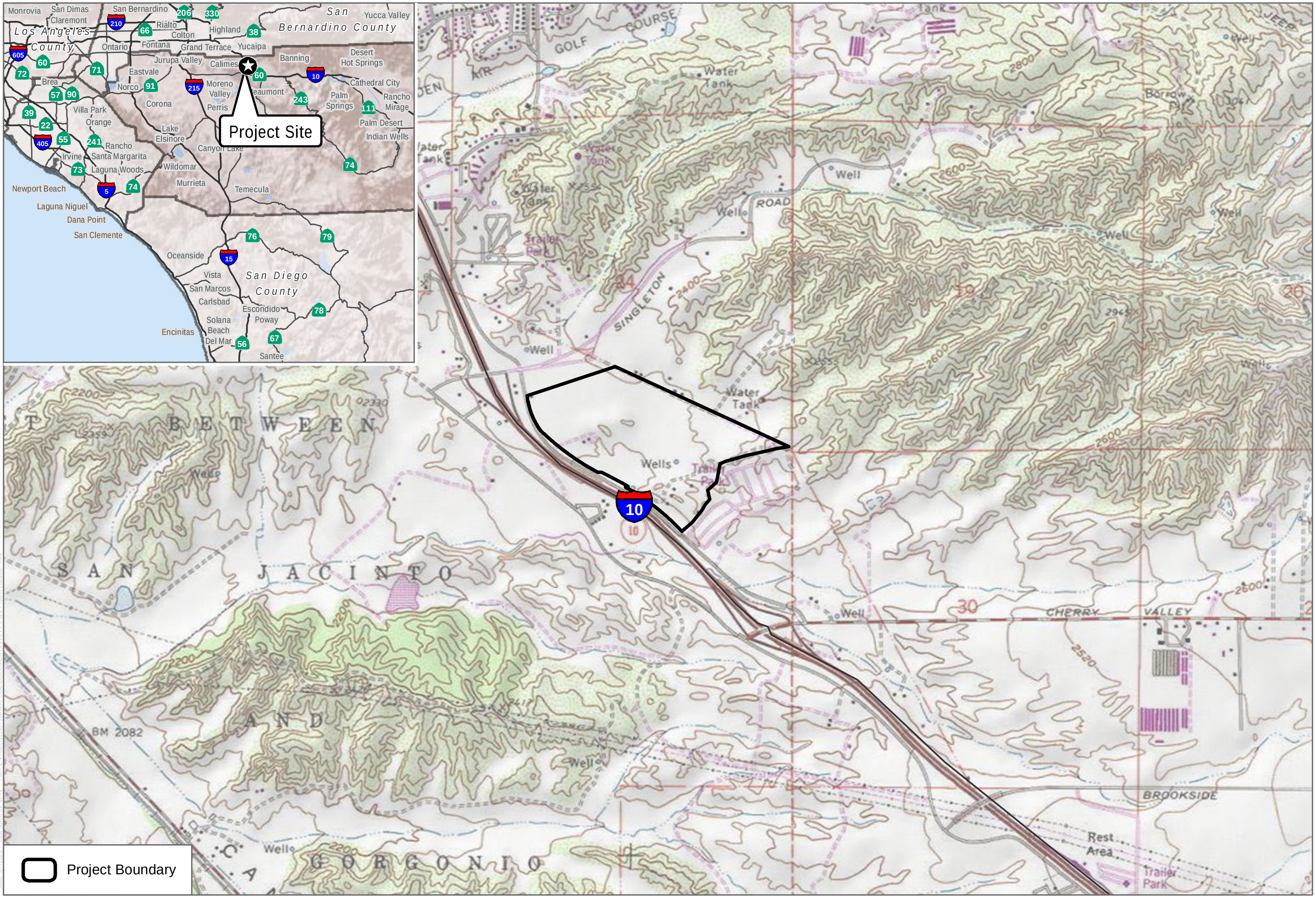

SOURCE: USGS 7.5-Minute Series El Casco Quadrangle

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FIGURE 2

Project Location

Fire Protection Plan for the Oak Valley North Project

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1.2.3 Existing Land Use

The Project site currently consists of primarily undeveloped land that has been subject to disturbances from various sources including previous agricultural uses, off-road vehicles, and isolated trash dumping. One single-story single-family residence sits atop a lone hill in the west-central region of the site. The Project area is primarily vegetated with non-native grasses, with sparse sage scrub and trees of various native and non-native species, however the site has been subject to regular mechanical weed abatement in the form of discing. The Project site is primarily flat; however, the house sets atop a lone hill in the west-central region of the Project site, and the eastern portion of the Project site is about 15 feet higher than the majority of the Project site. Numerous short dirt roads were observed throughout the Project site, with two driveways from Calimesa Boulevard at the southern perimeter of the Project site. Three ephemeral drainages were observed throughout the site.

Surrounding land uses that lie adjacent to the Project site include residential on all side of the Project, although the Project is setback from the residential areas to the southeast by the I-10 freeway and Calimesa Boulevard, and the Project is setback from residential to the northwest by a vacant lot that has also been recently disced.

1.2.4 Project Description

The Oak Valley North Project covers approximately 110.2 acres and proposes development of up to 982,232 square feet of warehouse and office building space and up to 223 multifamily residential units or a church on 110.2 gross acres, see Figures 3 and 4. Building 1 would have 236,892 square feet of floor area and 37 loading docks. Building 2 would have 249,840 square feet of floor area and 74 loading docks. Building 3 would have 249,000 square feet of floor area and 93 loading docks. Building 4 would have 246,500 square feet of floor area and 50 loading docks. Two additional Development Plan Reviews are proposed to establish two trailer lots. Trailer Lot 1 would be 10.04 acres and provide for 254 trailer parking spaces and 5 auto spaces. Trailer Lot 2 would be 27.24 acres and provide for 708 trailer parking spaces and 5 auto spaces. Also, a Tentative Parcel Map is proposed to subdivide the property and create 7 parcels and dedicate public roadway right-of-way to the City of Calimesa for improvements to Beckwith Road and Calimesa Boulevard.

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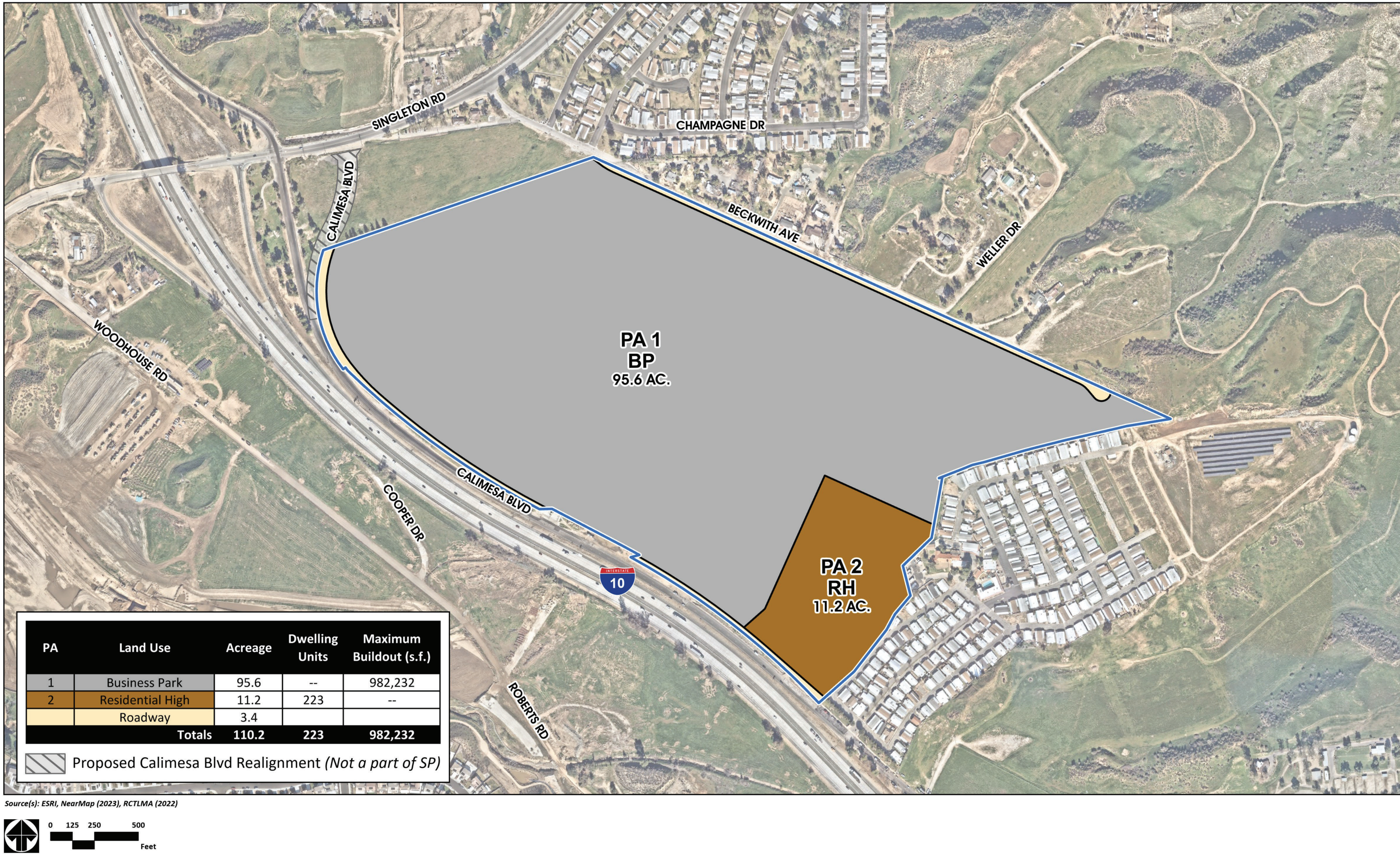

PA	Land Use	Acreage	Dwelling Units	Maximum Buildout (s.f.)
1	Business Park	95.6	--	982,232
2	Residential High	11.2	223	--
	Roadway	3.4		
	Totals	110.2	223	982,232

Source(s): ESRI, NearMap (2023), RCTLMA (2022)

SOURCE: HPA 2023

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FIGURE 3

Project Land Use

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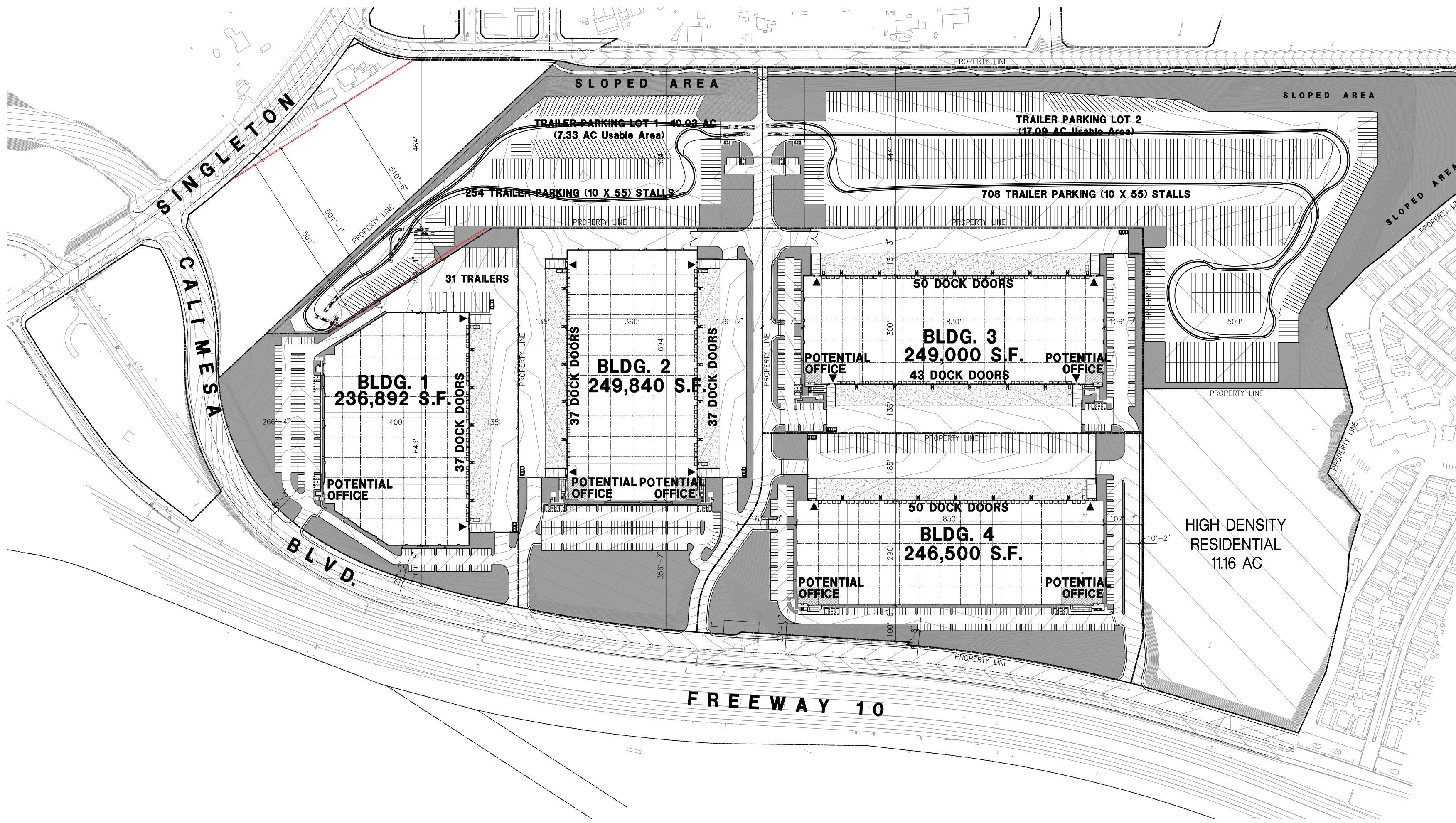


MASTER SITE PLAN (A)
scale: 1" = 150'-0"

SCALE: 1" = 150'-0"
0 150' 300' 450'
TRUE NORTH PLAN NORTH

PROPERTY OWNER

STEARNS PROPERTIES, LP, A CALIFORINA LIMITED PARTNERSHIP
450 NEWPORT CENTER DRIVE, SUITE 220
NEWPORT BEACH, CA 92660
TEL: 949-355-5278
ATTN: SCOTT MULKAY
EMAIL: S.MULKAY@BIRTCHER.COM

ADDRESS OF THE PROPERTY

9950 CALIMESA BLVD
CALIMESA, CA 92320

ASSESSOR'S PARCEL NUMBER

413-260-018 413-280-030 413-280-037 413-280-018
413-280-021 413-280-036 413-280-016 413-280-043

LAND USE

EXISTING LAND USE: BUSINESS PARK (BP), LIGHT INDUSTRIAL (LI) AND RESIDENTIAL LOW MEDIUM (RLM)
EXISTING ZONING: BUSINESS PARK (BP), LIGHT INDUSTRIAL (LI) AND RESIDENTIAL LOW MEDIUM (RLM)

PROPOSED GP LAND USE: SPECIFIC PLAN AREA (SPA)
PROPOSED ZONING: SPECIFIC PLAN AREA (SPA)

APPLICANT

BIRTCHER DEVELOPMENT
450 NEWPORT CENTER DRIVE, SUITE 220
NEWPORT BEACH, CA 92660
TEL: 949-355-5278
ATTN: SCOTT MULKAY
EMAIL: S.MULKAY@BIRTCHER.COM

APPLICANT'S REPRESENTATIVE

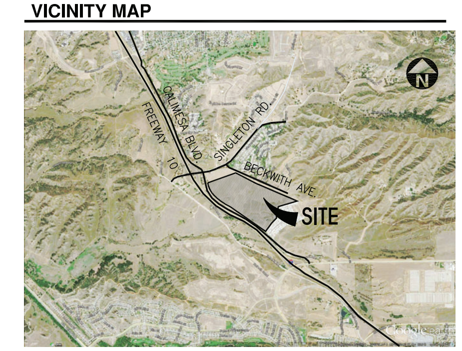
HPA, INC.
18831 BARDEEN AVE SUITE 100
IRVINE CA 92612
TEL: 949-862-2122
ATTN: INKON KIM

PROJECT DATA

	BLDG.1	BLDG.2	BLDG.3	BLDG.4	TRAILER LOT 1	TRAILER LOT 2	TOTAL
SITE AREA							
In s.f.	614,632	704,366	595,052	692,168	451,281	1,244,510	**4,302,009 s.f.**
In acres	14.11	16.17	13.66	15.89	10.36	28.57	**98.76 ac**
NET USABLE SITE AREA							
In s.f.					319,471	744,440	**1,063,911 s.f.**
in acres					7.33	17.09	**24.42 ac**
BUILDING AREA							
Office	20,000	20,000	20,000	20,000			80,000 s.f.
Warehouse	216,892	229,840	229,000	226,500			902,232 s.f.
TOTAL	236,892	249,840	249,000	246,500			**982,232 s.f.**
SITE COVERAGE							
Percentage	38.5%	35.5%	41.8%	35.6%			22.8%
AUTO PARKING REQUIRED							
Office: 1/250 s.f.	80	80	80	80			320 stalls
Whse: 1st 40K @ 1/1,000 s.f.	40	40	40	40			160 stalls
Whse: Above 40K @ 1/3,000 s.f.	59	64	63	63			249 stalls
TOTAL	**179**	**184**	**183**	**183**			**729 stalls**
AUTO PARKING PROVIDED							
Standard (9' x 19')	106	96	104	133	4	4	**447 stalls**
Accessible Stalls (9' x 19')	5	5	5	5	0	0	**20 stalls**
Accessible Stalls - Van (12' x 19')	2	2	1	1	1	1	**8 stalls**
EV Capable (Chargers + Supply Equip) 20% of Total	42	43	39	37	0	0	**161 stalls**
EV Chargers Installed 25% of Total EV Capable	11	11	10	10			
Clean Air/FEV/Carpool/Van Pool Vehicles	33	33	28	28	0	0	**122 stalls**
TOTAL	**199**	**190**	**187**	**214**	**5**	**5**	**758 stalls**
TRAILER PARKING PROVIDED							
Trailer (10' x 55')	30	0	0	77	251	708	**1,066 stalls**
BIKE SPACE REQUIRED							
5% of New Visitor Motorized Vehicle Parking	11	11	10	10			**42 spaces**
BIKE SPACE PROVIDED							
Exterior Bike Space	10	10	10	10			**40 spaces**
Interior Bike Space	14	14	10	10			**48 spaces**
TOTAL	**35**	**35**	**30**	**30**			**130 spaces**

	BLDG.1	BLDG.2	BLDG.3	BLDG.4	TRAILER LOT 1	TRAILER LOT 2	TOTAL
LANDSCAPE PROVIDED							
In s.f.	101,365	126,236	42,086	147,041	96,886	415,815	**929,429 s.f.**
Percentage	17.7%	16.6%	7.1%	24.0%	22.2%	35.1%	**22.3%**
ZONING ORDINANCE FOR CITY							
Zoning Designation - Business Park (BP) & Light industrial (LI)							
MAXIMUM BUILDING HEIGHT ALLOWED							
Height - 50'							
FLOOR AREA RATIO							
Maximum Allowed	0.5	0.5	0.5	0.5			0.5
Actual	0.414	0.329	0.418	0.403			0.236
SETBACKS							
Building	20'	20'	20'	20'			
Landscape	10'	10'	10'	10'			
Front Street Side/Side Street Side	20'	20'	20'	20'			
Side / Rear - none, adjoins R zone 30'	30' + 10'	30' + 10'	30' + 10'	30' + 10'			

VICINITY MAP



SOURCE: HPA 2023

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FIGURE 4a

Conceptual Site Plan–Residential Option

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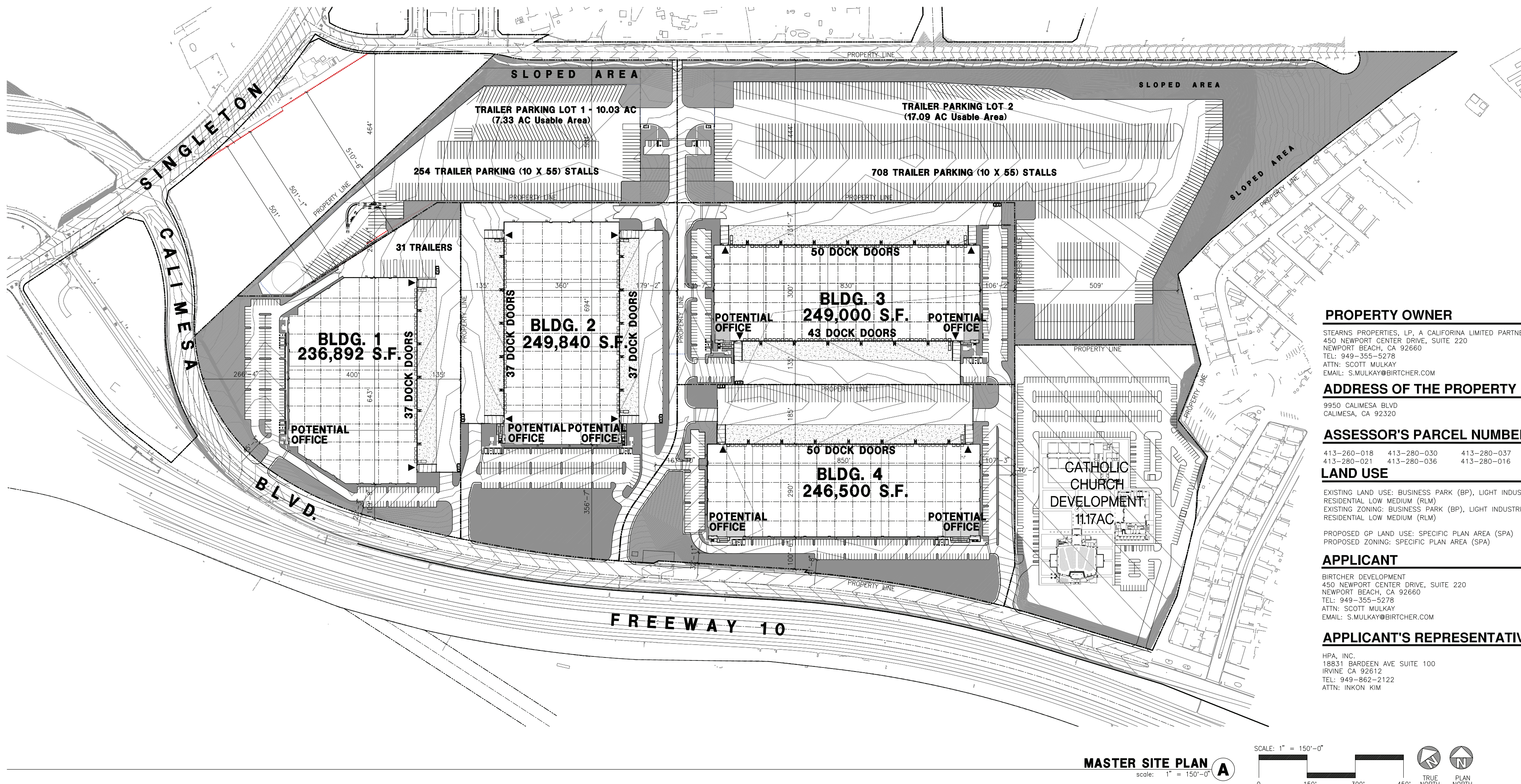

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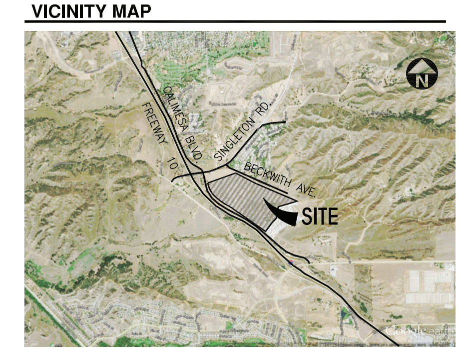

SOURCE: HPA 2023

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FIGURE 4b

Conceptual Site Plan–Church Option

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2 Project Site Risk Analysis

2.1 Field Assessment

A field assessment of the Oak Valley North Project area was conducted on September 4, 2023, in order to confirm/acquire Project site information, document existing conditions, and to determine potential actions for addressing the protection of the Project's structures. While on the Project site, Dudek's Fire Protection 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 to the structure(s), application of known ignition-resistant materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent to the Project site is necessary to understand the potential for fire within and around the Project site.

The following sections discuss the Project site characteristics, local climate, and fire history within and surrounding the Project site. The Oak Valley North 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 primarily influenced by wind AND FUEL CONDITIONS. The Project site is primarily flat with a hill in the west-central portion of the Project. The eastern portion of the Project site is about 15 to 20 feet higher than the rest of the Project site. The Project site is downhill from the open space northeast of the Project site. The elevations on the improved portions of the Project site range from approximately 2,274 feet above mean sea level (amsl) site to approximately 2,386 feet amsl.

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 onshore 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 non-native grasslands and wildflower fields, disturbed/developed areas and ornamental plants, and pockets of native coastal sage – chaparral scrub. Vegetation types were derived from an on-site field assessment of the Project site and concur with the project's Biology report. The majority of the open spaces adjacent to the Project site are vegetated with grasses interspersed with sage scrub which are more predominant northeast of the Project site. The vegetation cover types were assigned corresponding fuel models for use during Project site fire behavior modeling. Section 3 describes the fire modeling conducted for the Project Area.

2.2.3.2 Vegetation Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Section 3 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (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, grazing, 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 site. The fuel modification zones on the Project site will primarily consist of paved areas, however vegetated areas will consist of 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 to the Project's footprint (outside the fuel modification zones), where the wildfire threat will exist post-development, are classified as low to heavy fuel loads due to the range of fuels including grass, sage scrub, and heavy chapparal.

2.2.4 Fire History

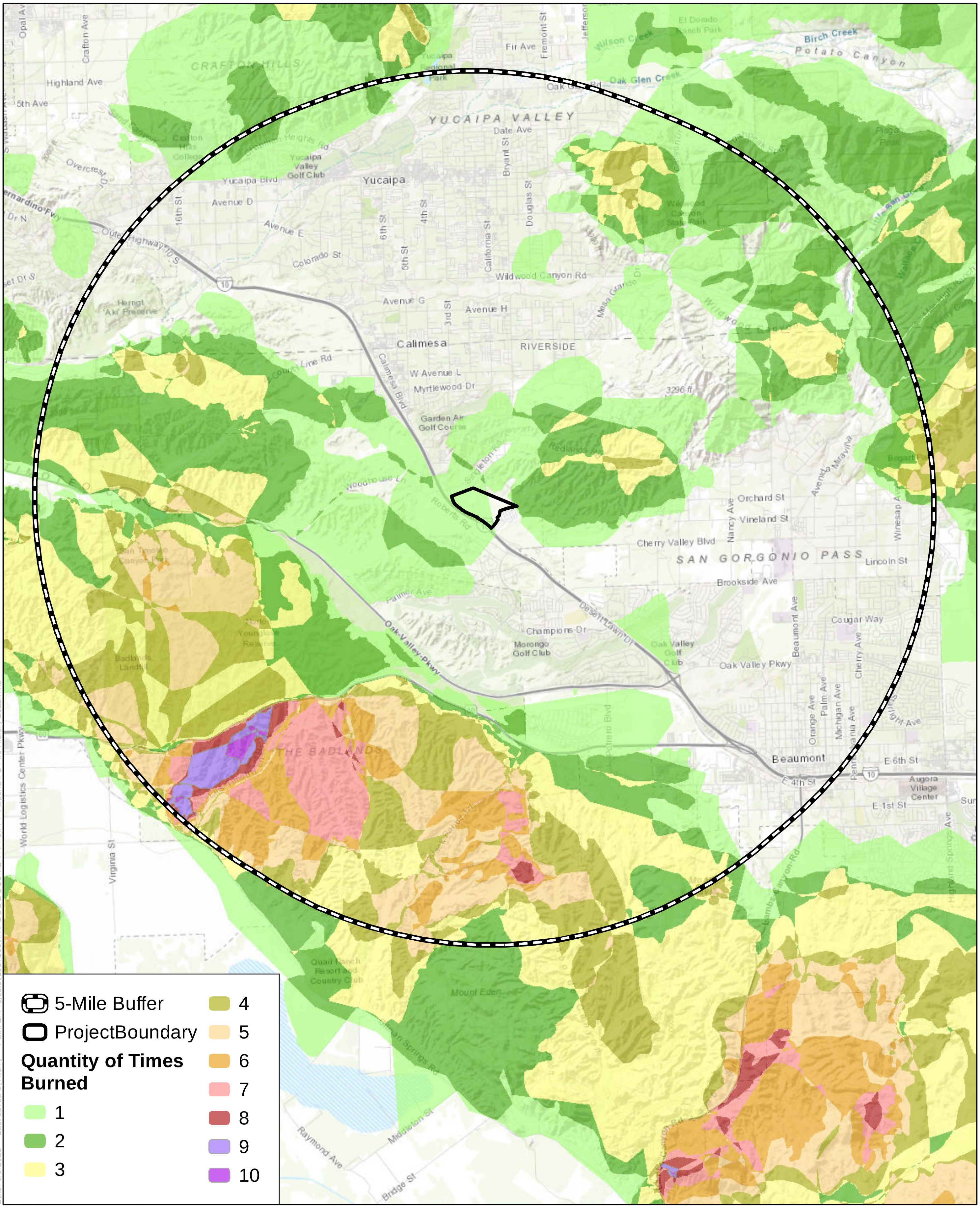
Fire history is an important component of an FPP. Fire history data provides valuable information regarding fire spread, fire frequency, most vulnerable areas, and significant ignition sources, amongst others. In turn, this understanding of why fires occur in an area and how they typically spread can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

Figure 5, Fire History Map, presents a graphical view of the Project area's recorded fire history. As presented in the exhibit, there have been 93 fires recorded since 1900 by CAL FIRE in their FRAP database (FRAP 2022)[2] in the vicinity of the Project, including one fire that burned the entire Project site in 1962. These fires, occurring in 1900, 1907, 1908, 1914, 1920, 1921, 1924, 1929, 1948, 1951, 1957(x3), 1958, 1959, 1962(x3), 1965, 1968 (x3), 1969, 1970(x4), 1972, 1973, 1975(x2), 1976, 1979 (x7), 1980(x4), 1981(x3), 1983, 1985, 1988(x3), 1989(x2), 1990, 1992, 1993(x3), 1994(x2), 1995, 1996(x2), 1997(x3), 1998(x2), 2005(x2), 2006, 2007, 2009(x5), 2010(x2), 2011, 2013(x2), 2014, 2015(x2), 2016, 2017(x2), 2019(X2), 2020(x3) burned within a five mile radius of the Project area. Approximately 4 fires have burned onto a portion of the Project site. 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

2 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 1878–2022.

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 seven years. Based on this analysis, it is expected that wildfire(s) 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.



SOURCE: BASE MAP- ESRI MAPPING SERVICE; FIRE DATA-CALFIRE 2022

DUDEK

0 1 2 Miles

FIGURE 5

Fire History Map

Fire Protection Plan for the Oak Valley North Project

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2.3 Analysis of Wildfire Risk from Adding New Development

Humans (i.e., human related activities or human created features, services (i.e., powerlines and electrical equipment), or processes) are responsible for the majority of California wildfires (Syphard et al. 2007, 2008; Romero-Calcerrada et al. 2008). Certain human activities result in sparks, flames, or heat that may ignite vegetative fuels without proper prevention measures in place. These ignitions predominantly occur as accidents, but may also be purposeful, such as in the case of arson. Equipment and powerlines cause a significant number of fires in Riverside County. After that, roadways are a particularly high source for wildfire ignitions due to high usage and vehicle-caused fires (catalytic converter failure, overheated brakes, dragging chains, tossed cigarette, and others) (Romero-Calcerrada et al. 2008)). In Southern California, the population living at, working in, or traveling through the wildland urban interface is vast and provides a significant opportunity for ignitions every day. However, it is a relatively rare event when a wildfire occurs, and an even rarer event when a wildfire escapes initial containment efforts. Approximately 90 to 95% of wildfires are controlled below 10 acres (CAL FIRE 2019; Santa Barbara County Fire Department 2019).

Research indicates that the type of clustered, contained development project like Oak Valley North, are not associated with increased vegetation ignitions. Syphard and Keeley (2015) summarize all wildfire ignitions included in the CAL FIRE Fire and Resource Assessment Program (FRAP) database dating back over 100 years. They found that equipment-caused fires were by far the most numerous – and these also accounted for most of the area burned – followed closely by the area burned by powerline fires. Ignitions classified as equipment-caused frequently resulted from exhaust or sparks from power saws or other equipment with gas or electrical motors, such as lawn mowers, trimmers or tractors and associated with lower density housing. Ignitions were more likely to occur close to roads and structures, and at intermediate density land uses and structure densities.

As Exhibits 1 through 3 illustrate, development density directly influences susceptibility to fire because in higher density developments (like the Project), there is one interface (the Project perimeter) with the wildlands whereas lower density development creates more structural exposure to wildlands, less or no ongoing landscape maintenance (an intermix rather than interface), and consequently more difficulty for limited fire resources to protect well-spaced buildings. The intermix includes development amongst the unmaintained fuels whereas the proposed Project converts all fuels within the footprint and provides a wide, managed fuel modification zone separating buildings from unmaintained fuel and creating a condition that makes defense easier. Syphard and Keeley go on to state that "The WUI, where housing density is low to intermediate is an apparent influence in most ignition maps," further enforcing the conclusion that lower density housing poses a higher ignition risk than higher density development. They also state that "Development of low-density, exurban housing may also lead to more homes being destroyed by fire" (Syphard et al. 2013). A vast wildland urban interface already exists in the area adjacent to the Project, dominated by older, more fire-vulnerable structures, constructed before stringent fire code requirements were imposed, with varying levels of maintained fuel modification buffers. As discussed in detail throughout this FPP, the Project is an ignition-resistant development designed to include professionally managed and maintained fire protection components, modern fire code compliant safety features and specific measures provided where ignitions are most likely to occur (such as along roadways). Therefore, the development of the Project would not be expected to materially increase the risk of vegetation ignitions.

Exhibit 1. Example of "lower density" development where homes are interspersed among wildland fuels, are of varying ages, and include varying levels of fuel modification zone setbacks. Homes are exposed on most or all sides by flammable vegetation and properties rely solely on owners for maintenance, are often far distances from the nearest fire station, and have minimal buffer from on-site fire spreading to wildlands.

Exhibit 2. Example of moderate density development. Homes are located on larger properties and include varying levels of ignition resistance and landscape/fuel modification provision and maintenance. This type of development results in a higher wildland exposure level for all homes and does not provide the same buffers from wildfire encroaching onto the site, or starting at a structure and moving into the wildlands, as a higher density project.

Exhibit 3. Example higher density development that is ignition resistant and excludes readily ignitable vegetative fuels throughout and provides a perimeter fuel modification zone. This type of new development requires fewer fire resources to defend and can minimize the likelihood of on-site fires spreading off site.

Moreover, frequent fires and lower density housing growth may lead to the expansion of highly flammable exotic grasses that can further increase the probability of ignitions (Keeley et al. 2012). This is not the case with the proposed Project as the landscapes are managed and maintained to remove exotic fuels that may establish over time.

As discussed above, research indicates that it is less likely for higher density developments to be impacted by wildfires than lower density developments. The same protections that starve wildfire of fuels and minimize or prevent wildfire from transitioning into a higher density Project, such as Oak Valley North, also serve to minimize or prevent on-site fires from transitioning into the wildlands. Customized project FMZs are crucial as the strategic design and placement of fuels treatments can disrupt or slow fire spread, reduce fire intensity, and facilitate fire suppression within a landscape (Braziunas et al. 2021). This is true regardless of the direction a vegetation fire may be burning – whether toward a community or from within a community. The risk of a structure being destroyed is significantly lower when defensible space is implemented on both shallow and steep properties (Syphard et al., 2014). Even if just half the landscape is treated, the percentage of houses exposed to fire can decrease from 51% to 16% (Braziunas et al. 2021). Moreover, when FMZs are designed properly, they not only protect homes but also the surrounding environment. For example, when the Tahoe Basin experienced the Angora Fire in 2007, fuel treatments had the dual effect of saving homes and increasing forest survival (Safford et al. 2009). In areas where fuel management had been carried out prior to the Angora Fire, home loss was significantly reduced in the adjacent community and 85% of the trees survived, as compared to the 22% that survived in untreated areas (Safford et al., 2009). Fuel management treatments also facilitated the ecological benefit of reduced fire severity, including higher post-fire soil litter cover, higher herbaceous plant cover, higher diversity, and lower levels of invasive beetles

(Safford et al. 2009). At a minimum, managing defensible space can reduce risk across multiple scales by damping fire risk, reducing the impact of fire, and in turn reducing annual fire risk (Braziunas et al. 2021).

Further, the requirement that all structures will include interior fire sprinklers significantly reduces the likelihood that a building fire spreads to the point of flashover, where a structure will burn beyond control and produce embers. Interior sprinklers are very efficient, keeping fires to the room of origin, or extinguishing the fire before the responding firefighters arrive. Similarly, the irrigated fuel modification zones are positioned throughout the development areas as well as the first zones on the perimeter of the Project. Irrigated zones include plants with high internal moisture and spacing between plants and plant groups that 1) make it difficult to ignite and 2) make it difficult for fire to spread plant to plant. Lastly, additional human presence on the site can result in fast detection of fires and fast firefighter response, a key in limiting the growth of fires beyond the incipient stage.

2.4 Off-site Wildfire Impacts

It is a relatively rare event when a wildfire occurs, and an even rarer event when a wildfire escapes initial containment efforts. As previously mentioned, approximately 90 to 95% of wildfires are controlled below 10 acres. Studies (Keeley and Syphard 2018; Syphard et al. 2007; Syphard and Keeley 2015) show the ignition resistance and fire safety awareness of the Project and its population influences the likelihood of fire ignitions and the potential for fire to spread off site into adjacent wildland fuels and negatively impact existing communities. As the research indicates, humans can drive wildfire ignition risk, but not discussed, they can also reduce it. When fire protection is implemented at the parcel level and leverages ignition-resistant building materials, infrastructure improvements, and landscape design the wildfire risk can be significantly reduced in the surrounding environment (Newman et al. 2013). When wildfire is planned for and incorporated into the building design, such as with the Project, it can not only withstand wildfire, but prevent it. This prevention benefits the Project and the surrounding areas by reducing the landscape level fire risk. Further, given the Project's multi-tiered approach to fire protection, it is unlikely that the Project would be a significant source of ignitions and result in increased off-site impacts related to wildfire, as discussed herein.

Common ignition sources in Southern California are related to powerlines and vehicles (Keeley and Syphard 2018). Powerline-based ignitions are a major concern with respect to off-site wildfire impacts. However, this risk can be mitigated by undergrounding powerlines, as they would be on the Project. Undergrounding powerlines significantly eliminates a potential ignition source within the Project site and benefits the larger vicinity. The remaining highest likelihood of vegetation ignitions in the Project area would be related to existing I-10 and other roads used by Project employees. However, the Project provides roadside fuel modification along all roads it creates, and neighboring development is converting fuels along the primary access road such that it will be free of flammable roadside fuel beds. Ongoing maintenance along I-10 is provided and is expected to continue, if not increase in frequency as part of overall fire reduction efforts not within the control of the Project. These efforts reduce or minimize the ability for a vehicle related spark, catalytic converter failure, or other ignition source to ignite and spread fire from the roadsides into unmaintained fuels. The Project is not expected to significantly increase the already known fire risk associated with roads and in fact the Project- and road-adjacent fuel modification would aid in reducing the preexisting risk. Interior roadways are also not expected to result in significant vehicle ignitions. The on-site roadways would comply with all fire department access requirements and be adjacent to areas with modified fuels. Therefore, even if ignition were to occur on the Project interior roadways it is highly unlikely it would spread beyond the Project site and due to the level of hardscape and the adjacent fuel modifications areas, would result in patchy and slow fire spread and reduced fire intensity.

Reducing WUI exposure can address protection of a wide range of highly valued resources and can offer protection to critical resources, habitat communities, and landscapes (Scott et al., 2016). Despite the potential for more frequent fire ignitions from developments, when developments are planned accordingly, such as the Project, the fuel availability and fuel continuity decrease, while the probability of fire suppression increases (Fox et al. 2018). This is a result of planned alterations to fuel, increased ignition-resistant construction, enhanced fire protection features, higher wildfire risk awareness, and maintenance of fire protection features. The dual benefit of building a fire-hardened development, like the Project, is that the same features that protect the development from a wildfire also play a significant role in protecting wildlands and surrounding areas from Project-related fires.

2.4.1 Vegetation Management

A study in southern Italy found that the ignition potential of an area was significantly influenced by landcover types and human drivers were low or inconsistent (Elia et al. 2019). Urban interfaces with shrubland-dominated vegetation were found to be more fire-prone than those with grasslands or other natural spaces (Elia et al. 2019). The Project area is a mixture of shrublands, grasslands, and disturbed habitats. All of the existing fuel on the site and within FMZ areas will be eliminated, displaced by the structures, or converted into hardscape/paving or landscaped areas that are modified to reduce fuel densities that are managed and maintained. The fuel conditions will be addressed through various vegetation management techniques, such as fuel modification zones (FMZs). The original intent of FMZs, also known as defensible space, was to protect natural resources from fires in developed areas and have since evolved to protecting communities and structures. In an FMZ, combustible vegetation would be removed and/or modified and partially or totally replaced with more appropriately spaced drought-tolerant, fire-resistant plants. The goal is to provide a managed area where fire spread is not facilitated toward the Project or away from the Project into wildland areas. Fuel modification works by redistributing the fire risk on a landscape and altering the interaction between fire, fuels, and weather (Cochrane et al. 2012). FMZs typically target surface fires but can also reduce the likelihood of canopy fires, lower ember cast, and have a shadow effect on the untreated landscape by lowering the probability of burning and the potential fire size (Cochrane et al. 2012). As a result, the risk of a structure being destroyed, whether from a fire from within the development or outside the development, is significantly lower when defensible space is implemented.

However, long-term protection of the development and the surrounding area is dependent on the maintenance of fuel modification as even fire-safe designs can degrade over time. To alleviate this the Project will conduct regular assessments of the FMZs. During this maintenance, dead and dying material and undesirable plants will be removed. Thinning will also be conducted as necessary to maintain plant spacing and fuel densities. This will keep the FMZs and landscaped areas in a highly fire resistive condition free of accumulated flammable debris and plants.

Fuel treatments and defensible space do more than just protect structures. When they are a component of a place-based fire-hardened design, such as the Project, they can not only serve to protect structures from wildfire but act as a buffer for natural areas and surrounding communities. These features will further reduce the potential for wildfire in open space areas and potential impacts on surrounding communities.

2.4.2 Firefighter Response

As discussed in Section 4, the Project is not anticipated to have a negative impact on response capacity. Further, the on-site roads would be able to provide sufficient access for fire apparatus in a high-risk area. The Project also provides water supply and fire flow which are critical resources in firefighting. The Project defensible space areas will allow firefighters to safely position themselves at the development edge and begin tactical protection efforts (Warziniack et al. 2019). This allows firefighters to not only readily protect structures and reduce the likelihood of building ignition but also gives them a safe position to respond to offsite wildfires. Using the Project's fire protection features firefighters would be able to use the Project as a tactical resource for protecting open space areas, whether it be from on-site or off-site fires. The Project would create additional access for fire apparatuses that were not previously existing. Enhancing firefighters' ability to respond to an incident increases their ability to suppress a fire whether both on site and off site. The presence of on-site fire resources increases response capacity and could be the difference between a small fire or a full conflagration.

2.4.3 Ignition-Resistant/Noncombustible Construction

The WUI fire problem is structures lacking ignition-resistant features (i.e., ember resistant vents, interior sprinklers); therefore, the best mitigation is to reduce the likelihood of building ignition occurring (Zhou 2013). Structural characteristics play a large role in whether a building burns, which is important in WUI environments as structures also serve as fuel (Gorte 2011). The benefit of structure-based mitigation is that it not only lowers the on-site risk but also lowers the risk of wildfire across a landscape (Mockrin et al. 2020). In WUI areas, this is because structures are also fuels that can spread a fire into open space. With the incorporation of ignition-resistant construction, the likelihood of structural ignition occurring within the Project area is minimized. The Project will provide form-in-place concrete buildings that are non-combustible from direct wildfire flames, heat, and embers. This lowers the threat from on-site fires impacting off-site areas as the structures themselves are very unlikely to act as fuel. While the Project includes vent coverings to prevent ember penetration the Project buildings will also include NFPA 13 commercial automatic sprinklers in every building. This is crucial in preventing off-site impacts as embers can also be generated by a structure fire and can be blown over the fuel modification into native fuels. Automatic sprinklers can isolate a fire to the area of origin, limit its ability to spread to the rest of the building, and even extinguish a fire before the responding firefighters arrive, thus damping the likelihood of ember production. Commercial sprinklers are structure protection level sprinklers that have an extremely high success rate of controlling or suppressing interior structure fires. This also reduces impacts on fire response capacity as the automatic sprinklers will allow firefighters to focus on reducing additional ignitions beyond the point of origin.

Structure design, such as the Project's, is crucial in protecting an area against wind-driven fires. The Project provides features that not only prevent fire intrusion but prevent structure fires from escaping into off-site areas. This allows the Project to not only protect the immediate area but the surrounding environment.

2.4.4 Shelter in Place Capability

Sheltering in place is the practice of going or remaining indoors during or following an emergency event. This procedure is recommended if there is little time for the public to react to an incident and it is safer for the public to stay indoors for a short time rather than travel outdoors. According to common Emergency Operations Plan language, shelter-in-place is an approach that has been used and is actively contemplated for emergencies, including wildfires. Shelter-in-place advises people to stay secure at their current location.

Consistent with the Project's approach, this tactic shall only be used if an evacuation will cause a higher potential for loss of life. Consideration should be given to assigning incident personnel to monitor the safety of citizens remaining in place. The concept of shelter in place is an available option in those instances where physical evacuation is impractical. This procedure is particularly effective for concrete commercial buildings. Sheltering-in-place provides a safe haven within the impacted area.

This FPP provides significant evaluation and conclusions regarding the shelter-in-place capability of the Project's buildings. Among other things, the Project has been designed to include ignition-resistant structures with the use of non-combustible construction materials (e.g., concrete), effective defensible space and fuel management zones, ember protection, and other redundant structure, infrastructure, building code, and water supply and flow requirements established as containing adequate protective features to act as temporary shelters during wildfires. All the on-site structures could be utilized for temporary refuge during a wildfire. In addition, there may be protected open-air areas that would be enhanced to serve as temporary sheltering sites as a contingency plan if evacuation is considered undesirable. These sites would be designated with input from CFD and may include green spaces, lee-side of buildings, or other protected areas.

Sheltering-in-place also has many advantages because it can be implemented immediately, allowing people to remain in their familiar surroundings, and providing individuals with everyday necessities such as telephone, radio, television, food, and clothing. However, the amount of time people can stay sheltered-in-place is dependent upon availability of food, water, medical care, utilities, and access to accurate and reliable information. It is not anticipated that any wildfire related shelter-in-place action would require longer than a few hours of on-site refuge.

The decision on whether to evacuate or shelter-in-place is carefully considered with the timing and nature of the incident. Sheltering-in-place is the preferred method of protection for people that are not directly impacted or in the direct path of a hazard. This will reduce congestion and transportation demand on the major transportation routes for those that have been directed to evacuate by police or fire personnel. Like with most new developments that incorporate ignition-resistant construction, wide fuel modification zones, ember protection, and fire defensibility throughout, responding fire and law enforcement personnel will be able to direct persons to temporarily refuge on site in designated buildings in the rare situation where shelter-in-place is determined to be safer than evacuating.

Shelter-in-place at this location in the planned structures will also be an option available to emergency managers during a wildfire event. A shelter-in-place plan will be prepared and provided to all on-site personnel outlining the actions to take if a shelter in place notification is provided by emergency management sources.

The Project buildings will be constructed of concrete or similar material which is non-combustible and highly resistant to heat. Because of the concrete/ignition-resistant construction, fuel modification zone setbacks and the type of lower fire intensity vegetative fuels in the vicinity of the site, sheltering in place is considered to be a safe option if a fast-moving wildfire precludes complete evacuation of the Project site. The heat flux produced by the nearest unmaintained vegetative fuels is not at a high enough temperature to ignite a concrete building even if it is directly next to the building. In this case, the heat would dissipate rapidly in the provided building setbacks that range between 100 and 600 feet, and the concrete structures would be capable of absorbing any residual heated air that may intersect with the buildings. The primary concern is anticipated to be with smoke and air quality rather than exposure to flames and heated air. Measures to safely refuge persons within the buildings and minimize smoke and air quality issues would be enacted in this scenario. For example, when wildfire ignites, it is common for HVAC systems to be turned off and they can be fitted with sensors that turn them off automatically when smoke is detected. This minimizes the potential for drafting smoke through the ventilation system into the buildings.

Project Design Feature: The Project will include features to turn off the HVAC system when smoke is detected or will prepare an emergency response plan that directs this action to be taken if a wildfire produces smoke that is impacting the Project site.

Most of the primary components of the Project's layered fire protection system are required by fire and building codes, because they have been tested in the lab and in real-time wildfires and found to result in saved structures. They are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire. They also make shelter-in-place possible as an evacuation contingency option when evacuation is not possible.

Even though current building and fire codes require these measures, at one time, many of them were used as mitigation measures for buildings in fire hazard areas, because they were known to reduce structure vulnerability to wildfire. These measures were adopted into the 2007 California Building Code and have been retained and enhanced in code updates since then. The following Project features are required for new development in fire hazard areas and would form the basis of the system to provide adequate access by emergency responders and provide the protection necessary to minimize structural ignitions:

- Application of the latest adopted ignition-resistant building codes
  - Non-flammable roofs, which would be Class "C" listed and fire-rated roof assembly, installed per manufacturer's instructions, to approval of the City. Roofs would be made tight with no gaps or openings on ends or in valleys, or elsewhere between roof covering and decking, in order to prevent intrusion of flame and embers. Any openings on ends of roof tiles would be enclosed to prevent intrusion of burning debris. When provided, roof valley flashings would not be less than 0.019-inch (No. 26 gage galvanized sheet) corrosion-resistant metal installed over a minimum 36-inch-wide underlayment consisting of one layer of 72-pound ASTM 3909 cap sheet running the full length of the valley.
- Exterior wall coverings are to be non-combustible form in place concrete
- Multipane glazing with a minimum of one tempered pane
- Ember-resistant vents (recommend BrandGuard, O'Hagin, or similar vents)
- Interior, automatic fire sprinklers to code for occupancy type
- No eaves or soffits
- There would be no use of paper-faced insulation or combustible installation in attics or other ventilated areas.
- There would be no use of plastic, vinyl (with the exception of vinyl windows with metal reinforcement and welded corners), or light wood on the exterior.
  - Any vinyl frames to have welded corners and metal reinforcement in the interlock area to maintain integrity of the frame certified to ANSI/AAMA/NWWDA 101/I.S 2 97 requirements.
- Skylights to be tempered glass.
- Rain gutters and downspouts to be non-combustible. They would be designed to prevent the accumulation of leaf litter or debris, which can ignite roof edges.
- Doors to be of approved noncombustible construction or would be solid core wood having stiles and rails not less than 1 3/8 inches thick or have a 20-minute fire rating. Doors to comply with City Building Code.
- There would be no combustible awnings, canopies, or similar combustible overhangs.
- No combustible fences to be allowed within 5 feet of structures.

- All chimneys and other vents on heating appliances using solid or liquid fuel, including outdoor fireplaces and permanent barbeques and grills, to have spark arrestors that comply with the City Fire Code. The code requires that openings would not exceed 1/4-inch. Arrestors would be visible from the ground.
- Modern infrastructure, access roads, and water delivery system
- Maintained FMZs

Notably, interior fire sprinklers, which would be provided in all structures (required by code since 2010), have an extremely high reliability track record (NFPA 2021) of controlling fire in 96% of reported fires, and statistics indicate that fires in structures with sprinklers resulted in 82% lower property damage and 68% lower loss of life (Hall 2013). NFPA 13 fire sprinklers are designed for structure protection and life safety. For wildland fire defense, should embers succeed in entering a structure, sprinklers provide an additional layer of life safety and structure protection.

Sheltering in Place as an Active Emergency Option at Oak Valley North

Sheltering in place or providing temporary refuge when evacuation is considered undesirable is not a new idea. Sheltering in place has been a useful tool in the emergency management toolbox since the 1950's. In some wildfire scenarios, temporarily sheltering in a protected structure is safer than evacuating. Huntzinger (2010) states that: "If sheltering in place can provide the community with the same level of protection from an emergency incident as mass evacuation, this will be the recommended practice to use." Many civilian deaths have occurred when the population evacuated late and was exposed to wildfire on unprotected roadways (McCaffrey et al. 2015). By contrast, fire hardened communities/projects that have implemented similar fire protection, setback, and building standards have fared well in fire events, making them suitable for temporary shelter. Developments constructed in accordance with modern fire-safe development standards also survived the 2003 Simi Fire, the 2008 Freeway Complex Fire, and the 2020 Silverado Fire without a single building lost. Nasiatke (2003) points out that another advantage to sheltering in place in an appropriately protected location is that there would be a substantial reduction in the number of evacuees that would need to be managed, allowing those evacuees at greater risk (i.e., in older, less protected communities) to more quickly evacuate.

2.4.5 Wildfire Risk Awareness Education

The Project includes an education awareness program that is a key piece in wildfire prevention in the area (Steffey et al. 2020). This program will provide wildfire information for the area and create greater risk awareness for occupants and their employees. The wildfire education program will be facilitated by the business owners of the Project and will disclose the potential wildfire risk and the requirements of the FPP. The educational program will also include information regarding the necessary landscape maintenance and structural-based fire protection features. Having ongoing education included in the Project creates a heightened level of wildfire risk awareness and fire protection measures. This benefits both the Project and the surrounding areas as people would be more aware of the wildfire risk and potential impacts. Further, it decreases the likelihood the Project occupants and users would cause an uncontrolled ignition and they would be aware of what steps to take if they observe an ignition. As such the impact on off-site areas would be further lowered by reducing the probability of ignition.

As described above it is not as simple to say development in areas with high fire hazards will equate to increased wildfire risk. It is possible to develop in these areas when fire protection is incorporated into Project design and create a site that is not only hardened against fire but designed to prevent fires. The dual benefit of creating a development that can prevent a fire is that it offers protection to the surrounding communities and the environment. The requirements and recommendations outlined in the FPP have been designed specifically for the proposed construction in the Project's location and can significantly reduce the potential threat to off-site areas.

3 Anticipated Fire Behavior

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected on and adjacent to the Oak Valley North Project site given characteristic site features such as topography, vegetation, and weather. Dudek utilized BehavePlus software package (Andrews et al. 2008) to analyze potential fire behavior on and adjacent to the Project site, with assumptions made for the pre- and post-Project slope and fuel conditions. Results are provided below.

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, 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 on and immediately adjacent to the proposed project. 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 fuel modification zones (FMZ) to illustrate post-Project fire behavior changes. Based on the anticipated existing and post-Project vegetation conditions, five different fuel models were used in the fire behavior modeling effort presented herein. Fuel model attributes are summarized in Tables 1 and 2.

Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM1	Short Grasses	Represented throughout the adjacent areas surrounding the Project site.	>1.0 ft.
Gr2	Low Load Dry Climate Grass	Represented throughout the adjacent areas surrounding the Project site.	<2.0 ft.
Gs1	Low Load, Dry Climate Grass-shrub	Represented throughout the adjacent areas surrounding the Project	>2.0 ft.

Table 2. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
8	Compact litter	Fuel Modification Zone 1: irrigated landscape and hardscape	<1.0 ft.
NB	Non-burnable	Parking lot areas that surround the structures	0 ft.

Table 3 summarizes the weather and wind input variables used in the BehavePlus modeling analysis.

Table 3. Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	FM1, Gr2, and Gs1	FM1, Gr2, and Gs1
1 h fuel moisture	4%	1%
10 h fuel moisture	5%	2%
100 h fuel moisture	9%	5%
Live herbaceous moisture	37%	30%
Live woody moisture	73%	60%
20 ft. wind speed	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	200, 270, and 310	65
Wind adjustment factor	0.4	0.4
Slope (uphill)	3 to 6%	3 to 5%

The results presented in Tables 4 and 5 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; rather, 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 Modeling Results

The results of fire behavior modeling analysis for existing and post-Project conditions are presented in Tables 4 and 5, respectively. Identification of modeling run (fire scenarios) locations is presented comprehensively in Appendix B, Fire Behavior Analysis.

The following are the fire Scenario locations and descriptions.

- Scenario 1. Fire flaming front approaching from the northwest toward the northwest project boundary with 14 mph northwestern winds.
  - Existing conditions:
    - Off site: Low load dry climate grasses
    - On site: Low load dry climate grasses
  - Post-Project conditions: Paved roadway, FMZ (irrigated), paved parking areas

- Scenario 2. Fire flaming front approaching from the northeast toward the northeastern boundary of the property with 18 mph northeastern winds and up to 50 mph gusts.
  - Existing conditions:
    - Off site: Low load dry climate grass and shrub
    - On site: Low load dry climate grass
  - Post-Project conditions: paved roadway, trailer parking, FMZ (irrigated), paved parking areas

- Scenario 3. Fire flaming front approaching from the southwest toward the southwestern boundary of the property with 14 mph onshore southern winds.
  - Existing conditions:
    - Off site: Low load dry climate grass
    - On site: Low load dry climate grass
  - Post-Project conditions: Paved roadway, FMZ (irrigated), paved parking areas

- Scenario 4. Fire flaming front approaching from the west toward the western boundary of the property with 14 mph onshore southwestern winds.
  - Existing conditions:
    - Off site: Low load dry climate grass
    - On site: Low load dry climate grass
  - Post-Project conditions: paved roadway, FMZ, paved parking areas

The results presented in Tables 4 and 5 depict values based on inputs to the BehavePlus software reflecting a "moment in time" 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.

3.4 Fire Behavior Summary

3.4.1 Existing Conditions

As presented in the Fire Behavior Scenario Analysis Map, low-load grasses would exhibit the most intense fire behavior (refer to Table 4, Fire Behavior Results for Existing Conditions). A worst-case fire under gusty Santa Ana winds and low fuel moistures (Scenario 2) is expected to be moving up to 4.5 mph. Flame length values were modeled at 10.5 feet though may grow to 18 feet with wind gusts; spotting is projected to occur up to 0.4 miles from the flaming front. For onshore wind conditions, the worst-case fire (Scenarios 1, 3 and 4) is expected to be moving up to 1.7 mph with flame lengths of up to 6.2 feet.

The results of fire behavior modeling analysis for existing and post-Project conditions are presented in Tables 4 and 5 respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 6, Fire Behavior Scenario Analysis Map.

Table 4. RAWS BehavePlus Fire Behavior Model Results – Existing Conditions

Fire Scenario	Flame Length (feet)	Spread Rate (mph)[1]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles)[2]
Scenario 1: 6% slope, Summer, On-shore wind from the NW, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	300	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	150	0.2
Short grasses (FM1)	5.6’	1.7	236	0.2
Scenario 2: 5% slope, Fall, Off-shore wind from the E/NE, 18 mph sustained winds with 50 mph wind gusts (Existing conditions)				
Low-load grasses (Gr2)	10.5’ (18.0’)	1.9 (6.2)	942 (3,037)	0.4 (1.3)
Low-load grass-shrub (Gs1)	7.2’ (14.0’)	0.7 (3.0)	416 (1,763)	0.3 (1.1)
Short grasses (FM1)	10.2 (16.6’)	4.5 (12.7)	892 (2,551)	0.4 (1.2)
Scenario 3: 3% slope, Summer, On-shore wind from the S/SW, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	298	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	149	0.2
Short grasses (FM1)	5.5’	1.7	235	0.2
Scenario 4: 3% slope, Summer, On-shore wind from the W, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	299	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	150	0.2
Short grasses (FM1)	5.5’	1.7	235	0.2

Notes:
1 Spotting distance from a wind driven surface fire.
2 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

3.4.2 Post-Project Condition

As presented in Table 4, Fire Behavior Modeling Results for Post-Project Conditions, Dudek conducted modeling of the Project site for post-Project fuel conditions for the Project. The FMZs include fire friendly and maintained landscaping on the periphery of the Project. For modeling the post-Project conditions, fuel model assignments were re-classified for the landscaping as listed in Table 2. Fuel model assignments for all other areas remained the same as those classified for the existing condition.

A worst-case fire under gusty Santa Ana winds and low fuel moistures (Scenario 2) is expected to be moving up to 0.1 mph. Flame length values were modeled at 2 feet; spotting is projected to occur up to 0.1 mile from the flaming front. For onshore wind conditions, the worst-case fire (Scenario 1) is expected to be moving nearly 0 mph with flame lengths of 1.4 feet.

The FMZs for the Project experienced a significant reduction in flame length and intensity. The flames predicted during existing conditions modeling during extreme weather conditions are reduced to a maximum 2 feet in length due to irrigated landscaping present.

Table 5. RAWS BehavePlus Fire Behavior Model Results – Post Project Conditions

Fire Scenario	Flame Length (feet)	Spread Rate (mph)[1]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles)[2]
Scenario 1: 6% slope, Summer, On-shore wind from the NW, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.4’	0	11	0.1
Scenario 2: 5% slope, Fall, Off-shore wind from the E/NE, 18 mph sustained winds with 50 mph wind gusts (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	2.0’ (3.0’)	0.1 (0.2)	27 (63)	0.1 (0.4)
Scenario 3: 3% slope, Summer, On-shore wind from the S/SW, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.3’	0	11	0.1
Scenario 4: 3% slope, Summer, On-shore wind from the W, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.3’	0	11	0.1

Notes:
1 mph = miles per hour.
2 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

3.5 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 and 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 WUI areas, and the region's fire history, it can be anticipated that periodic wildfires may start on, burn onto, or spot into (from falling embers) the Project site. The most likely type of fire anticipated in the vicinity of the Project area is a wind-driven fire from the southwest originating along the I-10 Freeway. The most likely threatening fire would be a Santa Ana wind driven fire from the northeast moving through the natural vegetation found on the lands adjacent to the Project.

The Project will consist primarily of large industrial structures, large, paved parking areas, and some irrigated and maintained landscaping. The fire risk is no greater or less for the Project than any other similar development in a Very High Fire Hazard Severity Zone due to its location, presence of flammable native vegetation and topography.

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 ignition-resistant design, construction, and defensible space, are implemented and enforced. The Project, once completed, would limit 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. Further, paved areas (i.e., roadways and parking) provide complete fuel breaks where fire cannot occur.

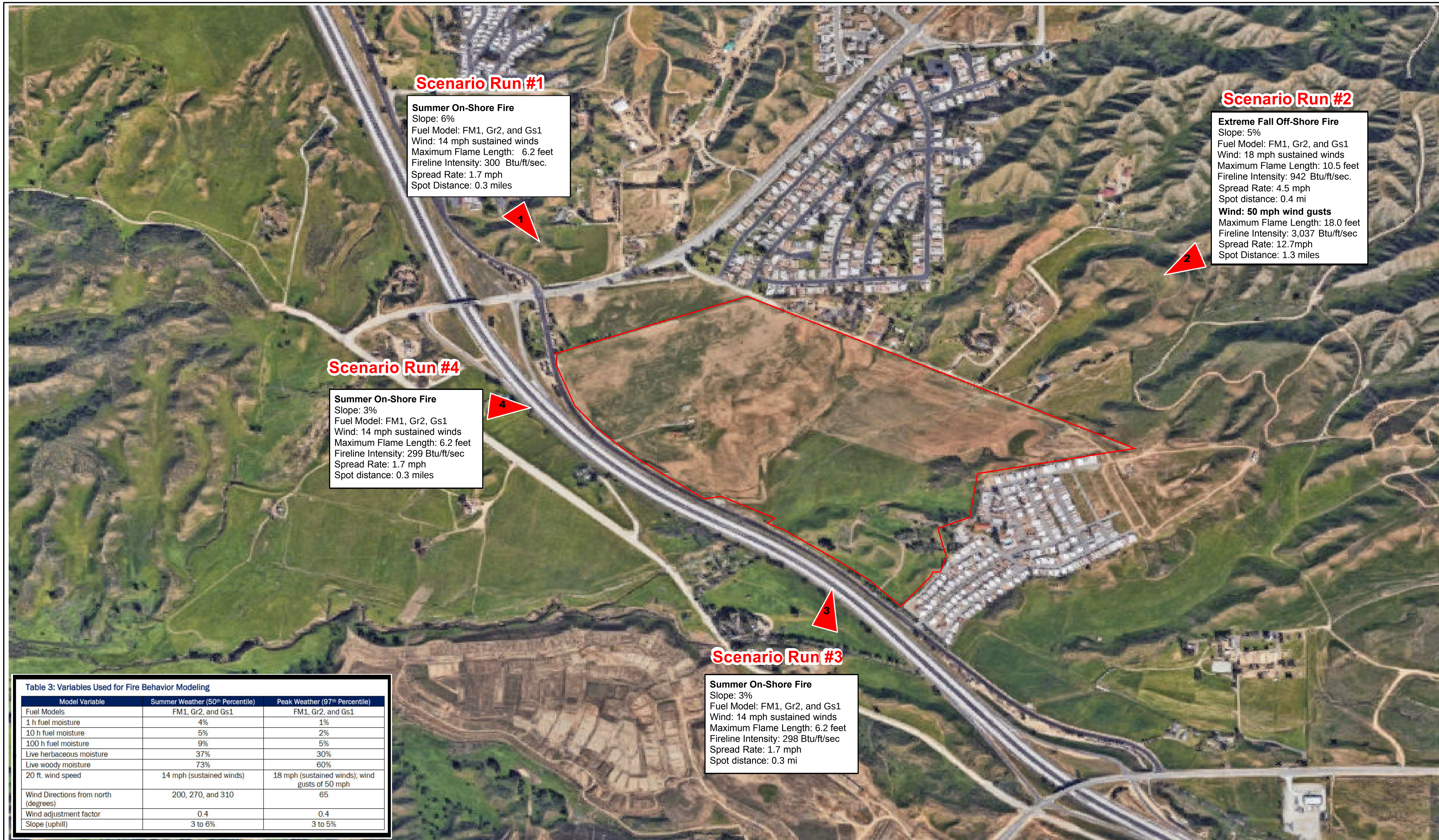

Table 3: Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	FM1, Gr2, and Gs1	FM1, Gr2, and Gs1
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10 h fuel moisture	5%	2%
100 h fuel moisture	9%	5%
Live herbaceous moisture	37%	30%
Live woody moisture	73%	60%
20 ft. wind speed	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	200, 270, and 310	65
Wind adjustment factor	0.4	0.4
Slope (uphill)	3 to 6%	3 to 5%

SOURCE: AERIAL-SANGIS IMAGERY 2022

DUDEK

0 250 500 1,000 Feet

FIGURE 6

BehavePlus Analysis Map

Fire Protection Plan for the Oak Valley North Project

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4 Emergency Response and Service

4.1 Emergency Response

The Project site is located within Calimesa Fire Department response area, which includes Calimesa's city limits. Table 6, Closest Responding Fire Stations Summary, presents a summary of the location, equipment, staffing levels, maximum travel distance, and travel time for the two closest, existing fire stations responding to the Project. Calimesa Fire Department is presently a single station fire department, but a mutual aid agreement with Riverside County Fire Department allows CFD and Riverside County Fire Department (RCFD) to run calls in each other's areas depending on availability and location of apparatus. The second nearest fire station after the CFD station is a Riverside County Fire Station in Cherry Valley. 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 6. Closest Responding Fire Stations Summary

Station No.	Location	Equipment	Staffing[1]	Maximum Travel Distance[2]	Travel Time[2]
21	906 Park Ave Calimesa, California 92320	Type 1 Engine, Type 6 Engine, Aerial Apparatus[3] Battalion Chief's Vehicle, Reserve Type 1, Reserve Type 3, Squad	3 Personnel on the Type 1 Engine, 2 Personnel on the Type 6 Engine, 1 Battalion Chief	2.1 miles	4.22
22	10055 Avenida Miravilla Cherry Valley, California 92223	Type 1 Engine	3 Personnel on Type 1 Engine	4.5 miles	8.3

Notes:

1 Staffing levels from site visit and 2016 Riverside County Fire Department Tri Data Report.

2 Assumes travel distance and time to the Project site entrance. Additional time to reach site buildings would be required.

3 Not in service at time of writing, expected to be in service 2024.

CFD Station 21 is staffed 24/7 with career firefighters who would currently provide initial response, is located at 906 Park Avenue, and can respond within 5 minutes to the entrance. Station 21 has one staffed Type 1 engine, one staffed Type 6 Engine, a Battalion Chief Unit, A Reserve Type 1, a Reserve Type 3, and a Squad. In addition to the current apparatus, an Aerial Apparatus is expected to be put into service in early 2024. Secondary response would be provided from RCFD Station 22, which is located at 10055 Avenida Miravilla in Cherry Valley. Station 22 has one staffed Type 1 engine and will be capable of responding within 9 minutes to the proposed entrance of the Project.

Within the area's emergency services system, fire and emergency medical services are also provided by neighboring agency Fire Stations such as Yucaipa Fire Department and RCFD. 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.

CFD has a goal of responding to incidents within 5 minutes, including dispatch and turnout time which is often considered between 2 and 2.5 minutes. However, the department's average response time to calls within their jurisdiction is 6 minutes, 57 seconds. As previously mentioned, response to the Project site from the closest existing Fire Station (Station 21) would achieve a 4.2-minute travel time to the entrance of the Project. Total response time including the addition of dispatch and turnout time results in a total response time of 6.2 to 6.7 minutes to the Project's entrance. Although above the 5-minute response time goal, the projected response time is less than the current average. Due to the low number of calls (discussed below) the Project may not adversely impact the overall goal achievement.

4.2 Estimated Calls and Demand for Service from the Project

The following estimated annual emergency call volume generated by the Project is based upon per-capita data for 2022 from CFD calls within their jurisdiction.[3]

- Total population served by: 10,026
- Total annual calls: 1,739. Per capita call generation: 0.173
- Total annual fire calls, including structure, vegetation, vehicle fires, and other fire calls (3% of total calls): 52. Per capita call generation: 0.005
- Total annual Emergency Medical Services (70.33% of total calls): 1,223. Per capita call generation: 0.122
- Total other calls (Rescue, Traffic Collisions, Hazardous Materials, Public Service, etc.; 26.68% of total calls): 464. Per capita call generation: 0.046

Using the data above, the estimated annual emergency call volume for the Project site was calculated (Tables 7a and 7b). In order to provide this conceptual estimate, Dudek made assumptions regarding industrial/mixed-use populations within Oak Valley North Project. Due to two potential options for the southwest portion of the Project, two scenarios were analyzed.

Scenario A

Scenario A assumes that the finished project will consist of the business park and the multifamily residential option. For the business park, the number of employees is anticipated to be 954 (1 employee per 1,030 square feet) however the number on site at any given time may likely be half the estimated employee population, due to employee shift work, estimated transient population and operating hours of individual businesses. For the residential option, the 642 residents may likely be off site during weekdays, however they have the ability to be on site at any time and will remain a static figure for the sake of estimating the Project call volume. The calculations

3 Information provided directly from CFD staff.

will assume that all occupants are at home. For this scenario, the maximum number of employees and residents on site at any given time is projected to be 1,119 persons.

Table 7a. Conceptual Calculated Call Volume Scenario A

Type of Call	Per Capita Call Generation Factor	Number of Estimated Annual Calls (1,119 persons)
Total Other Calls	0.046	51
Total Fires	0.005	6
Total EMS Calls	0.122	136
Total Calls	0.173	187

Scenario B

Scenario B assumes that the finished project will consist of the business park and the church option. The church is much different than either of these other two uses, with up to 1,200 people being on site during church services, but only 5-10 staff members on site for the majority of the week. Additionally, the 1,200 people is an absolute maximum with average attendance likely to be around half that, and the occupants are only expected to be at the church grounds for approximately one hour, the length of a typical service. For the purpose of calculating annual calls, 600 people are expected to be on site. Based on this information, the total maximum estimated population (which includes employees and transient use) of the Project site at any given time in Scenario B is projected to be 1,047 persons.

Table 7b. Conceptual Calculated Call Volume Scenario B

Type of Call	Per Capita Call Generation Factor	Number of Estimated Annual Calls (1047 persons)
Total Other Calls	0.046	48
Total Fires	0.005	5
Total EMS Calls	0.122	128
Total Calls	0.173	181

With the goal of analyzing the worst-case scenario impact to the first-in fire station's workload, Scenario A will be used. The new industrial/commercial development will increase the call volume at a rate of a conservatively calculated 181 calls per year (3-4 calls per week or 15 calls per month). Fire Station 21's emergency responses in 2022 totaled 1,739 calls per year or 5 calls per day. The level of service demand for the Project raises overall call volume by less than 1 call per day. 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. The expected number of potential calls per week generated by the Project at full build out will be a maximum of 4 calls, 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.

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

The 2022 CFC and 2022 CBC are adopted by reference (with amendments) by the City of Calimesa and Calimesa Fire Department and govern 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 CFD mapping shall be provided to CFD.

5.1 Roads

5.1.1 Access

Project site access, including road widths and connectivity, will comply with the requirements of the adopted codes as well as Riverside County Technical Policy 22-002 which is referenced in Calimesa's adopted fire code, including:

- Primary access to the Project site is currently provided by Calimesa Boulevard, which connects occupants to I-10 at Cherry Valley Boulevard and Singleton Road, although Singleton Road presently only includes a westbound offramp and an east bound on ramp.
- 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.
- Typical, interior Project roads, including collector and local roads, 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 CFD/RCFD Fire Prevention Standards.

- Any roads that have traffic lights shall have approved traffic preemption devices (Opticom) compatible with devices on the fire apparatus.
- 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 usable by fire apparatus to the approval of CFD prior to lumber drop onsite. Developer will provide information illustrating the new roads, in a format acceptable to the CFD for updating of Fire Department response maps.

5.1.2 Maximum Dead-End Road (Cul-de-Sac) Length

- Dead end streets longer than 150 feet shall be provided with a bulb turnaround at the terminus measuring 40 feet outside radius and 16 feet inside radius. Parallel parking along the perimeter of the bulb is allowed provided the outside turning radius is increased by 8 feet.
- Maximum Dead-End Road length for parcels zoned for 20 acres or larger is 5,280 feet.
- Turnarounds shall be provided at a maximum 1,320-foot intervals along the dead end.
- Fire apparatus turnarounds to include turning radius of a minimum 50 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 the adopted CFD Fire Code, including:

- Gates shall be equipped with conforming sensors for detecting emergency vehicle “Opticom” strobe lights from any direction of approach, if required.
- All emergency gates will be fitted with CFD-approved technology that enables remote (or on-site) gate control 24/7 such that it does not represent an obstructed roadway.
- All entrance gates will be equipped with a Knox 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 14 feet wide of clearance for one-way traffic when fully open at entrance.
  - Minimum of one foot wider than road width at exit up to a maximum of 24 feet unless greater width is required to clear turning apparatus.
  - 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 road meeting the following specifications:

- Grades 16% or less, cross grade 2.5% or less, with surfacing and sub-base consistent with Calimesa CFC.

5.1.5 Premises Identification

Identification of roads and structures will comply with CFD adopted Fire Code, as follows:

- All commercial/industrial structures required to be identified by street address numbers at the structure. Numbers to be minimum eight inches high with one-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; 6" 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 Public Works.
- Streets will have street names posted on non-combustible street signposts; letters/numbers will be per CFD standards.
- A lighted directory map shall be installed and maintained at each driveway entrance to multiple unit residential projects with more than 15 units.
- Temporary street signs shall be installed on all street corners within the Project prior to the placing of combustible materials on site. Permanent signs shall be installed prior to occupancy of buildings.

5.1.6 Ongoing Infrastructure Maintenance

Project Owner/Property Management Company shall be responsible for long term funding and maintenance of fuel modification zones; however, this responsibility may be transferred to the tenant by an appropriate lease agreement.

5.1.7 Pre-construction Requirements

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

A preconstruction meeting with the Calimesa Fire Prevention Unit is advised, prior to start of underground installation.

5.2 Ignition-Resistant Construction

All new structures within the 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 2022 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 C 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 the Oak Valley North Project site will be provided by Yucaipa Valley Water District. The Project site is within the District except for the southeastern portion which will be annexed into the District's water supply system boundary. The internal waterlines will supply sufficient fire flows and pressure to meet the demands for required on-site fire hydrants and interior fire sprinkler systems for all structures.

5.3.2 Hydrants

Fire hydrants will be located along fire access roadways and adjacent to each structure, as determined by the CFD 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 will be in accordance with CFD, and NFPA Standard 13. Fire sprinkler plans for each structure will be submitted and reviewed by CFD for compliance with the applicable fire and life safety regulations, codes, and ordinances as well as the CFD 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 the Project.

5.4.2 Fuel Modification Zone Requirements

A fuel modification zone (FMZ) is a strip of land between a structure and open space acting as a buffer where combustible vegetation has been removed and/or modified and partially or totally replaced with more appropriately 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 requires a 100-foot-wide fuel modification zone from the structure outwards towards undeveloped areas. This 100-foot-wide fuel modification zone is required to provide defensible space which is defined as managed and maintained areas adjacent to structures that enable fire suppression activities through the removal of flammable fuels and maintenance of landscapes that would not readily transmit wildfire. Defensible space enables firefighters to safely position themselves at the development edge and begin tactical protection efforts. For the Project, the first 100 feet around each of the proposed structures is primarily paved parking, with only some landscaped areas within the 100-foot FMZ. The paved areas provide total fuel modification as all fuels will be removed and replaced with noncombustible asphalt or concrete. The landscaped areas interspersed within the 100-foot strip will comply with FMZ requirements (refer to section 5.4.2.1). In some places, the pavement extends as far as 600 feet from the structure, not counting adjacent roadways, far exceeding the 100-foot requirement (further building specific detail below).

As a wildfire approaches the paved and landscaped areas of the FMZ, fire behavior is affected substantially as fuels are gradually removed thereby reducing flame lengths, spread rates and intensity. As demonstrated in Section 3, the 14.0- to 18.0-foot flame lengths predicted for existing non-maintained grass/grass-shrub habitats are reduced to approximately 3.0 feet once they reach the development footprint and the non-combustible parking lot areas. FMZs or “brush management” was initially made part of the Public Resources Code 4290 and 4291 to protect natural resources from fires originating in neighboring developed areas and have since become focused on protecting communities and structures. However, FMZs, as will be used for the Project, continue to have the same benefit of buffering preserved open space areas from accidental ignitions within communities. Positioning the low plant density, irrigated zone directly adjacent to the structure provides a significant buffer between the structure and other landscape fire and native vegetation. The same way that fuel modification will set back a wildland fire from a structure, the fuel modification will set back a structure fire from the more burnable native plants. Embers can be generated by a structure fire and can be blown over the fuel modification into native fuels, but the inclusion of automatic sprinklers in every building combined with the presence of staffed fire stations with fast response significantly reduces the potential for a structure fire to reach a size that would produce significant impacts. The highest likelihood of vegetation ignitions would be related to usage of roadways. Further, as depicted in the fire behavior modeling for existing and post-Project conditions, the Project at buildout would reduce the overall risk of wildfire spreading offsite with implementation of the fire safety requirements, defensible space, and vegetation management outlined in this FPP.

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 than the fire rated formed-on-site concrete exterior wall designs to be implemented on the Project’s building. For the Project, assuming 18-foot flame lengths, reduced fuel modification zones are justifiable for limited areas.

Based on the conceptual Project site plan, the Project has more than adequate on-site defensible space which consists of asphalt and concrete roadways, parking stalls, loading zones, and irrigated landscaping.

Building 1 – In the Project's current configuration, Building 1 is an industrial building in the northwest corner of the Project site located northeast of Calimesa Boulevard, southeast of the property line, though setback from the property line by approximately 150 feet, southwest of the trailer parking, and northwest of Building 2. This building achieves the full 100-foot FMZ. On all four sides, the FMZ overlays paved areas including loading docks, roadways, and parking. On the southwest side, a portion of the FMZ may overlay some landscaped areas. Any landscaped areas will comply with FMZ requirements.

Building 2 – In the Project's current configuration, Building 2 is an industrial building located northeast of Calimesa Boulevard, southeast of Building 1, southwest of trailer parking, and northwest of Building 3. This building achieves the full 100-foot FMZ. On all four sides, the FMZ overlays paved areas including loading docks, roadways, and parking. To the northeast, the building is setback from the property line and the worst-case fire conditions by approximately 500 feet.

Building 3 - In the Project's current configuration, Building 3 is an industrial building located northeast of Building 4, southeast of Building 2, southwest of trailer parking, and northwest of both trailer parking and the second planning area which may become a church or multifamily residential. This building achieves the full 100-foot FMZ. On all four sides, the FMZ overlays paved areas including loading docks, roadways, and parking. To the northeast, the building is setback from the property line and the worst-case fire conditions by approximately 500 feet.

Building 4 - In the Project's current configuration, Building 4 is an industrial building located northeast of Calimesa Boulevard, southeast of Building 2, southwest of Building 3, and northwest of the second planning area which may become a church or multifamily residential. This building achieves the full 100-foot FMZ. On all four sides, the FMZ overlays paved areas including loading docks, roadways, and parking. On the southwest side, a portion of the FMZ may overlay some landscaped areas. Any landscaped areas will comply with FMZ requirements.

Planning Area 2 (PA2) Church or Multifamily Residential – A footprint is not yet available to analyze, however the surrounding areas inform the proposed footprint. Further CFD's Fuel Modification Standard states that structures shall not be within 30 feet of a property line. The 30 feet surrounding the structure is anticipated to be paved and/or landscaped. Beyond that 30 feet: to the southwest, Calimesa Boulevard and I-10 provide a firebreak; to the northwest, the area around the PA2 is paved; to the northeast, the Project is setback from open space by approximately 1,000 feet; to the southeast, there is no open space due to the Rancho Calimesa Mobile Home Park. Any landscaped area will comply with FMZ requirements.

Appendix D, Project Fuel Modification Plan shows the locations where the fuel modification area is to be located.

Vegetation management will also be implemented as an interim fuel management area 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. The FMZs will be implemented according to the following requirements for the entire Project.

5.4.2.1 Fuel Maintenance Zone – Irrigated/Paved Zone (100 feet wide)

The FMZ occurs around the perimeter of the Project's wildland exposure at Project build out (Appendix D). The FMZ will be 100 feet wide from the structure outward far exceeding the 18-foot flame lengths. This 100-foot FMZ is achievable throughout the Project site, without exception. This area will primarily be paved, however in any landscaped areas all highly flammable native vegetation, especially found on the Prohibited Plant List (Appendix E) shall be removed except for species approved by the fire marshal. This area will largely be paved with some irrigated landscaping. The Project's plant palette will be approved by the fire department. A permanent, automatic irrigation system will be installed throughout the Project to maintain hydrated plants. CFD's Fuel Modification Standard identifies four zones within a fuel modification zone:

- **Zone A:** Setback Zone
- **Zone B:** Irrigated Zone
- **Zone C:** Thinning Zone
- **Zone D:** Interface Zone

The desired effect of these four zones is to slow and stop an oncoming fire from adjacent open space by increasing the amount of fuels removed starting with Zone D which is farthest from structures and closest to the wildland and allows more fuels, to Zone A which is the most stringent Zone and allows for nearly no fuels and is closest to the structure. The majority of the Project will comply with the most stringent Zone A requirements, given that the FMZ overlays paved areas such as parking, roadways, or sidewalks.

5.4.2.1.1 Zone A – Setback Zone

Zone A requirements include:

- Structures will comply with construction requirements for High Fire Hazard Severity Zone areas.
- Pruning of foliage to reduce fuel load, vertical continuity, removal of plant litter and dead wood.
- Complete removal of undesirable plant species, minimal allowance for retention of selective natural vegetation.
- Plants in this zone shall be highly fire resistant and selected from the approved plant list for the setback zone.
- Targeted trees are not allowed within 10 feet of combustible structures. Other tree species may be allowed pursuant to the Fire Code regarding clearance of brush and vegetative growth but are not recommended.
- No vegetation found on the Prohibited Plant List (Appendix E) shall remain in the fuel maintenance zone.
- Ground covers within first five 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.
- A minimum of 36 inches wide pathway with unobstructed vertical clearance around the exterior of each structure (360°) provided for firefighter access (2022 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.
- Ongoing maintenance is required to the satisfaction of ongoing CFD inspections including continual removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying natural vegetation and replacement with fire resistant plants, maintenance of the irrigation systems, regular trimming to prevent ladder fuels.

With most of the 100-foot FMZ being paved, the majority of the Project site will more than comply with Zone A requirements given that all fuels will be removed.

5.4.2.1.2 Zone B – Irrigated Zone

In three locations, the FMZ overlays manufactured slope (see Appendix D). These locations include the southwest perimeter of Buildings 1 and 4, and both the south and east perimeter of Planning Area 2. The manufactured slope comes closest to Building 1 at approximately 30 feet from the structure. Any FMZ overlaying Zone B will comply with the following:

- Some native or existing vegetation may remain if spaced according to planting guidelines and maintained free of deadwood, and individual plants are thinned to a percentage as specified during the preliminary review to reduce the fuel loading.
- Plantings will be irrigated, fire resistant, and drought tolerant.
- No vegetation found on the Prohibited Plant List (Appendix E) shall remain in the fuel maintenance zone.
- With the exception of specimen native vegetation approved for retention, irrigated surface fuels shall be maintained at a height not to exceed 18 inches.
- Plantings will be in accordance with planting guidelines and spacing standards established in CFD's Fuel Modification Standard
- Pruning of foliage to reduce fuel load, vertical continuity, removal of plant litter and dead wood.
- Complete removal of undesirable plant species, minimal allowance for retention of selective natural vegetation.
- Trees and tree form shrub species that naturally grow to heights that exceed 2 feet shall be vertically pruned to prevent ladder fuels.
- Fuel continuity should be interrupted so that groupings of shrubs are separated from adjacent groupings.
- Ongoing maintenance is required to the satisfaction of ongoing CFD inspections including continual removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying natural vegetation and replacement with fire resistant plants, maintenance of the irrigation systems, regular trimming to prevent ladder fuels.

5.4.3 Vegetation Management Maintenance

Vegetation management—i.e., assessment of the fuel modification zones' condition and removal of dead and dying and undesirable species and 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 CFD. The vegetation management will be funded by the Project and shall be conducted by their contractor(s). The Project shall be responsible for all vegetation management throughout the development, in compliance with the Project FPP that is consistent with requirements.

The permanent fuel maintenance zone required for the Project will be maintained by the applicant during construction and by the owner of each pad or a Property Management Company/Association which will be responsible for 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 vegetation management in perpetuity.

On-going/as-needed fuel modification maintenance during the interim period while the 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 any Open Space awaiting construction on Project site in accordance with weed abatement regulations.
- 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

There should not be a need to modify the fuel maintenance zone as it is planned to meet the fuel management needs of the Project site and comply with the fire code. However, if unforeseen circumstances were to arise that require 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 Wildlife, 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 E) are unacceptable from a fire safety standpoint and will not be planted on the Project site or allowed to establish opportunistically within FMZs or landscaped areas.

5.4.6 Construction Phase Vegetation Management

Vegetation management requirements shall be implemented at Project commencement and throughout the construction phase for each planning area. Vegetation management will be performed pursuant to the Fire Authority Having Jurisdiction (FAHJ) on all building locations prior to the start of work and prior to any import of combustible construction materials. Adequate fuel breaks will 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

The business owners of the Oak Valley North 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!" stance on evacuation. Additionally, management of on-site entities occupying the site's structures will be required to register for emergency alerts via the Alert RivCo messaging system (https://rivcoready.org/alert-rivco). Personnel and employees will be strongly encouraged to also register to receive emergency alerts.

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7 Evacuation Analysis

An evacuation analysis was prepared by Intersecting Metrics with technical input provided by Dudek (September 2023). Please refer to that separate technical report for details regarding evacuation planning, timing available and needed to evacuate the site, and discussion of other available contingency options that may be employed by emergency managers.

In summary, the evacuation analysis results indicate that depending on the wildfire scenario, which includes various locations and weather conditions, the site can be evacuated within a reasonable timeframe and enables emergency managers with contingency options by providing two evacuation routes and the ability to temporarily refuge the entire, or a portion of the anticipated on-site population within the hardened buildings and ignition-resistant landscape/hardscape throughout the site.

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8 Conclusion

This FPP for the Oak Valley North Project provides guidance for vegetation maintenance for the proposed fuel maintenance zones and landscaped areas on the Project site. As described, vegetation maintenance measures will be provided on all sides of the proposed development. The requirements and recommendations provided in this FPP have been designed specifically for the 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, would provide a level of safety equal to a 100-foot-wide FMZ. The Project is considered to represent a low wildfire risk to its occupants based on its fire protection design features and its ability to provide for evacuations and contingency on-site shelter in place.

Ultimately, it is the intent of this FPP to guide the fire protection efforts for the Project in a comprehensive manner. Implementation of the measures detailed in this FPP will reduce the risk of wildfire spreading from the Project site into surrounding areas and will improve the ability of firefighters to fight fires on the Project property and neighboring properties and 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 be exposed to wildfire or embers. Precautions and minimizing actions identified in this report are designed to reduce the likelihood that fire will impinge upon the Project's assets or threaten its 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 and help to limit the spread of fire from the Project site to surrounding areas. It will also help accomplish the goal of this FPP to assist firefighters in their efforts to defend structures.

It is recommended that the Oak Valley North maintain a conservative approach to fire safety. This approach must include maintaining the landscape and structural design 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 the 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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Appendix A
Representative Project Site Photographs

Picture 1. IMG 4725 Taken at southernmost corner of the property looking northwest along the inside of the property line.

Picture 2. IMG 4726 Taken at southernmost corner of the property looking northeast along inside of property line. Note Rancho Calimesa Mobile Home Park to the southeast.

Picture 3. IMG 4742 Taken along Calimesa Blvd about 1/3rd of the way up the southwest property line from Pictures 1 and 2, looking north/northeast across project site.

Picture 4: IMG 4745 Taken along Calimesa Blvd about 1/3rd of the way up the southwestern property line, looking south/southwest away from the project site. Note Calimesa Blvd and I-10 freeway.

Picture 5. IMG 4763 Taken along the northwestern property line looking north towards Singleton Road across adjacent vacant parcel not a part of project site. Note non-native grasslands, mechanically abated by discing.

Picture 6. IMG 4766 Taken along northwestern property line looking southeast across project site.

Picture 7. IMG 4786 Taken near eastern corner of project site looking northwest across the project site.

Picture 8. IMG 4537 Taken near eastern corner of project site looking northeast across low density residential and open space. Note non-native grasslands, sparse coastal sage scrub, and trees about 20 feet tall.

Picture 9. IMG 4797 Taken at eastern corner of project site looking northeast across off site open space. Note non-native grasslands, coastal sage scrub, and sparse trees about 20 feet high.

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Appendix B
BehavePlus Fire Behavior Analysis

1 BehavePlus 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 as the industry standard 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 6.0, 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, Behave 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 Behave and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling conducted on this site includes a relatively high-level of detail and analysis which results in reasonably accurate representations of how wildfire may move through available fuels on and adjacent to the property. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, this analysis incorporated predominant fuel characteristics, slope percentages, and representative fuel models observed on site. The BehavePlus fire behavior modeling system was used to analyze anticipated fire behavior within and adjacent to key areas just outside of the proposed lots. Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information. To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.
- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone/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 some limitations, it can still provide valuable fire behavior predictions which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

The seven fuel characteristics help define the 13 standard fire behavior fuel models[1] and the five custom fuel models developed for Southern California[2]. According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

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

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models[3] developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

- 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

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

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

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

BehavePlus software was used in the development of the Oak Valley North Project (Proposed Project) Fire Protection Plan (FPP) in order to evaluate potential fire behavior for the development site. Existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

2 Fuel Models

Dudek utilized the BehavePlus software package to analyze fire behavior potential for the Proposed site in Riverside County. As is customary for this type of analysis, four scenarios were evaluated, including three summer, onshore weather condition (northwest, west, and south/southwest of the site) and one extreme fall, offshore weather condition (east/northeast of the site). The Project site is surrounded by residential on all side of the project, although the project is set back from the residential areas to the southeast by the I-10 freeway and Calimesa Boulevard, and the project is setback from residential to the northwest by a vacant lot that has also been recently disced. With that said, fuels and terrain within and adjacent to the development area could produce flying embers that may affect the project, but defenses will be built into the structures to prevent ember penetration and to extinguish fires that may result from ember penetration. It is the fuels directly adjacent to and within fuel modification zones that could have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement, however, the buildings are surrounded by driveway/parking areas and hardscape. BehavePlus software requires site-specific variables for surface fire spread analysis, including fuel type, fuel moisture, wind speed, and slope data. The output variables used in this analysis include flame length (feet), rate of spread (feet/minute), fireline intensity (BTU/feet/second), and spotting distance (miles). The following provides a description of the input variables used in processing the BehavePlus models for the Proposed Project site. In addition, data sources are cited and any assumptions made during the modeling process are described.

2.1 Vegetation (Fuels)

To support the fire behavior modeling efforts conducted for this FPP, the different vegetation types observed within the project areas and adjacent to the project site were classified into the aforementioned numeric fuel models. As is customary for this type of analysis, the terrain and fuels within and adjacent to the project area were 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 non-native grasslands, sage scrub plant community, and disturbed habitat, are adjacent to the proposed development site. These fuel types can produce flying embers that may affect the project, but defenses will have been built into the structures to prevent ember penetration. Table 1 provides a description of the four fuel models observed in the vicinity of the site that were subsequently used in the analysis for this project. Modeled areas include low load grassland ground fuels (Fuel Models: FM1 and Gr2) as well as low load grass-shrub ground fuels (Fuel Model Gs2) found throughout the adjacent areas surrounding the Project site. A total of four fire modeling scenarios were completed for the project. These sites were selected based on the strong likelihood of fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenario 2) and an on-shore weather pattern (fire scenarios 1, 3, and 4). Dudek also conducted modeling of the site for post-Fuel Modification Zones' (FMZ) recommendations for this project (Refer to Table 2 for post-FMZ fuel model descriptions). Fuel modification includes establishment of 100 feet of irrigated landscape and hardscape zones on the periphery of the structures as well as trailer parking lots along the north and east areas of the development site. For modeling the post-FMZ treatment condition, fuel model assignments were re-classified for the FMZ 1 (Fuel Model: Gr1 and NB).

Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM1	Short Grasses	Represented throughout the adjacent areas surrounding the Project site.	>1.0 ft.
Gr2	Low Load Dry Climate Grass	Represented throughout the adjacent areas surrounding the Project site.	<2.0 ft.
Gs1	Low Load, Dry Climate Grass-shrub	Represented throughout the adjacent areas surrounding the Project	>2.0 ft.

Table 2. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
8	Compact litter	Fuel Modification Zone 1: irrigated landscape and hardscape	<1.0 ft.
NB	Non-burnable	Parking lot areas that surround the structures	0 ft.

2.2 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 primarily influenced by wind. The Project site is primarily flat with a hill in the west-central portion of the project. The eastern portion of the project site is about 15 to 20 feet higher than the rest of the project site. The project site is downhill from the open space northeast of the project site. The elevations on the improved portions of the Project site range from approximately 2,295 feet above mean sea level (amsl) site to approximately 2335 feet amsl, with natural slope values ranging from 3% to 6% were measured around the perimeter of the Project site from U.S. Geological Survey (USGS) topographic maps. Slope gradients for landscape areas are assumed to be flat (3%), as presented on the project's site plan.

2.3 Weather Analysis

Historical weather data for the Riverside County region was utilized in determining appropriate fire behavior modeling inputs for the Project area. 50th and 97th percentile moisture values were derived from Remote Automated Weather Station (RAWS) and utilized in the fire behavior modeling efforts conducted in support of this report. Weather data sets from the Beaumont RAWS (ID number 045617)[4] were utilized in the fire modeling runs.

RAWS fuel moisture and wind speed data were processed utilizing the Fire Family Plus software package to determine atypical (97th percentile) and typical (50th percentile) weather conditions. Data from the RAWS was evaluated from August 1 through November 30 for each year between 1985 and 2020 (extent of available data

4 Beaumont RAWS Station Latitude and Longitude: 33.963597, -117.007256

record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 1985 and 2020 for 50th percentile weather conditions.

Following analysis in Fire Family Plus, fuel moisture information was incorporated into the Initial Fuel Moisture file used as an input in BehavePlus. Wind speed data resulting from the Fire Family Plus analysis was also determined. Initial wind direction and wind speed values for the five BehavePlus runs were manually entered during the data input phase. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table 3 summarizes the wind and weather input variables used in the Fire BehavePlus modeling efforts.

Table 3: Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	FM1, Gr2, and Gs1	FM1, Gr2, and Gs1
1 h fuel moisture	4%	1%
10 h fuel moisture	5%	2%
100 h fuel moisture	9%	5%
Live herbaceous moisture	37%	30%
Live woody moisture	73%	60%
20 ft. wind speed	14 mph (sustained winds)	18 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	200, 270, and 310	65
Wind adjustment factor	0.4	0.4
Slope (uphill)	3 to 6%	3 to 5%

3 Fire Behavior Modeling Efforts

As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site. Four focused analyses were completed for both the existing project site conditions and the post project conditions, each assuming worst-case fire weather conditions for a fire approaching the project site from the northwest, east/northeast, south/southwest, and west. The results of the modeling effort included anticipated values for surface fires flame length (feet), rate of spread (mph), fireline intensity (Btu/ft/s), and spotting distance (miles). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Four fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these four fire scenarios are explained in more detail below:

Fire Scenario Locations and Descriptions:

- Scenario 1: A summer, on-shore fire (50th percentile weather condition) burning in low-load grass dominated vegetation located north/northwest of the project site. The terrain is flat (approximately up to 6% slope) with potential ignition sources from a structure fire, car fire, mechanical fire, or wildland fire from the north/northwest of the proposed property. This type of fire would typically spread moderately fast before reaching Singleton Road and the developed portion of the project site which includes non-combustible parking lot areas surrounding the structures.
- Scenario 2: A fall, off-shore Santa-ana wind driven fire (97th percentile weather condition) burning in low-load grass/grass-shrub dominated vegetation located east/northeast of the project site. The terrain is flat (approximately up to 5% slope) with potential ignition sources from wildland fire originating in the open space areas to the east/southeast of the proposed property. This type of fire would typically spread moderately fast before reaching the developed portion of the project site which includes non-combustible parking lot areas surrounding the structures.
- Scenario 3: A summer, on-shore fire (50th percentile weather condition) burning in low-load grass dominated vegetation located south/southwest of the project site. The terrain is flat (approximately up to 3% slope) with potential ignition sources from a structure fire, car fire, mechanical fire, or wildland fire from the south/southwest of the proposed property. This type of fire would typically spread moderately fast before reaching the I-10 freeway and Calimesa Road, then the developed portion of the project site.
- Scenario 4: A summer, on-shore fire (50th percentile weather condition) burning in low-load grass dominated vegetation located west of the project site. The terrain is flat (approximately up to 3% slope) with potential ignition sources from a structure fire, car fire, mechanical fire, or wildland fire from the west/northwest of the proposed property. This type of fire would typically spread moderately fast before reaching I-10 freeway and Calimesa Road, then the developed portion of the project site which includes non-combustible parking lot areas surrounding the structures.

4 Fire Behavior Modeling Results

The results presented in Tables 4 and 5 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

As presented in Table 4, wildfire behavior on the Project site is expected to be primarily of low to moderate intensity throughout the maintained and non-maintained surface grass dominated fuels throughout the perimeter areas of the site. Worst-case fire behavior is expected in untreated, surface grass/grass-shrub dominated vegetation under peak weather conditions (represented by Fall Weather, Scenario 2). The fire is anticipated to be a wind-driven fire from the east/northeast during a fall, Santa ana wind event. Under such conditions, expected surface flame length is expected to be significantly lower in the areas where fuel modification occurs, with flames lengths reaching approximately 20 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 4,038 BTU/feet/second with moderate spread rates of 12.7 mph and could have a spotting distance up to 1.4 miles away.

Wildfire behavior in non-maintained grasslands, modeled as FM1 and Gr2 fuel models being fanned by 14 mph sustained, on-shore winds Fires burning from the west/northwest and pushed by ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions, a low-load grass/grass-shrub vegetation fire could have flame lengths between approximately 4 feet and 7 feet in height and spread rates between 0.5 and 1.7 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.2 to 0.3 miles.

As depicted in Table 5, the FMZ areas experience a significant reduction in flame length and intensity. The 14.0- to 18.0-foot flame lengths predicted for non-maintained grass/grass-shrub habitats during pre-treatment modeling for fire scenario 2 are reduced to approximately 3.0 feet once they reach the development footprint and the non-combustible parking lot areas. During on-shore weather conditions, a fire approaching from the west towards the development footprint would be reduced from approximately 7-foot-tall flames to less than 1.3-foot tall once they reach the development footprint and the non-combustible parking lot areas with low fire intensity and spotting distances due to the higher live and dead fuel moisture contents and no materials to burn. These reduction of flame lengths and intensities are assumed to occur within the 100 feet of fuel modification that is achieved for most of the site (a combination of irrigated landscapes and hardscapes within Zone 1).

Table 4: RAWS BehavePlus Fire Behavior Model Results – Existing Conditions

Fire Scenario	Flame Length (feet)	Spread Rate (mph)[1]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles) [2]
Scenario 1: 6% slope, Summer, On-shore wind from the NW, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	300	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	150	0.2
Short grasses (FM1)	5.6’	1.7	236	0.2
Scenario 2: 5% slope, Fall, Off-shore wind from the E/NE, 18 mph sustained winds with 50 mph wind gusts (Existing conditions)				
Low-load grasses (Gr2)	10.5’ (18.0’)	1.9 (6.2)	942 (3,037)	0.4 (1.3)
Low-load grass-shrub (Gs1)	7.2’ (14.0’)	0.7 (3.0)	416 (1,763)	0.3 (1.1)
Short grasses (FM1)	10.2 (16.6’)	4.5 (12.7)	892 (2,551)	0.4 (1.2)
Scenario 3: 3% slope, Summer, On-shore wind from the S/SW, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	298	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	149	0.2
Short grasses (FM1)	5.5’	1.7	235	0.2
Scenario 4: 3% slope, Summer, On-shore wind from the W, 14 mph sustained winds (Existing conditions)				
Low-load grasses (Gr2)	6.2’	0.8	299	0.3
Low-load grass-shrub (Gs1)	4.5’	0.3	150	0.2
Short grasses (FM1)	5.5’	1.7	235	0.2

Notes:
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

Table 5: RAWS BehavePlus Fire Behavior Model Results – Post Project Conditions

Fire Scenario	Flame Length (feet)	Spread Rate (mph)[1]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles) [2]
Scenario 1: 6% slope, Summer, On-shore wind from the NW, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.4’	0	11	0.1
Scenario 2: 5% slope, Fall, Off-shore wind from the E/NE, 18 mph sustained winds with 50 mph wind gusts (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	2.0’ (3.0’)	0.1 (0.2)	27 (63)	0.1 (0.4)
Scenario 3: 3% slope, Summer, On-shore wind from the S/SW, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.3’	0	11	0.1
Scenario 4: 3% slope, Summer, On-shore wind from the W, 14 mph sustained winds (Existing conditions)				
NB (Parking Lot areas)	0	0	0	0
FMZ Zone 1 (FM8)	1.3’	0	11	0.1

Notes:
1 mph = miles per hour
2 Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

The following describes the fire behavior variables (Heisch and Andrews 2010) as presented in Tables 4 and 5:

Surface Fire:

- **Flame Length (feet):** The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames.
- **Fireline Intensity (Btu/ft/s):** Fireline intensity is the heat energy release per unit time from a one-foot wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function of rate of spread and heat per unit area, and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.
- **Surface Rate of Spread (mph):** Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

The information in Table 6 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 4 and 5. Identification of modeling run locations is presented graphically in Figure 5 of the FPP.

Table 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

Ignition-Resistant Construction Requirements

As of the date of this fire protection plan, the following are the requirements for ignition resistant construction for The Proposed Project, including requirements 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 will 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 ½ inch, or other alternative material the Fontana Fire Protection District 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 will 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 1⅜ inches thick with interior field panel thickness no less than 1¼ 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/NWWDA 101/LS2-97 for Structural Requirements.

Appendix D
Project Fuel Modification Plan

Project Boundary

Structure

Fuel Modification Zones

100-ft FMZ Equivalent Hardscape and Landscape

Zone B (100-ft FMZ Manufactured Slopes)

Offsite FMZ Equivalent

Document Path: Z:\Projects\j1557100\MAPDOC\DOCUMENT\Fire\FPP\Appendix E Fuel Mod Plan.mxd

SOURCE: BASEMAP-BING MAPPING SERVICE 2023; DEVELOPMENT- HPA 2023

DUDEK

0 210 420 Feet

APPENDIX D

Fuel Modification Plan

Fire Protection Plan for the Oak Valley North Project

Appendix E
Prohibited Plant List

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

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

*F = flammable, I = Invasive

Notes:

1. 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. Other plants not considered invasive at this time may be determined to be invasive after further study.
2. 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.
3. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
4. All vegetation used in Fuel Modification Zones and elsewhere in this development shall be subject to approval of the Fire Code Official.
5. Landscape architects may submit proposals for use of certain vegetation on a project specific basis. They shall also submit justifications as to the fire resistivity of the proposed vegetation.