Appendix O

Fire Protection Plan Letter Report (2022)

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December 23, 2022 13930

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300 North Coast Highway
Oceanside, California 92054

Subject: Fire Protection Plan – Letter Report for the Guajome Crest Project

1 Introduction

This Fire Protection Plan (FPP) – Letter Report demonstrates that the Guajome Crest Project will be in compliance with applicable portions of the City of Oceanside Municipal Code (Chapter 11, Fire Protection) and Oceanside Fire Department (OFD) Form 5205-17, Fire Master Plans for Commercial and Residential Development. The Project will also be consistent with the 2019 California Building Code, Chapter 7A (or current edition at the time of construction); 2019 California Fire Code, Chapter 49 (or current edition at the time of construction); and 2019 California Residential Code, Section 337, as adopted by the City of Oceanside and the OFD. The Project would be required to meet the adopted codes at the time of construction. This FPP-Letter Report has been prepared as prescribed in the County's "Guidelines for Determining Significance and Report Format and Content Requirements for Wildland Fire and Fire Protection (County of San Diego 2010)" document. For purposes of this FPP- Letter Report, the Guajome Crest Project will be referred to as the "Project".

Following extensive review of available digital site information, including topography, vegetation types, fire history, and the Project's site plan, Dudek fire protection planners conducted a field assessment of the Project on March 3, 2022.

1.1 Project Description

The Project site consists of a mostly vacant parcel (APN 157-412-15-00) and includes approximately 16.78 acres located in the Guajome Neighborhood Area of the City of OceansideCalifornia. The proposed project site is located along the north side of Guajome Lake Road, southeast of Albright Street in the east-central portion of the City of Oceanside. The City of Vista municipal boundary is located approximately 0.1 miles east of the project site. The project site is located approximately 0.5 miles south of State Route (SR) 76 and approximately 3.4 miles north of SR 78. The Project area falls within Section 2 of Township 11 South, Range 4 West of the San Luis Rey, California 7.5-minute U.S. Geological Survey Topographic Quadrangle Map (Figure 1, Project Location Map).

The project site has a General Plan designation of Residential with a consistent zoning designation of Single Family Detached (SFD-R). Areas surrounding the project site are zoned residential (north, east, and west of the project site) and open space zones (south of the project site. The proposed project requires for the Project to include a Development Plan, Tentative Map, and request for Density Bonus with waivers for development standards such as net lot area, lot width, and front, side, and rear yard setbacks. The project proposed a single-family residential development project which would include 84 single-family units on the 16.78-acre project site

(Figure 2, Conceptual Site Plan). The proposed single-family residential units would range from 2,096 square feet to 2,609 square feet. All homes would be developed on the southern portion of the project site which has been previously disturbed and graded. The project may be required to clear part or all of the Coastal Sage Scrub to provide a fuel modification zone for fire requirements. This will be addressed in the EIR. The project would avoid the northernmost portion of the project site along the riparian corridor, preserving approximately five acres of the 16.78-acre project site as open space. In existing conditions, the project site is mostly vacant and previously disturbed, with one existing residential house in the northern portion of the property. Access is proposed via two driveways from Guajome Lake Road along the southern boundary of the Project site, which also provides adequate emergency access to and from the development. Road improvements would include 40-foot curb to curb improvements including a five and half--foot parkway and a four and a half-foot sidewalk. The internal private road would be 28 to 32 feet wide with five-foot sidewalks. Each proposed home would include a 2-car garage, and a private driveway that would allow for additional parking of 2 more cars. All fire access roads will be designed and maintained to support the imposed loads of fire apparatus (not less than 75,000 lbs.) and be consistent with code requirements for asphaltic pavement surface. The project would also include supporting amenities, including a recreational area, open space and landscaping.

The project proposes a total of 84 single-family residences, nine (9) of which would be at the affordable/low-income level (15 percent of the total). The remaining homes would be designated as market rate. The proposed affordable homes would be proportional to the overall project in unit size, be dispersed throughout the project, and have access to all the amenities available to market rate units.

A total of approximately 8.4 acres of common open space is proposed, which includes landscaping throughout the project site. Each residence would include private open space in the form of front and rear yards. The project proposes approximately 414 square-feet of open space per residence in addition to the private open space provided for each lot.

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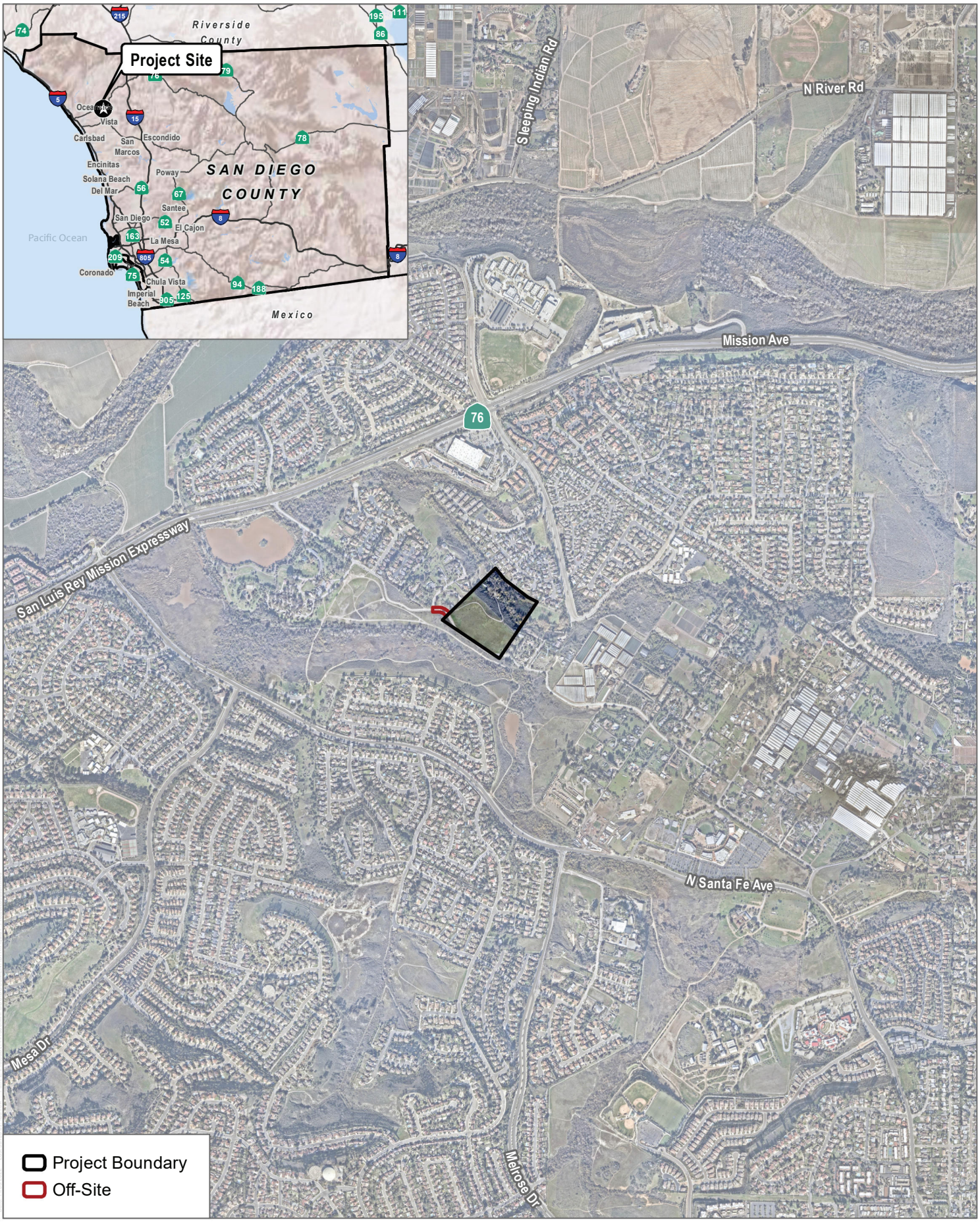

SOURCE: SANGIS 2020, Open Street Maps 2019

DUDEK

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FIGURE 1

Project Location

Fire Protection Plan for the Guajome Crest Project

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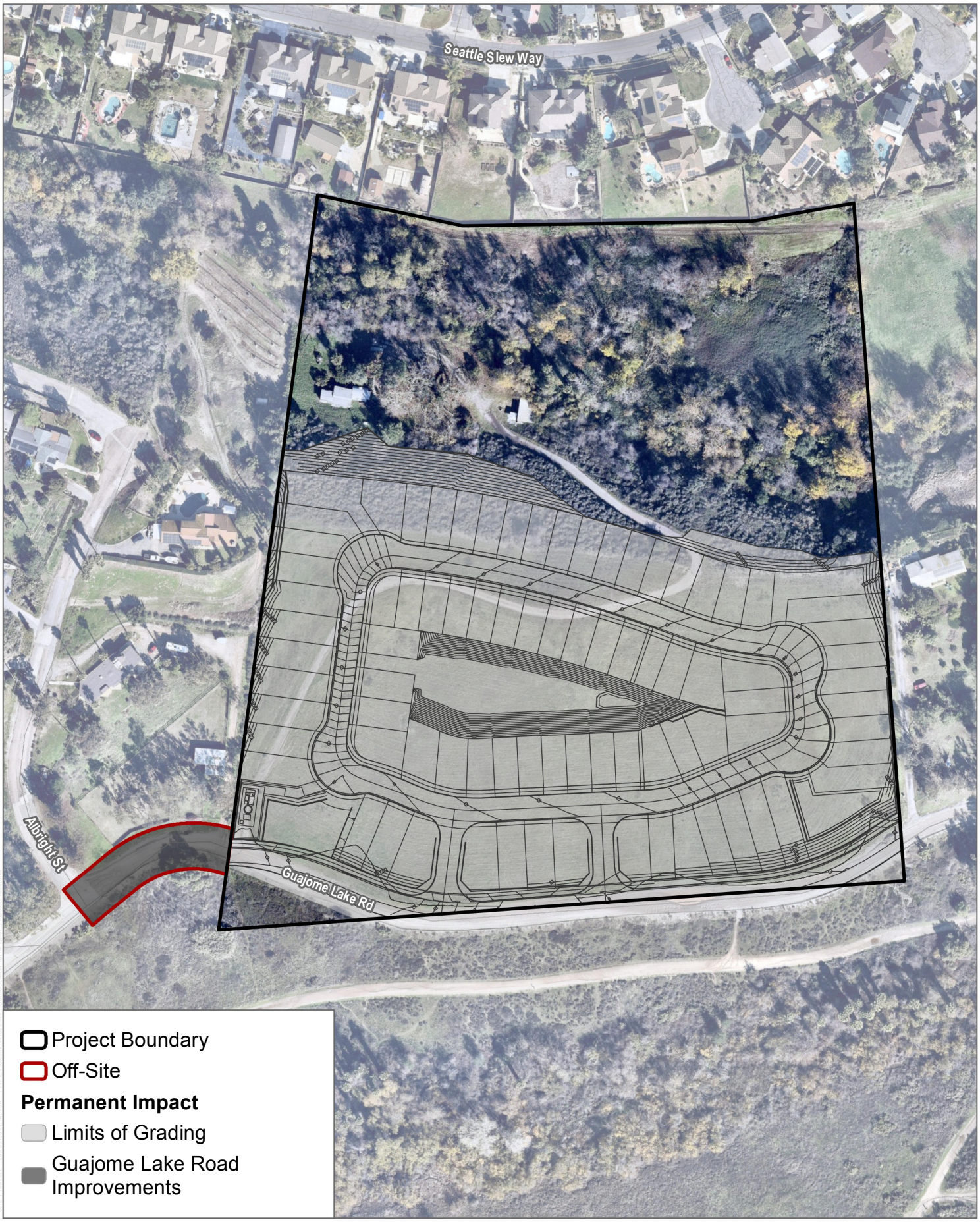

SOURCE: SANGIS 2020, Open Streets Map 2019

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FIGURE 2

Proposed Site Plan

Fire Protection Plan for the Guajome Crest Project

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2 Environmental Setting

2.1 Location

The approximately 16.78-acre Project site is located in the east-central portion of the City of Oceanside, California, within the Guajome Neighborhood Area. The Guajome Neighborhood Area is generally bound by Highway 76 to the north, North Santa Fe Avenue to the west and south, and East Vista Way to the east. The Project site is located along Guajome Lake Road, southeast of Albright Street. The majority of the Project site (aside from the small westernmost segment) is located to the northeast of Guajome Lake Road, and south of that is Guajome Regional Park separating the site from additional residential development. A stream runs through the northeastern portion of the Project site which ultimately empties into Guajome Lake which is roughly a half mile northwest of the site within Guajome Regional Park. The Project site is entirely within Accessor's Parcel Number (APN) 157-412-15-00, which lies within Section 2 of Township 11 South, Range 4 West of the San Luis Rey, California 7.5-minute U.S. Geological Survey Topographic Quadrangle Map.

In general, the Project area includes the development of 84 single-family residential lots with homes ranging in size from 2,096 square feet to 2,609 square feet, and supporting amenities, including a recreational area, open space and landscaping. Existing single-family developments are present to the northwest, northeast, and southeast of the site. Currently, the Project site includes a single-family residential home and storage shed in the northwestern portion of the Project site, and a dirt driveway that runs through the center of the project site, connecting the residence to Guajome Lake Road. The remainder of the project site is vacant and undeveloped with riparian habitat in the northern portion of the Project site and grassland throughout the Project site (refer to Attachment A, Representative Site Photographs).

The Project's location is located within an area statutorily designated a Non-Very High Fire Hazard Severity Zone (Non-VHFHSZ) by the California Department of Forestry and Fire Protection (CAL FIRE). Fire hazard designations are based on topography, vegetation, and weather, amongst other factors with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and wildland urban interface (WUI) locations. However, none of these conditions are fond on the Guajome Crest Project site.

CAL FIRE Fire and Resource Assessment Program (CAL FIRE 2022) fire history data[1] indicates only 19 wildfires have occurred within a 5-mile vicinity of the Project site; however, there have been no recorded wildfires on-site. Three small fires have burned within 1-mile of the Project site, and the most recent wildfire in the Project vicinity was the 2017 Lilac Fire (refer to Attachment B, Fire History Map).

[1] Based on polygon GIS data from CAL FIRE 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 1878–2021.

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, unless downslope winds are influencing the fire. Flat terrain tends to have little effect on fire spread, resulting in fires that are driven by wind.

The topography of the Guajome Crest Project site is generally flat, with a slightly moderate north-facing downhill slope leading down to the riparian areas in the northern portion of the Project site. The Project site ranges in elevation from approximately 126 feet above mean seas level (amsl) in the northwestern portion of the Project site, to approximately 136 amsl in the southeastern corner of the site along Guajome Lake Road to 192 feet amsl near the center of the Project site. Project site is comprised of gentle sloping terrain with a prominent hilltop near the center of the property. Near the center of the Project site, the terrain slopes down towards Guajome Lake Road to the south/southwest and down towards a riparian to the north/northeast.

2.3 Climate

The Guajome Crest Project site is located approximately 8 miles inland from the Pacific Ocean. It has a Mediterranean climate characterized by mild, dry summers and wet winters. Average temperatures near Oceanside range from approximately 54–66°F, and the area generally receives an average rainfall of approximately 10.3 inches per year (U.S. Climate Data for Oceanside, 2022).

North San Diego County and the Project area are influenced by the Pacific Ocean and are frequently under the influence of a seasonal, migratory subtropical high-pressure cell known as the "Pacific High." Wet winters and dry summers with mild seasonal changes characterize the Southern California climate. This climate pattern is occasionally interrupted by extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds. The average high temperature for the project area is approximately 78°F, with daily highs in the summer and early fall months (July–October) exceeding 90°F. Precipitation typically occurs between October and April.

The prevailing wind pattern is from the west (onshore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea) and at night winds are from the northeast (land), averaging 2 miles per hour (mph). During the summer season, the diurnal winds may average slightly higher (approximately 19 mph) than the winds during the winter season due to greater pressure gradient forces. Surface winds can also be influenced locally by topography and slope variations. The highest wind velocities are associated with downslope, canyon, and Santa Ana winds.

The Project area's climate has a large influence on the fire risk, as drying vegetation during the summer months becomes fuel available to advancing flames should an ignition be realized. Typically, the highest fire danger is produced by the high-pressure systems that occur in the Great Basin, which result in the Santa Ana winds of Southern California. Sustained wind speeds recorded during recent major fires in San Diego County exceeded 30 mph and may exceed 50 mph during extreme conditions[2]. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis during late summer and early fall. Santa Ana winds are warm winds that flow from the higher desert elevations in the north

2 The Lilac Fire was fanned by unusually powerful 30-35 mph Santa Ana winds with gusts reaching 66 mph (https://en.wikipedia.org/wiki/Lilac_Fire).

through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of canyons and dissipate as they spread across valley floors. Santa Ana winds generally coincide with the regional drought period and the period of highest fire danger. The Project site may be affected by strong winds from the north and east, such as the seasonal Santa Anas.

2.4 Vegetation

The Project site contains native and non-native vegetation communities and land covers, and one-single-family residence with associated driveways and structures. The site is currently comprised of seven (7) vegetation communities or land cover types, with non-native grasslands making up the majority of the southwest half of the site as well as a narrower area along the northeastern border of the site. The small section of the property southwest of Guajome Lake Road is mapped as disturbed habitat, as is a small area in the eastern corner of the site. An approximately 40-meter-wide strip of coastal sage scrub is present which reaches from the northwestern to the southeastern border of the site, but is bisected by the developed access road/driveway. The remainder of the Project site contains riparian habitat associated with the creek which runs through the site. Riparian habitat is composed of patches of non-native riparian, riparian forest, and southern arroyo willow riparian forest vegetation communities. Riparian habitat is dominated by arroyo willow (*Salix lasiolepis*), hickory (*Carya illinoiensis*), and sycamore (*Platanus racemosa*) with scattered non-native palm trees, as well as Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), and poison oak (*Toxicodendron diversilobum*) scattered throughout (Dudek Biological Resources Letter, 2021). Refer to Figure 3, Biological Resources Map. Once the Project is built, the on-site vegetation within the southeast portion of the Project site would primarily be characterized as hardscape or irrigated landscape, while the remainder of the strip of coastal sage scrub and the riparian habitat associated with the creek will mostly remain the same. Offsite vegetation includes landscape plantings associated with neighboring residential properties along with a riparian drainage to the west and south of the Project.

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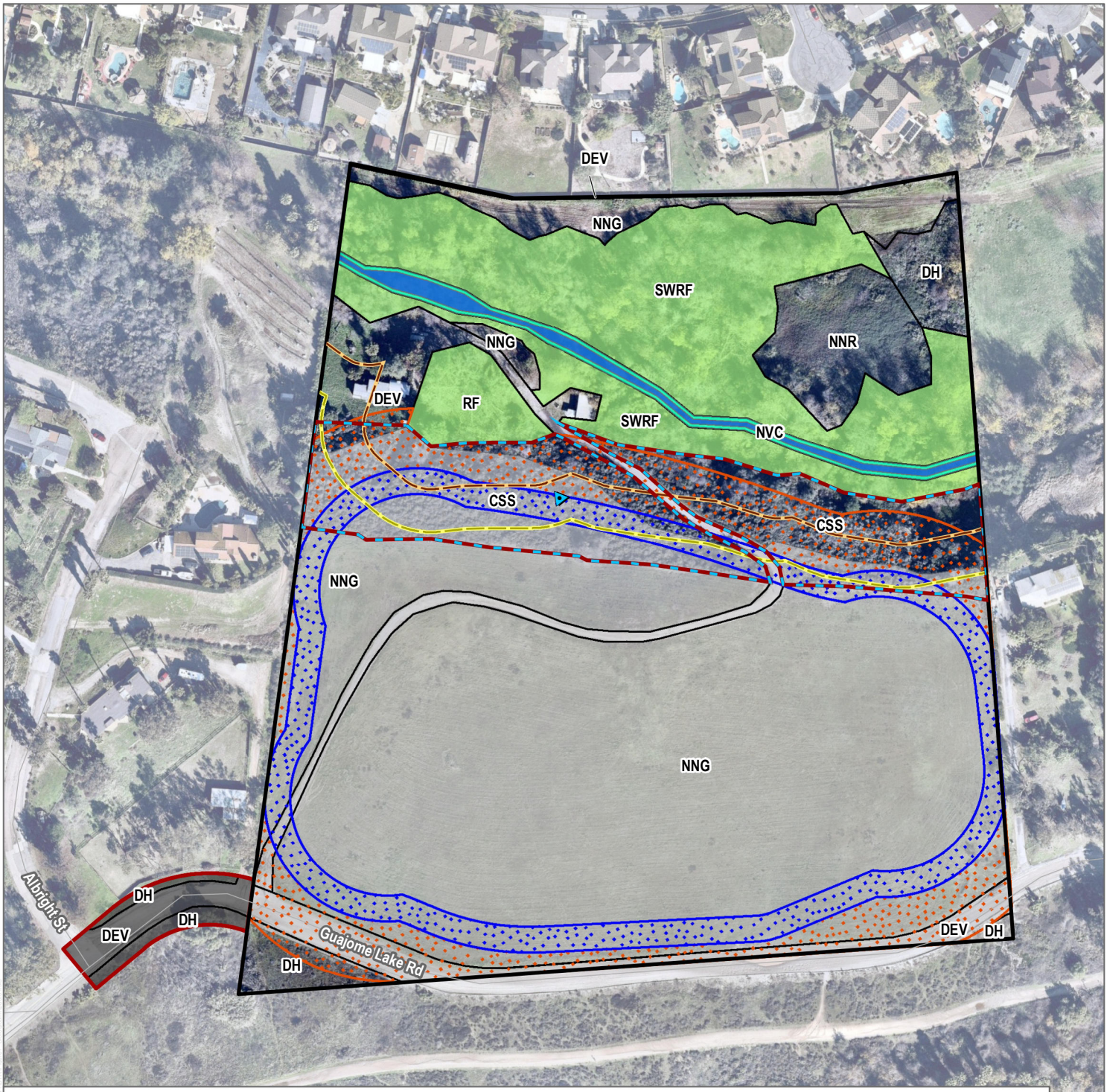

- Project Boundary
- Off-Site

Permanent Impact

- Limits of Grading
- Guajome Lake Road Improvements

Fuel Modification Zone

- Zone 1 (irrigated, 0-30')
- Zone 2 (non-irrigated thinning 30'-100')
- CAGN Nest Location
- CAGN Observed Use Area
- 50-foot Biological Buffer
- 50-foot Planning Buffer

Potential Jurisdictional Resources

USACE/RWQCB and CDFW

- Non-wetland water/Streambed

CDFW Only

- Top of Bank
- Associated Riparian Habitat

Vegetation Communities and Land Covers

- CSS, Diegan Coastal Sage Scrub
- DEV, Urban/Developed
- DH, Disturbed Habitat
- NNG, Non-Native Grassland
- NNR, Non-Native Riparian
- NVC, Non-Vegetated Channel
- RF, Riparian Forest
- SWRF, Southern Arroyo Willow Riparian Forest

SOURCE: SANGIS 2020, Open Streets Map 2019

DUDEK

0 80 160 Feet

FIGURE 3

Impacts to Biological Resources Map

Fire Protection Plan for the Guajome Crest Project

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3 Project Exposure to Wildland Fires

3.1 Water Supply

Water service for the Guajome Crest Project would be provided via the existing water connections to the existing public water system. Water service for the project would be provided by the City of Oceanside's Water Utilities Department from the existing 420 pressure zone. Proposed on-site water system piping would consist of an 8-inch water line that runs throughout the Project and connects to an existing 10-inch water line in Guajome Lake Road and to an existing 8-inch water line on Horse Shoe Way. The onsite water line will be improved to a public system.

Water fire flows will be consistent with OFD requirements for a residential development. The City's water service area requires new development to meet a minimum 1,500 gpm fire flow from one hydrant. The pressures in Guajome Crest will remain above 20 psi for a minimum duration of two hours when meeting the fire requirements for the City's water service area and OFD fire flows. The approved, permanent

3.2 Fire Access Roads

Project site access, including road widths and connectivity, will be consistent with the City's roadway standards and the CFC Section 503.

3.2.1 Access Roads

The Project proposes to build a looped internal road system that is designed to accommodate emergency vehicle access and residential traffic flow. There are two proposed access driveways into and out of the Guajome Crest Project site, both of which will accessed off Guajome Lake Road. Guajome Lake Road is accessed from Highway 76 to the north and Osborne Street to the South. Guajome Lake Road is currently built as an asphalt two-lane collector road between Highway 76 and Albright Street, then again from Old Colony Road and Osborne Street; between Albright Street and Old Colony Road, Guajome Lake Road changes to a two-lane unmaintained dirt road (including along the existing stretch in front of the Project site). Street improvements are proposed along the Project's frontage on Guajome Lake Road, which include the construction of a sidewalk with curb and gutter, and parkway. As previously mentioned, Guajome Lake Road, as its present alignment, does not meet current City Public Road Standards. Realignment of a portion of Guajome Lake Road is proposed on the southwest corner of the site towards Albright Street. This segment of Guajome Lake Road would be straightened to eliminate the northward bow in the road, with the approximately 420-foot-long realigned section located on the adjacent Guajome Lake County Regional Park.

The Project internal circulation will be improved per the City's public cul-de-sac street standards. Project cul-de-sac streets will be improved to 36-feet wide travel lanes with sidewalk, curb and gutter, and parkway within a 56-foot right-of-way. A proposed 30-foot-wide private drive easement (24-foot-wide pavement) will provide all-weather access to the common equestrian areas and the public water and sewer utilities areas. A full-width-cul-de-sac bulb will be constructed at the northern end of the access road to accommodate horse trailers, delivery trucks, and emergency vehicles that will need to turn around in this location.

All fire access and vehicle roadways will be of asphaltic concrete or approved alternative and designed and maintained to support the imposed loads of fire apparatus (not less than 75,000 pounds) that may respond, including Type I, II, and III engines, ladder trucks, and ambulances. Proposed Development Footprint roads meet City's Department of Public Works' and Engineering Division's Street Design Standards. The access roads will be required to be paved and capable of supporting the emergency vehicles loading of a minimum 75,000 pounds prior to combustible construction occurring. Fire apparatus roadways will also meet the following criteria:

- The road surface must provide all-weather driving capabilities. Paved surfaces shall be asphalt, concrete or other approved materials. A minimum width of a fire access roadway is 28 feet with no parking on either side of the street. For access roadways with parking on one side of the street, access roadways are required to be 32 feet wide and for access roadways with parking allowed on both sides of the street, access roadways are required to be 36 feet wide, except as designated by Oceanside approved street sections. Access roads be completed and paved prior to issuance of building permits and prior to combustible construction occurring.
- Road grades shall not exceed 12%.
- Any dead-end roads longer than 150 feet will have approved provisions for fire apparatus turnaround. Fire apparatus turnarounds will include an inside radius of 30 feet or greater and an outside turning radius of a minimum 50 feet, measured from the inside edge of improved width.
- Roadways and/or driveways will provide fire department access to within 200 feet of all portions of the exterior walls of the first floor of each structure.
- Vertical clearance of vegetation along roadways will be maintained at 13 feet, 6 inches. Vertical clearance throughout the development to be clear to the sky to allow aerial ladder truck operation.
- Fire access roads for each phase will meet Proposed Project approved fire code requirements and/or mitigated exceptions for maximum allowable dead-end distance, paving, and fuel management prior to combustibles being brought to the development area.
- Fire lane road at buildings that are greater than 35 feet in height above natural grade will be 35 feet wide (road closest to the building), per code or as approved by City Fire Marshal. The access road shall be equal to ¼ the difference in elevation from the fire access road to roof. The building curbside access roads serving buildings over two stories in height but less than 44 feet in height shall be permitted to be up to 10 feet away from the building (City of Oceanside 2017).
- Street parking is prohibited on streets narrower than 28 feet in width. Parking is permitted on a roadway that is at a least 32 feet in width and on both sides of the roadway if 36 feet or more in width. Parking will be assumed to be 6 to 8 feet in width. Where road widths do not accommodate parking, restrictions will apply and the streets will be posted with signs and marked with red curbs stating "No Parking; Fire Lane." Street sections and designated fire lanes are to be reviewed and approved by the City Engineer and the City Fire Marshal.

- Roads with a median or center divider will have at least the required minimum unobstructed width of 12 feet on both sides of the center median or divider. Emergency fire truck access points will be provided through the center divider at 1,000-foot intervals, where road segment length allows.
- Any roads that have traffic lights will have OFD–approved traffic preemption devices (e.g., Opticom) compatible with devices on the Fire apparatus.
- Developer will provide information illustrating the new roads, in a format acceptable to the City, to update the OFD emergency response maps.
- A Project Fire Master Plan will be required.

3.2.2 Interior Circulation Roads

- Interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the site and for fire department access. Any dead-end roads serving new buildings that are longer than 150 feet would have approved provisions for fire apparatus turnaround in accordance with OFD standards at the time of approval. OFD's Fire Marshal would establish a policy identifying acceptable turnarounds for various Project product types.
- Fire apparatus turnarounds would include inside turning radius of a minimum 30 feet, measured to inside edge of improved width.
- Minimum paved radius width for a project cul-de-sac would be 50 feet, or a Fire Department-approved alternative. Cul-de-sac bulbs would have signs posted and red painted curbs with white letters "No Parking; Fire Lane." Cul-de-sac bulbs are required on dead-end roads in residential areas where roadways serve more than two residences.
- Roadways and/or driveways would provide fire department access to within 200 feet of all portions of the exterior walls of the first floor of the structures (all structures are fire sprinklered).
- Traffic calming devices (including, but not limited to, speed bumps, speed humps, speed control dips, etc.) would be prohibited unless approved by the fire code official. The Project proposes two round-abouts for OFD review and approval.
- Vertical clearance along roadways is required to be 13 feet 6 inches. Proper maintenance is required to ensure that vegetation and trees on roadsides do not grow over or into the roadway and impede emergency apparatus access. The type of vegetation would be fire resistant and comply with this plan.
- Angle of approach/departure would not exceed 7 degrees (12%). Road grades would not exceed 12%.

Additionally, the HOA and/or private property owners adjacent to the site's roads would maintain all roadside landscape in a fire safe condition.

3.3 Gates

Gates are not proposed within the Guajome Crest Project site. However, should gates become desired or necessary for the Proposed Project, gates will comply with OFD codes. Public roads will not be gated. Any gates on private roads or on private driveways may be permitted but must comply with OFD standards for electric gates and will not represent a dead-end road condition that jeopardizes the dead end road length requirements for this Proposed Project.

- Access gates are to be equipped with a KNOX key switch, which overrides all command functions and opens the gate. All proposed gates will be equipped with sensors for detecting emergency vehicle "Opticom" strobe lights and/or sirens from any direction of approach. Strobe detection and key switches will be provided on the interior and exterior of gates. Gates will automatically open when any vehicle approaches via vehicle detection loops.
- Switches may be dual keyed for OFD and Law Enforcement (Oceanside Police Department) access.
- Gate activation devices will be equipped with a battery backup or manual mechanical disconnect in case of power failure.
- Further, gates will be:
    - Wider than the roadway;
    - Inclusive of area lighting;
    - Constructed from non-combustible 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, via contact by a person or a vehicle (including a vehicle detection loop); and
    - Located 30 feet from any intersecting road

3.4 Premises Identification

Identification of roads and structures will comply with the City of Oceanside Code of Ordinances, Chapter 11 – Fire Protection, Sec. 11.18, Section 505.1, as follows: 'Approved address numbers, building numbers, building identification and/or addresses shall be placed on all new and existing buildings and at appropriate additional locations, plainly visible and legible from the street or roadway fronting the property when approaching from either direction. The numbers shall contrast with their background and shall meet the flowing minimum size standards: four-inches high with 0.5-inch stroke for residential buildings, six-inches high with 0.5-inch stroke for commercial and multi-residential buildings and 12 inches high with a one-inch stroke for industrial buildings.'

Streets and roads shall be identified with approved signs by the City Engineer. Proposed roads within the Proposed Project development will be named, with the proper signage installed at intersections to the satisfaction of the

City. Access roads to private lots to be completed and paved prior to lumber drop and prior to the occurrence of combustible construction. Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles. Signs shall be of an approved size, weather resistant and be maintained until replaced by permanent signs.

An emergency response map update, including structures, fire hydrants, FDCs, and roadways or similar features in a format compatible with current OFD mapping services.

3.5 Fire Hydrants

Hydrants shall be located along fire access roadway(s) as determined by the OFD Fire Marshal in consultation with water department to meet operational needs, at intersections, and at distances listed in Table C105.1 of the CFC, 2019 edition. The approved, permanent fire hydrants shall be installed, tested, and fully operable/placed in service before combustible materials are brought on site. Hydrants will be consistent with City Design Standards as follows:

a. ***Required installations.*** The location, type and number of fire hydrants connected to a water supply capable of delivering the required fire flow shall be provided on the public or private street, or on the site of the premises to be protected or both. Fire hydrants shall be required within 600 feet of all exterior walls of the structures and accessible to the fire department apparatus by roads meeting the requirements of section 503 of the CFC; if fire hydrants are private a looped system is required. Fire service laterals, valves, backflow preventers, and meters will be installed on site as required by the OFD. All fire department connections shall be installed in accordance with mounting requirements as specified by the OFD Fire Marshal.

b. ***Location of fire hydrants.*** Hydrants will be in place and serviceable prior to delivery of combustible materials to the site. Fire hydrants shall be located according to OFD's Fire Marshal in consultation with the City's Water Utilities Department taking into consideration departmental operational needs. Hydrants must be located within three feet from the edge of a street where they will be visually or operationally obstructed (behind walls, fences, bushes, and behind parking spaces) and within 600 feet of all exterior walls of the structures. Prior to the issuance of building permits, the applicant shall submit to OFD plans demonstrating a water system capable of handling the fire flow requirements.

c. ***Fire hydrant construction and configuration.*** All fire hydrants shall be of bronze construction, including all internal parts except seats. Alternative materials may be used if approved by OFD's Fire Marshal and City's Water Utilities Department. The hydrant outlets must face the street.

d. ***Signing of water sources and fire department connections.*** Fire hydrants shall be identified by a reflectorized pavement blue marker and fire department connections shall be identified by a reflectorized green marker, with a minimum dimension of 3 inches, in the center of the travel lane adjacent the water source. Crash posts will be provided where needed in on-site areas where vehicles could strike fire hydrants and will be consistent with Section 312 of the CFC.

e. ***Vegetation Clearance.*** A three-foot clear space (free of ornamental landscaping, fencing, and retaining walls) shall be maintained around the circumference of all fire hydrants.

3.7 Fire Response

The Project site is located within the City of Oceanside's responsibility area and the Oceanside Fire Department jurisdictional response area. Initial emergency response for the Project would be provided by Oceanside Fire Station 6, located at 895 N. Santa Fe Ave., Oceanside, California. Oceanside Fire Station 6 is staffed by one Fire Captain, one Engineer, and three Firefighter Paramedics. Station 6's apparatus includes one Type 1 Medic Engine and one Medic Ambulance. Station 6 is approximately 1.5 miles from the entrance to the Project off Guajome Lake Road and approximately 1.8 miles to the most remote portion of the Project site with a calculated travel time of approximately 3 minutes and 40 seconds[3]. The OFD indicates "the minimum response standard for 911 medical emergencies in the City of Oceanside is to arrive within five minutes, 90% of the time." Further, the Oceanside General Plan (Public Safety Element) indicates a goal of maintaining an Insurance Services Office (ISO) rating of Class 5 City wide. This equates to having no structures over five road miles from the nearest fire station.

As indicated above, OFD has established internal goals for emergency response to all priority Level One or Emergency type calls within 5 minutes (3 minutes travel), 90% of the time. This is a more stringent response than suggested by the National Fire Protection Association (NFPA) which publishes a national guideline of 6 minutes and 30 seconds (4 minutes travel), 90% of the time. Travel time is one part of the overall response time and is based largely on the distance from the fire station to the project. The analysis that follows is based on travel time and assumes the dispatch and turnout times as a constant. Therefore, as indicated in Table 1, response to the Project site from the closest existing OFD fire station (Station 6) would achieve between a 3 minute to 4-minute travel time (5 minutes and 30 seconds to 6 minute and 30 second total response time) for the entire Guajome Crest Project. This analysis indicates that the first arriving engine from Station 5 can respond within OFD's five-minute response goal to an estimated 5% of the project with the remainder of the project incrementally beyond five minutes, up to 6.5 minutes (including one minute for dispatch and 1.5 minutes for turnout). Final decision regarding the need for mitigation for not strictly complying with the OFD's response time would be at OFD's discretion.

There are additional firefighting resources within the vicinity of the Project site, which includes OFD Station 5, located at 4841 N. River Road, Oceanside and OFD Station 8, located at 1935 Ave. del Oro, Oceanside. OFD Station 5 is approximately 2.5 miles from the Project site and 2.8 miles from the most remote portion of the Project site with a calculated travel time of 5 minutes and 25 seconds (7 minutes and 55 seconds total response time). Whereas OFD Station 8 is approximately 4.6 miles from the Project site and 4.9 miles from the most remote portion of the Project site with a calculated travel time of 8 minutes and 58 seconds (11 minutes and 28 seconds total response time).

[3] Calculated using the nationally recognized RAND Corporation formula used by the Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard: (T=0.65 + 1.7D), where T=time and D=distance).

Table 1. Fire Station Travel Time Response to Guajome Crest Project Site

Call Response Times to Guajome Crest	Estimated Percent of North River Farms Achievable		
	Fire Station 6	*Fire Station 5*	*Fire Station 8*
Less than 5 minutes	5%	0%	0%
5 to 6 minutes	90%	0%	0%
6 to 7 minutes	100%	10%	0%
7 to 8 minutes	100%	100%	0%
8 to 10 minutes	100%	100%	0%
Over 10 minutes	100%	100%	100%

Based on this modeling, the project would exceed the 5-minute response time goal for most of the Project area, however, would not substantially exceed the goal anywhere on the Project.

The Project proposes the development of 84 single family residential lots, which would generate a population of approximately 240 residents, calculated based on a per household occupancy of 2.86 (U.S. Census Bureau 2021). In 2021, the OFD responded to a total of 19,919 calls (City of Oceanside Annual Report, 2021). The total population within the OFD service area is 174,068 (U.S. Census Bureau 2021); therefore, the estimated number of annual calls per 1,000 population is 114 (generation rate of 0.114), the Project would potentially generate up to 27 additional calls per year (roughly 2 calls per month or 0.07 call per day), most of which would be expected to be medical-related calls, consistent with typical emergency call statistics (Refer to Table 2 for call volume calculations).

Table 2. Calculated Call Volume Associated with the Guajome Crest Project

Emergency Calls per 1,000 (City of Oceanside Data)	Number of Residents	Avg. No. Calls per Year (240\1,000)x114	Avg. No. Calls per Day (27/365)
114	240 (estimate)	27	0.07

Service level requirements are not expected to be significantly impacted with the increase of approximately 2 call per month for the local fire response system. For example, OFD's Station 6's Engine currently responds to roughly 5 to 6 call per day in its primary service area. For reference, a Fire Station that responds to 5 calls per day in an urban setting is considered average and 10 calls per day is considered busy. Therefore, the Project is not expected to cause a decline in the emergency response times. The requirements described in this FPP are intended to aid firefighting personnel and minimize the demand placed on the existing emergency service system.

3.7.1 Cumulative Impacts on Fire Response

3.7.1.1 Emergency Response

The Guajome Crest Project does not strictly comply with the City's five-minute response goal in that Station 6 is just outside the distance from which it could provide five-minute response to the entire Guajome Crest Project. However, the Project is within the City's General Plan goal of providing fire stations within five miles of all structures. Response goals and performance standards are not necessarily requirements in all cases. Because Station 6 can respond to a portion of Guajome Crest' structures within five-minutes travel time, which is significantly conforming with the national standard set by NFPA, we believe it is appropriate to propose coverage from Station 6.

Because Station 6 is only incrementally beyond the five-minute response goal, it would not be justified to build a new station just to serve the Guajome Crest Project. Further, requiring the Project to fund a new fire station would not be feasible based on the small number of units that would be contributing toward the station's initial costs and ongoing operation costs. Final decision regarding the need for mitigation for not strictly complying with the OFD's response time would be at OFD's discretion.

3.8 Building Construction

This section outlines ignition-resistant construction (for all structures) that will meet and/or exceed the requirements of the OFD Fire Code. The following construction practices respond to the requirements of the Oceanside Municipal Code, OFD Fire Code, and are consistent with the 2019 California Fire and Building Codes (Chapter 7A) as amended by the City of Oceanside. 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. While these standards will provide a high level of protection to structures in this development and should reduce the potential for ordering evacuations in a wildfire, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases. It should be noted, code updates are likely to occur before the Proposed Project is fully constructed. As such, building plans must meet the "then-current" California Building and Fire Codes and City amendments in effect at the time of building plan submittal.

While the Project would not be considered a shelter-in-place development, these structures would be intended to provide temporary refuge as a contingency to evacuation should evacuation be considered less safe. The following Project hardening features are required for new development in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions from a wildfire as well as providing adequate access by emergency responders

- Application of Chapter 7A, ignition resistant building requirements.
- New Class-A fire-rated roof and associated assembly. With the proposed Class-A fire-rated roof, there will be attic or void spaces above living spaces requiring ventilation to the outside environment. The attic spaces will require either ember-resistant roof vents or a minimum 1/16-inch mesh and shall not exceed

1/8-inch mesh for side ventilation (recommend BrandGuard, O'Hagin, or similar vents). Minimum vent size is provided as smaller mesh may result in ventilation and air flow issues. All vents used for this Project will be approved by OFD;

- Minimum 1-hour rated exterior walls and doors;
- Eaves and soffits would meet the requirements of SFM 12-7A-3 or be protected by ignition-resistant materials or non-combustible construction on the exposed underside, per City Building Code;
- 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;
- For homes not facing the open space areas or adjacent to areas with reduced fuel modification zones, multi-pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257 (such as SaftiFirst, SuperLite 20-minute rated glass product), or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2.

Project proposes to provide exterior glazing in windows (and sliding glass doors, garage doors, or decorative or leaded glass doors) facing the open space and naturally vegetated areas to be dual pane with both panes tempered glass to mitigate for the reduced FMZ along the northern, western and eastern boundaries. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring code-exceeding dual pane, both panes tempered is anticipated to be an important safety measure that provides enhanced structure protection and provides mitigation for reduced fuel modification zones and limited setbacks from adjacent structures. *The window upgrade also exceeds the requirements of Chapter 7A of the CBC and providing additional protection for the structure's most vulnerable, exterior side* (CODE EXCEEDING MITIGATION MEASURE);

- All emergency escape and rescue windows must be accessible by ground ladders at a 4:1 ratio;
- The new residential design also provides an unimpeded, all-weather pathway (minimum five feet wide side yard setback requirement) on all sides of the residential structures for firefighter access around the entire perimeter of the structure;
- Doors to conform to SFM standard 12-7A-1, or would 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, Chapter 7-A. Garage doors to be solid core 1.75-inch-thick wood or metal, to comply with code;
- NFPA 13D, automatic Interior Fire Sprinkler System to installed to code for all habitable, detached, single-family residential dwellings and garages;
- Modern infrastructure, access roads, and water delivery system.

3.9 Fire Protection Systems

An approved, automatic fire sprinkler system will be installed in all new structures for the Project in accordance with minimum NFPA 13D or 13R[4] standards, 2019 CFC and CBC, and OFD Fire Code or the current, adopted Code editions at the time building permits are issued.

3.10 Smoke Alarm Systems

All residential units shall have electric-powered, hard-wired smoke detectors and fire alarm systems in compliance with the Fire Code. Hard-wired smoke alarms are to be equipped with battery backup.

3.11 Defensible Space

As indicated in preceding sections of this report, an important component of a fire protection system is the fuel modification zone (FMZ). FMZs are typically designed to gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones and irrigated zones adjacent to each other on the perimeter of the WUI exposed structures. FMZs are arguably more important when situated adjacent to older structures that were built prior to the latest ignition resistant codes and interior sprinkler requirements.

3.11.1 Oceanside Fuel Modification Zone Standards

The purpose of this section is to document OFD's standards and make them available for reference. However, we are proposing a site-specific fuel modification zone program with additional measures that are consistent with the intent of the standards. OFD is consistent with the 2019 California Fire Code (Section 4907 — Defensible Space), Government Code 51175 – 51189, and Public Resources Code 4291, which require that fuel modification zones be provided around every building that is designed primarily for human habitation or use and buildings designed specifically to house farm animals. Fuel modification consists of at least 100 feet, measured in a horizontal plane, around all structures. A typical landscape/FMZ installation consists of a 30-foot-wide, irrigated Zone 1 and a 70-foot-wide, non-irrigated, Zone 2.

3.11.2 Specific Guajome Crest Fuel Modification Zones

The Project site will have two fuel modification zones that extends across the Project site, as depicted in Figure 4. This defensible space consists of a combination of an irrigated, well-maintained landscape that consists of fire-resistant plants within 30 feet of the building (Zone 1) and a thinned landscape in the areas between 30 and 100 feet (Zone 2) from the structures (where applicable). The following are requirements of Fuel Modification Zones 1 and 2:

[4] NFPA 13R. Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies. 2019 Edition.

1. The area (Zone 1) within 30 feet of a building or structure shall be cleared of vegetation that is not fire resistant and re-planted with fire-resistant plants. In the area between 30–100 feet (Zone 2) from a building (where applicable), all dead and dying vegetation shall be removed. Native vegetation may remain in this area provided that the vegetation is modified so that combustible vegetation does not occupy more than 50% of the square footage of this area. Weeds and annual grasses shall be maintained at a height not to exceed 4 inches. The chips from chipping of vegetation that is completed on-site may remain if the chips are dispersed so they do not exceed 6 inches in depth. Trees may remain in both areas provided that the horizontal distance between crowns of adjacent trees and crowns of trees and structures is not less than 10 feet. Mature trees shall be trimmed to a height of six feet above the ground or surrounding vegetation.
2. When a building or structure in a hazardous fire area is setback less than 100 feet from the property line, the person owning or occupying the building or structure shall meet the requirements in subsection (1) above, to the extent possible, in the area between the building or structure and the property line.
3. The building official and OFD may provide lists of prohibited and recommended plants. This FPP includes a proposed list of prohibited plants (Attachment D).
4. The Guajome Crest Project is surrounded by native and non-native shrubs and chaparral intermixed within an arroyo willow riparian forest to the north, larger single-family properties directly to the west and east, an extension of the Guajome Regional Park to the south, and existing single-family residential communities farther to the north, south, east and west. The FMZ widths provided for the project vary, depending on the location within the project and the off-site adjacent landscape. For example, most of the off-site areas include larger residential lots, roadways, or other disturbances that have reduced the fuels and are maintained, thus providing an equivalent FMZ.
5. The FMZs proposed for portions of this project are not standard OFD widths as some areas include reduced Zone 1 and/or Zone 2 areas and are less than 100 total feet within the property borders. These reductions are related to grading extents, portions of the fuel modifications zones extending in riparian forest protected areas, residential lot lines, or property boundaries that restrict Zone 1 and/or Zone 2. Figure 4 illustrates the FMZ extents and Table 3 summarizes the breakdown for FMZs for the perimeter lots. The adequacy of the provided FMZ widths is based on a variety of analysis criteria including predicted flame length, fire intensity (BTUs) and duration, site topography, extreme weather, position of structures on pads, position of roadways, adjacent fuels, and type of construction.

Table 3. Guajome Crest Project Fuel Modification Zone Summary

Area	Fuel Modification Distance	Comments
Northern Edge	Zone 1 = Full 30 feet on-site and Zone 2 = 30 to 100 feet onsite and a small portion off-site	On-site FMZ Zone 1 is irrigated and FMZ Zone 2 is non-irrigated thinning, both zones will be maintained by HOA. The off-site equivalent FMZ Zone 2 includes semi-rural properties already maintained per City's weed abatement ordinance.
Eastern Edge	Zone 1 = Full 30 feet of on-site FMZ; Zone 2 = off-site equivalent FMZ ranging from 30 to 100	On-site FMZ Zone 1 is irrigated and FMZ Zone 2 is non-irrigated thinning, both zones will be maintained by HOA. The off-site equivalent FMZ Zone 2 includes semi-rural properties already maintained per City's weed abatement ordinance.
Southern Edge	Zone 1 = Full 30 feet of on-site FMZ; Zone 2 = 30 to 100 feet onsite as well as a portion off-site	On-site FMZ Zone 1 is irrigated and FMZ Zone 2 is non-irrigated thinning, both zones will be maintained by HOA. The off-site equivalent FMZ Zone 2 includes Guajome Lake Road.
Western Edge	Zone 1 = Full 30 feet of on-site FMZ; Zone 2 = off-site equivalent FMZ ranging from 30 to 100	On-site FMZ Zone 1 is irrigated and would be maintained by HOA. Off-site FMZ Zone 2 includes semi-rural properties already maintained per City's vegetation management standards.

Based on the predicted fire intensity and duration along with flame lengths for this project site and the provided FMZs, the highest concern is considered to be from firebrands or embers as a principal ignition factor. To that end, this site, based on its location and ember potential, is required to include the latest ignition and ember resistant construction materials and methods for roof assemblies, walls, vents, windows, and appendages, as mandated by the City's Fire and Building Codes (Chapter 7A).

Additionally, from the exterior wall surface of the buildings extending 5 feet on a horizontal plane shall be constructed of continuous hardscape or limited fire-resistant plantings acceptable to the FAJH. Vegetation in this space shall not exceed six-inches to 18-inches in height and irrigation is required. Additionally, this space shall be free of combustible materials and the use of mulch is prohibited.

3.12 Roadway Fuel Modification Zones

Roadway fuel modification is at a minimum 10 feet on each side of a roadway and larger where roads front private lots and front yard landscaping provides the equivalent of fuel modification zone. All fire access roads shall have an unobstructed vertical clearance of not less than 13 feet 6 inches.

3.13 Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustion) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the Undesirable Plant List

(Attachment D) are unacceptable from a fire safety standpoint, and will not be planted on the site or allowed to establish opportunistically within fuel modification zones or landscaped areas.

3.14 Fuel Modification Area Vegetation Maintenance

All fuel modification area vegetation management shall occur as-needed for fire safety, compliance with the FMZ requirements detailed in this report, and as determined by the OFD. The Project Homeowners Association (HOA) shall be responsible for all vegetation management within the common areas and Zone 2 throughout the project site, in compliance with the requirements detailed herein and OFD requirements. The HOA shall be responsible for ensuring long-term funding and ongoing compliance with all provisions of this report. The homeowners are responsible for ongoing Zone 1 maintenance requirements in rear yards, from the structure to the rear property line or wall/fence. All homeowners will sign acknowledgement of maintenance requirements and the HOA will include language in the CC&R's outlining these restrictions. The HOA will be responsible for enforcing the landscape annually and will retain a qualified WUI FMZ inspector who will assess the FMZs and prepare a report for submittal to the OFD. All fuel modification area vegetation management shall be completed annually no later than June 1st of each year and more often as needed for fire safety, as determined by the OFD.

3.15 Environmentally Sensitive Areas/Riparian Areas

Once the fuel modification zones are in place, they will extend to the property line and cannot be extended beyond the property line. Off-site, adjacent lands are preserved open space and environmentally sensitive areas. Any disturbance within these areas would require approval from landowners and potentially from appropriate resource agencies.

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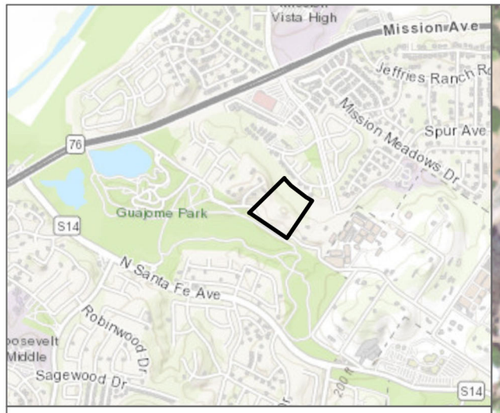

Project Boundary

Land Use

- Development
- Manufactured Slope
- Roadway
- Water Quaility Basin

Fuel Modification Zone

- Zone 1 (irrigated, 0-30')
- Zone 2 (non-irrigated thinning 30'-100')
- Offsite Equivalent Fuel Modification Area
- FMZ Dimensions

SOURCE: AERIAL-NAIP 2020

DUDEK

0 70 140 Feet

FIGURE 4

Fuel Modification Plan

Fire Protection Plan for the Guajome Crest Project

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3.16 Anticipated Fire Behavior

3.16.1 Fire Behavior Computer Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected adjacent to the Proposed Project given characteristic site features such as topography, vegetation, and weather. The BehavePlus 6.0. fire behavior modeling software package was utilized to analyze fire behavior for the wildland fuels around the perimeter of the property. Results are provided below and a more detailed presentation of the BehavePlus analysis, including fuel moisture and weather input variables, is provided in Attachment C.

3.16.2 BehavePlus Fire Behavior Modeling Effort

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 north, northwest, northeast, southeast 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), as well as crown fires (critical surface intensity (Btu/ft/s), critical surface flame length (feet), transition ratio (ratio: surface fireline intensity divided by critical surface intensity), transition to crown fire (yes or no), crown fire rate of spread (mph), critical crown rate of spread (mph), active ratio (ratio: crown fire rate of spread divided by critical crown fire rate of spread), active crown fire (yes or no), and fire type (surface, torching, conditional crown, or crowning)) for a fire going through the arroyo willow riparian forest/riparian areas north, south, and west of the Project site. 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 three 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 through the approximately 25-foot-tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation north/northwest of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a car fire originating along Highway 76 or a structure fire originating in the single-family community north of the Project site. This

type of fire would typically spread by jumping from crown to crown or downslope through the riparian vegetation relatively slow towards the northwestern portion of the development.

- **Scenario 2:** A fall, off-shore fire (97th percentile weather condition) burning through the approximately 25-foot-tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation north/northeast of the Proposed Project site. The terrain is relatively flat before reaching the shrub chaparral (approximately 3% to 16% slope) with potential ignition sources from a structure fire originating in the single-family community north of the Project site. This type of fire would typically spread by jumping from crown to crown or downslope through the riparian vegetation relatively slow towards the northern portion of the development.
- **Scenario 3:** A fall, off-shore fire (97th percentile weather condition) burning through the approximately 25-foot-tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation south/southeast of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a structure fire originating in the single-family communities south of the Project site. This type of fire would typically spread by jumping from crown to crown or through the riparian vegetation relatively slow towards the southern portion of the development.
- **Scenario 4:** A summer, on-shore fire (50th percentile weather condition) burning through the approximately 25-foot-tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation south/southwest of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a car fire originating along Highway 76 or a structure fire originating in the single-family communities south of the Project site. This type of fire would typically spread by jumping from crown to crown or through the riparian vegetation relatively slow towards the southwestern portion of the development.

Table 4 provides a description of the four existing fuel models observed in the vicinity of the site that were subsequently used in the analysis for this project. A total of four fire modeling scenarios were completed for the Project area. These modeling scenario locations were selected based on the small possibility of fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenarios 2 and 3) and an on-shore weather pattern (fire scenarios 1 and 4). Dudek also conducted modeling of the site for post-Fuel Modification Zones' (FMZ) recommendations for this project (Refer to Table 5 for post-FMZ fuel model descriptions). Fuel modification includes establishment of irrigated and thinned zones on the periphery of the single-family residential structures as well as interior landscape requirements. For modeling the post-FMZ treatment condition, fuel model assignments were re-classified for the FMZ 1 (Fuel Model Gr1) and FMZ 2 (Fuel Models Gr2 and Sh2).

Table 4. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM9	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	<2.0 ft.
Sh4	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh5	High-load, Dry Climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	>3.0 ft.

Table 5. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr1	Short, sparse, dry climate grasses	Fuel Modification Zone 1: irrigated landscape throughout the development	<1.0 ft.
Gr2	Low-load, dry climate grasses	Fuel Modification Zone 2: 50% thinning of brush along south, east and western portions of the development	<2.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Fuel Modification Zone 2: 50% thinning of brush along the northern portion of the development	<2.0 ft.

3.16.3 Fire Behavior Modeling Results

The results presented in Tables 6 and 7 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 6, wildfire behavior adjacent to the Project site is expected to be primarily of moderate to high intensity through the non-maintained surface shrub and chaparral dominated fuels within the arroyo willow riparian forest of the Guajome Lake areas adjacent to the northern portion of the Project site. Worst-case fire behavior under peak weather conditions (represented by Fall Weather, Scenario 2) is anticipated to be a wind-

driven fire from the east/northeast during the fall. Under such conditions, expected surface flame length are expected to reach approximately 38 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 15,726 BTU/feet/second with moderate spread rates of 5.7 mph and could have a spotting distance up to 2.2 miles away. Because embers could spot within 2.2 miles of the Project site, a crown fire could potentially occur within the small arroyo willow riparian forest area downslope and north of the Project development area. Potential crown fire flame lengths could reach approximately 100+ feet with sustained winds of 16 mph with moderately slow crown spread rates of 3.8 mph.

Wildfire behavior through the non-maintained surface shrub and chaparral dominated fuels within the arroyo willow riparian forest of the Guajome Lake areas adjacent to the northern portion of the Project site being fanned by 16 mph sustained, from the north/northwest and pushed by on-shore ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions a surface vegetation fire could have flame lengths between approximately 2 feet and 7 feet in height and spread rates between 0.1 and 0.3 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.1 to 0.3 miles. A crown fire could potentially reach 65 feet under these conditions.

As depicted in Table 7, post development fire behavior expected in the irrigated and replanted with plants that are acceptable with the Oceanside Fire Department (OFD) (FMZ Zone 1 – Gr1), as well as in an area with thinning of the existing shrubs (FMZ Zone 2 – Sh2/Gr2) under peak weather conditions experience a significant reduction in flame length and intensity. The approximately 38-foot flame lengths predicted for non-maintained chaparral vegetation during pre-treatment modeling for fire scenario 2 are reduced to approximately 14 feet at the outer edges of the FMZ (Zone 2) and to 2.6 feet by the time the inner portions of the FMZ (Zone 1) are reached. During on-shore weather conditions, a fire approaching from the north/northwest towards the development footprint would be reduced from approximately 7-foot tall flames to less than 1.2-feet tall for Zone 1 and 1.3 feet for Zone 2, with low fire intensity and spotting distances due to the higher live and dead fuel moisture contents. 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 Zones 1 and 2). Therefore, the FMZs proposed for the Guajome Crest Residential Development Project are approximately 2.5-times the flame length of the worst case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 6: RAWS BehavePlus Fire Behavior Model Results – Existing Conditions

Fire Scenario	Flame Length[1] (feet)	Spread Rate[1] (mph[5])	Fireline Intensity[1] (Btu/ft/s)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (mph)	Crown Fire Flame Length (feet)
Scenario 1: 3% slope; Summer on--shore summer wind (50th percentile) – Pre-FMZ (North/northwest of Project site)							
Willow Forest/Riparian Habitat (FM9)	2.9	0.1	58	0.2	No	0.3	63.7
Moderate-load shrubs (Sh2)	1.3	0.0	10	0.1	Crowning [4]	0.3	63.7
Riparian Habitat - Timber Shrub (Sh4)	2.2	0.1	32	0.1	No	0.3	63.3
High-load shrubs (Sh5)	6.4	0.3	317	0.3	Crowning [4]	0.3	65.1
Scenario 2: 16% slope; Fall off-shore extreme wind (97th percentile) – Pre-FMZ (North/northeast of Project site)							
Willow Forest/Riparian Habitat (FM9)	4.5 (10.6')[6]	0.2 (1.5)	147 (969)	0.3 (1.0)	No	0.8 (3.8)	111.0
Riparian Habitat - Timber Shrub (Sh4)	11.1 (22.5)[6]	0.8 (4.0)	1,056 (4,951)	0.6 (1.5)	No	0.8 (3.8)	113.7
High-load shrubs (Sh5)	20.9 (38.3)[6]	1.5 (5.7)	4,208 (15,726)	0.9 (2.3)	Crowning [4]	0.8 (3.8)	120.1
Scenario 3: 3% slope; Fall off-shore extreme winds (97th percentile) – Pre-FMZ (South/southeast of Project site)							
Willow Forest/Riparian Habitat (FM9)	4.4 (10.6')[6]	0.2 (1.5)	144 (966)	0.3 (1.0)	No	0.8 (3.8)	111.0
Moderate-load shrubs (Sh2)	7.1 (14.4)[6]	0.2 (0.9)	404 (1,876)	0.6 (1.5)	Crowning [4]	0.8 (3.8)	117.5
Riparian Habitat - Timber Shrub (Sh4)	11.0 (22.5)[6]	0.8 (3.9)	1,032 (4,928)	0.9 (2.3)	No	0.8 (3.8)	113.7
Scenario 4: 3% slope; Summer on-shore summer winds (50th percentile) – Pre-FMZ (South/southwest of Project site)							
Willow Forest/Riparian Habitat (FM9)	2.9	0.1	58	0.2	No	0.3	72.8
Moderate-load shrubs (Sh2)	1.3	0.0	10	0.1	Crowning [4]	0.3	72.8
Riparian Habitat - Timber Shrub (Sh4)	2.2	0.1	32	0.1	No	0.3	72.4
High-load shrubs (Sh5)	6.4	0.3	317	0.3	Crowning [4]	0.3	74.1

Note:

1. Wind-driven surface fire.
2. Riparian overstory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3. A surface fire in the mixed sycamore riparian forest would transition into the tree canopies generating flame lengths higher than the average tree height (25 feet). Viable airborne embers could be carried downwind for approximately 1.0 mile and ignite receptive fuels.
4. Crowning= fire is spreading through the overstory crowns.
5. MPH=miles per hour.
6. 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 7: RAWS BehavePlus Fire Behavior Model Results – Post Project Conditions

Fire Scenario	Flame Length (feet)	Spread Rate (mph)[5]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles) [6]
Scenario 1: 3% slope; Summer on--shore summer wind (50th percentile) – Post-FMZ (North/northwest of Project site)				
FMZ Zone 1 (Gr1)	1.2	0.1	8	0.1
FMZ Zone 2 (Sh2)	1.3	0.0	10	0.1
Scenario 2: 16% slope; Fall off-shore extreme wind (97th percentile) – Post-FMZ (North/northeast of Project site)				
FMZ Zone 1 (Gr1)	1.9 (2.9)	0.3 (0.3)	44 (44)	0.2 (0.3)
FMZ Zone 2 (Sh2)	7.8 (15.7)	0.2 (0.9)	414 (1,887)	0.3 (1.1)
Scenario 3: 3% slope; Fall off-shore extreme winds (97th percentile) – Post-FMZ (South/southeast of Project site)				
FMZ Zone 1 (Gr1)	2.6 (2.6)	0.3 (0.3)	44 (44)	0.2 (0.3)
FMZ Zone 2 (Gr2)	7.4 (11.6)	1.2 (3.1)	442 (1,165)	0.3 (0.9)
Scenario 4: 3% slope; Summer on-shore summer winds (50th percentile) – Post-FMZ (South/southwest of Project site)				
FMZ Zone 1 (Gr1)	1.2	0.1	8	0.1
FMZ Zone 2 (Gr2)	4.0	0.4	118	0.2

[5] mph = miles per hour
[6] Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

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Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM9	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	<2.0 ft.
Sh4	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh5	High-load, Dry Climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	>3.0 ft.

Table 2. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr1	Short, sparse, dry climate grasses	Fuel Modification Zone 1: irrigated landscape throughout the development	<1.0 ft.
Gr2	Low-load, dry climate grasses	Fuel Modification Zone 2: 50% thinning of brush along south, east and western portions of the development	<2.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Fuel Modification Zone 2: 50% thinning of brush along the northern portion of the development	<2.0 ft.

Table 3: Variables Used for Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	FM9, Sh2, Sh4, and Sh5	FM9, Sh2, Sh4, and Sh5
1 h fuel moisture	11%	3%
10 h fuel moisture	12%	5%
100 h fuel moisture	17%	10%
Live herbaceous moisture	66%	30%
Live woody moisture	133%	60%
20 ft. wind speed	16 mph (sustained winds)	16 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	255 and 290	35 and 140
Wind adjustment factor	0.4	0.4
Slope (uphill)	3%	3 to 16%

SOURCE: AERIAL- NAIP 2020

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0 150 300 Feet

FIGURE 5

BehavePlus Analysis

Fire Protection Plan for the Guajome Crest Project

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4 Alternative Materials and Methods of Non-Conforming Fuel Modification

As previously mentioned, due to site constraints, it is not possible to achieve a full 100 feet FMZ width for every Project lot, specifically in the northwestern portion of the development adjacent to the riparian forest habitat and along the western and eastern property boundaries. As such, this Fire Protection Plan Letter Report provides both City and State fire and building code required elements for constructing a residential structure in a very high fire hazard severity area, as well as enhanced, code exceeding mitigation measures for the lots with non-conforming fuel modifications zones. The code exceeding mitigation measures are customized for this Project site based on the fire behavior modeling analysis results and site fire environment evaluation and focus on meeting or exceeding the fire safety provided by a City defined, full 100 feet of fuel modification zone.

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

4.1 Additional Structure Protection Measures and Justification

The following **are City and State fire and building code required measures for** building in wildland urban interface areas.

1. The proposed Guajome Crest Project achieves a minimum 30 feet of on-site FMZ for every lot, and the lots along the northern property boundary (minus lots in the northwestern corner adjacent to the riparian forest habitat) achieve a full 100 feet of FMZ (30 feet irrigated Zone 1 and 70 feet of a Zone 2). Lots within the northwestern corner of the development, as well as lots adjacent to the eastern, western, and southern property boundaries are unable to achieve a full 100 feet of FMZ within the property limits for various reasons; these lots are able to achieve between 30 and 100 feet of FMZ and will be required to implement the **code exceeding mitigation measures** described below.

2. Each of the new single-family residential structures within the proposed Guajome Crest Project site will be code compliant, ignition resistive, and fully-sprinklered in compliance with applicable portions of the City of Oceanside Municipal Code, as well as with the 2019 edition of the California Building Code (CBC), Chapter 7A (or then current edition); 2019 edition of the California Fire Code (CFC), Chapter 49 (or then current edition); and 2019 edition of the California Residential Code (CRC), Section 237 (or then current edition), as adopted by the City;

3. NFPA 13D Automatic, interior fire sprinkler system to code for occupancy type

4. Zone 1 requires a minimum 30 feet of irrigated landscape planted with drought-tolerant, fire resistive plants. No undesirable, highly flammable plant species shall be planted. The landscaping will be routinely maintained and will be watered by an automatic irrigation system that will maintain healthy vegetation with high moisture contents that would prevent ignition by embers from a wildfire;

5. The new residential design also provides an unimpeded, all-weather pathway (minimum five feet wide side yard setback requirement) on all sides of the residential structures for firefighter access around the entire perimeter of the structure;

The following **code exceeding mitigation measures** are being provided for nonconforming **lots unable to achieve a full 100 feet of fuel modification or are adjacent to the naturally vegetated coastal sage scrub habitat in the northern portion of the property.** These code exceeding mitigations were found to meet or exceed the code required 100 feet fuel modification zones through science and application and were accepted by numerous fire agencies throughout California:

1. Because of riparian forest habitat constraints in the northwestern portion of the development and property boundary constraints along the western and eastern boundaries, the Project proposes to provide exterior glazing in windows (and sliding glass doors, garage doors, or decorative or leaded glass doors) facing the open space/naturally vegetated areas or reduced fuel modification zones in the northwestern portion of the development and along the western and eastern property boundaries to be dual pane with both panes tempered glass to mitigate for the reduced FMZ. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring code-exceeding dual pane, both panes tempered is anticipated to be an important safety measure that provides enhanced structure protection and provides mitigation for reduced fuel modification zones and limited setbacks from adjacent structures. *The window upgrade also exceeds the requirements of Chapter 7A of the CBC and providing additional protection for the structure's most vulnerable, exterior side* **(CODE EXCEEDING MITIGATION MEASURE);**

2. Wildland exposed sides of the structures along the northern portion of the Project site shall also include 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas. 5/8-inch Type X fire rated gypsum sheathing is required to be manufactured in accordance with established ASTM standards defining type X wallboard sheathing as that which provides not less than one-hour fire resistance when tested in specified building assemblies and has been tested and certified as acceptable for use in a one-hour fire rated system. CertainTeed Type X Gypsum Board has a Flame Spread rating of 15 and Smoke Developed rating of 0, in accordance with ASTM E 84, (UL 723, UBC 8-1, NFPA 255, CAN/ULC-S102); UL classified for Fire Resistance (ANSL/UL 263; ASTM E119) and listed under UL File No. CKNX.R3660 (Certainteed, 2021). Please refer to the specification in Appendix H for a more detailed description of CertainTeed 5/8-inch Type X Fire Rated Gypsum sheathing (or similar product) **CODE EXCEEDING MITIGATION MEASURE;**

3. Annual FMZ Inspections. Yearly fuel modification maintenance shall be required by the Project's HOA and each individual property owner. The communities HOA as well as individual property owners, shall be responsible for obtaining an FMZ inspection and report from a qualified OFD-approved 3rd party inspector in May of each year certifying that vegetation management activities throughout the Project site and within each individual lot have been performed pursuant to this Fire letter. This includes verifying that wood bark and other combustible mulches shall not be used within the first 5 feet from the homes. See details regarding the fuel modification zone vegetation maintenance program below **(CODE EXCEEDING MITIGATION MEASURE)**.

4.2 Justification for Reduced Fuel Modification Zones

As presented in this FPP Letter Report, the FMZs provided for the proposed Project are not standard FMZs. Rather, several lots cannot achieve the required 100 feet of FMZ due to lot constraints and Project boundary limitations. An important component of a fire protection system for this Project is the provision for ignition-resistant construction and modified vegetation buffers. The structure ignition resistance standards detailed in the 2019 California Fire Code and Chapter 7A of the 2019 California Building code (or current editions at the time of construction) will enable the new single-family residential structures to withstand the type of wildfire that may occur in the fuels outside the development footprint. Fuel modification zone requirements, including a minimum 30 feet of fully irrigated landscapes with drought-tolerant, fire resistive plantings (Zone 1) and a 70-foot zone (Zone 2), will provide a reasonable level of wildfire protection to the ignition resistant structure. Additionally, undesirable, highly flammable plant species shall not be planted in fuel modification zones. For lots along the eastern and western property boundaries and that are unable to achieve the full 100-foot FMZ, as well as for lots in the northern portion of the project site adjacent to the naturally vegetated coastal sage scrub and riparian forest habitats, windows (and sliding glass doors, garage doors, or decorative or leaded glass doors) facing the open space and naturally vegetated areas will be required to be dual pane with both panes tempered glass. Additionally, the exposed sides of structures in the northern portion of the Project site shall include 5/8-inch Type X fire rated gypsum sheathing applied behind the exterior covering or cladding (stucco or exterior siding) on the exterior side of the framing, from the foundation to the roof for a facade facing the open space and naturally vegetated areas. The installation of the 5/8-inch Type X fire rated gypsum sheathing increases a wall's fire rating to a minimum of 1 hour, from the 30-minute rating for standard ½-inch drywall. Also, yearly fuel modification maintenance shall be required for all lots by the Project's HOA and each individual property owner. The communities HOA as well as individual property owners, shall be responsible for obtaining an FMZ inspection and report from a qualified OFD-approved 3rd party inspector in May of each year. Dudek has found that the code exceeding mitigation measures provided have been used for many other similar successful projects and demonstrate that they meet or exceed the code required 100 feet fuel modification zone. Fire behavior modeling, as previously presented, was used to predict flame lengths and was not intended to determine sufficient fuel modification zone widths. However, the results of the fire modeling provide important fire behavior projections, which is key supporting information for determining buffer widths that would minimize structure ignition and provide "defensible space" for firefighters. With that said, it is anticipated that the proposed structures will be able to

withstand the short duration, low to moderate intensity fire and ember shower that is projected from off-site, adjacent fuels based on several factors, as discussed below.

Structure Ignition

There are three primary concerns for structure ignition: 1) radiant and/or convective heat, 2) burning embers, and 3) direct flame contact (NFPA 1144 2008, Ventura County Fire Protection District 2011, IBHS 2008, and others). Burning embers have been a focus of building code updates for at least the last decade, and new structures in the WUI built to these codes have proven to be very ignition resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the Chapter 7A exterior fire ratings for walls, windows and doors. Additionally, provisions for modified fuel areas separating wildland fuels from structures have reduced the number of fuel-related structure losses. As such, most of the primary components of the layered fire protection system provided for the Guajome Crest Project are required by the City of Oceanside and State codes but are worth listing because they have been proven effective for minimizing structural vulnerability to wildfire and, with the inclusion of required interior sprinklers (required in the 2013 Building/Fire Code update), of extinguishing interior fires, should embers succeed in entering a structure. Even though these measures are now required by the latest Building and Fire Codes, at one time, they were used as mitigation measures for buildings in WUI areas, because they were known to reduce structure vulnerability to wildfire. These measures performed so well, they were adopted into the code. The following project features are required for this new development in WUI areas and form the basis of the system of protection necessary to minimize structural ignitions as well as providing adequate access by emergency responders:

- Application of Chapter 7A, ignition resistant building requirements
- Minimum 1-hour rated exterior walls and doors
- Multi- pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257, or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2. For lots unable to achieve the full 100 feet of FMZs and/or exposed to naturally vegetated open space areas, dual pane dual tempered glass windows will be installed on the exposed sides of the new residential structures. Dual pane, one pane tempered glass has been shown during testing and in after fire assessments to significantly decrease the risk of breakage and ember entry into structures. Therefore, requiring code-exceeding dual pane, both panes tempered is anticipated to be an important safety measure that provides enhanced structure protection and provides mitigation for reduced fuel modification zones and limited setbacks from adjacent structures. *The window upgrade also exceeds the requirements of Chapter 7A of the CBC and providing additional protection for the structure's most vulnerable, exterior side*
- Ember resistant vents (recommend BrandGuard or similar vents)

- NFPA 13D Automatic, interior fire sprinkler system to code for occupancy type.

Fuel Separation

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

These results support Cohen's (2000) findings that if a community's homes have a sufficiently low home ignitability, the community can survive exposure to wildfire without major fire destruction. This provides the option of mitigating the wildland fire threat to homes/structures at the residential location without extensive wildland fuel reduction. Cohen's (1995) studies suggest, as a rule-of-thumb, larger flame lengths and widths require wider fuel modification zones to reduce structure ignition. For example, valid SIAM results indicate that a 20-foot-high flame has minimal radiant heat to ignite a structure (bare wood) beyond 33 feet (horizontal distance). Whereas, a 70-foot-high flame requires about 130 feet of clearance to prevent structure ignitions from radiant heat (Cohen and Butler 1996). This study utilized bare wood, which is more combustible than the ignition resistant exterior walls for structures built today. Obstacles, including steep terrain and non-combustible fire walls can block or deflect all or part of the radiation and heat, thus making narrower fuel modification distances possible. Fires in ravines, chutes, coves, v-drainages, and steep-sided canyons can, under specific conditions, result in an upward draft, similar to a fireplace chimney. Chimneys on the landscape are created when air is drawn in from lower elevations, creating strong upslope drafts. The result can be acceleration of radiant and convective heat as well as actual fire spread, similar to opening the damper in a fireplace chimney. Areas where the terrain includes a restriction or narrowing can result in this type of acceleration. The terrain features adjacent the Project site include few mild examples of these "chimneys" that are not expected to significantly alter fire behavior.

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5 Emergency Pre-Planning – Evacuation and Wildfire Education Program

Early evacuation for any type of wildfire emergency at the Project site is the preferred method of providing for resident safety, consistent with the OFD's current approach within San Diego County. As such, the Project would formally adopt, practice, and implement a "Ready, Set, Go!" approach to evacuation. The "Ready, Set, Go!" concept is widely known and encouraged by the State of California and most fire agencies. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing the 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 area activities during periods of fire weather extremes.

Based on the developed landscapes throughout the area and lack of wildlands, Project-provided road enhancements/widening of the existing dirt-road Guajome Lake Road, additional fire hydrants provided throughout the Project site, and minimal overall Project size and limited number of new residents and vehicles to the area, the reduced fuel modification zones is considered satisfactorily addressed, and the Project is considered to meet the intent of the code.

This FPP does not provide a guarantee that all residents and visitors will be safe at all times because of the enhanced fire protection features it requires. There are many variables that may influence overall safety. This FPP provides requirements and recommendations for implementation of the latest fire protection features that have proven to result in reduced wildfire related risk and hazard. Even then, fire can compromise the fire protection features through various, unpredictable ways. The goal is to reduce the likelihood that the system is compromised through implementation of the elements of this FPP and a regular occurring maintenance program.

For maximum benefit, the developer, contractors, engineers, and architects are responsible for proper implementation of the concepts and requirements set forth in this report. Homeowners are responsible to maintain their structures and lots as required by this report, the applicable City Fire and Building Codes.

Please feel free to contact me regarding this letter FPP and its conclusions.

	12.23.2022	Noah Stamm, Fire Protection Planner III
Prepared by (Signature)	Date	Printed Name, Title
	12.23.2022	Michael Huff, Principal
Prepared by (Signature)	Date	Printed Name, Title
Project Applicant (Signature)	Date	Printed Name, Title

Att: *Figure 1 – Project Vicinity*
Figure 2 – Project Site Plan
Figure 3 – Project Biological Resource Map
Figure 4 – Project Fuel Modification Zone Plan
Figure 5 – Fire Behavior Modeling Map
Attachment A – Photograph Log
Attachment B – Fire History Map (5-mile buffer)
Attachment C – Fire Behavior Modeling Summary Report
Attachment D – Prohibited Plant List

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Attachment A

Representative Photographs

Photograph 1: Photograph looking west/northwest along the southern property boundary, standing in Guajome Lake Road, near the proposed Project entrance. Note the existing residential community along the western property boundary.

Photograph 2: Photograph looking northwest across the Project development area, standing in Guajome Lake Road. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 3: Photograph looking north across the Project development area, standing in Guajome Lake Road. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 4: Photograph looking east along the southern property boundary, standing in Guajome Lake Road, near the proposed Project entrance. Note: the existing residential lot along the eastern property boundary.

Photograph 5: Photograph looking southeast across the Project development area towards the southeast corner of the property, standing in the center of the southern portion of the development. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 6: Photograph looking south across the Project development area towards the south property boundary, standing in the center of the southern portion of the development. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 7: Photograph looking southwest across the Project development area towards the southwest portion of the property, standing in the center of the southern portion of the development. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 8: Photograph looking west across the Project development area towards the west/southwest corner of the property, standing in the center of the southern portion of the development. Note: the southern portion of the Project site (developed area) consists of sparse/low-load grass vegetation.

Photograph 9: Photograph looking west/northwest across the Project development area towards the western property boundary, standing in the center of the southern portion of the development. Note: the existing single-family residential homes along the western property boundary.

Photograph 10: Photograph looking west across the Project development area towards the western property boundary, standing in the center of the southern portion of the development. Note: the existing single-family residential homes along the western property boundary.

Photograph 11: Photograph looking northwest across the Project development area towards the northwestern portion of the property site, standing in the center of the property along the existing dirt driveway. Note: the sage scrub vegetation and riparian habitat located along the northern portion of the development.

Photograph 12: Photograph looking north across the Project development area towards the north portion of the property site. Note: the sage scrub vegetation and riparian forest located along the northern portion of the development, as well as the residential community to the north of the Project site.

Photograph 13: Photograph looking northwest towards the northeast portion of the property site. Note: the sage scrub vegetation and riparian forest located along the northern portion of the development, as well as the residential community to the north of the Project site.

Photograph 14: Photograph looking northwest down the existing driveway that leads to the structure located in the northwest corner of the property. Note: the sage scrub vegetation and riparian forest located along the northern portion of the development, as well as the residential community to the north of the Project site.

Photograph 15: Photograph looking east across the Project development area towards the eastern property boundary. Note: the existing single-family residential homes along the eastern property boundary.

Photograph 16: Photograph looking southeast across the Project development area towards the southeastern corner of the development. Note: the existing single-family residential homes along the eastern property boundary.

Photograph 17: Photograph looking north along the eastern property boundary and the driveway to the existing single-family residential homes along the eastern property boundary.

Photograph 18: Photograph looking east down Guajome Lake Road (currently a dirt road) and the driveway entrance to the existing single-family residential homes along the eastern property boundary.

Photograph 19: Photograph looking west up Guajome Lake Road (currently a dirt road) towards the western side of the development.

Photograph 20: Photograph looking west up Guajome Lake Road (currently a dirt road) towards the intersection with Albright Street and the sage scrub and riparian vegetation south of the Project site.

Photograph 21: Photograph looking northwest up Guajome Lake Road (currently a dirt road) towards the western side of the development.

Photograph 22: Photograph looking north/northeast at the existing driveway entrance into the Guajome Crest property located at 2839 Guajome Lake Road.

Photograph 23: Photograph looking west up Guajome Lake Road (currently a dirt road) towards the intersection with Albright Street and the sage scrub and riparian vegetation south of the Project site.

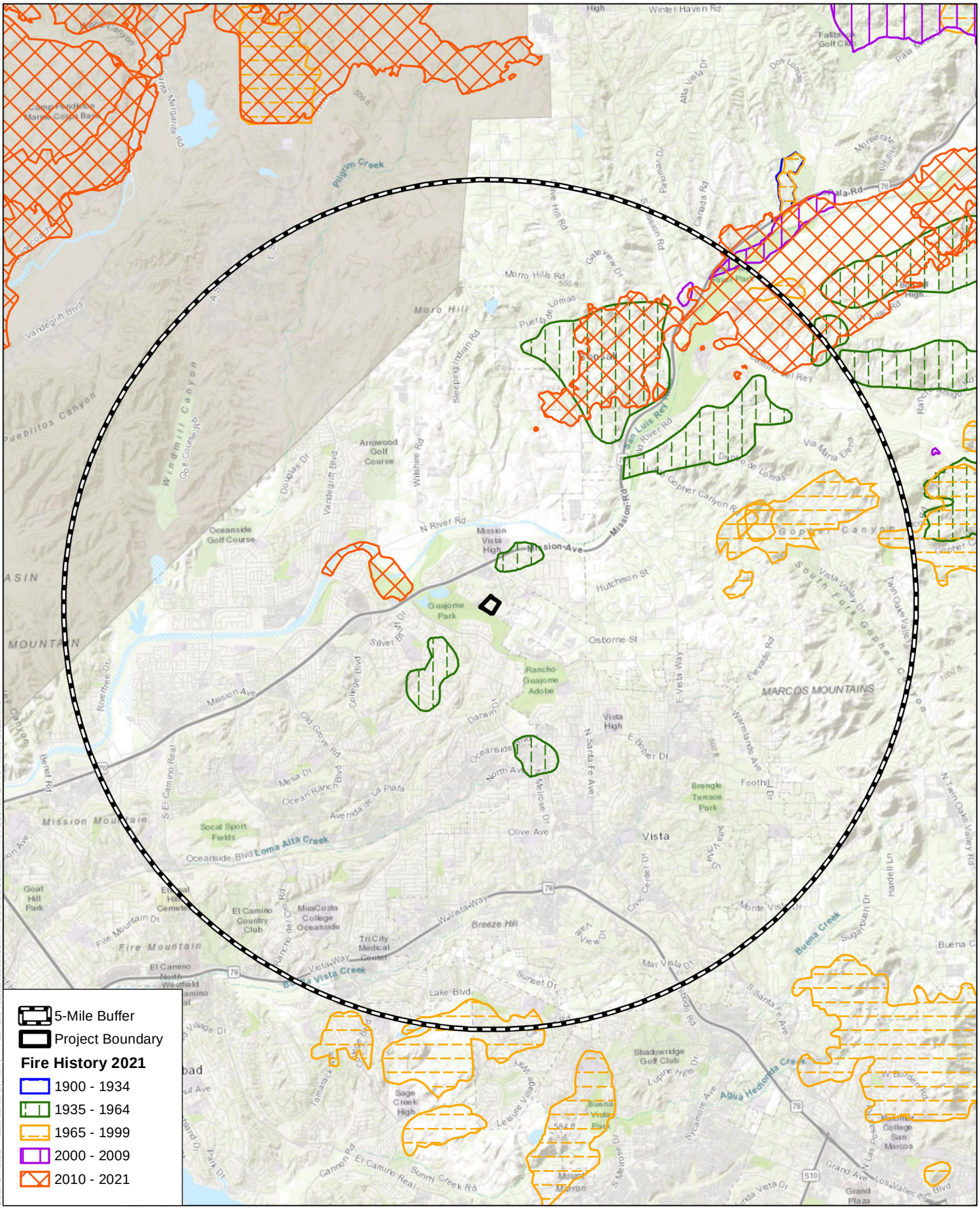
Photograph 24: Photograph looking west down the paved Guajome Lake Road towards the intersection with Old Ranch Road and the residential community west of the Project site. Note: Guajome Regional Park is located to the south.

Photograph 25: Photograph looking south into Guajome Regional Park.

Photograph 26: Photograph looking northwest down the Guajome Lake Road towards the intersection with Highway 76 and the entrance into the Guajome community. Note: Guajome Lake is located to the northwest.

Attachment B

Fire History Map



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SOURCE: BASE MAP- ESRI MAPPING SERVICE; FIRE DATA-CALFIRE 2021

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ATTACHMENT B

Fire History Map

Fire Protection Plan for the Guajome Crest Project

Attachment C

Fire Behavior Analysis Summary

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 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

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.

- Timber-understory Models TU1 through TU5
- Timber litter Models TL1 through TL9
- Slash blowdown Models SB1 through SB4

BehavePlus software was used in the development of the Guajome Crest Project (Proposed Project) Fire Protection Plan (FPP) in order to evaluate potential fire behavior for the Project 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 Project site in Oceanside, California. Refer to Figure 5, *Fire Behavior Modeling Map* for fire modeling scenario locations. As is customary for this type of analysis, four fire scenarios were evaluated, including two summer, onshore weather condition (north and west of the Project Site) and two extreme fall, offshore weather condition (east/southeast and south of the Project Site). The Project site is considered an infill project and is surrounded by a existing residential communities to the north, south, east, and west, as well as Guajome Lake to the west and the Guajome Regional Park to the west and south. With that said, fuels and terrain within and adjacent to the Project development area, although unlikely, could produce flying embers that may affect the Project, but defenses have been built into the residential 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 would have the potential to affect the Project's structures from a radiant and convective heat perspective as well as from direct flame impingement. The 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 the Guajome Crest Project 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 the low-load grass fuels (Fuel Model Gr1), moderate- to- high-load shrubs and chaparral fuels (Fuel Models Sh2 and Sh5), and non-native riparian areas intermixed with southern arroyo willow riparian forest fuels (Fuel Model Sh4) found throughout the Project development area and within adjacent areas to the west and south of the Project site. These fuel types can produce flying embers that may affect the project, but defenses have been built into the structure(s) to prevent ember penetration. Table 1 provides a description of the four existing fuel models observed in the vicinity of the site that were subsequently used in the analysis for this project. A total of four fire modeling scenarios were completed for the Project area. These modeling scenario locations were selected based on the small possibility of fire approaching from these directions during a Santa Ana wind-driven fire event (fire scenarios 2 and 3) and an on-shore weather pattern (fire scenarios 1 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 irrigated and thinned zones on the periphery of the single-family residential structures as well as interior landscape requirements. For modeling the post-FMZ treatment condition, fuel model assignments were re-classified for the FMZ 1 (Fuel Model Gr1) and FMZ 2 (Fuel Models Gr2 and Sh2).

Table 1. Existing Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
FM9	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	<2.0 ft.
Sh4	Arroyo Willow and riparian forest habitat	Represents the arroyo willow and riparian habitat that exist nearby and directly adjacent to the northern portion of the Project site.	>8.0 ft.
Sh5	High-load, Dry Climate shrubs	Represents the vegetation communities located throughout the adjacent areas surrounding the Project without maintenance.	>3.0 ft.

Table 2. Post-development Fuel Model Characteristics

Fuel Model Assignment	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr1	Short, sparse, dry climate grasses	Fuel Modification Zone 1: irrigated landscape throughout the development	<1.0 ft.
Gr2	Low-load, dry climate grasses	Fuel Modification Zone 2: 50% thinning of brush along south, east and western portions of the development	<2.0 ft.
Sh2	Moderate-load, Dry climate shrubs	Fuel Modification Zone 2: 50% thinning of brush along the northern portion of the development	<2.0 ft.

2.2 Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Natural slope values ranging from 3% to 16% 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%) or 50% (2:1 Manufactured slopes), as presented on the project's site plan.

2.3 Weather Analysis

Historical weather data for the Oceanside 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 Wire Mountain RAWS (ID number 045749)[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 2016 and 2020 (extent of available data record) for 97th percentile weather conditions and from June 1 through September 30 for each year between 2016 and 2021 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	FM9, Sh2, Sh4, and Sh5	FM9, Sh2, Sh4, and Sh5
1 h fuel moisture	11%	3%
10 h fuel moisture	12%	5%
100 h fuel moisture	17%	10%
Live herbaceous moisture	66%	30%
Live woody moisture	133%	60%
20 ft. wind speed	16 mph (sustained winds)	16 mph (sustained winds); wind gusts of 50 mph
Wind Directions from north (degrees)	255 and 290	35 and 140
Wind adjustment factor	0.4	0.4
Slope (uphill)	3%	3 to 16%

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 north, northwest, northeast, southeast and west. The results of the modeling

[4] San Pasqual RAWS Station Latitude and Longitude: 33.236048, -117.367989

effort included anticipated values for surface fires flame length (feet), rate of spread (mph), fireline intensity (Btu/ft/s), and spotting distance (miles), as well as crown fires (critical surface intensity (Btu/ft/s), critical surface flame length (feet), transition ratio (ratio: surface fireline intensity divided by critical surface intensity), transition to crown fire (yes or no), crown fire rate of spread (mph), critical crown rate of spread (mph), active ratio (ratio: crown fire rate of spread divided by critical crown fire rate of spread), active crown fire (yes or no), and fire type (surface, torching, conditional crown, or crowning)) for a fire going through the arroyo willow riparian forest/riparian areas north, south, and west of the Project site. 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 three 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 through the approximately 25-foot tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation north/northwest of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a car fire originating along Highway 76 or a structure fire originating in the single-family community north of the Project site. This type of fire would typically spread by jumping from crown to crown or downslope through the riparian vegetation relatively slow towards the northwestern portion of the development.
- **Scenario 2:** A fall, off-shore fire (97th percentile weather condition) burning through the approximately 25-foot tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation north/northeast of the Proposed Project site. The terrain is relatively flat before reaching the shrub chaparral (approximately 3% to 16% slope) with potential ignition sources from a structure fire originating in the single-family community north of the Project site. This type of fire would typically spread by jumping from crown to crown or downslope through the riparian vegetation relatively slow towards the northern portion of the development.
- **Scenario 3:** A fall, off-shore fire (97th percentile weather condition) burning through the approximately 25-foot tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of shrubs and chaparral dominated vegetation south/southeast of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a structure fire originating in the single-family communities south of the Project site. This type of fire would typically spread by jumping from crown to crown or through the riparian vegetation relatively slow towards the southern portion of the development.
- **Scenario 4:** A summer, on-shore fire (50th percentile weather condition) burning through the approximately 25-foot tall arroyo willow forest and riparian habitat and moderate- to- high-load intermix of

shrubs and chaparral dominated vegetation south/southwest of the Proposed Project site. The terrain is relatively flat (approximately 3% slope) with potential ignition sources from a car fire originating along Highway 76 or a structure fire originating in the single-family communities south of the Project site. This type of fire would typically spread by jumping from crown to crown or through the riparian vegetation relatively slow towards the southwestern portion of the development.

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 adjacent to the Project site is expected to be primarily of moderate to high intensity through the non-maintained surface shrub and chaparral dominated fuels within the arroyo willow riparian forest of the Guajome Lake areas adjacent to the northern portion of the Project site. Worst-case fire behavior under peak weather conditions (represented by Fall Weather, Scenario 2) is anticipated to be a wind-driven fire from the east/northeast during the fall. Under such conditions, expected surface flame length are expected to reach approximately 38 feet with wind speeds of 50+ mph. Under this scenario, fireline intensities reach 15,726 BTU/feet/second with moderate spread rates of 5.7 mph and could have a spotting distance up to 2.2 miles away. Because embers could spot within 2.2 miles of the Project site, a crown fire could potentially occur within the small arroyo willow riparian forest area downslope and north of the Project development area. Potential crown fire flame lengths could reach approximately 100+ feet with sustained winds of 16 mph with moderately slow crown spread rates of 3.8 mph.

Wildfire behavior through the non-maintained surface shrub and chaparral dominated fuels within the arroyo willow riparian forest of the Guajome Lake areas adjacent to the northern portion of the Project site being fanned by 16 mph sustained, from the north/northwest and pushed by on-shore ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions a surface vegetation fire could have flame lengths between approximately 2 feet and 7 feet in height and spread rates between 0.1 and 0.3 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.1 to 0.3 miles. A crown fire could potentially reach 65 feet under these conditions.

As depicted in Table 5, post development fire behavior expected in the irrigated and replanted with plants that are acceptable with the Oceanside Fire Department (OFD) (FMZ Zone 1 – Gr1), as well as in an area with thinning of the existing shrubs (FMZ Zone 2 – Sh2/Gr2) under peak weather conditions experience a significant reduction in flame length and intensity. The approximately 38-foot flame lengths predicted for non-maintained chaparral vegetation during pre-treatment modeling for fire scenario 2 are reduced to approximately 14 feet at the outer edges of the FMZ (Zone 2) and to 2.6 feet by the time the inner portions of the FMZ (Zone 1) are reached. During on-shore weather conditions, a fire approaching from the north/northwest towards the development footprint would be reduced from approximately 7-foot tall flames to less than 1.2-feet tall for Zone 1 and 1.3 feet for Zone 2, with low fire intensity and spotting distances due to the

higher live and dead fuel moisture contents. 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 Zones 1 and 2). Therefore, the FMZs proposed for the Guajome Crest Residential Development Project are approximately 2.5-times the flame length of the worst case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

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

Fire Scenario	Flame Length[1] (feet)	Spread Rate[1] (mph[5])	Fireline Intensity[1] (Btu/ft/s)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (mph)	Crown Fire Flame Length (feet)
Scenario 1: 3% slope; Summer on--shore summer wind (50th percentile) – Pre-FMZ (North/northwest of Project site)							
Arroyo Willow Forest/Riparian Habitat (FM9)	2.9	0.1	58	0.2	No	0.3	63.7
Moderate-load shrubs (Sh2)	1.3	0.0	10	0.1	Crowning [4]	0.3	63.7
Riparian Habitat - Timber Shrub (Sh4)	2.2	0.1	32	0.1	No	0.3	63.3
High-load shrubs (Sh5)	6.4	0.3	317	0.3	Crowning [4]	0.3	65.1
Scenario 2: 16% slope; Fall off-shore extreme wind (97th percentile) – Pre-FMZ (North/northeast of Project site)							
Arroyo Willow Forest/Riparian Habitat (FM9)	4.5 (10.6')[6]	0.2 (1.5)	147 (969)	0.3 (1.0)	No	0.8 (3.8)	111.0
Riparian Habitat - Timber Shrub (Sh4)	11.1 (22.5)[6]	0.8 (4.0)	1,056 (4,951)	0.6 (1.5)	No	0.8 (3.8)	113.7
High-load shrubs (Sh5)	20.9 (38.3)[6]	1.5 (5.7)	4,208 (15,726)	0.9 (2.3)	Crowning [4]	0.8 (3.8)	120.1
Scenario 3: 3% slope; Fall off-shore extreme winds (97th percentile) – Pre-FMZ (South/southeast of Project site)							
Arroyo Willow Forest/Riparian Habitat (FM9)	4.4 (10.6')[6]	0.2 (1.5)	144 (966)	0.3 (1.0)	No	0.8 (3.8)	111.0
Moderate-load shrubs (Sh2)	7.1 (14.4)[6]	0.2 (0.9)	404 (1,876)	0.6 (1.5)	Crowning [4]	0.8 (3.8)	117.5
Riparian Habitat - Timber Shrub (Sh4)	11.0 (22.5)[6]	0.8 (3.9)	1,032 (4,928)	0.9 (2.3)	No	0.8 (3.8)	113.7
High-load Shrubs (Sh5)	20.7 (38.2)[6]	1.5 (5.7)	4,122 (15,640)	0.8 (2.3)	Crowning [4]	0.8 (3.8)	120.1
Scenario 4: 3% slope; Summer on-shore summer winds (50th percentile) – Pre-FMZ (South/southwest of Project site)							
Arroyo Willow Forest/Riparian Habitat (FM9)	2.9	0.1	58	0.2	No	0.3	72.8
Moderate-load shrubs (Sh2)	1.3	0.0	10	0.1	Crowning [4]	0.3	72.8
Riparian Habitat - Timber Shrub (Sh4)	2.2	0.1	32	0.1	No	0.3	72.4
High-load shrubs (Sh5)	6.4	0.3	317	0.3	Crowning [4]	0.3	74.1

Note:

1. Wind-driven surface fire.

2. Riparian overstory torching increases fire intensity. Modeling included canopy fuel over Sh4, which represents surface fuels beneath the tree canopies.
3. A surface fire in the mixed sycamore riparian forest would transition into the tree canopies generating flame lengths higher than the average tree height (25 feet). Viable airborne embers could be carried downwind for approximately 1.0 mile and ignite receptive fuels.
4. Crowning= fire is spreading through the overstory crowns.
5. MPH=miles per hour.
6. 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)[5]	Fireline Intensity (Btu/ft./sec)	Spot Fire (Miles) [6]
Scenario 1: 3% slope; Summer on--shore summer wind (50th percentile) – Post-FMZ (North/northwest of Project site)				
FMZ Zone 1 (Gr1)	1.2	0.1	8	0.1
FMZ Zone 2 (Sh2)	1.3	0.0	10	0.1
Scenario 2: 16% slope; Fall off-shore extreme wind (97th percentile) – Post-FMZ (North/northeast of Project site)				
FMZ Zone 1 (Gr1)	1.9 (2.9)	0.3 (0.3)	44 (44)	0.2 (0.3)
FMZ Zone 2 (Sh2)	7.8 (15.7)	0.2 (0.9)	414 (1,887)	0.3 (1.1)
Scenario 3: 3% slope; Fall off-shore extreme winds (97th percentile) – Post-FMZ (South/southeast of Project site)				
FMZ Zone 1 (Gr1)	2.6 (2.6)	0.3 (0.3)	44 (44)	0.2 (0.3)
FMZ Zone 2 (Gr2)	7.4 (11.6)	1.2 (3.1)	442 (1,165)	0.3 (0.9)
Scenario 4: 3% slope; Summer on-shore summer winds (50th percentile) – Post-FMZ (South/southwest of Project site)				
FMZ Zone 1 (Gr1)	1.2	0.1	8	0.1
FMZ Zone 2 (Gr2)	4.0	0.4	118	0.2

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.

[5] mph = miles per hour
[6] Spotting distance from a wind driven surface fire; it should be noted that the wind mph in parenthesis represent peak gusts of 50 mph.

Crown Fire:

- Transition to Crown Fire: Indicates whether conditions for transition from surface to crown fire are likely. Calculation depends on the transition ratio. If the transition ratio is greater than or equal to 1, then transition to crown fire is Yes. If the transition ratio is less than 1, then transition to crown fire is No.
- Crown Fire Rate of Spread (mph): The forward spread rate of a crown fire. It is the overall spread for a sustained run over several hours. The spread rate includes the effects of spotting. It is calculated from 20-ft wind speed and surface fuel moisture values. It does not consider a description of the overstory

Fire Type:

- Fire type is one of the following four types: surface (understory fire), torching (passive crown fire; surface fire with occasional torching trees), conditional crown (active crown fire possible if the fire transitions to the overstory), and crowning (active crown fire; fire spreading through the overstory crowns). Dependent on the variables: transition to crown fire and active crown fire.

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.

Attachment D

Prohibited Plant List

ATTACHMENT D
Prohibited Plants List

Botanical Name	Common Name	Comment*
Trees		
Abies species	Fir	H
Acacia species (numerous)	Acacia	H
Agonis juniperina	Juniper Myrtle	H
Araucaria species (A. heterophylla, A. araucana, A. bidwillii)	Araucaria (Norfolk Island Pine, Monkey Puzzle Tree, Bunya Bunya)	H
Cedrus species (C. atlantica, C. deodara)	Cedar (Atlas, Deodar)	H
Chamaecyparis species	False Cypress	H
Cryptomeria japonica	Japanese Cryptomeria	H
Cupressocyparis leylandii	Leyland Cypress	H
Cupressus species (C. fobesii, C. glabra, C. sempervirens,)	Cypress (Tecate, Arizona, Italian, others)	H,Tecate=SDC
Eucalyptus species (numerous)	Eucalyptus	H
Juniperus species (numerous)	Juniper	H
Larix species (L. decidua, L. occidentalis, L. kaempferi)	Larch (European, Japanese, Western)	H
Palm species	Palms	H
Picea (numerous)	Spruce	H
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)	H
Platycladus orientalis	Oriental arborvitae	H
Podocarpus gracilior	Fern Pine	H
Pseudotsuga menziesii	Douglas Fir	H
Taxodium species (T. ascendens, T. distichum, T. mucronatum)	Cypress (Pond, Bald, Monarch, Montezuma)	H
Taxus species (T. baccata, T. brevifolia, T. cuspidata)	Yew (English, Western, Japanese)	H
Thuja species (T. occidentalis, T. plicata)	Arborvitae/Red Cedar	H
Tsuga species (T. heterophylla, T. mertensiana)	Hemlock (Western, Mountain)	H
Groundcovers & Shrubs		
Acacia species	Acacia	H
Adenostoma fasciculatum	Chamise	H,SDC
Adenostoma sparsifolium	Red Shanks	H,SDC
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)	H,SDC
Arundo donax	Giant Reed	
Bambusa species	Bamboo	H
Dodonaea viscosa	Hopseed Bush	H
Eriogonum fasciculatum	Common Buckwheat	H,SDC
Heteromeles arbutifolia	Toyon	M
Heterotheca grandiflora	Telegraph Plant	H,SDC
Juniperus species	Juniper	H
Lonicera japonica	Japanese Honeysuckle	H
Malosoma Laurina	Laurel Sumac	M
Miscanthus species	Eulalia Grass	H

Botanical Name	Common Name	Comment*
Muehlenbergia species	Deer Grass	H,SDC
Groundcovers & Shrubs (cont.)		
Pennisetum setaceum	Fountain Grass	H
Pickeringia montana	Chaparral Pea	H,SDC
Quercus dumosa	Scrub Oak	M
Rosmarinus species	Rosemary	H
Rhus integrifolia	Lemonade Berry	M
Salvia mellifera	Black Sage	H,SDC
Thuja species	Arborvitae	H
Urtica urens	Burning Nettle	H,SDC
Xylococcus bicolor	Mission Manzanita	M

*H = High Fuel Plants, M = Moderate Fuel Plants, SDC = San Diego County Native Species

Notes:

1. This list was prepared by Dudek for the Guajome Crest Project. Certain plants are considered to be undesirable in the landscape due to characteristic that make them highly flammable. These characteristics can be either physical or chemical. Physical properties would include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Plants with these characteristics should not be planted close to structures in fire hazard areas. These species are typically referred to as "Target Species" or "Moderate to High Fuel Plants", since their complete or partial removal from the landscape is a critical part of hazard reduction. High Fuel Plants are highly flammable and should not be planted within 50 feet of a structure. Moderate Fuel Plants are considered moderately flammable and should be avoided when only slow burning/low fuel species are permitted within a given fuel modification zone. Many of these species, if existing on the property and adequately maintained (e.g., pruning, thinning, irrigated, litter removal and weeding), could remain as long as the potential for spreading a fire has been reduced or eliminated.
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 Vegetation Management Zones and elsewhere in this development shall be subject to approval of the City's Fire Code Official and Landscape Architect.
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.

REFERENCES:

City of Oceanside, California. 1995. Vegetation Management. Landscape Development Manual. Community Services Department, Engineering Division.

County of Los Angeles Fire Department. 1998. Fuel Modification Plan Guidelines. Appendix I: Undesirable Plant List.

County of San Diego. 2004. Department of Planning and Land Use, Building Division. Fire, Plants, Defensible Space and You (DPLU #199). June 2004.

Willis, E. 1997. San Diego County Fire Chief's Association. Wildland/Urban Interface Development Standards. August 1997.