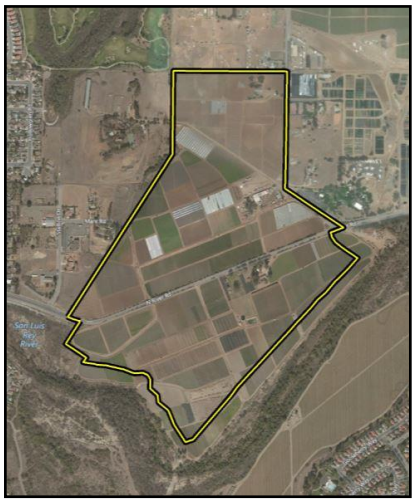
APPENDIX J1

Fire Protection Plan

NORTH RIVER FARMS
FIRE PROTECTION PLAN



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EXECUTIVE SUMMARY

This Fire Protection Plan (FPP) has been prepared for the North River Farms residential community (Project) in the north-eastern portion of the City of Oceanside, California. This FPP evaluates and identifies the potential fire risk associated with the proposed Project's land uses and identifies requirements for water supply, fuel modification and defensible space, access, building ignition and fire resistance, fire protection systems, and wildfire emergency pre-planning, among other pertinent fire protection criteria. The purpose of this plan is to generate and memorialize the fire safety requirements of the Oceanside Fire Department (OFD) along with project-specific measures based on the site, its intended use, and its fire environment.

This document provides analysis of the site's fire environment and its potential impact on the proposed project as well as the project's potential impact on the existing OFD's fire protection service. This document will be incorporated as a technical appendix of the project's Environmental Impact Report. Requirements and recommendations herein are based on site-specific fire environment analysis and proposed project characteristics and incorporate input from OFD, area fire planning documents, site risk analysis, and standard principles of fire protection planning.

The recommendations and conditions provided herein are also consistent with the lessons learned from After Fire Action Reports from numerous fires occurring over the last 20 years, including the 2003, 2007, 2010, and 2017 San Diego County Fires.

As determined during the analysis of this site and its fire environment, the North River Farms Project site, in its current condition, is considered to include characteristics that, under favorable conditions, have the potential to facilitate fire spread. Under extreme conditions, wildfires within the San Luis Rey River riparian corridor along the eastern and southern portions of the site could burn erratically and aggressively and result in significant ember production. Once the project is built, the North River Farms Project on-site fire potential will be lower than its current condition due to conversion of vegetative fuels to managed landscapes and ignition resistant structures.

It is important to note that the fire safety requirements that will be implemented on this site, including ignition resistant construction standards, along with requirements for water supply, fire apparatus access, fuel modification and defensible space, interior fire sprinklers and 5 minute or less fire response travel times were integrated into the code requirements and internal OFD guidelines based on results of post-fire assessments, similar to the After Action Reports that are now prepared after large fire events. When it became clear that specifics of how homes were built, how fire and embers ignited homes, what effects fuel modification had on structure ignition, how fast firefighters could respond, and how much (and how reliable)

water was available, were critically important to structure survivability, the Fire and Building codes were revised appropriately. OFD and San Diego County now boast some of the most restrictive codes for building within Wildland Urban Interface (WUI) areas that focus on preventing structure ignition from heat, flame, and burning embers.

The developed portion of this property is proposed for improvements that include construction of up to 689 residential dwelling units on 176. 6 acres. The entire site has been designed with fire protection as a key objective. The site improvements are designed to facilitate emergency apparatus and personnel access throughout the site. Driveway and road improvements with fire engine turnouts and turnarounds provide access to within 150 feet of all sides of every building. Water availability and flow will be consistent with OFD requirements including fire flow and hydrant distribution. These features along with the ignition resistance of all buildings, the interior sprinklers, and the pre-planning, training and awareness will assist responding firefighters through prevention, protection and suppression capabilities.

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

Early evacuation for any type of wildfire emergency at the North River Farms is the preferred method of providing for resident safety, consistent with the OFD's and San Diego County's current approach for evacuation. As such, the North River Farm's Homeowner's Association will formally adopt, practice, and implement a "Ready, Set, Go!" (International Fire Chiefs Association 2013) approach to site evacuation. The "Ready, Set, Go!" concept is widely known and encouraged by the state of California and most fire agencies, including OFD. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing potential for errors, maintaining the site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and site uses during periods of fire weather extremes.

Based on the results of this FPP's analysis and findings, the following FPP implementation measures will be provided by the North River Farm's project as part of the proposed development plan. These measures are discussed in more detail throughout this FPP.

1. Preparation of a Construction Fire Prevention Plan detailing the important construction phase restrictions and fire safety requirements that will be implemented to reduce risk of ignitions and pre-plans for responding to an unlikely ignition.
2. Project buildings will be constructed of ignition resistant construction materials based on the latest Building and Fire Codes.
3. Fire resistive landscaping per City of Oceanside standards will be provided throughout the development.
4. Fire apparatus access roads will be provided throughout the community and will vary in width and configuration, but will all provide at least the minimum required unobstructed travel lanes, lengths, turnouts, turnarounds, and clearances.
5. Firefighting staging areas/temporary refuge areas are available along roadways and site green spaces.
6. Water capacity and delivery provide for a reliable water source for operations and during emergencies requiring extended fire flow.
7. Project-specific and larger neighborhood evacuation plans are proposed to be prepared and would be part of the Project and community outreach and ongoing education.
8. The Community HOA will include an outreach and educational role to coordinate with OFD and the local Fire Safe Council, oversee landscape committee enforcement of fire safe landscaping, ensure fire safety measures detailed in this FPP have been implemented, educate residents on and prepare community-wide "Ready, Set, Go!" plans.

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1 INTRODUCTION

This Fire Protection Plan (FPP) has been prepared for the proposed North River Farms Project (Project) in Oceanside, California, an incorporated city in northern San Diego County. The purpose of the FPP is to assess the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those impacts. Additionally, this plan generates and memorializes the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), which is the Oceanside Fire Department (OFD). Requirements and recommendations are based on site-specific project characteristics and incorporate input from the project applicant and the FAHJ.

As part of the assessment, the plan has considered the property location, topography, geology, surrounding combustible vegetation (fuel types), climatic conditions, and fire history. The plan addresses water supply, access (including secondary), structural ignitability and fire resistive building features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect one or more at-risk communities and essential infrastructures. The plan recommends measures that property owners will take to reduce the probability of ignition of structures throughout the area addressed by the plan.

The following tasks were performed toward completion of this plan:

- Gather site specific climate, terrain, and fuel data;
- Collect site photographs;
- Process and analyze the data using the latest GIS technology;
- Predict fire behavior using scientifically based fire behavior models, comparisons with actual wildfires (e.g., 2017 Lilac Fire) in similar terrain and fuels, and experienced judgment;
- Analyze and guide design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the proposed project and the project site; and
- Prepare this FPP detailing how fire risk will be mitigated through a system of fuel modification, structural ignition resistance enhancements, and fire protection delivery system upgrades.

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

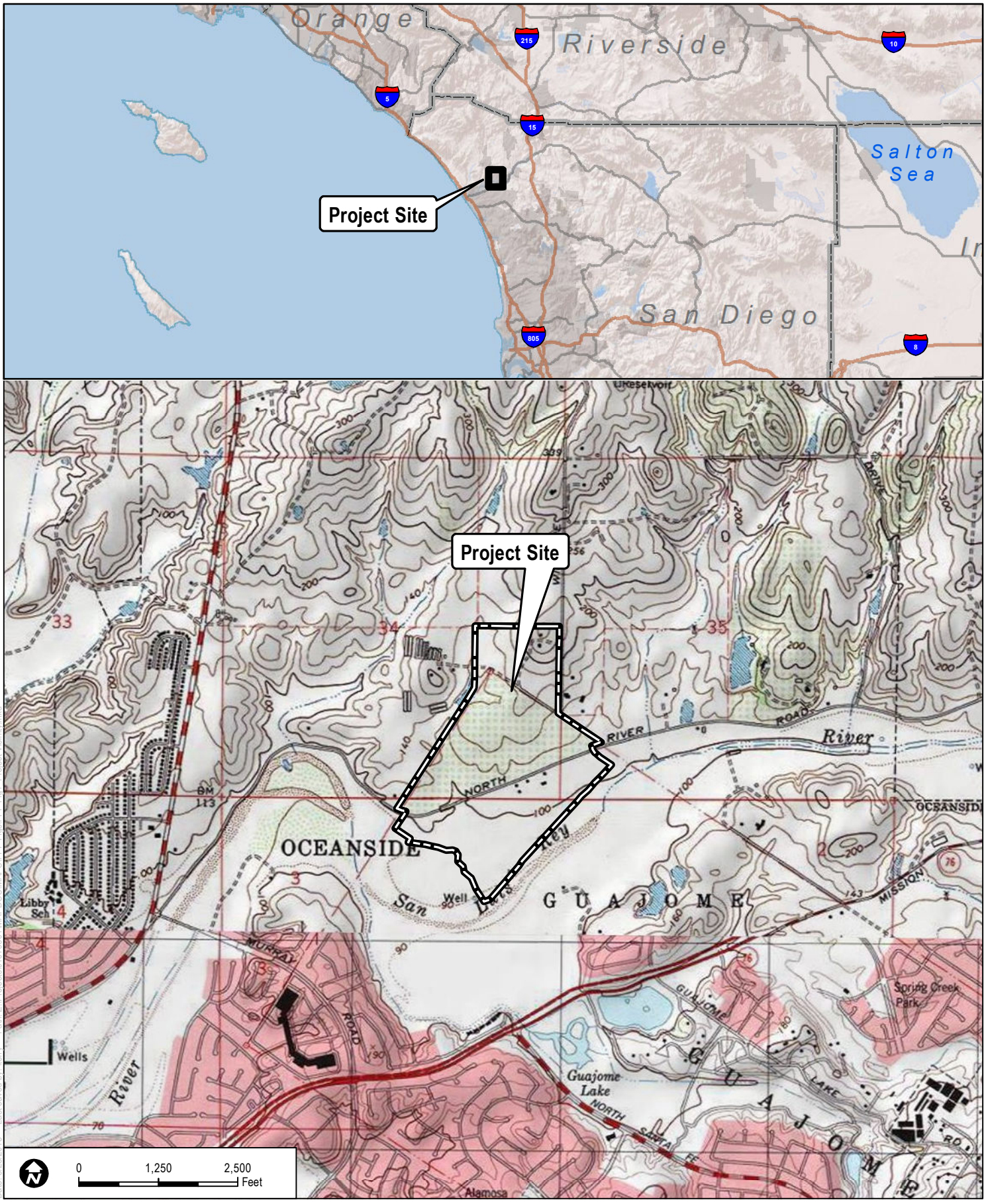
1.1 Applicable Codes/Existing Regulations

Applicable regulations to the proposed project include Chapter 11: Fire Protection of the Oceanside Municipal Code, OFD Form 5205-17: Fire Master Plans for Commercial and Residential Development, and the 2016 California Fire Code (CFC). The project will also be consistent with the latest edition of the California Building Code (CBC), Chapter 7A, and the latest edition of the CFC, Chapter 49, as adopted by City. Chapter 7A of the California Building Code focuses primarily on preventing ember penetration into homes, a leading cause of structure loss from wildfires. Thus, it is an important component of the requirements of this FPP given the project's location is within an area statutorily designated a Non-Very High Fire Hazard Severity Zone (Non-VHFHSZ) by California Department of Forestry and Fire Protection (CAL FIRE) and the City. 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 found on the North River Farms project.

1.2 North River Farms Project Summary

1.2.1 Location

The 176.6-acre project site is located in rural-suburban area in the northeastern portion of the City of Oceanside (City) and comprises a portion of Assessor's Parcel Numbers 157-100-83-00 and 157-100-84-00 (Figure 1, Project Vicinity Map). The project site marks the western entry to a region known as South Morro Hills within the City. The North River Farms project site is located approximately 0.5 miles north of Highway 76 and approximately 0.7 miles east of Vandergrift Boulevard. The project site is generally bisected into northern and southern sections by the existing North River Road alignment. The northern portion of the project site is bordered on the east by Wilshire Road. Beyond the road, neighbors include 1-acre lots, the Paradise Falls wedding venue, and a dog and horse training facility. To the west, the project site borders the Arrowood Golf Course and subdivision along with single-family residential uses and a church. Existing agriculture and the San Luis Rey River border the southern area of the project site.



SOURCE: USGS 7.5 Minute Series, Morro Hills Quadrangle

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0 1,000 2,000 Feet

FIGURE 1

Project Vicinity Map

Fire Protection Plan for the North River Farms Project

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The site is located on the U.S. Geological Service (USGS) 7.5-minute Morro Hill quadrangle map in Section 34, Township 10 South, Range 4 West. The project site has a General Plan land use designation of A (Agriculture) and is zoned A-SP (Agriculture – Scenic Park Overlay).

1.2.2 Project Description

The North River Farms Project envisions the development of a high quality agriculturally focused community, composed of four separate planning areas. The proposed project would allow for the development of up to 689 residential dwelling units on approximately 176.6 acres for an overall density of approximately 4 dwelling units per gross acre. Figure 2 depicts the locations of these generalized land uses within the project boundary and Table 1 presents generalized land use summaries for the Project.

Table 1
Proposed Residential Land Uses by Planning Area

Area	Gross Acres	Proposed Land Use	Proposed Residential Dwelling Units	Proposed Land Use Density (dwelling unit per acre)
Riverside Village	45.2	Medium-density residential	250	6.0-9.0
Village Core	24.9	Medium-density residential and mixed use	130	6.0-9.0
North Village	56.4	Single-family and medium-density residential	209	3.6-5.9
Hilltop Village	37.0	Single-family residential	100	3.6-5.9
Roadway Network	13.1	-	-	-
Total	**176.6**	**-**	**689**	

Source: SWA Group, April 2018.
Notes:
Dwelling unit counts may be adjusted based on final development plans as proposed, with a maximum 689 units proposed.
The dwelling unit maximum is applicable to the overall project site within the density ranges noted for each planning area. 10% of density transfer amongst planning areas is acceptable. Lower unit counts and densities may be allowed when present as part of individual development plans.

1.2.2.1 Riverside Village (Planning Area 1)

The Riverside Village encompasses 45.2 acres in the southwestern corner of the project site, west of the Village Core and south of N. River Road. The Riverside Village would be composed of a mix of single-family detached and cluster homes, a proposed park, and agricultural space. This planning area would contain medium-density residential with approximately 250 dwelling units at a proposed density of 6.0–9.0 dwelling units per acre. The minimum lot area would be 3,000 square feet (SF) with a maximum structure height of 35 feet.

Direct access would be provided from N. River Road with internal pedestrian and vehicular access to the Village Core. The Riverside Village would also provide access to the agricultural lands and the San Luis Rey River to the south.

1.2.2.2 Village Core (Planning Area 2)

The approximately 24.9-acre Village Core would be located near the center of the project site east of the Riverside Village and south of the North River Road. The Village Core is envisioned for medium-density residential and mixed use, including 130 residential dwelling units at a proposed density of 6.0-9.0 dwelling units per acre, a boutique hotel, maker spaces, retail shops, a farmers market, collaborative work space, and a Village Square Park. For this FPP analysis, a conservative assumption of 30,000 SF of commercial, including 5,000 SF of restaurant space, and 100 rooms within the hotel was used. The minimum residential dwelling lot size would be 2,000 SF with a maximum height of 36 feet for residential and 45 feet for commercial. Primary access would be from N. River Road with internal pedestrian and vehicular access from the Riverside Village.

1.2.2.3 North Village (Planning Area 3)

The North Village is comprised of 56.4 acres and located north of N. River Road and south of the Hilltop Village. The North Village would allow for approximately 209 residential units for a proposed density of approximately 3.6–to 5.9 dwelling units per acre. The minimum lot area would be 4,000 SF with a maximum height of 35 feet.

The proposed residential lots would be buffered from N. River Road through a combination of agricultural fields and landscape buffers. Pedestrian trails would be provided throughout the North Village and would allow for connection to the Village Core. The North Village would contain a north-to-south Village Promenade. Primary access would be from N. River Road.

1.2.2.4 Hilltop Village (Planning Area 4)

The Hilltop Village would allow for approximately 100 single-family residential units on 37.0 acres for a proposed density of 3.6–5.9 dwelling units per acre. The minimum lot area would be 6,000 SF and a maximum structure height of 35 feet. Primary access would be from the Village Promenade off of N. River Road and Wilshire Road to the east. The proposed project will complete off-site road improvements at the intersection of existing Wilshire Road and North River Road. Off-site roadway improvements at the intersection include improving turning movements, reconfigure vehicle lanes, and make safety improvements to improve evacuation of residences from the Hilltop Village.

PA-4
Hilltop
Village

PA-3
North
Village

PA-3
North
Village

North River Rd.

PA-2
Village
Core

PA-1
Riverside
Village

Project Site

Planning

Land Use

Agriculture

Single Family Residential (RS)

Single Family Residential (RMA)

Single Family Residential (RMB)

Medium Density Residential/Mixed Use

Buffer

Park

Basin

Habitat

Backbone Roads

bing

AERIAL SOURCE: BING MAPPING SERVICE; SITE PLAN - HUNSAKER 2018

DUDEK

N

0 190 380 Feet

Path: Z:\Projects\U107\9801\MAPDOC\MAPS\FPP Figs\FPP Fig 2 Project Site Map.mxd

FIGURE 2

Project Site Plan

Fire Protection Plan for the North River Farms Project

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1.2.2.5 Additional Land Uses

In addition to the residential and commercial sites, there will be community / neighborhood parks as well as a network of trails, common area slopes, natural drainage buffers, and agriculture.

Agriculture

Approximately 31.6 acres would be dedicated to agriculture throughout the project. The proposed agricultural land uses would include community gardens, agriculture trails, production agriculture, and agritourism. Community gardens allow residents the opportunity to manage their own garden plot and grow food with and for their family and neighbors.

The proposed trail network within the community is comprised of an interconnected system of on-street sidewalks, Class II and III bicycle lanes and Class I trails. Each of these trail types seeks to further engage the resident with agriculture. The trail network within project site has been designed to connect to the City of Oceanside's planned off -site trail network by connecting to the existing trail along North River Road and also providing a "river trail" adjacent to the San Luis Rey River setback. The project will include access points to trail systems to facilitate emergency response. Trails will be managed and maintained by the HOA or other approved entity.

The food produced at the project site will be available at an on-site farm stand and in-home veggie box delivery program, along with produce from our neighbor's yields.

Agritourism can include a variety of facilities and activities including education, farm dinners, festivals, farm visits, lodging, tours, demonstrations, wineries, animal interactions, trails, and museums. A farm is envisioned to be associated with the proposed hotel.

Open Space and Landscaping

Approximately 16.0 acres of the project site are planned for park and open space features including a variety of parks, and the paseo area. Several neighborhood parks are proposed throughout the project site, including Village Green, Riverside Village Park, Mill Park, and View Park. The proposed project also includes pocket parks and additional open space in conjunction with landscaped internal roadways, perimeter edges, and drainage/water quality features.

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2 PROPOSED PROJECT SITE RISK ANALYSIS

2.1 Field Assessment

Dudek conducted a field assessment of the project site on February 26, 2018, in order to confirm/acquire site information, document existing site conditions, and to determine potential actions for addressing the protection of the project's structures. While on site, Dudek's Fire Planners assessed the area's topography, natural vegetation and fuel loading, surrounding land use and general susceptibility to wildfire. Among the field tasks that were completed are:

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

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

2.2 Site Characteristics and Fire Environment

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

2.2.1 Topography

The topography of the North River Farms Project site is generally flat, with a slight slope towards the agricultural area and San Luis Rey River in the southern end of the project site. Elevations range from approximately 90 feet above mean sea level (AMSL) in the southern project site to approximately 240 feet AMSL in the northeasterly boundary just north of Wilshire Road. Due to the high level of existing disturbance caused from agricultural use, the site is generally topographically uniform except for the general trending slope from northeast to southwest. Gradients are generally in the 2% to 3% range increasing to 5% to 10% in the upper northeast corner of the property.

2.2.2 Vegetation (Fuels)

The project area is currently composed of a variety of vegetation types, including primarily farm land, that were mapped by Dudek (Dudek 2017). These vegetation communities/land cover types are listed in Table 2 and shown on Figure 3, Vegetation Map. Extensive vegetation type mapping is useful for fire planning because it enables each vegetation community to be assigned a fuel model, which is used by a software program to predict fire characteristics, as discussed in Section 3.1. The Project site's vegetative fuel types is primarily farmland (row crops), although smaller pockets of Southern Willow Scrub, Mulefat Scrub, and eucalyptus woodland types are present. More detailed information regarding the plant communities and land cover types within the Project Area is provided in the North River Farms Biological Resources Technical Report (Dudek 2017). Appendix A provides photographs of the site in its current, undeveloped condition as well as the off-site land uses.

Table 2
Vegetation Communities and Land Covers[1]

Vegetation Communities and Land Covers	Code[2]	Habitat Group	Proposed Northerly Parcel (acres)	Proposed Southerly Parcel (acres)	Proposed ROW (acres)	Off-site (acres)	Total Acreage
Riparian/Waters and Wetlands							
Southern Arroyo Willow Riparian Forest*	61320	A	—	—	—	0.02	0.02
Disturbed Southern Willow Scrub*	63320	A	0.07	—	—		0.07
Mulefat scrub*	63310	A	—	0.37	—	0.04	0.40
Non-Vegetated Channel*	64200	A	0.14	0.20	—	0.10	0.45
		Subtotal	*0.22*	*0.57*	—	*0.16*	*0.94*

Table 2
Vegetation Communities and Land Covers[1]

Vegetation Communities and Land Covers	Code[2]	Habitat Group	Proposed Northerly Parcel (acres)	Proposed Southerly Parcel (acres)	Proposed ROW (acres)	Off-site (acres)	Total Acreage
Non-Natural Land Covers							
Disturbed Wetland*	11200	A	—	0.07	—	—	0.07
Disturbed Habitat	11300	F	0.68	0.70	1.09	0.13	2.61
Urban/Developed	12000	F	0.48	0.35	2.49	0.09	3.40
Row Crops	18320	F	96.79	72.09	0.50	0.19	169.57
Non-Native Woodland	79000	F	—	0.55	0.03	—	0.57
Eucalyptus Woodland	79100	F	0.10	—	—	—	0.10
		Subtotal	*98.05*	*73.76*	*4.11*	*0.40*	*176.32*
		Total	**98.27**	**74.33**	**4.11**	**0.56**	**177.27**

1 Source: Biological Resources Technical Report for North River Farms Project, Dudek 2017.
2 Holland (1986) as modified by Oberbauer et al. (2008).

The site's vegetation fire risk is primarily determined by project-adjacent vegetation along the San Luis Rey River and the surrounding private properties. The growth of vegetation types/fuel models is influenced by aspect (orientation), soil constituents, soil depth, soil moisture, and weather. Off-site fuels within San Luis Rey Riverbed were evaluated for wildfire behavior as they are the nearest wildland fuels that would be subject to wildfire along the south side of the project. The primary vegetation types that are found along the riverbed are Southern Arroyo Willow Riparian Forest and Mulefat Scrub. Southern Arroyo Willow Riparian Forest is dominated by moderately tall (35' to 45' in height) black willow (*Salix gooddingii*) trees with closed or partially closed canopies while dense understories are mule fat (*Baccharis salicifolia*), giant reed (*Arundo donax*), and stingy nettle (*Urtica dioica ssp. holosericea*). The mulefat scrub plant community north of the riverbed is composed primarily of mulefat with an understory of stinging nettle and poison hemlock (*Conium maculatum*). Typically, native riparian species are not well adapted to frequent or severe fire (Bell 1997). However, riparian areas within the San Luis Rey River Watershed have been invaded with dense stands of giant reed (a 15-foot high, extremely flammable plant) and have a buildup of large quantities of dead material from drought conditions. As such, riparian corridors are changing from barriers to the spread of fires into wicks that carry fire up and downstream into the crowns of native willows (Dudley 1998) and thus increases the threat to life and property as was experienced in the 2017 Lilac Fire.

Private properties to the west, north, and east are dominated by non-native grasses and forbs that have been cut annually by the property owners in accordance with the City's weed abatement

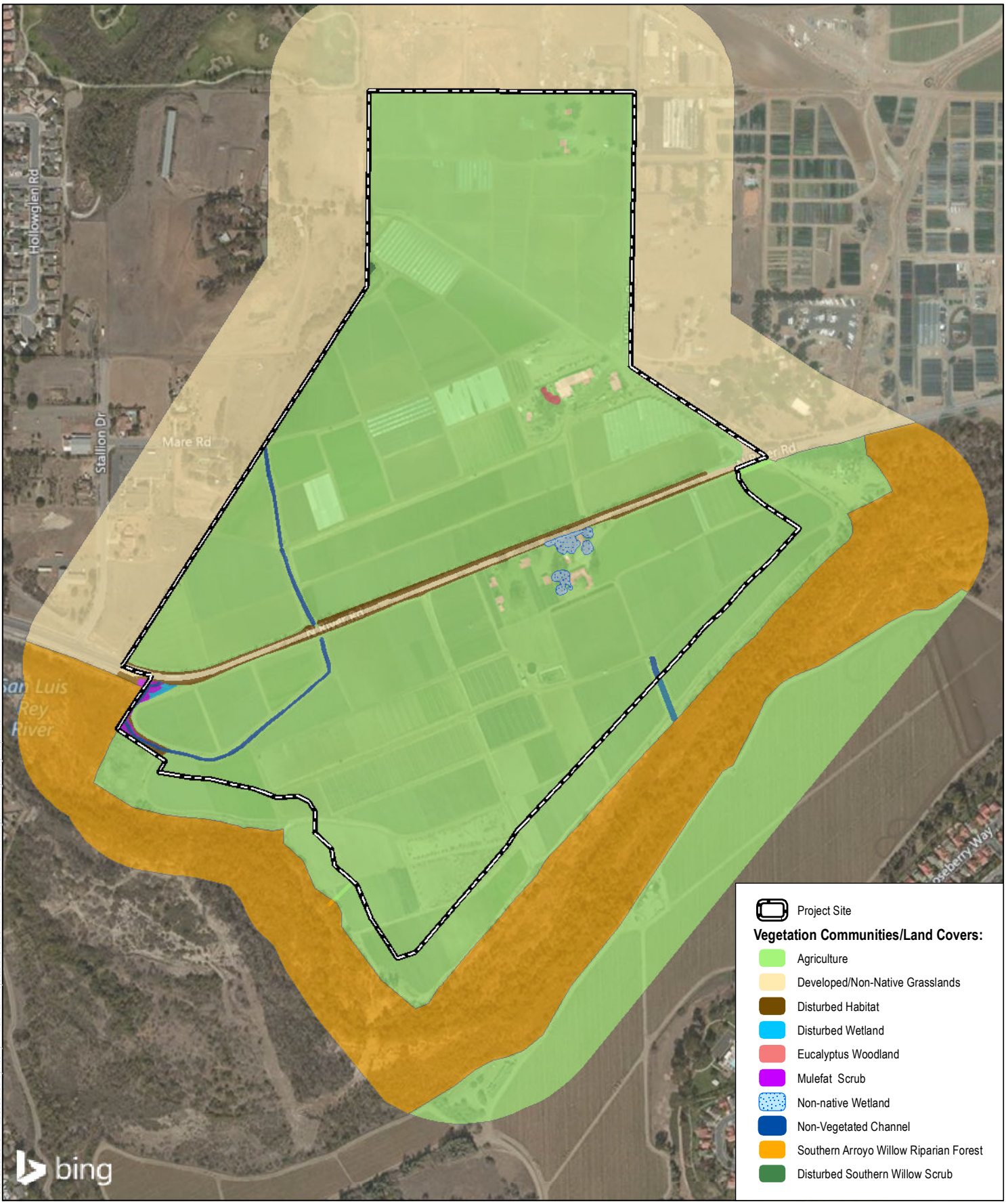
standards. This fuel modification practice has reduced the fuel height and density, which will result in significantly reduced flame lengths and fire intensity associated with fire in this grassland fuel type.

These project-adjacent vegetation communities correspond to designated fuel models (pre-determined vegetation type, densities, and structural characteristics) for fire behavior modeling purposes. Dudek has classified each of the vegetation types off-site into fuel models, as discussed further below.

2.2.3 Vegetation Dynamics

Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, the willow species that compose of the Southern Arroyo Willow Riparian community in the San Luis Rey riverbed are considered to be less likely to ignite, but would exhibit higher potential hazard (higher intensity heat and flame length) than grass-dominated plant communities (fast moving, but lower intensity) on adjoining private properties, if ignition occurred. The corresponding fuel models for each of these vegetation types are designed to capture these differences. Additionally, vegetative cover influences fire suppression efforts through its effect on fire behavior. For example, although fires burning in grasslands may exhibit lower flame lengths and heat outputs than those burning in native willow habitats, fire spread rates in grasslands are often more rapid.

As described, vegetation plays a significant role in fire behavior, and is an important component to the fire behavior models discussed in this report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, and fire exclusion tends to convert grasslands to shrublands over time as shrubs sprout back or establish and are not disturbed by repeated fires. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (fire, grazing, or farming) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed FMZs. The FMZs will consist of irrigated and maintained landscapes that will be subject to regular “disturbance” in the form of maintenance and will not be allowed to accumulate excessive biomass over time, which results in reduced fire ignition, spread rates, and intensity.



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SOURCE: BING MAPPING SERVICE 2016

DUDEK

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FIGURE 3

Vegetation Communities and Land Covers Map

Fire Protection Plan for the North River Farms Project

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Conditions remote from the project's footprint, where the wildfire threat will exist post-development, are classified as low for the disturbed grasslands due to the high maintenance on the single-family properties. Whereas, the wildfire threat is classified as moderate to high in the riparian habitat in the riverbed because of the presence of highly flammable plant species, such as *Arundo spp*. in addition to the vertical and horizontal structure of the riparian forest that would promote a fire spreading within the tree crowns.

2.2.4 Fire History

Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. Fire frequency, behavior, and ignition sources are important for fire response and planning purposes. One important use for this information is as a tool for pre-planning. It is advantageous to know which areas may have burned recently and, therefore, may provide a tactical defense position, what type of fire burned on the site, and how a fire may spread. Appendix B – the North River Farms Vicinity Fire History Map, presents a graphical view of the project area's recorded fire history. As presented in the map, there have been approximately 19 fires recorded since 1910 by CAL FIRE in their FRAP database (CAL FIRE FRAP 2016) [1] in the direct vicinity of the project site. These fires, occurring in 1937 (two times), 1938, 1941, 1953, 1957, 1971, 1972, 1975, 1983, 1984, 1985, 2005, 2007, 2010, 2014 (three times), and 2017 burned within 5 miles of the project site. No fires in the recorded history have burned across the project site, however the River Fire burned within the San Luis Rey Riverbed adjacent to the southwest corner of the project site in 2014, burning 168 acres. The 2017 Lilac Fire which burned approximately 5 miles to the northeast of the project site, was the most recent, and second largest wildfire in the vicinity of the project, with a total burned area of approximately 4,100 acres. The Oceanside Fire Department (OFD) may have data regarding smaller fires (less than 10 acres) that have occurred near the site that are not included in CAL FIRE's dataset.

2.2.5 Climate

The project site is located approximately 1.5 miles from the Pacific Ocean. It has a Mediterranean climate characterized by mild, dry summers and wet winters. Average temperatures near Oceanside range from approximately 53–68°F, and the area generally receives an average rainfall of approximately 10.5 inches per year (Western Regional Climate Center 2016).

[1] Based on polygon GIS data from CAL FIRE's Fire and Resource Assessment Program (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 1878–2016.

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 75°F, with daily highs in the summer and early fall months (July–October) exceeding 93°F. Precipitation typically occurs between December and April.

The prevailing wind pattern is from the west (on-shore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea) and at night winds are from the northeast (land), averaging 2 miles per hour (mph). During the summer season, the diurnal winds may average slightly higher (approximately 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.

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 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 is affected by strong winds, such as the seasonal Santa Anas.

2.2.6 Existing Land Use

2.2.6.1 On-Site Land Uses

The project site is currently used by West Coast Tomato Growers as agricultural land to cultivate tomatoes. Several existing and vacant single-family structures are located in the northern and central portions of the project site. Additional structures include a single-family residence converted into an office building, storage structures, temporary greenhouses, a transfer facility, equipment maintenance area, and a water filtration facility with an associated lined pond and

[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).

water tank. As previously mentioned, North River Road bisects the project site in the central region with a network of unimproved roads throughout the agricultural fields. Additionally, Wilshire Road, which intersects with North River Road, provides as the east border of the property. An irrigation system also extends throughout the project site.

2.2.6.2 Surrounding Land Uses

To the west of project site is a mix of land uses including the Second Missionary Baptist Church property as well as single-family residential properties. To the north and east of the property is Morro Hills, a rural agricultural community with a substantial amount of production agricultural land and plant nursery operations. Beyond existing agriculture and to the south of the project site lies the San Luis Rey River, which is zoned Open Space-Scenic Park. The Arrowood Public Golf Course and Morro Hills Master Planned Community border the project site at its northwest corner.

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3 DETERMINATION OF PROJECT EFFECTS

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

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

The wildland fire risk in the vicinity of the Project site has been analyzed and it has been determined that wildfires may occur in San Luis Rey River corridor to the south of the project site, as well as potentially to the east of the project site, but would not be significantly increased in frequency, duration, or size with the construction of the Project. The Project includes fire resistant landscaping, fuel modification areas, and ignition resistant structures. With the project, the site, will be converted to ignition resistant, maintained landscapes.

The types of potential ignition sources that currently exist in the area include vehicle and roadway, off-site semi-rural residential properties and farmlands. The project would introduce potential ignition sources, but would include better access throughout the site, managed and maintained landscapes, more “eyes and ears” on the ground, and generally a reduction in the receptiveness of the area’s landscape to ignition. Fires from off-site would not have the same spread potential due to a lack of continuous fuels across this site and would therefore be expected to burn around and/or over the site via spotting.

Native vegetation in the San Luis Rey Riverbed to the south of the project is projected to be preserved to its natural riparian, wetland, and upland habitats over time, which would provide for both increased wildlife habitat and wetlands functions of the area. These fuels will be the nearest wildfire threat to the Project’s structures and as such, have been analyzed with anticipation of their future, mature conditions. Based on available fuel modification setbacks, fire burning through the San Luis Rey Riverbed fuels is expected not to directly threaten the Project’s structures, but will produce embers that may land within the Project’s landscapes or structures. Embers are not likely to result in an ignition based on ember decay rates and the types of non-combustible and ignition resistant materials as well as less receptive landscapes that will be used on site. The Project would comply with applicable fire and building codes and would include a layered fire protection system designed to current codes and inclusive of site-specific measures

that will result in a Project that is less susceptible to wildfire than surrounding landscapes and that would facilitate fire fighter and medical aid response.

Would the project result in inadequate emergency access?

The Project includes fire access consistent with the OFD Fire Code. Fire access on the Project site will be improved from its current condition, which provides only limited access on dirt/gravel roads. The on-site roadways that include dead ends are inclusive of cul-de-sacs meeting fire department requirements. Roads will conform to surface, width, turning radius, and vertical clearance of Code requirements for emergency access. Therefore, emergency access is considered adequate for this site.

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

The North River Farms Project includes a substantial number of new residential structures. Service level requirements could cause a decline in the OFD response times and capabilities for existing residents. It is clear that from a response time perspective, the project does not strictly comply with the City's five minute total response goal. However, the Project is well-within the City's General Development Plan goal of providing fire stations within five miles of all structures.

The project is projected to add a conservatively estimated 265 calls per year to the OFD's existing call load. The primary response (first due) would be provided by Station 5, which averaged 1,960 calls per year from 2011 to 2015, or roughly 5.4 calls per day. The addition of 265 calls/year (0.73 calls per day) to a station that currently responds to 5.4 daily calls is considered absorbable and the station's capacity to respond to the additional calls is available, as analyzed in Section 5.2.3.1 of this FPP. The anticipated 6.1 calls per day (5.4 daily calls + 0.73 additional calls per day) is below what would be considered a busy station. For perspective, urban fire stations that respond to five calls per day are considered average and 10 calls per day would be considered a busy station while a suburban station that responds to roughly 8 to 10 calls per day can be considered busy.

The Project would not, in and of itself, require new or physically altered Fire Department facilities. The adequacy of fire protection for an area takes into consideration response time, call volumes, fire flows, project fire safety features, service populations, compliance with fire fee

requirements, and other considerations. While the project would incrementally exceed the City's response time goals, the unacceptable response time is an existing condition for the area, and the response time would comply with NFPA national guidelines. The project would not significantly increase call volumes received at local stations. The proposed water system would provide sufficient fire flows and meet fire hydrant requirements. In addition, an extensive list of fire safety features would be incorporated into the project design to ensure adequate fire safety within the project site. The project would also comply with regulatory compliance measures and pay the appropriate fire mitigation fees. With the payment of these fees and implementation of the measures discussed above, project impacts would be minimized.

Nonetheless, OFD has indicated that a future station in this area may be necessary to address existing response gaps in the area. The project applicant would pay the appropriate fire mitigation fees to help fund such future improvements as OFD deems are needed; however, no new station is currently planned for the area. Because response time deficiencies would remain absent a new station, impacts would be significant and unavoidable.

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

The project will be served by the City of Oceanside's Water Utilities Department and 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 North River Farms 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 measures described in the responses to these significance questions are provided more detail in the following sections.

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4 ANTICIPATED FIRE BEHAVIOR

4.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected adjacent to the Proposed Project given characteristic site features such as topography, vegetation, and weather. The BehavePlus 5.0.5., 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 Appendix C.

4.2 BehavePlus Fire Behavior Modeling Effort

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

Table 3
Existing Fuel Model Characteristics

Fuel Model	Vegetation Description	Location	Fuel Bed Depth (Feet)
GR1	Mowed/Cut Dry Climate Grasses	Adjoining, Single-Family Properties with maintenance	<.1/2 ft.
GR4	Non-Maintained, Moderate Load, Dry Climate Grasses	Adjoining, Single-Family Properties without maintenance	<2.0 ft.
SH4	Riparian Forest (Timber-Shrub)	San Luis Rey Riverbed	> 8.0 ft.

4.3 Fire Behavior Modeling Results

Fire Behavior results derived from the BehavePlus modeling efforts are presented in Table 4 and in Figure 4, North River Farms Project BehavePlus Analysis Map. Four focused analyses (fire scenarios) were completed, each assuming worst-case fire weather conditions for a fire approaching the project site from the west or east. The site and adjacent areas were modeled as a

Fuel Model GR1 (Mowed/Cut Dry Climate Grasses fuelbed), Fuel Model Gr4 (Non-Maintained, Moderate Load, Dry Climate Grasses fuelbed), and Fuel Model Sh4 (Riparian Forest fuelbed). This detailed analysis compared fire behavior outside the proposed development with outputs including surface fire flame length (feet), rate of spread (mph), fireline intensity (BTU/ft/s), spotting distance (miles), and transition to from surface fire to crown fire.

Table 4
BehavePlus Fire Behavior Modeling Results

Fire Scenario	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft/s)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (mph)
Scenario 1: Summer Weather Conditions; Open Grasslands with 19 mph Sustained Winds; 5% slope						
Mowed/cut Dry Climate Grasses (GR1)	2.3	0.26	35	0.1	No	N/A
Non-maintained, Moderate Load Grasses (GR4)	15.6	1.9	1,513	0.5	No	N/A
Scenario 2: Extreme Weather Conditions; Grasslands/Farmlands with 35 mph Sustained Winds; 5% - 10% slopes						
Mowed/cut Dry Climate Grasses (GR1)	3.1	0.47	67	0.2	No	N/A
Non-maintained, Moderate Load Grasses (GR4)	26.3	8.3	6,906	1.3	No	N/A
Scenario 3: Extreme Weather Conditions; Riparian Forest with 35 mph Sustained Winds; 5% slope						
Riparian Forest-Timber Shrub (SH4)	18.5	2.5	3,215	0.9	Yes	2.5
Scenario 4: Summer Weather Conditions; Riparian Forest with 19 mph Sustained Winds, 5% slope						
Riparian Forest-Timber Shrub (SH4)	10.0	<1.0	851	0.4	Yes	<1.0

Note:

1 Spotting distance from a wind driven surface fire.

2 Fire Behavior Analysts recorded peak wind gusts up to 66 mph during the Lilac Fire. Using extreme weather fine dead fuel moisture values and observed wildfire peak gusts for the project vicinity, the BehavePlus modeling efforts would result in surface fire flame lengths ranging from 27 to 40 feet (grasslands vs. riparian forest) and rapid rates of spread (6 mph in riparian forests and 20 mph in grasslands). A surface fire in the riparian forest would transition into the tree canopies generating flame lengths higher than the average tree height (45 feet). Viable airborne embers could be carried downwind for 2.9 miles and ignite receptive fuels.

INPUTS

Variables Used for Fire Behavior Modeling Efforts

Variable	Summer Weather Condition (Onshore Winds)	Extreme Weather Condition (offshore/Santa Ana Winds)
Fuel Models	GR1, GR4, and SH4	GR1, GR4, and SH4
1h Moisture	3%	2%
10h Moisture	5%	3%
100h Moisture	7%	5%
Live Herbaceous Moisture	60%	30%
Live Woody Moisture	90%	60%
20-foot Wind Speed (upslope/downslope)	19 mph (maximum sustained winds)	35 mph (sustained winds) and peak wind gusts of 66 mph
Wind Direction	225°	45°
Wind Adjustment Factor (BehavePlus)	0.4	0.4

RESULTS

BehavePlus Fire Behavior Modeling Results

Fire Scenario	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft/s)	Spot Fire[1] (miles)	Surface Fire to Tree Crown Fire	Tree Crown Fire Rate of Spread (mph)
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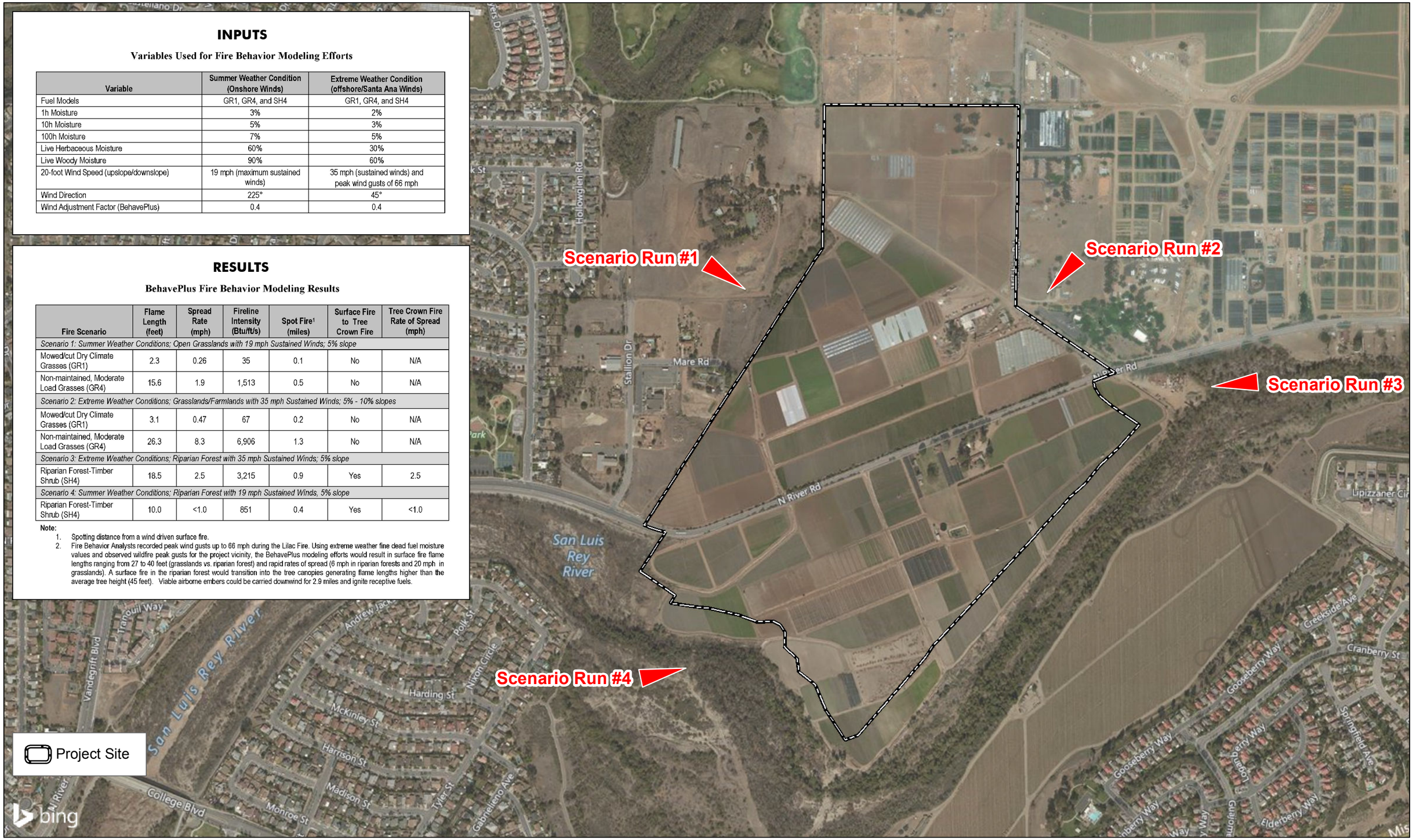
Note:

1. Spotting distance from a wind driven surface fire.
2. Fire Behavior Analysts recorded peak wind gusts up to 66 mph during the Lilac Fire. Using extreme weather fine dead fuel moisture values and observed wildfire peak gusts for the project vicinity, the BehavePlus modeling efforts would result in surface fire flame lengths ranging from 27 to 40 feet (grasslands vs. riparian forest) and rapid rates of spread (6 mph in riparian forests and 20 mph in grasslands). A surface fire in the riparian forest would transition into the tree canopies generating flame lengths higher than the average tree height (45 feet). Viable airborne embers could be carried downwind for 2.9 miles and ignite receptive fuels.



SOURCE: AERIAL-BING MAPPING SERVICE 2016

DUDEK 0 300 600 Feet

FIGURE 4

BehavePlus Fire Behavior Modeling

Fire Protection Plan for the North River Farms Project

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Based on the fire behavior modeling results presented herein, the maximum flame lengths anticipated in untreated, surface grass fuels could reach 26.3 feet in height with rapid rates of spread (8.3 mph) under extreme weather conditions, represented by sustained winds blowing at 35 mph. Should ignition in the San Luis Rey riverbed occur, the riparian forest understory would be expected to burn aggressively due to the presence of large amounts of biomass from dense stands of willows and giant reed (*Arundo donax*), which is extremely flammable. Modeling outputs indicate a transition to crown fire is expected from a fire burning in the riparian forest understory, since the canopy heights to lowest branch are roughly 4 feet above ground and in most situations the canopies touch the ground. Under such conditions, expected surface flame lengths in peripheral riparian forest surface fuels could reach up to 18.5 feet and ignite the tree canopies with flame lengths in excess of the tree heights (65 feet) as was observed during the Lilac Fire (see Appendix A, Photograph #9). Embers could be generated from both surface and crown fires resulting in ignition of receptive fuel beds 0.9 to 1.3 miles downwind.

Fires burning in from the southwest or west and pushed by ocean breezes exhibit less severe fire behavior. Under typical summer weather conditions, a grass fire could have flame lengths ranging from 2 to 16 feet in height and spread rates up to 1.9 mph. These results depend on whether the grass fuel bed is cut to less than 6 inches in height or untreated. Modeling outputs indicate flame lengths (10 feet) and a transition to crown fire resulting from a fire burning in riparian forest and mulefat scrub areas. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.1 to 0.5 mile.

It should be noted that the results presented in Tables 4-6 depict values based on inputs to the BehavePlus software. The fuels models used in this analysis are dynamic models that were designed by the U.S. Forest Service to more accurately represent southern California fuel beds. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. 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.

4.4 Project Area Fire Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of shrublands and riparian habitats. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that 1) native landscapes, from forest to grasslands, become

highly flammable each fall and 2) the climate of southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a six-month drought period each year. Based on this research, the anticipated growing population of north San Diego County wildland urban interface areas, and the regions fire history, it can be anticipated that periodic wildfires will occur in the open space areas of San Diego County, with the South Morro Hills area and San Luis Rey River corridor, being no exception.

Although the North River Farms Project site has never burned, a recent large wildfire (2017 Lilac Fire) occurred upstream along the San Luis Rey Riverbed about five miles east of the site. The Lilac fire burned very similarly to the results found in the modeled fire behavior for riparian forest under extreme weather conditions. It was evident that the ground fires that occurred in the San Luis Rey Riverbed during the Lilac Fire laddered[3] into willow tree canopies, ultimately leading to a crown fire (see Appendix A, Photograph #10) by which the fire progressed downstream from tree-to-tree canopies. As such, the project is expected to be vulnerable to recurring wildfire ignition and spread and may be subject to nearby wildfire that could, under worst case conditions, spread through the San Luis Rey Riverbed and burn along the periphery of the Project's developed areas. However, the Proposed Project site, once developed, would not facilitate wildfire spread, especially given the ignition resistance of the structures and planned landscape and farmlands.

[3] Ladder fuels comprised of low tree branches or understory vegetation can spread fire from the ground into trees.

5 EMERGENCY RESPONSE AND SERVICE

5.1 Fire Facilities

The project is located within the OFD jurisdictional response area of 41 square miles. OFD currently operates eight active Fire Stations, four of which are analyzed herein due to their proximity to the North River Farms Project. Table 4 provides a summary of the OFD fire and emergency medical delivery system for Fire Stations 5, 6, 7, and 8.

Table 5
Oceanside Fire Department Responding Fire Stations Summary

Fire Station	Address	Staffing Per Shift	Apparatus
5	4841 North River Road, Oceanside, California 92057	3	Medic Engine
6	895 North Santa Fe Ave., Vista, California 92084	5	Medic Engine Medic Ambulance
7	3350 Mission Ave., Oceanside, California 92058	6	Battalion Chief Vehicle Tiller Truck Medic ambulance
8	1935 Avenida Del Oro, Suite F, Oceanside, California 92056	3	Medic Engine

The closest station is Fire Station 5 located approximately 3.0 miles from the project site, Station 5 includes a medic engine and is staffed with three fire fighters 24-hours per day/seven days per week. Fire Station 6, located at 895 North Santa Fe Avenue, is the next closest station (a travel distance of 3.7 miles) and staffs a minimum of five fire fighters 24-hours per day/seven days per week and houses an engine and a medic ambulance. Stations 7 and 8 are relatively the same travel distances (approximately 5.9 miles) to the Project site. Station 7, staffs six fire fighters on-duty, 24-hours per day and houses a Battalion Chief staff vehicle, Tiller truck, and medic ambulance. Station 8 houses a medic engine with three fire fighters on-duty, 24-hours per day.

In addition, there are automatic aid agreements and dropped boundary agreements on first alarm or greater emergency calls with surrounding communities. The OFD is also part of both the San Diego County and State of California Master Mutual Aid Agreements.

5.2 Emergency Response

5.2.1 Travel Time Response Modeling

Dudek conducted a GIS-based travel time coverage modeling effort in order to determine if the project meets the OFD's response goal. 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.

5.2.1.1 GIS Response Travel Time Modeling

Following compilation of all necessary data layers received from project applicants and acquired via publicly available sources, Dudek verified that all data layers were in the correct State Plane Zone coordinate system with units in feet. A network data set was then created utilizing ESRI's Network Analyst extension in the Arc Catalog module. The data set was created by merging the existing centerline street layer with the proposed North River Farms Project centerline street data, provided by project applicants, and assigning parameters to the created data set. Several parameters are available during the creation of a network data set and include elevation constraints, U-turn capabilities, curb approach direction and travel impedance.

Due to the emergency nature of the response scenarios modeled in this analysis, U-turns were permitted on every road. Curb approach determines on which side of the street the vehicle needs to approach and includes three options, left, right, or either. The 'either' option was selected for all roads in this analysis based on the emergency nature of the response situations. Finally, travel impedance was utilized to include the effect of speed limits on response travel time. A custom impedance value was created for each road segment and was a function of road segment distance (miles) divided by speed (mph). This value was utilized in Network Analyst calculations for both modeling types and reflected the time necessary for a vehicle to cover the distance of the road

segment. Speed was set at 35 mph, consistent with National Fire Protection Association (NFPA) 1142 Table C.11(b) and the Insurance Services Office (ISO) travel time formula (T=0.65 +1.7D).

Once the network data set parameters were finalized, the route analysis was run using the Network Analyst extension in ArcGIS 10.2.2. This function determines the best route between a minimum of two points based on the parameters chosen. The analysis includes response from OFD Fire Stations 5 through 8, which are the closest stations to North River Farms. A route analysis procedure was then run using Network Analyst with each respective fire station as the starting point, and a remote location within the Project as the destination. The maps depicting each Station travel time coverage area are presented in Figures 5 through 8.

5.2.1.2 Travel Time Modeling Results

As indicated in Table 6 and Figures 5 through 8, response to the Project site from the closest existing OFD fire station (Station 5) would achieve a 3 to 4 minute travel time (5.5 to 6.5 minute total response time) for the entire North River Farms 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).

Other modeled OFD Fire Stations (6, 7, and 8) are further away from the North River Farms Project site and would have response times ranging from 7.5 minutes to over 13 minutes.

Table 6
Fire Station Travel Time Response to North River Farms

Call Response Times to North River Farms	Estimated Percent of North River Farms Achievable			
	Fire Station 5	*Fire Station 6*	*Fire Station 7*	*Fire Station 8*
Less than 5 minutes	5%	0%	0%	0%
5 to 6 minutes	90%	0%	0%	0%
6 to 7 minutes	100%	0%	0%	0%
7 to 8 minutes	100%	35%	0%	0%
8 to 10 minutes	100%	100%	0%	0%
Over 10 minutes	100%	100%	100%	100%

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

5.2.2 Response Travel Time Capability Assessment

The North River Farms Project includes a substantial number of new residential structures. Service level requirements could, in the absence of fire facilities and resources improvements, cause a decline in the OFD response times and capabilities for existing residents. It is clear that from a response time perspective, the project does not strictly comply with the City's five minute response goal. The City expresses a desire for a new fire station in the Morro Hills area, which, depending on where the station is sited, may provide service to North River Farms within the five minute goal. To the extent that a new station is approved, financed and built, the North River Farms project would pay its fair-share through property taxes and fire service fees. It is common for a project's developer to enter into a developer agreement or fire service agreement with a fire agency. That agreement includes details of what will be provided by the developer in terms of funding toward fire service and defining the project's fair-share financial contributions.

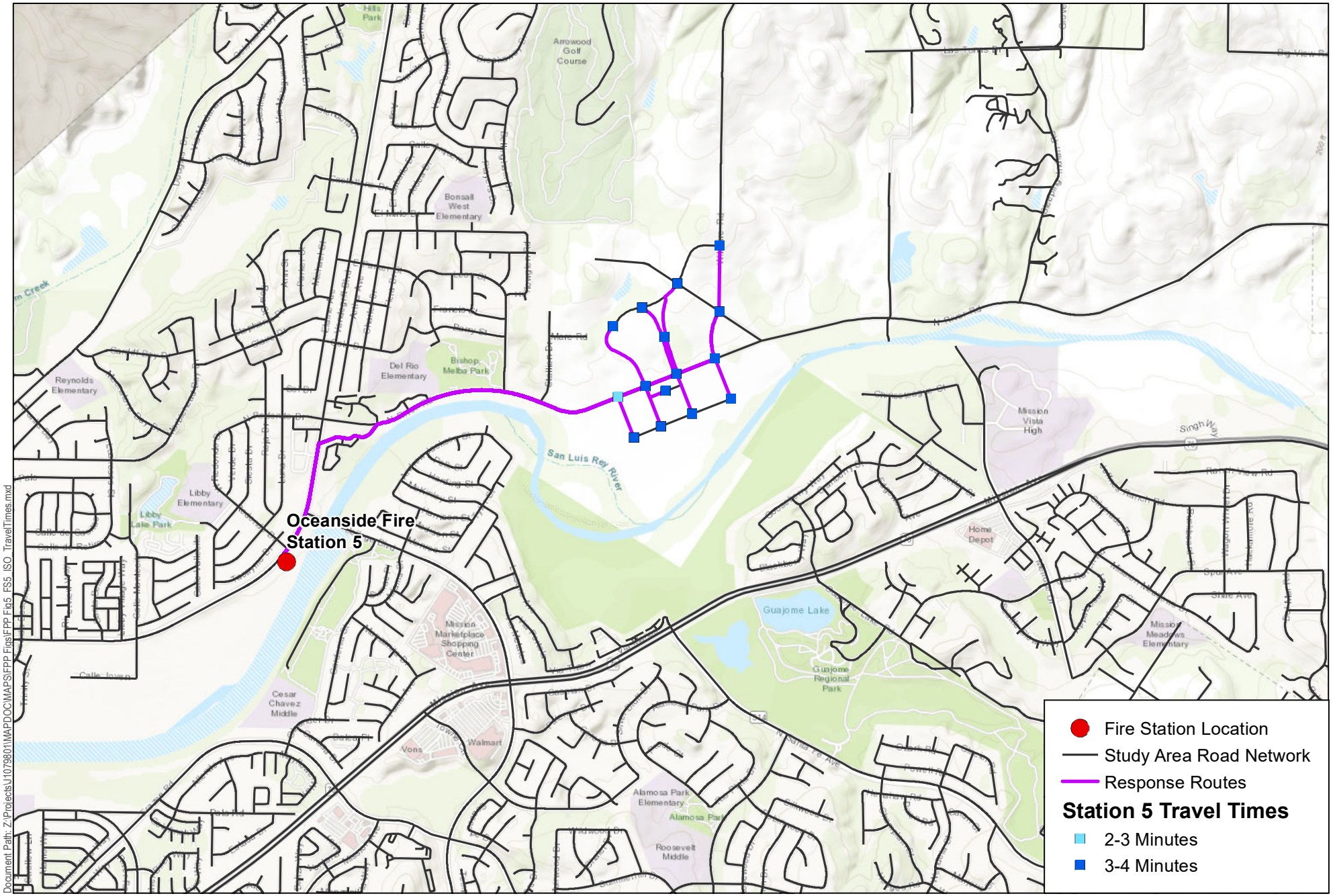
5.2.3 Call Volume Analysis

As presented in Table 7, Dudek obtained and summarized reported call volumes from OFD Station 5 for the period 2011 through 2015. As previously presented, Fire Station 5 is the closest station to the Project and would be the first due engine. As indicated, over the five year period, the station averaged 1,960 calls per year. This equals 5.4 calls per day. In addition, each fire station's work load availability is reduced by an estimated 15% (approximately 3.6 hours) when engine and crew are unavailable as either the engine is down for maintenance or the crew is receiving training. The existing call load for Station 5 is important for this analysis because if the station to provide permanent or interim response to the North River Farms Project, there must not be a significant impact on the station from additional Project-generated calls. Too many calls generated by a project on an already busy station would not support use of that station, even on an interim basis as it could significantly erode service to existing residents.

Table 7
Oceanside Fire Department Station 5 Call Volume

Annual Emergency Calls/Responses[1]	Fire Station 5[2]
2015	2103
2014	2084
2013	1786
2012	1970
2011	1861
Average Monthly Responses	**164**
Average Calls Per Day	**5.4**

1 Data for 2016 and 2017 were not available at the time of this reports' preparation
2 Call volume sourced from monthly Oceanside Fire Department Board Agenda Annual Reports



SOURCE: ESRI 2015; SANGIS 2015; Hunsaker 2015

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0 1,000 2,000 Feet

FIGURE 5

Fire Station 5 - ISO Travel Time Analysis

Fire Protection Plan for the North River Farms Project

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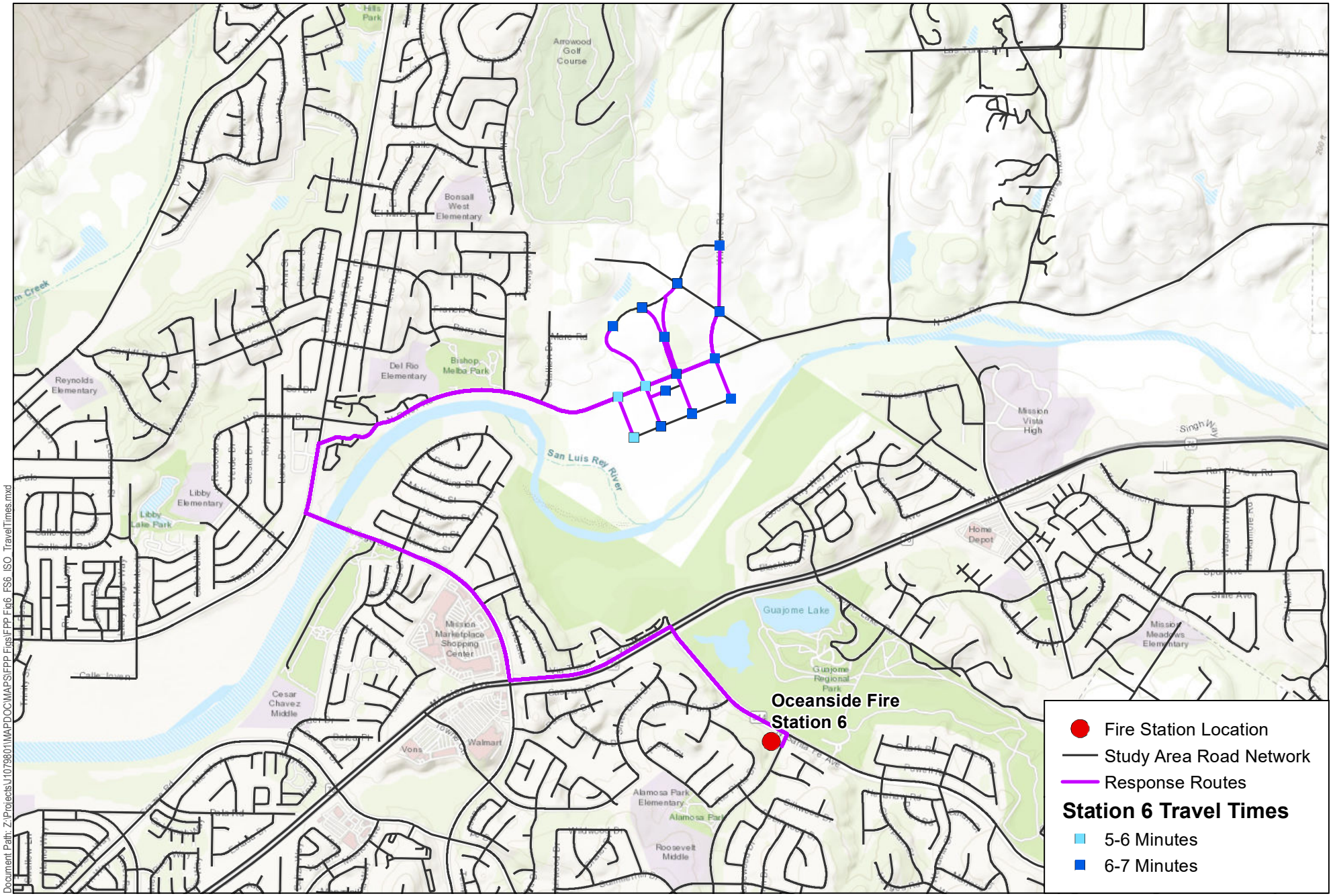

SOURCE: ESRI 2016; SANGIS 2016; Hunsaker 2016

DUDEK

0 1,000 2,000 Feet

FIGURE 6

Fire Station 6 - ISO Travel Time Analysis

Fire Protection Plan for the North River Farms Project

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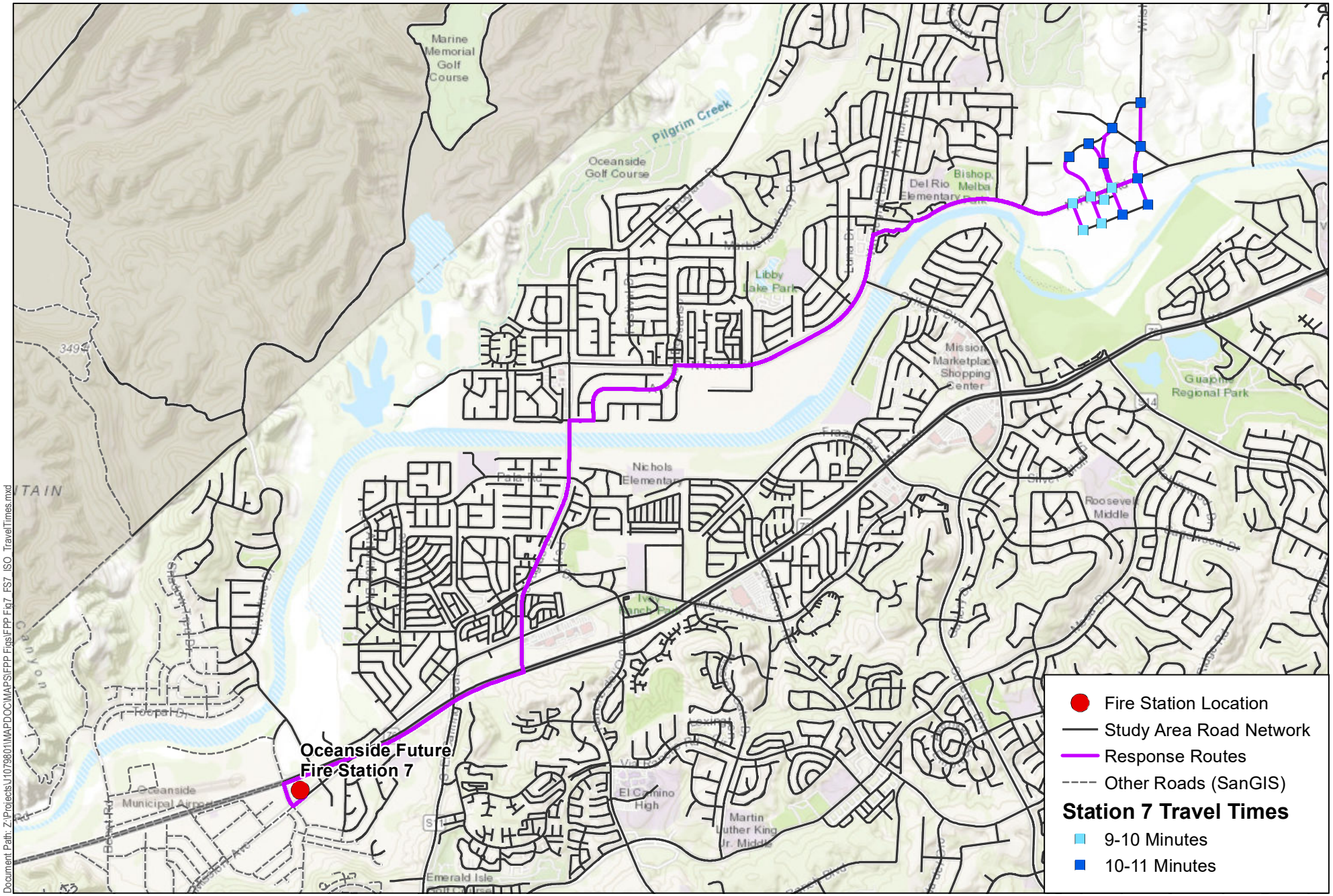

Document Path: Z:\Projects\U1079801\MAPDOC\MAPS\FPP Figs\FPP Fig7_FS7_ISO_TravelTimes.mxd

SOURCE: ESRI 2016; SANGIS 2016; Hunsaker 2016

DUDEK

0 1,500 3,000 Feet

FIGURE 7

Fire Station 7 - ISO Travel Time Analysis

Fire Protection Plan for the North River Farms Project

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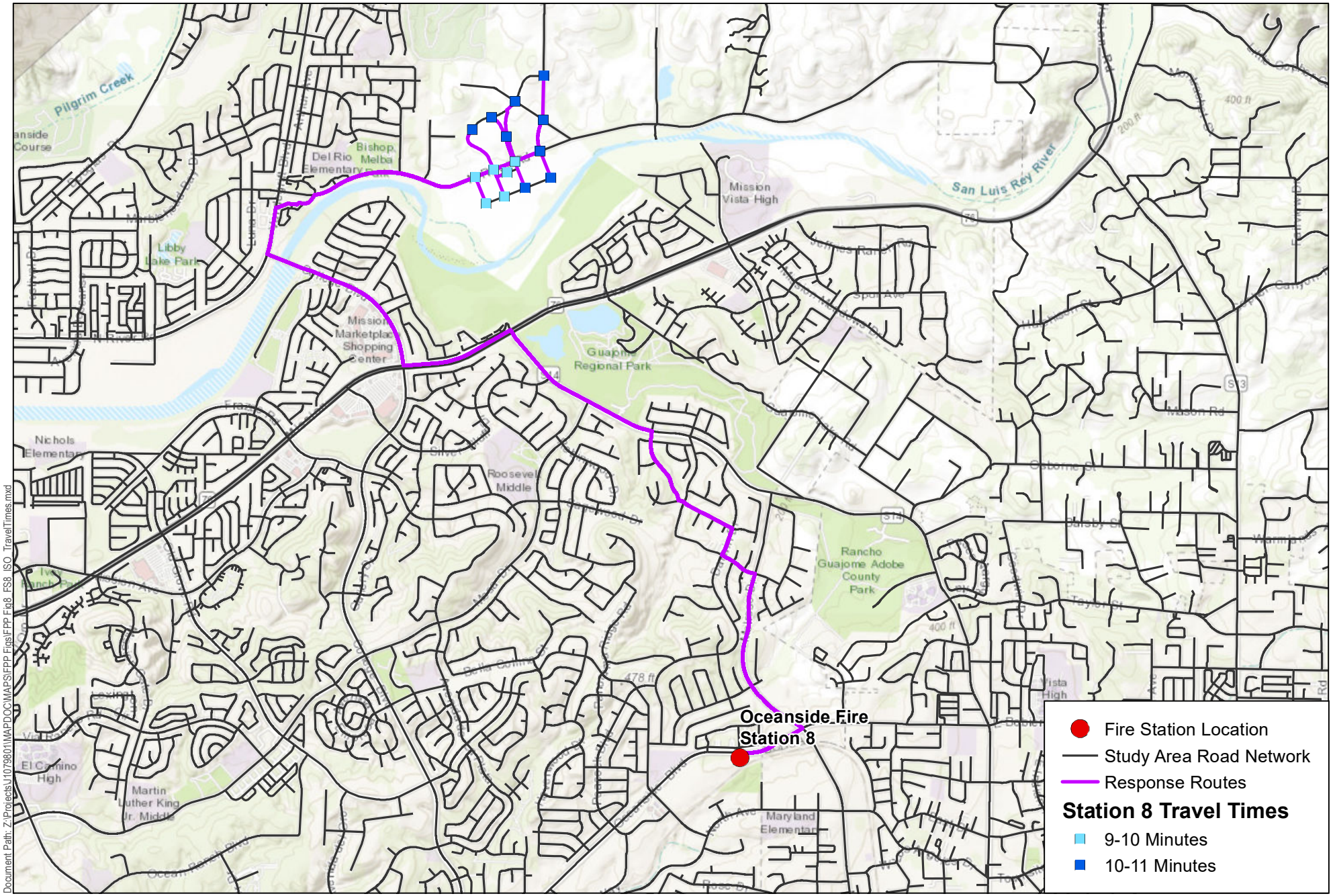

SOURCE: ESRI 2016; SANGIS 2016; Hunsaker 2016

DUDEK

0 1,500 3,000 Feet

FIGURE 8

Fire Station 8 - ISO Travel Time Analysis

Fire Protection Plan for the North River Farms Project

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5.2.3.1 North River Farms Project Call Load

The estimated incident call volume at buildout from the North River Farms Project site is based on a conservative estimate of the maximum potential number of persons on site at any given time combining all phases and uses together (considered a "worst case" scenario). The project may include up to approximately 689 residential units, along with a mix of commercial, retail, office, and educational uses. The retail uses would be sized in accordance with the project residents' needs and therefore it is anticipated that most of the additional on-site traffic at the retail centers would be Project related. A total population of 2,267 residents are calculated based on a per household occupancy of 2.81 (U.S. Census Bureau 2016). For the "worst case" scenario this analysis we have increased the per/unit population to 3 and assumed an additional 200 people at the other on-site amenities. Table 8 summarizes the service population calculations for each of the project's uses to derive this population calculation of 2,267 people:

Table 8
The North River Farms Population Calculations

Use	Formula	Population
Residential Areas	689 Dwelling Units x 2.86 PPH[1]	1,936
Commercial/Retail – Village Center	13.8 employees x 11.9 acres of mixed use	281
Parks, Other Project Areas[2]		50
	Total Population	**2,267**

[1] The U.S. Census Bureau (2016) lists Oceanside with an average number of persons per household as 2.81.
[2] An additional 50 users (net of the project's residents) was assumed to be using the parks or other areas of the project at any given time.

The population within the OFD jurisdiction is approximately 175,000 (U.S. Census Bureau Website 2016). That population generated some 20,452 incidents requiring emergency calls that OFD responded to in 2015 (Annual Report). This call volume for 175,000 people equates to a per capita call generation factor of 0.117. This is equivalent to 117 calls per 1,000 persons. Our experience working in a large number of fire agency jurisdictions is that call generation of between 80 and 100 per 1,000 persons is typical. Although 117 per 1,000 persons is higher than the averages Dudek has observed, it is not considered excessively high where data issues may be at fault. Therefore, using the conservative 117 calls per 1,000 persons, North River Farms is calculated to generate up to 265 calls per year, or 0.73 emergency calls per day.

The call volume generated by North River Farms would be considered less than significant given the current call volume experienced by Station 5 (5.4 calls per day). At build out, North River Farms would increase Station 5 calls from 5.4 per day to 6.1. For perspective, a busy fire station would be one that runs in excess of 10 calls per day while an average station runs about 5 calls per day. The addition of less than one call per day would have an unfavorable effect on Station 5.

However, it is estimated that in the absence of other population increases within Engine 5's first-due area, it would be able to absorb the additional calls.

5.2.4 Cumulative Impacts on Fire Response

5.2.4.1 Emergency Response

The North River Farms Project does not strictly comply with the City's five minute response goal in that Station 5 is just outside the distance from which it could provide five minute response to the entire North River Farms 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 5 can respond to a portion of North River Farms' structures within 5 minutes travel time, which is significantly conforming with the national standard set by NFPA, we believe it is appropriate to propose coverage from Station 5. With future planning of infrastructure and improvements to the South Morro Hills area, a future additional station could be proposed.

Because Station 5 is only incrementally beyond the five minute response goal, it would not be justified to build a new station just to serve the North River Farms project. Further, requiring North River Farms to fund a new fire station would not be feasible based on the relatively small number of units that would be contributing toward the station's initial costs and ongoing operation costs.

It is important to note that the City has identified the Morro Hills area as having existing response gaps along with potential for additional population growth above and beyond North River Farms. The City has not conducted a focused capabilities assessment to provide gap analysis details, but the OFD indicates that additional resources may be necessary at some point, both on an interim basis and then a new fire station sited within Morro Hills when the population reaches a point that call demand/response times and funding meet required thresholds. A focused capabilities assessment may be warranted as future planning documents come forward.

5.2.4.2 Call Volume/Load

North River Farms would generate emergency calls, primarily medical, proportionally with its population. At build out, there may be as many as 0.73 calls per day generated by the on-site service population. The addition of less than one call per day to a station that is currently running less than 5 calls per day is not considered a significant increase. The additional call volume should not be a diminishing factor.

Given that 10 or more calls per day is typically considered a busy station, Station 5 would realize just over six calls per day and although there would be a noticeable increase in call volume, it would not, according to CEQA, be considered to exceed significance thresholds.

The additional call volume would normally not be considered a significant impact based on North River Farms' generated calls alone, but could be elevated to a significant level based on cumulative call loads from additional future development in the Morro Hills area. This impact, combined with OFD's current estimates of engine company down time vs available time and its impact on the OFD's capability to provide service that meets their internal standards, particularly in the Morro Hills area, would be expected to require future additional response resources.

The Project would not, in and of itself, require new or physically altered Fire Department facilities. The adequacy of fire protection for an area takes into consideration response time, call volumes, fire flows, project fire safety features, service populations, compliance with fire fee requirements, and other considerations. While the project would incrementally exceed the City's response time goals, the unacceptable response time is an existing condition for the area, and the response time would comply with NFPA national guidelines. The project would not significantly increase call volumes received at local stations. The proposed water system would provide sufficient fire flows and meet fire hydrant requirements. In addition, an extensive list of fire safety features would be incorporated into the project design to ensure adequate fire safety within the project site. The project would also comply with regulatory compliance measures and pay the appropriate fire mitigation fees. With the payment of these fees and implementation of the measures discussed above, project impacts would be minimized.

Nonetheless, OFD has indicated that a future station in this area may be necessary to address existing response gaps in the area. The project applicant would pay the appropriate fire mitigation fees to help fund such future improvements as OFD deems are needed; however, no new station is currently planned for the area. Building a fire station, even a temporary station at the North River Farms site would be premature/speculative and infeasible. If standards of cover analysis indicates that the North River Farms site would provide optimal coverage for the Morro Hills area, there is potential for a temporary station built by OFD on a designated two-acre site. The applicant has also proposed additional funding through a development agreement or CFD overlay to provide more immediate response resources for the project and for the benefit of the existing community. Nonetheless, as response time deficiencies would remain absent a new station, impacts remain significant and unavoidable.

To the extent that a new station is approved, financed and built, the North River Farms project would pay its fair-share through property taxes and fire service fees. It is common for a project's developer to enter into a developer agreement or fire service agreement with a fire agency. That agreement includes details of what will be provided by the developer in terms of funding toward fire service and defining the project's fair-share financial contributions.

6 FIRE SAFETY REQUIREMENTS- INFRASTRUCTURE, BUILDING IGNITION RESISTANCE, AND DEFENSIBLE SPACE

The City's Municipal Fire and Building Codes as well as OFD Form 5205-17 (2017 Fire Master Plans for Commercial and Residential Development) govern the building, infrastructure, and defensible space requirements detailed in this FPP. While these standards will provide a high level of protection to structures in this development, there is no guarantee that compliance with these standards will prevent damage or destruction of structures by fire in all cases. The following summaries highlight important fire protection features.

6.1 Fire Access

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

6.1.1 Access Roads

With the exception of N. River Road, the project proposes to build local streets that are designed to accommodate emergency vehicle access and residential traffic flow. The primary project access for the North River Farms Project's northern and southern development areas will be via N. River Road, which will be accessed from Douglas Drive and Vandegrift Boulevard. North River Road is currently built as a two-lane collector road. The proposed project would widen the road to a four-lane major road per the General Plan Circulation Element. The project proposes road widening along its frontage, installation of two travel lanes, sidewalks, and landscape improvements within an average 100-foot-wide right-of-way. Roundabouts are proposed in two locations along N. River Road. One at the west entry to the proposed project at the Riverside Village entrance, and one at the intersection with Wilshire Road.

The project's on-site roads will be private to Oceanside approved street sections. 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 78,000 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.

A minimum of three entrances from each of the Proposed Project Planning Areas will be provided from North River Farms Road. The location of these entrances satisfies the need for supplementary access into the north and south portions of the development. The Proposed Project road circulation will facilitate evacuation and emergency operations and provide multiple access points to minimize congestion or obstruction during an emergency incident.

Access roads will be at a minimum provided first layer of pavement 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, except as designated by Oceanside approved street sections. Access roads be completed and paved (at least first pavement layer) 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 150 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 in the commercial areas 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.

6.1.2 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 150 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%.

6.1.3 Gates

Gates are not proposed within North River Farms. 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.

6.1.4 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 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.

6.2 Structures and Fire Protection Systems

6.2.1 Ignition-Resistant Structural Requirements

This section outlines ignition-resistant construction (for all structures) that will meet the requirements of the OFD Fire Code. The following construction practices respond to the requirements of the 2016 California Fire Code, the 2016 California Building Code (CBC), the California Code of regulations, Title 14, as amended. These requirements include the ignition - resistant requirements found in Chapter 7A of the CBC and County Building Code. While these standards will provide a high level of protection to structures in this development, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

6.2.1.1 Additional Requirements and Recommendations Based on Occupancy Type

All retail, commercial, office buildings or other structures will comply with appropriate Fire and Building Codes.

6.2.2 Fire Protection Systems

6.2.2.1 Water

Water service for the North River Farms 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 8-inch and 23-inch diameter water mains. The existing inactive pressure reducing station located at the intersection of Wilshire Road and N. River Road would be reconstructed as part of the water system improvements needed to provide adequate water service to the North River Farms project.

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 North River Farms 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.

6.2.2.2 Fire Hydrants

Hydrants shall be located along fire access roadways as determined by the OFD Fire Marshal in consultation with water department to meet operational needs, at intersections, at the beginning radius of cul-de-sacs, and at distances listed in Table C105.1 of the CFC, 2016 edition. Fire hydrants shall be fully operable 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 accessible to the fire department apparatus by roads meeting the requirements of section 503 of the CFC. 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. 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.

6.2.2.3 Fire Sprinklers

All structures will be provided Automatic, interior fire sprinklers. Automatic internal fire sprinklers shall be in accordance with National Fire Protection Association (NFPA) 13 or 13-D and City of Oceanside installation requirements as appropriate. Actual system design is subject to final building design and the occupancy types in the structure.

6.2.3 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.

6.3 Defensible Space and Vegetation Management

6.3.1 Fuel Modification

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.

6.3.1.1 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 2016 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.

Specific North River Farms Fuel Modification Zones

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 (Appendix D).
4. The North River Farms project is surrounded by rural, large single-family properties and agricultural land uses on three sides. The southern edge of the proposed project is bordered by the San Luis Rey River corridor. The FMZ widths provided 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 rural residential, roadways, or other disturbances that have reduced the fuels and are maintained, thus providing reciprocal 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, residential lot lines, or property boundaries that restrict Zone 1 and 2. Figure 9 illustrates the FMZ extents and Table 9 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.
6. The North River Farms property contains a sensitive habitat, Southern willow scrub (disturbed habitat) within Zone 2 for lot nos. 24 through 27 (PA-4, Hilltop Village) and Lot nos. 92 through 94 (PA-3, North Village). This northwestern portion of the development is

adjacent to semi-rural properties that are maintained per the City's vegetation management standards. The on-site portion of the Southern willow scrub area will include removal of non-native species as part of a habitat enhancement program. Willows will not be disturbed and only dead brush and non-native species will be removed.

Table 9
North River Farms Lot Fuel Modification Zone Summary

Area	Fuel Modification Distance	Comments
Northern Edge	Zone 1 = 40 to 52 feet on-site and Zone 2 = 48 to 60 feet off-site	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 weed abatement ordinance.
Eastern Edge	100-foot wide; Zones 1 and 2 occur within property	Zones 1 and 2 consist of irrigated landscaping maintained by HOA combined with paved road (Wilshire Road).
Southern Edge	minimum 100 feet in width	100+ feet of agriculture lands that will be maintained per guidelines specific in Section 6.3.3.
Western Edge	Zone 1 = 40 to 52 feet on-site and Zone 2 = 48 to 60 feet off-site	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. See Section 6.3.1.1, item #6 for on-site, vegetation treatment of Southern willow scrub area along the northwestern portion of the development.

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).

6.3.2 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.

6.3.3 Farmland – Row Crops and Orchards

Row crops and orchards at North River Farms would be managed and maintained by an on-site agriculture management team. The crops and orchard trees planned for North River Farms would

be maintained in an ignition resistant condition and are not considered to represent a wildfire risk. However, the project's Farm Plots, agricultural fields, and orchards are near wildland areas and the rows closest to natural vegetation could be exposed to extreme, radiant heat. The agriculture areas would perform a dual role as food production and fuel modification zone land uses. General fire protection safety measures are as follows:

- All agriculture areas would include maintenance for healthy, hydrated plants.
- Dead, dying, declining plants would be removed when detected
- Fallow fields would be plowed annually prior to June 1 so that spent plants are not allowed to remain standing where they could facilitate fire spread
- All agricultural areas would include a 10-foot wide firebreak between the native vegetation and farmland. This area may be mowed and can double as a roadway or pathway.

The following guidelines provide defensible space around farm equipment and structures and serve as access points for firefighting efforts.

- A 10-foot wide fire road would be cleared around the perimeter of the farmland.
- Store boxes, stakes, and other combustible farm supplies safely, including leaving 10-foot wide firebreaks between stacks.
- All dry grasses mowed or disked to bare soil.
- Off-site removal of all row crop debris unless plowed back into the soil.
- Create a safe zone clear of all vegetation for ranch equipment.
- Clear vegetation around fuel tanks per CFC[4].
- Properly mark all storage areas used for chemicals or hazardous materials.
- Irrigation system would be functional and routinely maintained at all times.

The following maintenance and management guidelines have been developed to minimize the likelihood of ignition and reduce the fire spread potential within proposed orchards:

- Maintain orchard tree canopies such that a 5-foot horizontal clearance exists between the outward edges of tree canopies.
- Maintain mature orchard tree canopies such that a 4-foot vertical clearance exists between the bottom edges of the canopy and the upper edge of the mulch understory.

[4] Any diesel fuel tanks that may be included on site associated with the agricultural operations would be no larger than 500 gallon convault style tank with self-containment, to the Code.

- Maintain a minimum distance of 15 feet from the outward edge of the canopy of the perimeter row of orchard trees to adjacent shrubs taller than 2 feet in overall height.
- Maintain compacted mulch layer throughout the entire orchard at a depth of 2-inches. Composted mulch/wood chips produce low flame lengths and tend to have a slower rate of spread (Quarles and Smith 2008).
- Clovers and other legumes can be used as a cover crop between rows or underneath orchard trees if cut or mowed to a height of 2-3 inches before drying out.
- Routinely prune orchard trees to remove deadwood and dying material and routinely remove dead trees in a timely manner so that they will not facilitate fire ignition or spread, even if this occurs on a large-scale basis.
- Maintain the orchard free of debris, trimmings, and other organic waste.
- Maintain orchard trees to ensure their overall health and vigor, including routine pruning, irrigation, and pest/disease management.
- Routinely inspect, maintain, and repair the orchard's irrigation system for leaks, damage and effectiveness.
- Routinely mow and/or line trim any weeds or non-native grasses occurring within the orchards and replenish mulch in such areas to minimize or prevent weed/grass re-growth.

6.3.4 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 (Appendix 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.

6.3.5 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.

6.3.6 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 land owners and potentially from appropriate resource agencies.

6.3.7 Pre-Construction Requirements

- Perimeter fuel modification areas must be implemented and approved by the OFD prior to combustible materials being brought on site.
- Existing flammable vegetation shall be removed on vacant lots prior to commencement of construction.

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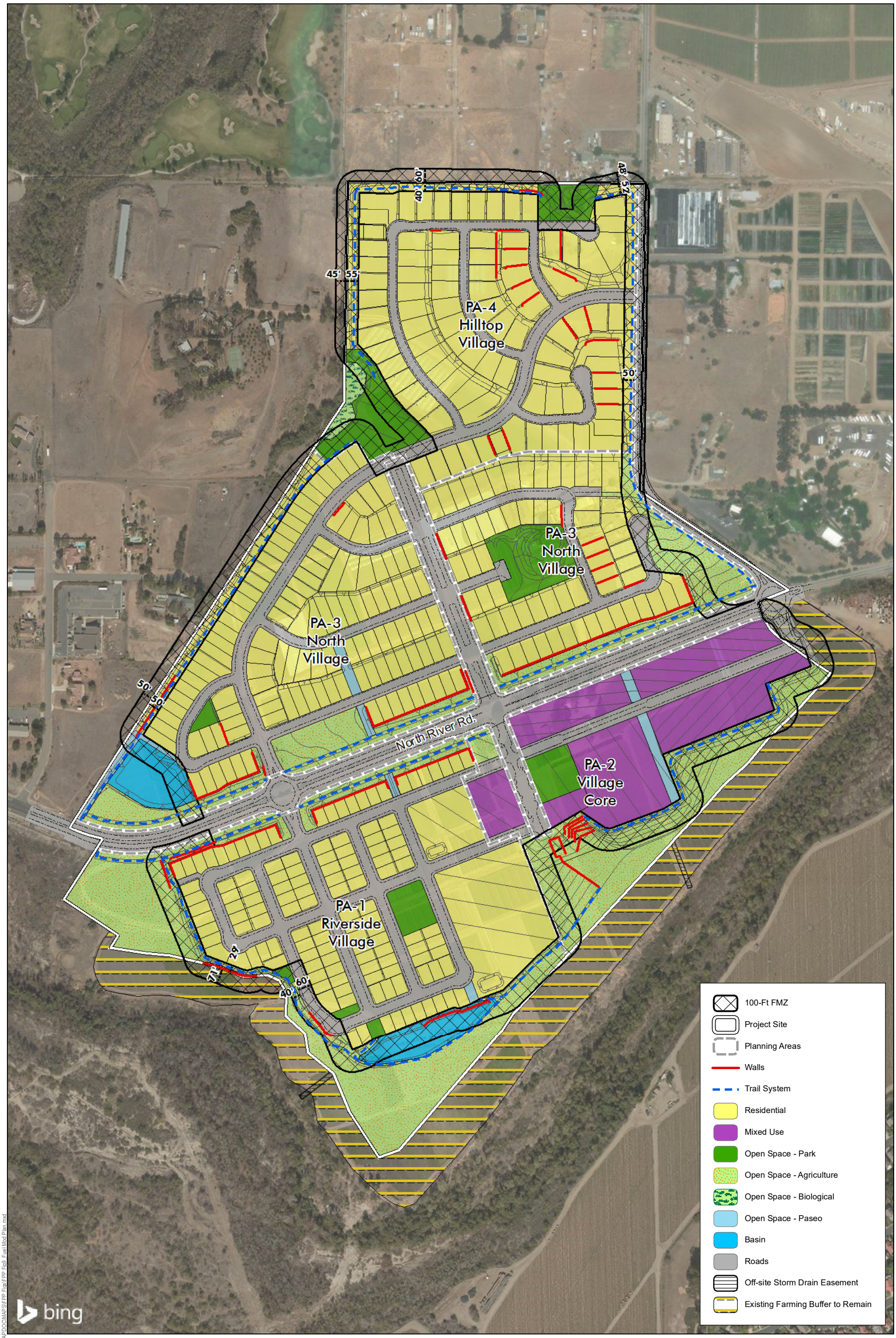

AERIAL SOURCE: BING MAPPING SERVICE; SITE PLAN - HUNSAKER 2018

DUDEK

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FIGURE 9

Conceptual Fuel Modification Plan

Fire Protection Plan for the North River Farms Project

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7 EVACUATION PLAN

An evacuation plan will be prepared for the North River Farms Project that indicates how the project will evacuate during a wildfire emergency. The evacuation plan will be prepared in coordination with OFD and County of San Diego Emergency Operations planning documents such that it does not conflict with existing evacuation and operational pre-plans.

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8 HOMEOWNER'S ASSOCIATION WILDFIRE EDUCATION PROGRAM

The residents of the North River Farms Project will be provided a proactive educational component disclosing the potential wildfire risk and this report's requirements. This educational information must include maintaining the landscape and structural components according to the appropriate standards and embracing a "Ready, Set, Go" stance on evacuation.

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9 CONCLUSION

This FPP has been prepared for the North River Farms Project. It is submitted in compliance with OFD's Fire Code. The recommendations in this document meet fire safety, building design elements, infrastructure, fuel management/modification, and landscaping recommendations of the applicable City codes and OFD policies. The recommendations provided in this FPP have been designed specifically for the proposed construction of structures within the vicinity of a fire hazard severity zone on the North River Farms project site. The project site's fire protection system includes a redundant layering of protection materials, measures, and methods that have been shown through post-fire damage assessments to reduce risk.

Ignition resistant landscaping would occur throughout the site. Fuel modification will be installed on the Project's perimeter, especially along the southern boundary which abuts the Riparian forest within the San Luis Rey riverbed. The site's landscaping will be maintained throughout each year and an inspection will be funded by the HOA to ensure compliance with this FPP and fire safe plant palettes, planting densities and spacing.

The site improvements are designed to facilitate emergency apparatus and personnel access to all portions of the site. Roads and driveways meeting the code width standards and including fire engine turnouts and turnarounds provide access to within 150 feet of all sides of every building. Water availability and flow via the City of Oceanside Water Utilities Department will be consistent with OFD requirements including fire flow and hydrant distribution. These features along with the ignition resistance of all buildings, the interior sprinklers, and the pre-planning, training and awareness will assist responding firefighters through prevention, protection and suppression capabilities.

Ultimately, it is the intent of this FPP to recommend the construction of structures that are defensible from wildfire and, in turn, do not represent significant threat of ignition source for adjacent communities. During extreme fire conditions, there are no guarantees that a given structure will not burn. Fire safety measures identified in this report are designed to reduce the likelihood that fire would impinge upon the proposed structures. Wildfires may occur in the area that could damage property or harm persons. However, implementation of the recommendations in this FPP will substantially reduce the risk associated with this project's wildfire hazard vicinity location.

This FPP does not provide a guarantee that all residents and visitors will be safe at all times because of the advanced 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.

It is recommended that the North River Farms community maintains a conservative approach to fire safety. This approach must include maintaining the landscape and structural components according to the appropriate standards and embracing a **"Ready, Set, Go!"** stance on evacuation. This project is not labeled a shelter-in-place community. However, the fire agencies and/or law enforcement officials may, during an emergency, as they would for any new community provided the layers of fire protection as the North River Farms, determine that it is safer to temporarily refuge residents on the site than to evacuate. When an evacuation is ordered, it will occur according to pre-established evacuation decision points (as detailed in an Evacuation Plan for the project site), or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors. Fire is a dynamic and somewhat unpredictable occurrence and it is important for anyone living at the WUI to educate themselves on practices that will improve safety.

The goal of the fire protection features, both required and those offered above and beyond the Codes, provided for the North River Farms residential project is to provide the structures with the ability to survive a wildland fire with little intervention of firefighting forces. Preventing ignition to structures results in reduction of the exposure of firefighters and residents to hazards that threaten personal safety. It will also reduce property damage and losses. Mitigating ignition hazards and fire spread potential reduces the threat to structures and can help the fire department optimize the deployment of personnel and apparatus during a wildfire. The analysis in this FPP provides support and justifications for acceptance of the proposed fuel modification zones for this project based on the site specific fire environment.

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APPENDIX A

Representative Site Photograph Log

NORTH RIVER FARMS

REPRESENTATIVE PHOTOGRAPHS

February 26, 2018

Photograph 1. View looking northeast across the northern portion of the site while standing along North River Road at the western edge of the Project site.

Photograph 2. View looking southeast from North River Road across the southern portion of the site. Note: San Luis Rey River with Southern riparian willow forest in the background (yellow arrow).

Photograph 3. View looking southwest across the eastern edge of property from Wilshire Road.

Photograph 4. View looking east along North River Road, which divides the property into north and south sections.

Photograph 5. View facing east across the northern portion of site, standing at the end of Mare Road along the western border of the property.

Photograph 6. View of northwest edge of property looking southeast from end of Stallion Drive .

Photograph 7. View facing south from the intersection of North River Road and Wilshire Road.

Photograph 8. View from offsite (Chincoteague Ct. cul-de-sac) and facing northwest towards San Luis Rey River and Southern riparian willow forest along the southern edge of site (yellow arrow).

Photograph 9. Photograph shows the Lilac fire behavior within the Southern riparian willow forest in the San Luis Rey Riverbed. The Lilac Fire burnt through this area in December 2017 and transitioned from the ground into the lower canopies of the willow trees. *Photo Source: Reuters*

Photograph 10. Tree canopies and trunks were scorched during the Lilac Fire. Photo taken south of Hwy 76, just east of the Project site.

APPENDIX B

North River Farms Vicinity
Fire History Map

5-Mile Buffer

Project Site

ALARM

0 - 1934

1935 - 1969

1970 - 1989

1990 - 1999

2000 - 2016

Approximate Perimeter of Lilac Fire

ID	YEAR	FIRE NAME	ACRES
1	1937		87.26
2	1937		118.76
3	1938		193.55
4	1941		115.34
5	1953	PUEBLITOS CANYON	1158.27
6	1957	CLANCY	611.57
7	1971		81.80
8	1972		25.74
9	1975		66.73
10	1983	ASSIST #28	679.82
11	1984	GOPHER #3	39.15
12	1985	GOPHER	674.28
13	2005	MISSION	18.94
14	2007	VUELTA	214.81
15	2010	76-2	11.91
16	2014	TOMAHAWK- BASILONE COMPLEX	5365.31
17	2014	PULGAS-BASILONE COMPLEX	15186.10
18	2014	RIVER	167.91
19	2017	LILAC FIRE	4100.00

SOURCE: BASE- ESRI MAPPING SERVICE; FIRE DATA-FRAP 2016; Lilac Fire-SANGIS

DUDEK

0 4,000 8,000 Feet

ATTACHMENT B

North River Farms Vicinity Fire History Map

Fire Protection Plan for the North River Farms Project

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APPENDIX C

BehavePlus Fire Behavior Analysis

APPENDIX C
North River Farms Project
Fire Behavior Modeling

BEHAVEPLUS FIRE BEHAVIOR MODELING

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

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

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

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-

quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.

- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

Although BehavePlus has some limitations, it can still provide valuable fire behavior predictions which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

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

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

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

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

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

BEHAVEPLUS FUEL MODEL INPUTS

Dudek utilized BehavePlus version 5.5 software to evaluate fire behavior potential for the project site. Four fire scenarios were evaluated, including two summer, onshore weather conditions and two more extreme fall, offshore weather conditions. 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.

Vegetation/Fuel Models

To support the fire behavior modeling efforts conducted for this FPP, the different vegetation types observed adjacent to the site were classified into the aforementioned numeric fuel models. Dudek analyzed fire behavior for the fuels beyond the eastern edge (east of Wilshire Road); southeastern and southern edges within the San Luis Rey Riverbed; the western edge north and east of Stallion Drive of the property. As is customary for this type of analysis, the terrain and

fuels directly adjacent to the property are used for determining flame lengths and fire spread. It is these fuels that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement.

Vegetation types were derived from vegetation mapping data (Dudek 2017) for the North River Farms Project. Based on vegetation mapping data, three different fuel models were used in the fire behavior modeling effort presented herein. Fuel model attributes are summarized in Table 1. Modeled areas include the non-native grasslands (Fuel Model Gr1= maintained grasses; Gr4= non-maintained grasses) to the west, north, and east of the project site. Southern Arroyo Willow Riparian and Mulefat Scrub (Fuel Model SH4= Timber-Shrub) occur along the river bottomlands south of the site. Mature tree canopies for black willow trees (*Salix gooddingii*) are assumed to have a canopy base height ranging from 35 to 45 feet off the ground. Shrubby willows in association with mulefat (*Baccharis salicifolia*) naturally occur with 10 to 20 feet canopy base height. Canopy bulk density, the weight of canopy fuels per cubic foot of volume, is assumed to be the maximum allowable value in BehavePlus to represent broadleaf trees which, given canopy density and leaf size, have more weight per area than conifer trees (the standard for this value input in BehavePlus (Heinsch and Andrews 2010)). Foliar moisture, the moisture content of canopy foliage, is assumed to be 100%, a reasonable estimate in lieu of site-specific data (Scott and Reinhardt 2001).

Table 1
Existing Fuel Model Characteristics

Fuel Model	Vegetation Description	Location	Fuel Bed Depth (Feet)
GR1	Mowed/Cut Dry Climate Grasses	Adjoining, Single-Family Properties with maintenance	<1/2 ft.
GR4	Non-Maintained, Moderate Load, Dry Climate Grasses	Adjoining, Single-Family Properties without maintenance	<2.0 ft.
SH4	Riparian Habitat (Timber-Shrub)	San Luis Rey Riverbed	>8.0 ft.

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. Slope values ranging from 2% to 10% were measured around the perimeter of the proposed project site from U.S. Geological Survey (USGS) topographic maps.

Weather Analysis

The County of San Diego, Department of Planning and Land Use (County of San Diego 2010) developed guidelines to identify acceptable fire behavior modeling weather inputs for fire conditions during summer months and Santa Ana fire weather patterns. The County analyzed and processed fire weather from Remote Automated Weather Stations (RAWS) between April 15 to December 31 in order to represent the general limits of the fire season. Data provided by the County's analysis included temperature, relative humidity, and sustained wind speed and is categorized by weather zone, including Maritime, Coastal, Transitional, Interior, and Desert.

As identified in the County's guidelines, Dudek utilized the Fine Dead Fuel Moisture (FDFM) tool within BehavePlus (v. 5.0.5) fire behavior modeling software package to determine potential fuel moisture values to be input into the BehavePlus runs. The temperature, relative humidity, and wind speed data for the Coastal (County of San Diego 2010) weather zone were utilized for this FPP based on the project's location. Reference fuel moistures were calculated in the FDFM tool and were based on site-specific topographic data inputs. Table 2 summarizes the FDFM inputs and the resulting fine dead fuel moisture values.

Table 2
BehavePlus Fine Dead Fuel Moisture Calculations

Variable	Summer Weather	Extreme (Peak) Weather
Dry Bulb Temperature	90 -109 deg. F	90 -109 deg. F
Relative Humidity	10 - 14 %	5 -9 %
Reference Fuel Moisture	2 %	1 %
Month	May June July	May June July
Time of Day	12:00 - 13:59	12:00 - 13:59
Elevation Difference	Level (within 1,000 ft.)	Level (within 1,000 ft.)
Slope	30% +	30% +
Aspect	East	East
Fuel Shading	Exposed (< and > 50% shading)	Exposed (< and > 50% shading)
Fuel Moisture Correction	1 %	1 %
Fine Dead Fuel Moisture	3 %	2 %

The weather variables presented in Table 3 are based on the calculated FDFM (Table 2) and the wind speed values identified in the County of San Diego standards.

Table 3
Variables Used for Fire Behavior Modeling Efforts

Variable	Summer Weather Conditions (Sea Breeze)	Peak Weather Condition (offshore/Santa Ana Conditions)
Fuel Models	GR1, GR4, and SH4	GR1, GR4, and SH4
1h Moisture	3%	2%
10h Moisture	5%	3%
100h Moisture	7%	5%
Live Herbaceous Moisture	60%	30%
Live Woody Moisture	90%	60%
20-foot Wind Speed (upslope/downslope)	19 mph (maximum sustained winds)	35 mph (sustained winds) and 66 mph (peak gusts)
Wind Direction	225°	45°
Wind Adjustment Factor (BehavePlus)	0.4	0.4

FIRE MODELING SCENARIOS

Based on slope and fuel conditions, four different fire scenarios were evaluated for the project site. These sites were selected based on the strong likelihood 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).

- **Scenario 1:** On-shore wind and a summer fire burning in short, sparse grasses intermixed with agricultural farmland throughout the northern and northwestern portion of the project site. The terrain is relatively gentle, flat (5% slope) with potential ignition sources from farm vehicles travelling throughout the agricultural land, as well as from a potential human started fire from the surrounding residential neighborhood. Fire in this area would be moving slightly downhill toward the Proposed Project.
- **Scenario 2:** Off-shore wind and a fall fire burning in short, sparse grasses intermixed with agricultural farmland in the eastern portion of the project site, in relatively gentle, rolling terrain (5% to 10% slope). Potential ignition sources could be from vehicles travelling on Wilshire Road. Fire in this area would be moving slightly downhill toward the Proposed Project.
- **Scenario 3:** Off-shore wind and a fall fire burning in Southern Arroyo Willow Riparian Forest in the adjacent San Luis Rey Riverbed along the southern edge of the project site. This area has relatively flat terrain (5% slope) with potential ignition sources from a wildfire that originates east of the project site in the San Luis Rey Riverbed. Fire in this area would be moving downstream, through the riverbed bottomlands toward the eastern corner of the site.

- **Scenario 4:** On-shore wind and a summer fire burning in Southern Arroyo Willow Riparian Forest in the San Luis Rey Riverbed adjacent to the southwestern edge of the project site. This area has relatively flat terrain as well, (5%), with potential ignition sources from a wildfire that originates west/southwest of the project site, in the San Luis Rey Riverbed Open Space and Bike Trail area along the western portion of the proposed project site. Fire in this area would be moving slightly upstream, through the river bottomlands before reaching the site.

FIRE BEHAVIOR MODELING RESULTS

The BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site. The modeling effort included an analysis of potential fire behavior under two weather scenarios (summer conditions and extreme conditions) and within two potential fuel types (non-native grasses and riparian forest). The results of the modeling effort included anticipated values for surface fires (flame length (feet), rate of spread (mph), and fireline intensity (Btu/ft/s)) and 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)). Modeled fire behavior outputs derived from the BehavePlus modeling efforts are presented in Tables 4-6. Identification of modeling run locations is presented graphically in Figure 4 of the North River Farms Fire Protection Plan (2018).

Table 4
BehavePlus Fire Behavior Modeling Results
(Summer Weather "Sea Breeze" Conditions)

Fire Behavior Variable	Modeling Results		
	Fuel Model GR1	*Fuel Model GR4*	*Fuel Model SH4*
Surface Fire			
Flame Length (feet)	2.3	15.6	10.0
Fireline Intensity (Btu/ft/s)	35	1,513	851
Surface Rate of Spread (mph)	0.26	1.9	0.73
Spotting Distance	0.1	0.5	0.4
Crown Fire			
Critical Surface Intensity (Btu/ft/s)	N/A	N/A	42
Critical Surface Flame Length (feet)	N/A	N/A	2.5
Transition Ratio	N/A	N/A	20.13
Transition to Crown Fire	N/A	N/A	Yes
Crown Fire Rate of Spread (mph)	N/A	N/A	0.78

Table 4
BehavePlus Fire Behavior Modeling Results
(Summer Weather "Sea Breeze" Conditions)

Fire Behavior Variable	Modeling Results		
	Fuel Model GR1	*Fuel Model GR4*	*Fuel Model SH4*
Critical Crown Rate of Spread (mph)	N/A	N/A	0.11
Active Ratio	N/A	N/A	6.93
Active Crown Fire	N/A	N/A	Yes
Fire Type	Surface	Surface	Crowning

Table 5
BehavePlus Fire Behavior Modeling Results
(Extreme Weather Conditions)

Fire Behavior Variable	Modeling Results		
	Fuel Model GR1	*Fuel Model GR4*	*Fuel Model SH4*
Surface Fire			
Flame Length (feet)	3.1	26.3	18.5
Fireline Intensity (Btu/ft/s)	67	6,906	3,215
Surface Rate of Spread (mph)	0.47	8.3	2.5
Spotting Distance	0.2	1.3	0.9
Crown Fire			
Critical Surface Intensity (Btu/ft/s)	N/A	N/A	42
Critical Surface Flame Length (feet)	N/A	N/A	2.5
Transition Ratio	N/A	N/A	75.99
Transition to Crown Fire	N/A	N/A	Yes
Crown Fire Rate of Spread (mph)	N/A	N/A	2.48
Critical Crown Rate of Spread (mph)	N/A	N/A	0.11
Active Ratio	N/A	N/A	22.03
Active Crown Fire	N/A	N/A	Yes
Fire Type	Surface	Surface	Crowning

Table 6
BehavePlus Fire Behavior Modeling Results
(Extreme Weather Conditions - 66 mph Peak Gusts)

Fire Behavior Variable	Modeling Results		
	Fuel Model GR1	*Fuel Model GR4*	*Fuel Model SH4*
Surface Fire			
Flame Length (feet)	3.1	40.1	27.7
Fireline Intensity (Btu/ft/s)	67	17,302	7,735

Table 6
BehavePlus Fire Behavior Modeling Results
(Extreme Weather Conditions - 66 mph Peak Gusts)

Fire Behavior Variable	Modeling Results		
	Fuel Model GR1	*Fuel Model GR4*	*Fuel Model SH4*
Surface Rate of Spread (mph)	0.47	20.87	6.01
Spotting Distance	0.3	2.7	0.9
Crown Fire			
Critical Surface Intensity (Btu/ft/s)	N/A	N/A	42
Critical Surface Flame Length (feet)	N/A	N/A	2.5
Transition Ratio	N/A	N/A	182.82
Transition to Crown Fire	N/A	N/A	Yes
Crown Fire Rate of Spread (mph)	N/A	N/A	6.1
Critical Crown Rate of Spread (mph)	N/A	N/A	0.11
Active Ratio	N/A	N/A	53.85
Active Crown Fire	N/A	N/A	Yes
Fire Type	Surface	Surface	Crowning

Interpretation of Fire Behavior Modeling Results

The following describes the fire behavior variables (Heisch and Andrews 2010) as presented in Tables 4-6:

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.

Crown Fire:

- Critical Surface Intensity (Btu/ft/s): The fireline intensity of the surface fire that is required for a transition from a surface fire to a crown fire. It is calculated from foliar moisture content and canopy base height.
- Critical Surface Flame Length (feet): Associated with the critical surface intensity required for transition to crown fire.
- Transition Ratio: The surface fireline intensity divided by the critical surface intensity. If the transition ratio is greater than or equal to one, then the surface fireline intensity is sufficient for a transition to 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.
- Critical Crown Rate of Spread (mph): The rate at which a crown fire must spread to maintain itself as an active crown fire. It is calculated from the canopy bulk density. Crown fire rate of spread is compared to critical crown fire rate of spread to determine whether an active crown fire is possible.
- Active Ratio: The crown fire rate of spread divided by the critical crown fire rate of spread. If the active ratio is greater than or equal to one, then the fire may be an active crown fire.
- Active Crown Fire: Indicates whether conditions are such that a fire can maintain itself as an active crown fire. Calculation depends on the active ratio. If the Active Ratio is greater than or equal to 1, then Active Crown Fire is Yes. If the Active Ratio is less than 1, then Active Crown Fire is No.

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 7 presents an interpretation of these fire behavior variables as related to fire suppression efforts for surface fires.

Table 7
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.

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

SUMMARY

Based on the fire behavior modeling results presented herein, the maximum flame lengths anticipated in untreated, surface grass fuels could reach 40 feet in height with rapid rates of spread (2.7 mph) under extreme weather conditions, represented by Santa Ana winds blowing at gusts of 66 mph. Should ignition in the San Luis Rey riverbed occur, the riparian forest understory would be expected to burn aggressively due to the presence of large amounts of biomass from dense stands of willows and giant reed (*Arundo donax*), which is extremely flammable. Modeling outputs indicate a transition to crown fire is expected from a fire burning in the riparian forest understory, since the canopy heights to lowest branch are roughly 4 feet above ground and in most situations the canopies touch the ground. Under such conditions, expected surface flame lengths in peripheral riparian forest surface fuels could reach up to 28 feet and ignite the tree canopies with flame lengths in excess of 45 feet. Embers could be generated from both surface and crown fires resulting in ignition of receptive fuel beds 1.0 to 3.0 miles downwind.

Fires burning in from the southwest or west and pushed by ocean breezes exhibit less severe fire behavior. Under typical summer weather conditions, a grass fire could have flame lengths ranging from 2 to 16 feet in height and spread rates up to 1.9 mph. These results depend on whether the grass fuel bed is cut to less than 6 inches in height or untreated. Modeling outputs indicate flame lengths (10 feet) and a transition to crown fire resulting from a fire burning in riparian forest and mulefat scrub areas. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.1 to 0.5 mile.

It should be noted that the results presented in Tables 4-6 depict values based on inputs to the BehavePlus software. The fuels models used in this analysis are dynamic models that were designed by the U.S. Forest Service to more accurately represent southern California fuel beds. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. 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.

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APPENDIX D

Prohibited Plant List

APPENDIX 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 North River Farms 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.

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