APPENDIX N
FIRE PROTECTION PLAN AND TRAFFIC EVACUATION ASSESSMENT

APPENDIX N-1
FIRE PROTECTION PLAN

Fire Protection Plan

Blackhall Studios-Santa Clarita

SEPTEMBER 2022

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
BTU	British Thermal Unit
CAL FIRE	California Department of Forestry and Fire Protection
CBC	California Building Code
CC&Rs	Covenants, Conditions and Restrictions
CFC	California Fire Code
CFPP	Construction Fire Prevention Plan
FAHJ	Fire Authority Having Jurisdiction
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
FRAP	Fire and Resource Assessment Program
GIS	Geographic Information Systems
I-5	Interstate 5
ISO	Insurance Service Office
LACoFD	Los Angeles County Fire Department
MPH	miles per hour
NFPA	National Fire Protection Association
Project	Blackhall Studios-Santa Clarita Project
SCVWA	Santa Clarita Valley Water Agency
SRA	State Responsibility Area
USGS	United States Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
WRCC	Western Regional Climate Center
WUI	Wildland Urban Interface

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Executive Summary

This Fire Protection Plan (FPP) has been prepared for the Blackhall Studios-Santa Clarita Project (Project), which proposes the development of approximately 476,000 square feet of sound stages, approximately 221,000 square feet of production and administrative office space, approximately 560,000 square feet of workshops, warehouses and support use buildings, and approximately 37,500 square feet of catering and other specialty services. A five-level (four elevated) parking structure and other surface parking lots are planned for the proposed development within a 93.5-acre parcel and 11.4-acre property owned by the Metropolitan Water District (MWD) that is proposed to be used as ancillary parking and a shrub and tree nursery, located in Santa Clarita (City), Los Angeles County, California. The Project current land use and zoning designation is Mixed-Use Neighborhood (MX-N) and Non-Urban Residential (NU5); however, the Project includes a General Plan Amendment to update the land use and zoning designation to MX-N across the Project site.

The Project site is undeveloped and cleared of most of the natural vegetation. Regionally, the Project site is located in the Newhall community of Santa Clarita, California. Locally, the Project site is contiguous to Railroad Avenue on the west; 13th Avenue, Arch Street and 12th Avenue to the south; and Placerita Creek to the north. The Project proposes development on multiple parcels, which include Assessor Parcel Numbers (APN's): 2834-001-007, -14, -15, -002-046, -003-044, -004-045, -005-041, -006-041, -007-045, -008-039, -010-043, -011-021, -012-023, -013-041, -014-043, -015-021, -016-041, -017-021, -020-114, -021-134 and -022-067 for the Blackhall Studios site, and 2834-001-272, -020-270, -271, -021-270 and -271 for the MWD site. Primary access to the site is via Railroad Avenue.

Portions of the Project site are designated Very High Fire Hazard Severity Zone (VHFHSZ) within a Local Responsibility Area (LRA), as designated by the Los Angeles County Fire Department (LACoFD) and California Department of Forestry and Fire Protection (CAL FIRE). Fire hazard designations are based on topography, vegetation, and weather, amongst other factors. VHFHSZ designation does not indicate that an area is not safe for development. It does indicate that specific fire protection features that minimize structure vulnerability will be required, including Los Angeles County Building Code Chapter 7A and provisions for maintained fuel modification zones, amongst others described in the FPP.

The Project site is currently undeveloped and cleared of most of the natural vegetation. The Placerita Creek wash area has been primarily undisturbed by past development activity on the Project site and includes native vegetation communities, such as sage and buckwheat scrub habitats. The topography of the Project site is relatively flat with slopes ranging from level to 30 percent. A significant ridgeline is designated in the northern portion of the Project site within the proposed on-site retained open space. The Project area, like all of Southern California and Los Angeles County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread, and, considering the site's terrain and vegetation, may result in a fast-moving and intense wildfire.

The FPP evaluates and identifies the potential fire risk associated with the Project's land uses and identifies requirements for water supply, fuel modification and defensible space, access, building ignition and fire resistance, and fire protection systems, among other pertinent fire protection criteria. The purpose of this FPP is to generate and memorialize the fire safety requirements and standards of the LACoFD along with Project-specific measures based on the Project site, its intended use, and its fire environment.

Fire service would be provided by the LACoFD. The Project population and number of calculated emergency calls were evaluated for their potential to impact LACoFD's response capabilities from its nearest existing stations. The addition of approximately 228 calls per year to Station 73's 2,635 call volume is considered insignificant. The closest existing LACoFD fire station's response times conforms to internal response time standards for all structures within the Project site.

As determined during the analysis of the site and its fire environment, the Project site, in its current condition, may include characteristics that, under favorable weather conditions, could have the potential to facilitate fire spread. Under extreme conditions, wind-driven wildfires from the east/northeast are likely to cast embers onto the property. Once the Project is built, the on-site fire potential will be lower than its current condition due to fire safety requirements that will be implemented. The proposed structures in the VHFHSZ would be built using ignition-resistant materials pursuant to the most recent County Fire and Building Codes (Chapter 7-A – focusing on structure ignition resistance from flame impingement and flying embers in areas designated as high fire hazard areas), which are the amended 2019 California Fire Code and 2019 California Building Code. This would be complemented by:

- Ignition resistant landscaping,
- Perimeter fuel modification zone,
- Improved water availability, capacity, and delivery system,
- Project area firefighting resources,
- Fire department access throughout the developed areas,
- Monitored defensible space/fuel modification,
- Interior, automatic fire sprinkler systems in all structures,
- Monitored interior sprinklers in applicable structures,
- Fire response travel times based on County response guidelines, and
- Other components that would provide properly equipped and maintained structures with a high level of fire ignition resistance.

Post wildfire save and loss assessments have revealed specifics of how structures and landscapes can be constructed and maintained to minimize their vulnerability to wildfire. Among the findings were: how construction materials and methods protect homes, how fire and embers contributed to ignition of structures, what effects fuel modification had on structure ignition, the benefits of fast firefighter response, and how much (and how reliable) water was available, were critically important to structure survivability. Following these findings over the last 20 years and continuing on an ongoing basis, the Fire and Building codes are revised, appropriately. Los Angeles County now contains 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.

Fire risk analysis conducted for the Project resulted in the determination that wildfire has occurred and will likely occur near the Project area again, but the Project would provide ignition-resistant landscapes (drought-tolerant and low-fuel-volume plants) and ignition-resistant structures, and defensible space with the implementation of specified fire safety measures. Based on modeling and analysis of the Project area to assess its unique fire risk and fire behavior, it was determined that the Los Angeles County standard of 100-foot-wide fuel modification zones (FMZs) would help considerably to set the Project's structures back from off-site fuels, and due to the Project design, a majority of the 100-feet of FMZ would be paved/irrigated landscaping. The 100-foot-wide FMZ, when properly maintained, will effectively minimize the potential for structure ignition from direct flame impingement or radiant heat within the Project site. The FMZs for the Project would be maintained in perpetuity by the property owner or property management agency or similarly funded entity.

This FPP provides a detailed analysis of the Project, the potential risk from wildfire, and potential impacts on the LACoFD, as well as analysis on meeting or exceeding the requirements of Los Angeles County. Further, this FPP provides requirements, recommendations, and measures to reduce the risk and potential impacts to acceptable levels, as determined by the LACoFD.

1 Introduction

The Fire Protection Plan (FPP) has been prepared for the proposed Blackhall Studios-Santa Clarita Project (Project) in the City of Santa Clarita, Los Angeles County, California. The purpose of the FPP is to evaluate the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those risks to a level consistent with County of Los Angeles (County) thresholds. Additionally, this FPP establishes and memorializes the fire safety requirements of the Fire Authority Having Jurisdiction (FAHJ), which is the Los Angeles County Fire Department (LACoFD). Requirements and recommendations detailed in the FPP are based on Project site-specific characteristics, applicable code requirements, and input from the Project's applicant, planners, engineers, and architects, as well as the FAHJ.

As part of the assessment, the FPP has considered the fire risk presented by the Project site including the property location and its topography, geology, surrounding combustible vegetation (fuel types), climatic conditions, fire history, and the proposed land use. The FPP addresses water supply, access, structural ignitability, and ignition resistive building features, fire protection systems, and equipment, impacts to existing emergency services, defensible space, and vegetation management. The FPP also identifies fuel modification zones and recommends the types and methods of treatment that, when implemented and maintained, are designed to protect the Project's assets. The FPP also recommends measures that developer/builders, property owners, and property management agency will take to reduce the probability of structural and vegetation ignition.

The Project is located within the boundaries of the LACoFD and thus the FPP addresses LACoFD's response capabilities and response travel time within the Project area, along with projected funding for facility improvements and fire service maintenance.

The following tasks were performed toward completion of this FPP:

- Gather site-specific climate, terrain, and fuel data;
- Collect site photographs[1];
- Process and analyze the data using the latest geographic information system (GIS) technology;
- Predict fire behavior using scientifically based fire behavior models, comparisons with actual wildfires in similar terrain and fuels, and experienced judgment;
- Analyze and guide the design of proposed infrastructure;
- Analyze the existing emergency response capabilities;
- Assess the risk associated with the Project site;
- Evaluate nearby firefighting and emergency medical response resources; and
- Prepare the FPP detailing how fire risk will be mitigated through a system of fuel modification, structural ignition resistance enhancements, and fire protection delivery system upgrades.

[1] Field observations were used to augment existing digital site data in generating the fire behavior models and formulating the recommendations presented in the FPP. Refer to Appendix A, Representative Site Photographs, for site photographs of existing site conditions.

1.1 Applicable Codes and Existing Regulations

The FPP demonstrates that the Project would comply with applicable portions of Title 32 of the Los Angeles County Code, as amended, and adopted by reference the 2019 edition of the California Fire Code (CFC) (or current edition at the time of Project approval). Title 32 is hereafter referred to as the Los Angeles County Fire Code or "Fire Code". The Project also complies with Los Angeles County Building Code Chapter 7A, hereafter referred to as Chapter 7A. The Project would also be subject to the provisions of section 4291 of the Public Resources Code regarding brush clearance standards around structures and the Los Angeles County Fire Department guidelines for Fuel Modification Plans.

Chapter 7A addresses structural ignition resistance and reducing ember penetration into structures, a leading cause of loss from wildfires (California Building Standards Commission 2019). Thus, code compliance is an important component of the requirements of the FPP, given the Project's wildland-urban interface (WUI) location that is partially within an area statutorily designated as a Very High Fire Hazard Severity Zone (VHFHSZ) within a Local Responsibility Zone (LRA) by the California Department of Forestry and Fire Protection (CAL FIRE) (FRAP 2007). Fire hazard designations are based on topography, vegetation, and weather, among other factors with more hazardous sites, including steep terrain, unmaintained fuels/vegetation, and WUI locations. Projects situated in VHFHSZ require fire hazard analysis and the application of fire protection measures to create ignition-resistant structures and defensible communities within these WUI locations. VHFHSZ designations do not, in and of themselves, indicate that it is unsafe to build in these areas. As described in the FPP, the Project would meet applicable code requirements for building in these higher fire hazard areas. These codes have been developed through decades of wildfire structure save and loss evaluations to determine the causes of building losses and saves during wildfires. The resulting fire codes now focus on mitigating former structural vulnerabilities through construction techniques and materials so that the buildings are resistant to ignitions from direct flames, heat, and embers, as indicated in the Los Angeles County Building Code (Chapter 7-A, Section 701A.1 Scope).

1.2 Project Summary

1.2.1 Location

As shown in Figure 1, Project Location Map, the Project site lies in the southwestern portion of Santa Clarita, in the Newhall community, and is located approximately 2 miles east of Interstate 5 (I-5), 2 miles west of the Antelope Valley Freeway (State Route 14), and 2 miles south of the Santa Clara River. The Project site is situated at the northeast corner of Railroad Avenue and 13th Street and bounded by 12th Street, Arch Street, and 13th Street on the south; Railroad Avenue on the west; Metropolitan Water District (MWD) right-of-way (ROW) on the east; and HOA maintained slopes associated with adjacent residential uses to the north. The 93.5-acre Project site and 11.4-acre property owned by the Metropolitan Water District (MWD) that is proposed to be used as ancillary parking and a shrub and tree nursery is within Los Angeles County's Santa Clarita Valley Plan Area. The Project is located in U.S. Geological Survey's 7.5 Minute Newhall, California quadrangle. The Project will be situated on multiple parcels comprised of the following APN's: 2834-001-007, -14, -15, -002-046, -003-044, -004-045, -005-041, -006-041, -007-045, -008-039, -010-043, -011-021, -012-023, -013-041, -014-043, -015-021, -016-041, -017-021, -020-114, -021-134 and -022-067 for the Blackhall Studios site, and 2834-001-272, -020-270, -271, -021-270 and -271 for the MWD site. Primary access to the site is via Railroad Avenue.

Regional access to the Project site would be via I-5 via Lyons Avenue and SR-14 via Newhall Avenue, which both intersect with Railroad Avenue, the Project's primary access road. Local access to the Project site would be provided by Railroad Avenue and Placerita Canyon Road/Arch Street.

Portions of the Project site lie within the local responsibility area (LRA) VHFHSZ, as statutorily designated by CAL FIRE (2007) and the LACoFD (Figure 2, Fire Hazard Severity Zone Map).

1.2.2 Project Description

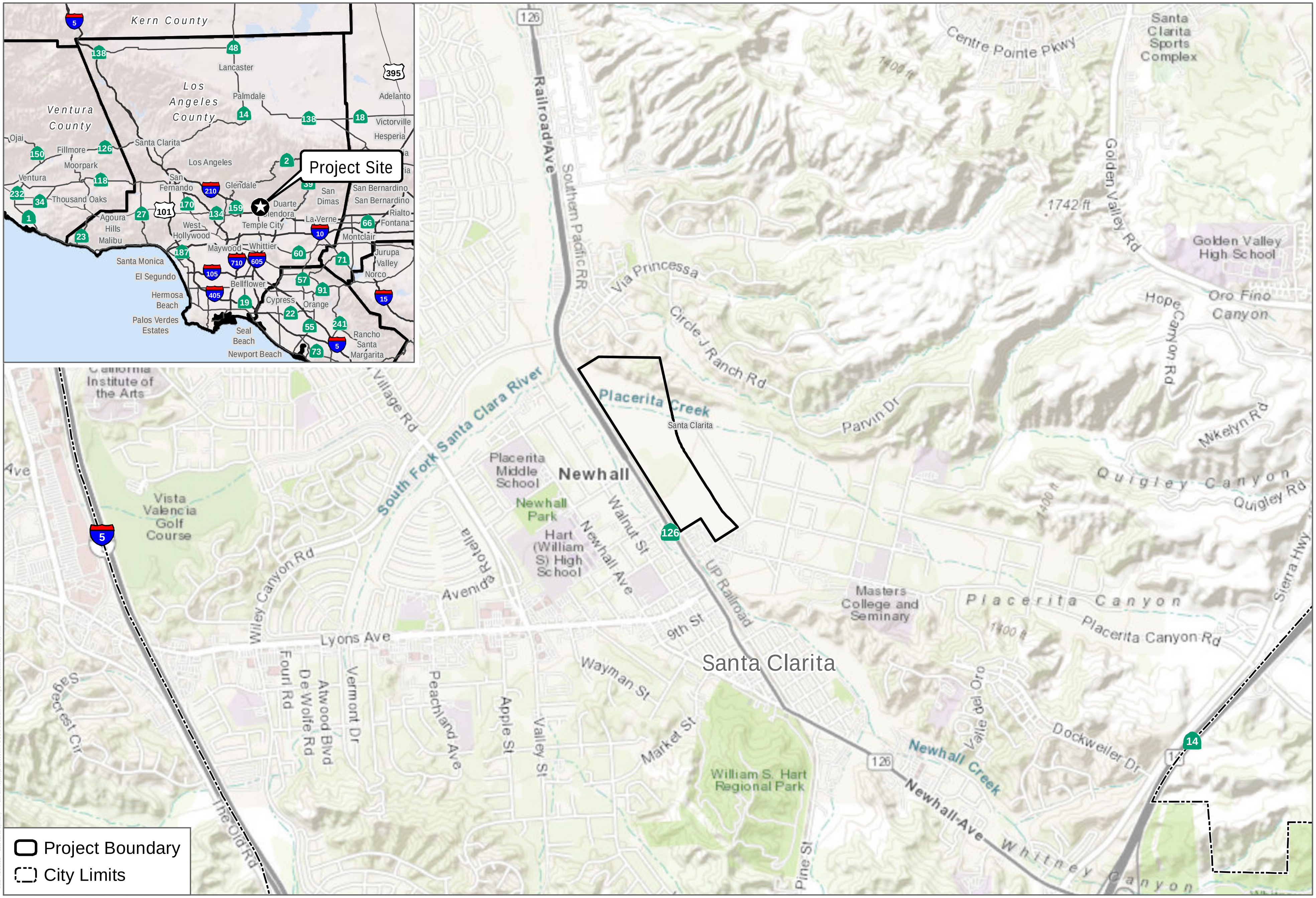
Santa Clarita proposes to develop a 93.54-acre parcel within the City of Santa Clarita, Los Angeles County to create a full-service film and television studio campus known as the Blackhall Studios-Santa Clarita (Project). The facility will become one of the most significant independent media production facilities in the country. As shown in Figure 3, the current configuration of the Project is that the sound stages will be a total of approximately 476,000 square feet, approximately 210,000 square feet of production and administrative office space, approximately 571,000 square feet of workshops, warehouses and support use buildings, and approximately 37,500 square feet of catering and other specialty services. A five-level (four elevated) parking structure and other surface parking lots are planned for the proposed development.

1.2.3 Current Land Use

The Project site is an undeveloped piece of land that has been cleared of the majority of its natural vegetation. The Project site also includes an additional 11.4-acre property owned by the Metropolitan Water District (MWD) that is proposed to be used for ancillary parking and a shrub and tree nursery. The central and southern portions of the Project site have been disturbed by past uses, are relatively flat, and are characterized by low, ruderal plants and gravel driveways. The northern portion of the Project site includes natural features, such as a prominent ridgeline (which transects the northeastern corner of the Project site) and a natural creek and creek wash area (Placerita Creek).

Additionally, there are approximately 16 oak trees (coast live oak and valley oak) located throughout the Project site, the majority of which are located near Placerita Creek or along the ridgeline that traverses the northern portion of the Project site. The remaining trees are sporadically located throughout the central and southern portion of the Project site. A drainage ditch runs along the northeastern boundary, adjacent to the MWD property immediately northeast of the Project Site, and a drainage ditch runs along the southwestern boundary of the Project site, adjacent to a railroad line, used by Metrolink and Union Pacific, and Railroad Avenue. The southwesterly drainage ditch discharges into a culvert underneath the railroad track approximately 370 feet southeast of the Railroad Avenue bridge over Placerita Creek.

The ridgeline, which transects a portion of the Project site's northern boundary, is identified in the City's General Plan Conservation and Open Space Element as a "significant ridgeline." This ridgeline slopes downward to the southwest toward Placerita Creek and the creek wash area, which transects the Project site. The Placerita Creek wash area has been primarily undisturbed by past development activity on the Project site and includes native vegetation communities, such as sage and buckwheat scrub habitats. The Project site has General Plan land use designations of MX-N (Mixed Use Neighborhood) and NU5 (Non-Urban Residential, one dwelling unit per acre) with identical zoning classifications. The previously disturbed areas of the Project site, encompassing the central and southeastern portions of the Project site, are designated MXN, and the undulating and hilly portions of the Project site to the northwest containing portions of Placerita Creek are designated NU5. The area surrounding the Project site includes residential uses to the north, east and west of the Project site, and commercial uses to the west and south.



SOURCE: ESRI; County of Los Angeles 2020

DUDEK

0 1,250 2,500 Feet

FIGURE 1
Project Location
Fire Protection Plan for the Blackhall Studios

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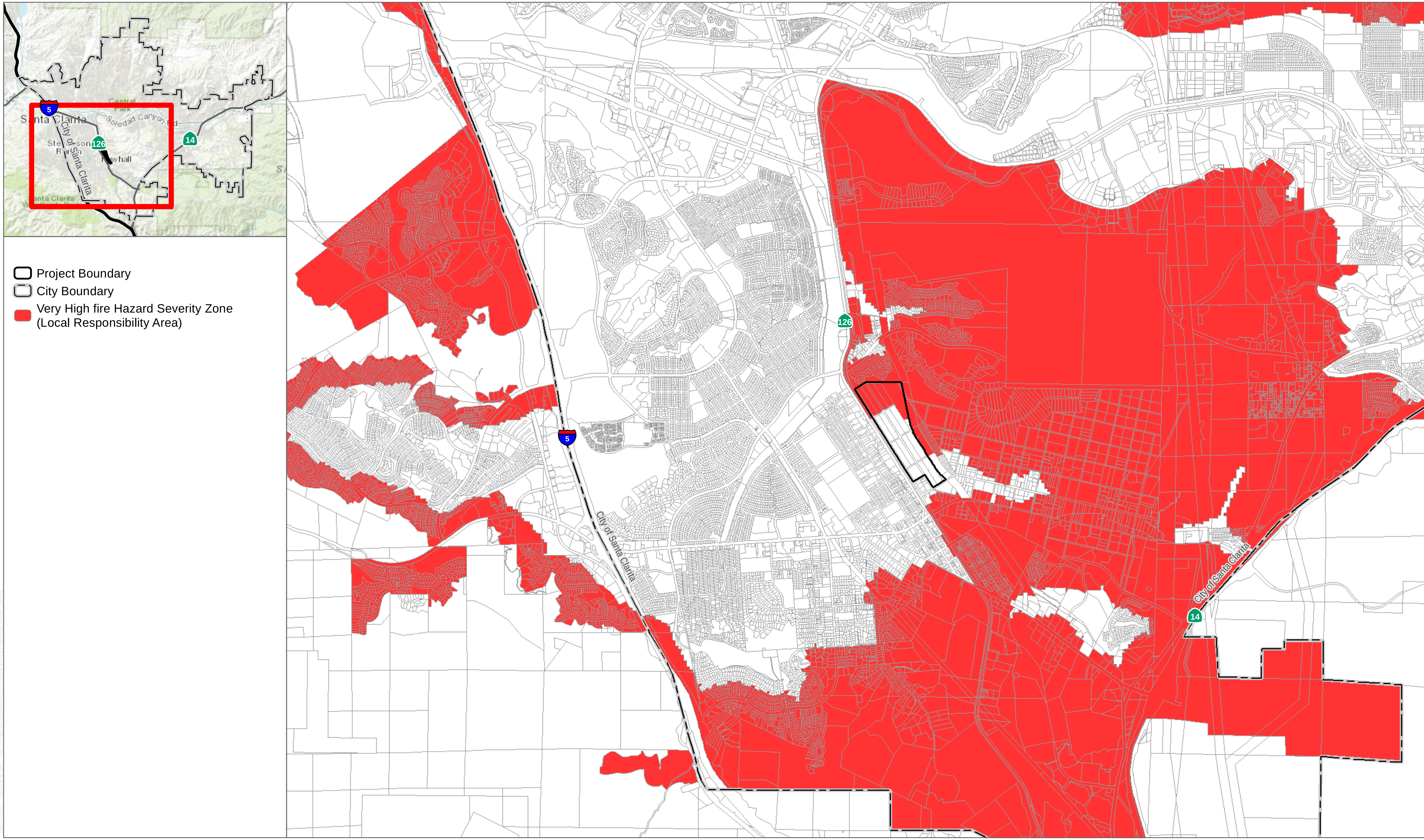

SOURCE: LOS ANGELES COUNTY 2022; CAL FIRE 2022

DUDEK

0 1,500 3,000 Feet

FIGURE 2

Fire Hazard Severity Zone

Fire Protection Plan for the Blackhall Studios

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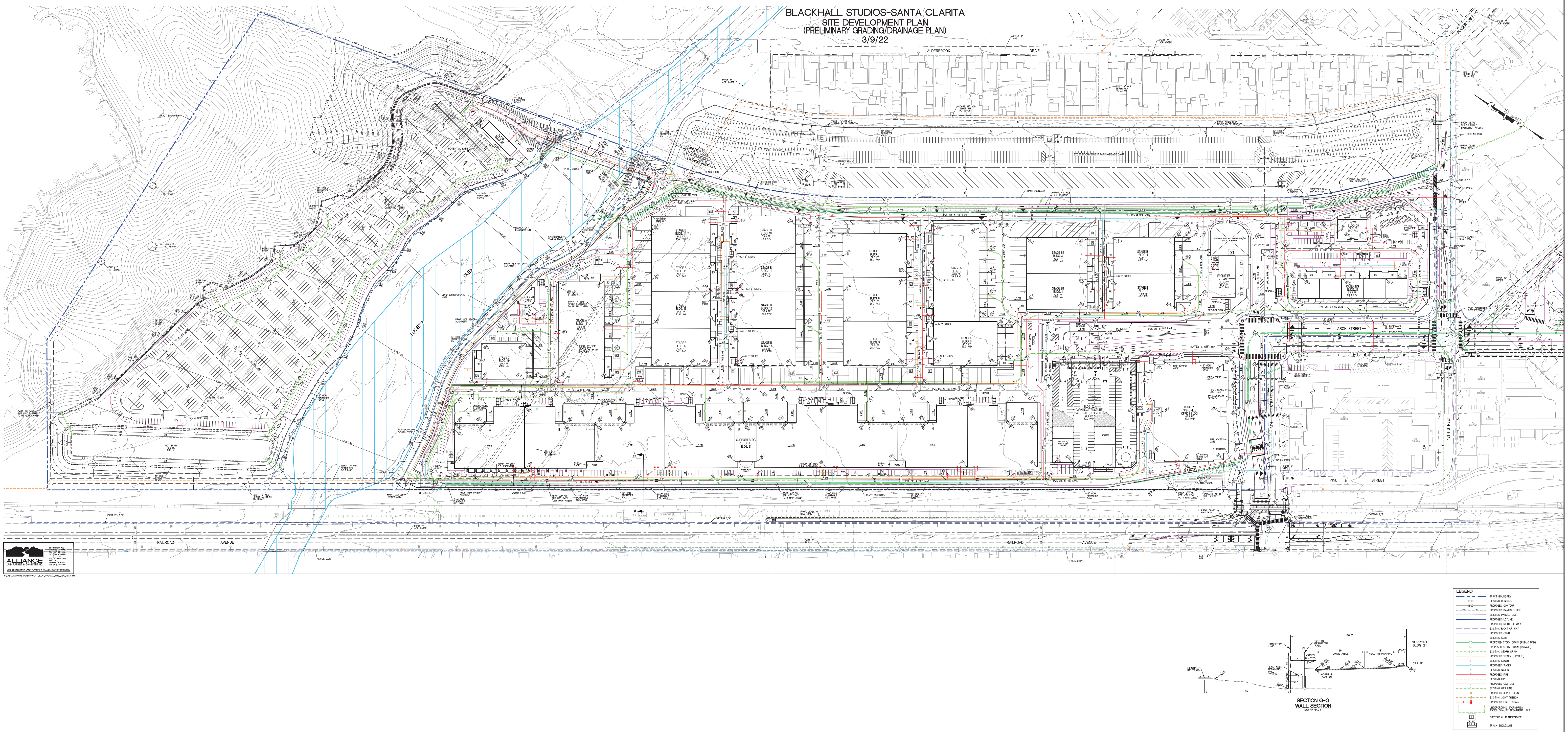

FIGURE 3
Project Site Plan

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2 Project Site Risk Analysis

2.1 Environmental Setting and Field Assessment

After review of available digital Study Area information, including topography, vegetation types, fire history, and the Project's Development Footprint, a Dudek Fire Protection Planner conducted a Project site assessment on March 22, 2022, 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 Planner assessed the area's topography, natural vegetation, and fuel loading, surrounding land use, and general susceptibility to wildfire. Among the field tasks that were completed included:

- Topography evaluation;
- Vegetation/fuel assessments;
- Photograph documentation of the existing condition;
- Confirmation/verification of hazard assumptions;
- Off-site, adjacent property fuel and topography conditions;
- Surrounding land use confirmations;
- Necessary fire behavior modeling data collection;
- Ingress/egress documentation;
- Nearby Fire Station reconnaissance.

Study Area photographs were collected (refer to Appendix A, *Representative Site Photographs*), and fuel conditions were mapped using aerial images. Field observations were utilized to augment existing site data in generating the fire behavior models and formulating the requirements and recommendations detailed in the FPP.

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 the fire environment are topography, vegetation (fuels), and climate. The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Structure ignition depends on a variety of factors and can be prevented through a layered system of protective features including fire-resistive landscapes directly adjacent to the structure(s), application of known ignition resistive materials and methods, and suitable infrastructure for firefighting purposes. Understanding the existing wildland vegetation and urban fuel conditions on and adjacent to the site is necessary to understand the potential for fire within and around the Project site.

The following sections discuss the characteristics of the Project area and the surrounding region. The intent of evaluating conditions at a macro-scale provides a better understanding of the regional fire environment, which is not constrained by property boundary delineations.

2.2.1 Topography

Topography influences fire risk by affecting fire spread rates. Typically, steep terrain results in faster fire spread up-slope and slower spread down-slope. Terrain that forms a funneling effect, such as chimneys, chutes, or saddles on the landscape can result in especially intense fire behavior. Conversely, flat terrain tends to have little effect on fire spread, resulting in fires that are driven by vegetation and wind.

The topography of the Project site is relatively flat in the development area with slopes ranging from level to 30 percent, in the northern portion of the Project site where a significant ridgeline is designated within the proposed onsite retained open space. Elevations in the Project Site range from approximately 1,340 feet amsl at the northern end of the Project site to approximately 1,235 feet amsl at the western property boundary.

Topographic features that may present a fire spread facilitator are the slope and canyon alignments, which may serve to funnel or channel winds, thus increasing their velocity and potential for influencing wildfire behavior. From a regional perspective, the alignment of tributary canyons and dominant ridges is conducive to channeling and funneling wind, thereby increasing the potential for more extreme wildfire behavior in the region.

2.2.2 Climate

The Project site, like much of Southern California, is influenced by the Pacific Ocean and 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 77°F, with an average temperature in the summer and early fall months (July–October) of 88°F. July and August are typically considered the hottest months of the year. The area is considered to be a semi-arid climate. Annual precipitation typically averages approximately 18 inches annually with the wettest months being January and February (Western Regional Climate Center, 2021).

From a regional perspective, the fire risk in southern California can be divided into three distinct "seasons" (Nichols et al. 2011, Baltar et al 2014). The first season, the most active season and covering the summer months, extends from late May to late September. This is followed by an intense fall season characterized by fewer but larger fires. This season begins in late September and continues until early November. The remaining months, November to late May cover the mostly dormant, winter season. Mensing et al. (1999) and Keeley and Zedler (2009) found that large fires in the region consistently occur at the end of wet periods and the beginning of droughts. Typically, the highest fire danger in southern California coincides with Santa Ana winds. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis near the end of fire season during late summer and early fall. They are dry, warm winds that flow from the higher desert elevations in the east through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Localized wind patterns on the Project site are strongly affected by both regional and local topography.

The prevailing wind pattern is from the west (onshore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea), and at night winds are from the northeast (land). The highest wind velocities are associated with downslope, canyon, and Santa Ana winds. The Blackhall Studios-Santa Clarita Project site does not include topography that would create unusual weather conditions; however, regionally the Project site is subject to periodic extreme fire weather conditions that occur throughout foothill portions of Los Angeles County.

2.2.3 Vegetation

The Project property and surrounding areas primarily support coastal sage scrub and grassland plant communities. The adjacent lands have similar vegetation types. The vegetation cover types were assigned a corresponding fuel model for use during site fire behavior modeling. Section 3.0 describes the fire modeling conducted for the Project area.

Extensive vegetation type mapping is useful for fire planning because it enables each vegetation community to be assigned a fuel model, which is used in a software program to predict fire behavior characteristics, as discussed in Section 3.1, Fire Behavior Modeling. Vegetative fuels on-site are characteristic of the area and are primarily grasslands and coastal sage scrub (CCS) habitats that occurs along and adjacent to the Placerita Creek stream channel. Man-made land cover types, such as disturbed land were also observed. The area proposed for development and within the Project grading limits will be converted to ignition resistant landscapes, roads, structures, and landscaped vegetation following Project completion. Vegetative fuels within proposed fuel modification zones will be removed or structurally modified as a result of development, altering their current structure and species composition, irrigation and maintenance levels, resulting in a perimeter wildfire buffer.

Post-development vegetation composition proximate to the Project footprint is expected to be significantly different than current conditions. Following build-out, irrigated and thinned landscape vegetation associated with fuel modification zones (FMZ) A and B would be located in the immediate area surrounding the Project site, extending up to 100 horizontal feet from each of the structures. Typical FMZ is 100 feet wide, although there are areas along the Project's western Project boundary and in the northern portion on the Project site where the FMZ is less than 100 feet. The FPP will require the Project to construct all structures according to Chapter 7A requirements. The provided FMZ areas will be maintained on an ongoing basis in order to comply with LACoFD's Fuel Modification Plan guidelines.

2.2.3.1 Vegetative Fuel Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Section 3.0 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, non-native grass-dominated plant communities become seasonally prone to ignition and produce lower intensity, higher spread rate fires. In comparison, sage scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels.

As described, vegetation plays a significant role in fire behavior, and is an important component of fire behavior models discussed in the report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In summary, high-frequency fires tend to convert shrublands to grasslands or maintain grasslands, while fire exclusion tends to convert grasslands to shrublands, over time. In general, biomass and associated fuel loading will increease over time, assuming that disturbance (fire, or grading) or fuel reduction efforts are not diligently implemented. It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed fuel modification zones on-site. The Project's 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. Conditions adjacent to the Project's footprint (outside the fuel modification zones), where the wildfire threat will exist post-development, are classified as moderate to high fuel loads due to the dominance of sparse sage scrub-grass fuels.

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in Chapter 3 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. For example, California sagebrush scrub can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels. The corresponding fuel models for each of these vegetation types are designed to capture these differences. Vegetation distribution throughout the Project site varies by location and topography. Areas where the Project's Development Footprint is located, are primarily grasslands.

As described, vegetation plays a significant role in fire behavior, and is an important component of the fire behavior models discussed in the 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 (e.g., fire) 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 for the Project site. 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.

2.2.4 Fire History

Fire history is an important component of a site-specific FPP. Fire history data provides valuable information regarding fire spread, fire frequency, ignition sources, and vegetation/fuel mosaics across a given landscape. 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 Project site, and how a fire may spread.

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

According to available data from the CAL FIRE in the FRAP database, two hundred and seven (207) fires have burned within 5 miles of the Project site since the beginning of the historical fire data record. Recorded wildfires within 5 miles range from <0.1 acres to 115,537 acres (1970 Clampitt Fire) and the average fire size is approximately 2,807.3. When considering only fires greater than 10 acres and less than 100,000, the average fire size is approximately 1,913.9 acres. The 2020 Elsmere Fire (approximately 159.2 acres), 2020 Calgrove Fire (approximately 4.2 acres), and 2019 Saddle Ridge Fire (approximately 8,799.3 acres are the most recent fires. One fire has burned on the Project site, the 1962 Newhall Fire (approximately 8,582.8 acres) burned north of the Placerita Creek stream channel. LACoFD may have data regarding smaller fires (less than 10 acres) that have occurred on-site that have not been included herein. Fire history for the general vicinity of the Project site is illustrated in Appendix B, Fire History Map.

Based on an analysis of the fire history data set, specifically, the years in which the fires burned, the average interval between wildfires within 5 miles of the Project site was calculated to be less than 1 year with intervals ranging between 0 (multiple fires in the same year) to 8 years. Based on the analysis, it is expected that there will be wildland fires within 5 miles of the Project site at least every 8 years and on average, every year, as observed in the fire history record. Based on fire history, wildfire risk for the Project site is associated primarily with a Santa Ana wind-driven wildfire burning or spotting on-site from the north or east, although a fire approaching from the south during more typical on-shore weather patterns is possible. The proximity of the Project to large expanses of open space to the east (Quigley Canyon Open Space) and southeast (Placerita Canyon), has the potential to funnel Santa Ana winds, thereby increasing local wind speeds and increasing wildfire hazard in the Project vicinity.

3 Anticipated Fire Behavior

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of the fire that would be expected adjacent to the Project site given characteristic features such as topography, vegetation, and weather. Dudek utilized BehavePlus software package version 6 (Andrews, Bevins, and Seli 2008) to analyze potential fire behavior[2].

3.2 Fire Behavior Modeling Analysis

An analysis was conducted to evaluate fire behavior variables and to objectively predict flame lengths, intensities, and spread rates for four modeling scenarios, including three summer, onshore weather condition (northwest from the Project Site) and one extreme fall, offshore weather condition (northeast of the Project Site). These fire scenarios incorporated observed fuel types representing the dominant vegetation representative of the site and adjacent land, in addition to slope gradients, wind, and fuel moisture values. Modeling scenario locations were selected to better understand different fire behavior that may be experienced on or adjacent to the site.

Vegetation types, which were derived from the field assessment for the Project site and classified into a fuel models that is largely representative of onsite vegetation, for a more detailed description of onsite vegetation refer to the Project's Biological Technical Report (Rincon 2022). Fuel models are selected by their vegetation type, fuel stratum

[2] A discussion of fire behavior modeling is presented in Appendix C, Fire Behavior Modeling.

most likely to carry the fire, and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that are both on and adjacent to the proposed development. Fuel models were also assigned to illustrate post-Project fire behavior changes. 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).

Based on the anticipated pre- and post-Project vegetation conditions, four different fuel models were used in the current conditions of the fire behavior modeling effort and one additional fuel model was used to depict a fire post construction, as present herein. Modeled areas include coastal sage scrub (Fuel Model SH2) and mature coastal sage scrub (Fuel Model SH5) that occurs along and adjacent to the Placerita Creek stream channel and in patches on the bluff hillsides in the northern portion of the site; short grass and forbs (Fuel Model GS1) occurs in the meadow areas on site and on the bluff hillsides both onsite and offsite. Table 1 provides a description of the fuel models observed that were subsequently used in the analysis for the Project. For modeling the post-development condition, fuel model assignments were re-classified to FM8 representing an irrigated landscape, GS2 Moderate Load, Dry Climate Grass-Shrub, and SH2 Moderate load, Dry Climate Grass-Shrub.

Table 1. Fuel Models Used for Fire Behavior Modeling

Fuel Model	Description	Location of Fuel Models	Fuel Bed Depth (Feet)
Existing Conditions			
GR1	Short, sparse dry climate grass	Low growing or mowed grass and forbs. Existing maintained meadow areas throughout the majority of the project site south of Placerita Creek.	1.0 ft.
GS2	Moderate Load, Dry Climate Grass-Shrub	Primarily moderate height grass with scattered small shrubs. Existing meadow areas onsite and offsite in the vicinity of Placerita Creek and on the bluff hillsides.	<2.0 ft.
SH2	Moderate load, Dry Climate Grass-Shrub	Coastal sage scrub. Occurs within and adjacent to the Placerita Creek stream channel, in the northwest portions of the project site and patches on the bluff hillsides.	<3.0 ft.
SH5	High Load, Dry Climate Shrub	Mature coastal sage scrub. Occurs within and adjacent to the Placerita Creek stream channel and in northwest portions of the project site.	>4.0 ft.
Post-Development Conditions			
FM8	Irrigated Landscape	Fuel type will occur post development within Zone A - setback irrigated zone.	<1.0 ft.
GS2	Moderate Load, Dry Climate Grass-Shrub	Primarily moderate height grass with scattered small shrubs. Existing meadow areas onsite and offsite in the vicinity of Placerita Creek and on the bluff hillsides.	<2.0 ft.
SH2	Moderate load, Dry Climate Grass-Shrub	Coastal sage scrub. Occurs within and adjacent to the Placerita Creek stream channel, in the northwest portions of the project site and patches on the bluff hillsides.	<3.0 ft.

Table 2 summarizes the weather and wind input variables used in the BehavePlus modeling process.

Table 2. Fuel Moisture and Wind Inputs

Model Variable	Summer Weather Condition (50th Percentile)	Peak Fall Weather Condition (97th Percentile)
Fuel Models	8, GS2, SH2	8, GR1, SH2 and SH5
1 hr. Moisture	5%	2%
10 hr. Moisture	6%	3%
100 hr. Moisture	9%	5%
Live Herbaceous Moisture	40%	30%
Live Woody Moisture	80%	60%
20-foot Wind Speed (mph)	20 mph	40 mph
Wind Directions from north (degrees)	180, 225 and 270	45
Wind adjustment factor	0.4	0.4
Slope (uphill)	0 to 30%	10%

3.2.1 Fire Protection Features' Beneficial Effect on Wildfire Ignition Risk Reduction

Each of the fire protection features provided as part of the code requirements or customized for this Project are based on the FPP's evaluation work to protect the Project site, its structures and their occupants from wildfires. These features also have a similar positive impact on the potential for wildfire ignitions caused by the Project and its inhabitants.

As mentioned previously, the ignition resistant landscapes and structures and the numerous specific requirements would minimize the ability for an on-site fire to spread to off-site fuels, as follows:

1. **Ignition resistant, planned and maintained landscape** – all site landscaping of common areas and fuel modification zones will be subject to strict plant types that are lower ignition plants with those closest to structures requiring irrigation to maintain high plant moistures which equates to difficult ignition. These areas are closest to structures, where ignitions would be expected to be highest, but will be prevented through these ongoing maintenance efforts.
2. **Fuel Modification Zone** – the FMZ is a minimum of 100 feet for the majority of the project (varies between 50 and 100 feet wide) includes specifically selected plant species, very low fuel densities and ongoing funded and applied maintenance, resulting in a wide buffer between the developed areas and the off-site native fuels. Where less than 100 feet, additional fire protection features are provided to compensate and provide the same level of protection.
3. **Annual FMZ inspections** – Blackhall Studios-Santa Clarita's Owner and/or property management agency will have a contracted, 3rd party, LACoFD-approved FMZ inspector perform an inspection each year to ensure that FMZs are maintained in a condition that is consistent to the County's and FPP's requirements and would provide a benefit of a wide barrier separating wildland fuels from on-site ignitions.
4. **Ignition resistant structures** – all structures within the VHFHSZ will be built to the Chapter 7A ignition resistant requirements that have been developed and codified as a direct result of after fire save and loss assessments. These measures result in structures that are designed, built and maintained to withstand fire and embers associated with wildfires. It must be noted that the 100 feet of FMZ would result in a buffer from wildfire directly next to these structures. Structures can be built in the VHFHSZs and WUI areas when they are part of an overall approach that contemplates wildfire and provides design features that address the related risk. A structure within a VHFHSZ that is built to these specifications can be at lower risk than an older structure in a non-fire hazard severity zone. The ignition resistance of on-site structures would result in a low incidence of structural fires, further minimizing potential for project-related wildfires.
5. **Interior fire sprinklers** – sprinklers in structures are designed to provide additional time for occupants to escape. Sprinklers in industrial structures are designed to provide structural protection. The common benefit of fire sprinklers is that they are very successful at assisting responding firefighters by either extinguishing a structural fire or at least, containing the fire to the room of origin and delaying flash over. This benefit also reduces the potential for an open space vegetation ignition by minimizing the possibility for structure fires to grow large and uncontrollable, resulting in embers that are blown into wildland areas. This is not the case with older existing homes in the area that do not include interior sprinklers.
6. **Fire access roads** – roads provide access for firefighting apparatus. Project roads provide code-consistent access throughout the community. Better access to wildland areas may result in faster wildfire response and continuation of the fire agencies' successful control of wildfires at small sizes.
7. **Water** – providing firefighting water throughout the Project with the required number of fire hydrants accessible by fire engines is a critical component of both structural and vegetation fires. The Project

provides firefighting water volume, availability and sustained pressures to the satisfaction of LACoFD. Water accessibility helps firefighters control structural fires and helps protect structures from and extinguish wildfires.

3.3 Fire Behavior Modeling Results

The results of fire behavior modeling analysis for pre- and post-Project conditions are presented in Table 3 and Table 4, respectively. Identification of modeling run (fire scenarios) locations is presented graphically in Figure 4, BehavePlus Fire Behavior Analysis.

As presented, in the Fire Behavior Analysis (Appendix C), wildfire behavior on the Project site is expected to be primarily of moderate to high intensity throughout the non-maintained scrub-dominated fuels within the Placerita Creek steam channel. As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Project site. Four focused analyses were completed, each assuming worst-case fire weather conditions for a fire approaching the Project site from the northeast and northwest. 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)). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities.

Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds. Four fire modeling scenario locations were selected to better understand the different fire behavior that may be experienced on or adjacent the site based on slope and fuel conditions; these four fire scenarios are explained in more detail below:

Fire Scenario Locations and Descriptions:

- **Scenario 1.** Fire flaming front approaching from the northeast around the vicinity of Placerita Creek through the existing grassland (Fuel Model GS2), sage scrub (Fuel Models SH2 and SH5), and mowed grass (Fuel Model GR1) vegetation adjacent to and on the northern portion of the project, with strong northeastern Santa Ana winds. Post-development includes the irrigated landscaping (Fuel Model 8) and paved parking areas.
- **Scenario 2.** Fire flaming front approaching from the west towards the northwestern portion of the project, entering the site through the grassland and sage scrub vegetation (Fuel Models GS2 and SH2), with moderate westerly onshore winds. Post-development includes landscaped water quality basin (Fuel Model 8) and paved parking area.
- **Scenario 3.** Fire flaming front originating on the project site and moving to the north towards the bluff on the northernmost portion of the project site, through the existing grassland vegetation (Fuel Model GS2), with moderate southerly onshore winds. Post-development includes the existing native grassland vegetation (Fuel Model GS2) on the bluff that will be maintained as open space.
- **Scenario 4.** Fire flaming front originating on the project site and moving to the northeast towards the offsite bluff northeast of the project site, through sage scrub vegetation (Fuel Models SH2 and SH5) and grassland

(Fuel Model GS2), with moderate southwesterly onshore winds. Post-development includes irrigated landscaping (Fuel Model 8), paved drive and parking area, irrigated landscaping and grassland (Fuel Model GS2).

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

3.3.1 Existing Conditions

Based on the BehavePlus analysis results presented below and in Tables 3 and 4, worst-case fire behavior is expected in untreated, surface shrub and chaparral fuels northeast of the proposed Project site under peak weather conditions (represented by Fall Weather, Scenario 1). The fire is anticipated to be a wind-driven fire from the northeast during the fall. Under such conditions, expected surface flame lengths reach 36.4 feet with wind speed of 40 mph. Under this scenario, fireline intensities reach 14,081 BTU/feet/second with spread rates of 4.7 mph and could have a spotting distance up to 1.8 miles away.

Fires burning from the west/northwest and pushed by ocean breezes typically exhibit less severe fire behavior due to lower wind speeds and higher humidity. Under typical onshore weather conditions, a chaparral scrub fire could have flame lengths between approximately 6.3 feet and 19.5 feet in height and spread rates between 0.2 and 1.5 mph. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.3 to 0.7 miles.

Table 3. BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Fuel Model SH5	36.4	14,081	4.7	1.8
Fuel Model SH2	13.1	1,529	0.7	0.9
Fuel Model GR1	3.1	67	0.5	0.3
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Fuel Model GS2	7.6	473	0.7	0.4
Fuel Model SH2	6.3	309	0.2	0.3
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Fuel Model SH5	19.5	3,604	1.5	0.7
Fuel Model GS2	7.9	505	0.7	0.4
Fuel Model SH2	6.5	333	0.2	0.3

3.3.2 Post-Development Conditions

As previously mentioned, Dudek conducted modeling of the site for post-fuel modification zones. Typical fuel modification includes establishment of minimum 100-foot wide paved/irrigated landscaping zone (Zones A and B) from all on-site structures. For modeling the post-FMZ treatment condition, the fuel model assignment for grasslands was re-classified FM8.

Based on the BehavePlus analysis, post development fire behavior is expected in irrigated and replanted with plants that are acceptable with LACoFD (Zones A and B – FM-NB and FM8). Under such conditions, expected surface flame length is expected to be significantly lower, with flames lengths reaching approximately 8 feet with wind speeds of 40+ mph. Under this scenario, fire line intensities reach 505 BTU/feet/second with relatively slow spread rates of 0.7 mph and could have a spotting distance up to 0.4 miles away. Therefore, the typical 50 to 100-foot Fuel Modification Zone (FMZ) proposed for the proposed Project site is approximately 5 times the flame length of the worst-case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

Table 4. Fire Behavior Modeling Results for Post-Project Conditions

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Irrigated landscaping (FM8)	2.6	46	0.1	0.3
Pavement (FM-NB)	0	0	0	0
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Irrigated landscaping/Water Quality Basin (FM8)	1.6	16	0.1	0.1
Pavement (FM-NB)	0	0	0	0
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model SH2	6.5	333	0.2	0.3
Fuel Model GS2	7.9	505	0.7	0.4

Surface Fire:

- Flame Length (feet): The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames.
- Fireline Intensity (Btu/ft/s): Fireline intensity is the heat energy release per unit time from a one-foot-wide section of the fuel bed extending from the front to the rear of the flaming zone. Fireline intensity is a function

of rate of spread and heat per unit area and is directly related to flame length. Fireline intensity and the flame length are related to the heat felt by a person standing next to the flames.

- Surface Rate of Spread (mph): Surface rate of spread is the "speed" the fire travels through the surface fuels. Surface fuels include the litter, grass, brush and other dead and live vegetation within about 6 feet of the ground.

The information in Table 5 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 3 and 4. Identification of modeling run locations is presented graphically in Figure 4 of this FPP.

Table 5. 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.

3.4 Project Area Fire Risk Assessment

Wildland fires are a common natural hazard in most of southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of shrublands and grasslands, like those found on and adjacent to the Blackhall Studios-Santa Clarita Project site. 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 expanding into WUI areas, and the regions' fire history, it can be anticipated that periodic wildfires may start on, burn onto, or spot into the site. The most common type of fire anticipated in the vicinity of the Project Area is a wind-driven fire from the northwest/northeast, moving through the sage scrub on the adjacent lands.

With the conversion of the landscape to ignition-resistant development, wildfires may still encroach upon and drop embers on the site but would not be expected to burn through the site or produce sustainable spot fires due to the lack of available fuels. Studies indicate that even with older developments that lacked the fire protections provided in the Project, wildfires declined steadily over time (Syphard, et. al., 2007 and 2013) and further, the acreage burned remained relatively constant, even though the number of ignitions temporarily increased. This is due to the conversion of landscapes to ignition resistant, maintained areas, more humans monitoring areas resulting in early fire detection and discouragement of arson, and fast response from the fire suppression resources that are located within these developing areas.

Therefore, it will be important that the latest fire protection technologies, developed through intensive research and real-world wildfire observations and findings by fire professionals, for both ignition resistant construction and for creating defensible space in the ever-expanding WUI areas, are implemented and enforced. The Project, once developed, would not facilitate wildfire spread and would reduce projected flame lengths to levels that would be manageable by firefighting resources for protecting the site's structures, especially given the ignition resistance of the structures and the planned ongoing maintenance of the entire site landscape. The Project will implement the latest fire protection measures, including fuel modification. In addition, the FMZs (50 to 100-feet) for the Project site would be approximately 7 to 15 times wider than the longest calculated flame length conditions for portions of the proposed developed area that abut coastal sage scrub plant communities (reference Table 3).

Given the climatic, vegetative, topographic characteristics, and local fire history of the area, the Project Site, once developed, is determined to be subject to periodic wildfires that may start on, burn toward, or spot into the site. The potential for off-site wildfire encroaching on or showering embers on the site is considered moderate to high, but the risk of ignition from such encroachments or ember showers is considered low based on the type of ignition resistant landscapes and construction and fire protection features that will be provided for the structures.

While it is true that humans are the cause of most fires in California, there is no data available that links increases in wildfires with the development of ignition-resistant projects. The Project will include a robust fire protection system, as detailed in this FPP. This same robust fire protection system provides protections from on-site fire spreading to off-site vegetation. Accidental fires within the landscape or structures in the Project will have limited ability to spread. The landscape throughout the Project and on its perimeter will be maintained and irrigated, which further reduces its ignition potential. Structures will be highly ignition resistant on the exterior and the interiors will be protected with automatic sprinkler systems, which have a very high success rate for confining fires or extinguishing them. It is the recommendation of this FPP that the Project be a fire-adapted development with a program that raises fire awareness among its employees.

Table 2. Fuel Moisture and Wind Inputs

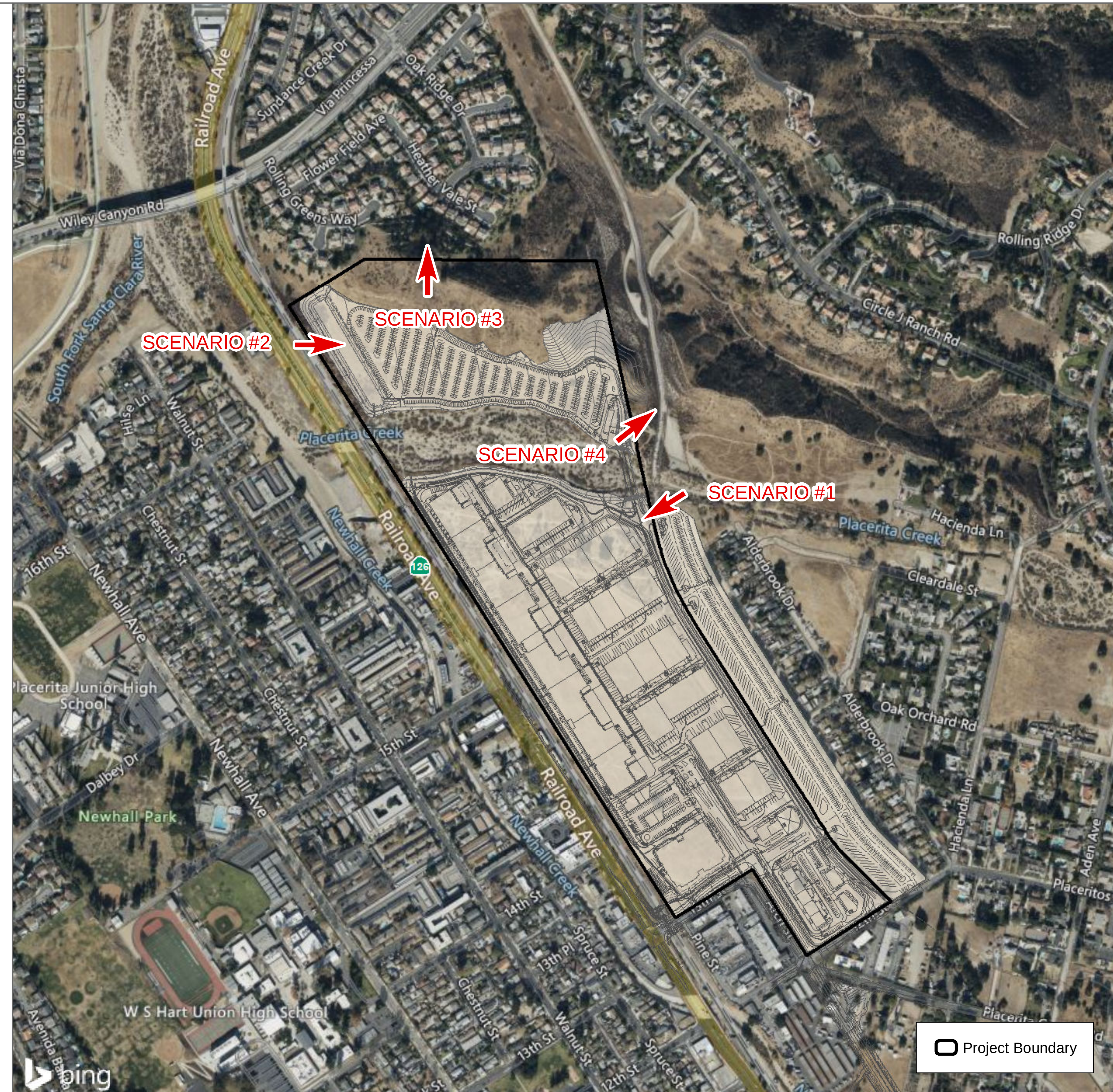
Model Variable	Summer Weather Condition (50th Percentile)	Peak Fall Weather Condition (97th Percentile)
Fuel Models	8, GS2, SH2	8, GR1, SH2 and SH5
1 hr. Moisture	5%	2%
10 hr. Moisture	6%	3%
100 hr. Moisture	9%	5%
Live Herbaceous Moisture	40%	30%
Live Woody Moisture	80%	60%
20-foot Wind Speed (mph)	20 mph	40 mph
Wind Directions from north (degrees)	180, 225 and 270	45
Wind adjustment factor	0.4	0.4
Slope (uphill)	0 to 30%	10%

Table 3. BehavePlus Fire Behavior Modeling Results – Existing Conditions

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Fuel Model SH5	36.4	14,081	4.7	1.8
Fuel Model SH2	13.1	1,529	0.7	0.9
Fuel Model GR1	3.1	67	0.5	0.3
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Fuel Model GS2	7.6	473	0.7	0.4
Fuel Model SH2	6.3	309	0.2	0.3
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Fuel Model SH5	19.5	3,604	1.5	0.7
Fuel Model GS2	7.9	505	0.7	0.4
Fuel Model SH2	6.5	333	0.2	0.3

Table 4. Fire Behavior Modeling Results for Post-Project Conditions

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Irrigated landscaping (FM8)	2.6	46	0.1	0.3
Pavement (FM-NB)	0	0	0	0
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Irrigated landscaping/Water Quality Basin (FM8)	1.6	16	0.1	0.1
Pavement (FM-NB)	0	0	0	0
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model SH2	6.5	333	0.2	0.3
Fuel Model GS2	7.9	505	0.7	0.4



SOURCE: AERIAL-BING MAPPING SERVICE; DEVELOPMENT-ALLIANCE ENGINEERING 2022

DUDEK

0 300 600 Feet

FIGURE 4

BehavePlus Analysis

Fire Protection Plan for the Blackhall Studios

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4 Emergency Response Service

The following sections analyze the Project in terms of current LACoFD Fire Service capabilities and resources to provide Fire Protection and Emergency Services. The analysis that follows examines the ability of the existing LACoFD fire stations to adequately serve the Project site. Response times were evaluated using Project build-out conditions. It was assumed that phased construction would include access roads to the newly constructed buildings and that the shortest access route to those structures would be utilized.

4.1 Emergency Response Fire Facilities

The Project is located within the LACoFD jurisdictional response area. Regionally, LACoFD provides fire, emergency medical, and rescue services from 173 stations. The Department serves over 4 million residents throughout 59 cities and all unincorporated portions of Los Angeles County. The Project site lies within the Northern Operations Bureau, Division 3. Fire Station 73 would provide an initial response; however, Stations 126 and 124 are available to provide a secondary response to the Project, if needed. These three existing stations were analyzed herein due to their proximity to the Project site. Figure 5 illustrates the station locations and Table 6 provides a summary of the LACoFD fire and medical delivery system for Fire Stations 73, 126 and 124.

Table 6. Closest LACoFD Responding Stations Summary

Station	Location	Equipment	Staffing
Station 73	24875 Railroad Ave, Santa Clarita	Engine, Squad	3-person Engine 2-person Squad
Station 126	26320 Citrus St, Santa Clarita	Engine, Quint	3-person Engine 2 person Quint
Station 124	25870 Hemingway Ave, Stevenson Ranch	Engine, Squad	3-person Engine 2-person Squad

Source: Los Angeles County Fire Museum 2021

The closest existing fire station to the Blackhall Studios-Santa Clarita development is Station 73 located immediately across the street from the Project site at 24875 Railroad Ave, Santa Clarita, California, which includes a three (3)-person Engine Company and a two (2)-person Paramedic Squad Truck 24-hours per day/seven days a week. Additionally, Station 126 located at 26320 Citrus St, Santa Clarita, California would likely provide a secondary response, and Station 124 located at 25870 Hemingway Ave, Stevenson Ranch, California, could also provide additional response to the Project.

Within the area's emergency services system, fire and emergency medical services are also provided by other agencies. Generally, each agency is responsible for structural fire protection and wildland fire protection within their area of responsibility. However, mutual aid agreements enable non-lead fire agencies to respond to fire emergencies outside their district boundaries. In the Project area, fire agencies cooperate under a statewide master mutual aid agreement for wildland fires. There are also mutual aid agreements in place with neighboring fire agencies and typically include interdependencies that exist among the region's fire protection agencies for structural and medical responses but are primarily associated with the peripheral "edges" of each agency's boundary.

4.1.1 Emergency Response Travel Time Coverage

Land use in the Santa Clarita Valley vicinity area varies greatly from urbanized and suburban clusters to vast rural areas. LACoFD's response time targets by land-use type are:

- 5 minutes or less for urban areas
- 8 minutes or less for suburban areas
- 12 minutes or less for rural areas

In an effort to understand fire department response capabilities, Dudek conducted an analysis of the travel-time response coverage from the closest, existing station (Fire Station 73). The response time analysis was conducted using travel distances that were derived from Google Road data and Project development plan data. Travel times were calculated applying the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH) as well as the nationally recognized Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard formula (T=0.65 + 1.7 D, where T= time and D = distance) for comparison. The ISO response travel time formula discounts speed for intersections, vehicle deceleration, and acceleration, and does not include turnout time. Tables 7 and 8 presents tabular results of the emergency response time analysis using the distance at speed formula and the ISO formula, respectively.

Table 7. Project Emergency Response Analysis using Speed Limit Formula

Station	Travel Distance to Project Entrance	Travel Time to Project Entrance[1]	Maximum Travel Distance[2]	Maximum Travel Time	Total Response Time[3]
Station 73	0.3 miles	0 minutes 31 seconds	0.67 miles	1 minutes 9 seconds	3 minutes 09 seconds
Station 126	3.1 miles	5 minutes 19 seconds	3.47 miles	5 minutes 57 seconds	7 minutes 57 seconds
Station 124	4.0 miles	6 minutes 52 seconds	4.37 miles	7 minutes 29 seconds	9 minutes 29 seconds

Notes:

1. Assumes travel distance and time to the Project entrance and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH), a 35-mph travel speed, and does not include turnout time.
2. Assumes travel distance and time to the furthest point within the Project site from fire station, and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH), a 35-mph travel speed, and does not include turnout time.
3. Emergency response time target thresholds include travel time to furthest point within the Project site from fire station, and application of the distance at speed limit formula (T=(D/S) * 60, where T=time, D=distance in miles, and S=speed in MPH) a 35 mph travel speed along with dispatch and turnout time, which can add an additional two minutes to travel time.

Table 8. Project Emergency Response Analysis using ISO Formula

Station	Travel Distance to Project Entrance	Travel Time to Project Entrance[1]	Maximum Travel Distance[2]	Maximum Travel Time	Total Response Time[3]
Station 73	0.3 miles	1 minutes 10 seconds	0.67 miles	1 minutes 47 seconds	3 minutes 47 seconds

Table 8. Project Emergency Response Analysis using ISO Formula

Station	Travel Distance to Project Entrance	Travel Time to Project Entrance[1]	Maximum Travel Distance[2]	Maximum Travel Time	Total Response Time[3]
Station 126	3.1 miles	5 minutes 55 seconds	3.47 miles	6 minutes 33 seconds	8 minutes 33 seconds
Station 124	4.0 miles	7 minutes 27 seconds	4.37 miles	8 minutes 6 seconds	10 minutes 6 seconds

Notes:

1. Assumes travel distance and time to the Project entrance and application of the ISO formula, T=0.65+1.7(Distance), a 35-mph travel speed, and does not include turnout time.
2. Assumes travel distance and time to the furthest point within the Project site from fire station, and application of the ISO formula, T=0.65+1.7(Distance), a 35-mph travel speed, and does not include turnout time.
3. Emergency response time target thresholds include travel time to furthest point within the Project site from fire station, and application of the ISO formula, T=0.65+1.7(Distance), a 35-mph travel speed along with dispatch and turnout time, which can add an additional two minutes to travel time.

Emergency response time target thresholds include travel time along with dispatch and turnout time, which can add two minutes to travel time. LACoFD Fire Station 73 would provide an initial response as the closest existing fire station. As indicated in Table 7 and Table 8, the total response time from Station 73 to the Blackhall Studios-Santa Clarita Project site entrance conforms to the response time standard of five (5) minutes for urban areas. The second engine to the Project site is estimated to arrive within approximately 7 minutes and 57 seconds (Speed Limit Formula) or 8 minutes and 33 seconds (ISO Formula). All response calculations are based on an average response speed of 35 mph, consistent with nationally recognized National Fire Protection Association (NFPA) 1710. Based on these calculations, the Project would meet or substantially conform with the County's response time standard for "suburban areas" from existing fire stations.

4.2 Estimated Calls and Demand for Service

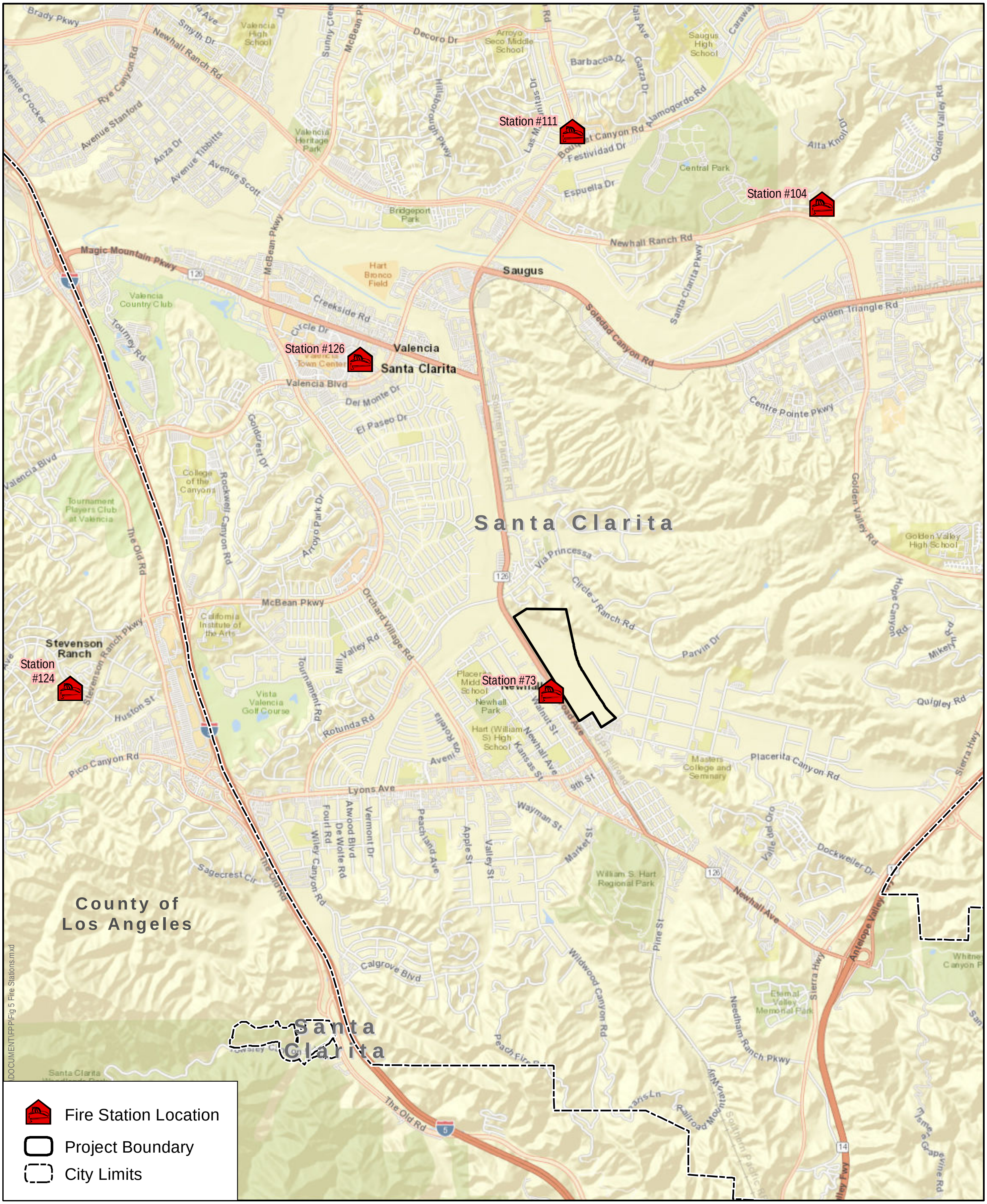
Emergency call volumes related to typical projects, such as new residential developments, can be reliably estimated based on the historical per-capita call volume from a particular fire jurisdiction. The LACoFD documented 307,025 total incidents for 2020 generated by a County-wide service area total population of approximately 4,250,000 persons in 58 cities and all unincorporated communities within Los Angeles County. The County's per capita annual call volume is approximately 95 calls per 1,000 persons. The resulting per capita call volume is 0.095.

The estimated incident call volume at Project buildout is based on a conservative estimate of the maximum potential number of persons on-site at any given time (considered a "worst-case" scenario). The Project includes approximately 476,000 square feet of sound stages, approximately 210,000 square feet of production and administrative office space, approximately 571,000 square feet of workshops, warehouses and support use buildings, and approximately 37,500 square feet of catering and other specialty services. The Project would include 3,400 vehicle parking spaces and 90 trailer parking spaces, including potential additional parking on MWD lot. Using Los Angeles County Fire agencies' estimate per capita call volume of 0.095 (95 annual calls per 1,000 population), the Blackhall Studios-Santa Clarita Project's estimated 2,400 employees would generate up to 228 additional calls per year (19 calls per month). The type of calls expected would primarily be medical-related.

4.2.1 Response Capability Impact Assessment

The available firefighting and emergency medical resources in the vicinity of the Project site include an assortment of fire apparatus and equipment considered fully capable of responding to the type of fires and emergency medical calls potentially occurring within the Project site. In 2020 Station 73, the primary responding station for the Project, responded to a total of 2,635 incidents with an approximate call volume of 7 calls a day (LACoFD 2021).

The Blackhall Studios-Santa Clarita Project includes an estimated 2,400 employees and is conservatively projected to add up to 228 calls per year (approximately 19 calls per month or less than one call a day), mostly medical, initially within Station 73's first-in response jurisdiction. The addition of 228 calls per year is not considered a significant impact given Station 73's annual call volume of 2,635 calls per year, raising the average number of daily calls from seven to eight. A busy suburban fire station would run 10 or more calls per day. An average station runs about five calls per day. The level of service demand for the Blackhall Studios-Santa Clarita Project site slightly raises overall call volume but is not anticipated to impact the existing fire station to a point that they cannot meet the demand. Station 73 would respond to an additional 228 calls per year (approximately 19 calls per month or less than one call a day), although the number will likely be lower than that based on the conservative nature of the population and calls per capita data used in this estimate. Final determination of the potential impact on the existing emergency response delivery system will be made by the LACoFD.



SOURCE: ESRI MAPPING SERVICE; LOS ANGELES COUNTY GIS

DUDEK

0 1,500 3,000 Feet

FIGURE 5

Los Angeles County Fire Department Battalions and Stations Map

Fire Protection Plan for the Blackhall Studios

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5 Buildings, Infrastructure and Defensible Space

This FPP demonstrates that the Project would comply with applicable portions of the 2020 Los Angeles Fire Code (Title 32), as amended, and adopted by reference the 2019 edition of the CFC. The Project also complies with Los Angeles County Building Code Chapter 7A. The Project would also be subject to the provisions of section 4291 of the Public Resources Code regarding brush clearance standards around structures and the Los Angeles County Fire Department guidelines for Fuel Modification Plans. The Project will meet or exceed applicable codes or will provide alternative materials and/or methods. While these standards will provide a high level of protection to structures for the Project, 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. All underground utilities, hydrants, water mains, curbs, gutters, and sidewalks will be installed, and the drive surface shall be approved prior to combustibles being brought on site.

5.1 Fire Apparatus Access

5.1.1 Access Roads

The Project would involve the construction of new structures and roadways and would generate new trips to and from the Project site. Project site access, including road widths and connectivity, will be consistent with the County's roadway standards and the Fire Code Section 503. Additionally, an adequate water supply prior to any combustibles being brought on-site, per California Fire Code 3312.1, and approved paved access roadways shall be installed and will include:

- The primary access to the Project is provided via Railroad Avenue and secondary access would be provided via Placerita Road/Arch Street, which satisfies secondary access requirements detailed in Title 21, Section 21.24 – Design Standards, Part 1 - Access of the Los Angeles County Code of Ordinances.

- Internal circulation is comprised of a loop roadway system that connects both the primary and secondary access points. All interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the Project site and for fire department access serving all proposed structures.

- The road system will be developed to be consistent with the County's roadway standards (Title 21) and the Fire Code, Section 503. All roads would comply with applicable Los Angeles County Fire Department (LACoFD) and Los Angeles County Fire Code requirements regarding sizing, condition, maintenance, and secured access.

- Private and public streets for each phase shall meet all Project approved fire code requirements, paving, and fuel management before combustibles being brought to the site.

- Fire access roadways that allow parking shall provide a minimum clear width of not less than 34 feet for parking on one side and a clear width of not less than 42 feet for parking on both sides. The interior access roads will be designed to accommodate a minimum of a 75,000-pound (lb.) fire apparatus load.
- All interior circulation roads include all roadways that are considered common or primary roadways for traffic flow through the Project site and fire department access serving all proposed structures.
- Fire apparatus roads shall have an unobstructed width of not less than 20 feet, exclusive of shoulders, except for approved security gates per Section 503.6, a minimum turning radius of 32 feet, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. Where a fire hydrant is located along a fire apparatus road, the road shall be constructed to a minimum unobstructed road width of 26 feet, exclusive of shoulders.
- Roads with a median or center divider will have a minimum 20 feet unobstructed width on both sides of the center median or divider.
- Roadways and/or driveways will provide fire department access within 150 feet of all portions of the exterior walls of the first floor of each structure.
- Access roads shall be completed and paved prior to the issuance of building permits and prior to the occurrence of combustible construction.
- The developer will provide information illustrating the new roads, in a format acceptable to the LACoFD for updating of Fire Department response maps.
- Traffic calming devices such as speed bumps, speed humps, etc. shall be prohibited unless approved by LACoFD.

5.1.2 Gates

Gates on private roads and/or private driveways are permitted, but subject to LA County Fire Code requirements and standards, as described in Section 503.6, including:

- Where a single gate is provided, the gate width shall be not less than 20 feet (6096 mm). Where a fire apparatus road consists of a divided roadway, the gate width shall be not less than 15 feet (4572 mm) for residential use and 20 feet (6096 mm) for commercial/industrial uses.
- Gates shall be of the swinging or sliding type.
- Construction of gates shall be of materials that allow manual operation by one person.
- Gate components shall be maintained in an operative condition at all times and replaced or repaired when defective.
- Electric gates shall be equipped with a means of opening the gate by Fire Department personnel for emergency access. Emergency opening devices shall be approved by the fire code official.
- Methods of locking shall be submitted for approval by the fire code official.
- Electric gate operators, where provided, shall be listed in accordance with UL 325.
- Gates intended for automatic operation shall be designed, constructed, and installed to comply with the requirements of ASTM F 2200.

5.1.3 Road Width and Circulation

Internal circulation would be from a series of internal streets that loop back to the primary and secondary access points at Placerita Canyon Road/Arch Street and Railroad Avenue. On-site roads will be constructed to current Los Angeles County Fire Apparatus Access Code standards, including all interior fire access roadways where a fire hydrant is located, shall be constructed to a minimum unobstructed road width of 26 feet, exclusive of shoulders and shall be improved with aggregate cement or asphalt paving materials. Fire apparatus roads where a hydrant is not located shall have a minimum unobstructed width of not less than 20 feet, exclusive of shoulders, except for approved security gates in accordance with Section 503.6, a minimum turning radius of 32 feet, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. A minimum vertical clearance of 13 feet 6 inches may be allowed for protected tree species adjacent to access roads. Any applicable tree-trimming permit from the appropriate agency is required.

Fire access roadways designed to allow parking shall provide a minimum clear width of not less than 34 feet for parking on one side and a clear width of not less than 42 feet for parking on both sides. The interior residential access roads will be designed to accommodate a minimum of a 75,000-pound (lb.) fire apparatus load (LACoFC 503.2.3).

5.1.4 Dead-End Roads

Dead-end fire apparatus access roads that exceed 150 feet shall have an approved turnaround (County Code Section 503.2.5). The Project primary and secondary access are from Railroad Avenue and Placerita Canyon Road/Arch Street, respectively, and the Project's internal roadways are a looped design. There are no dead-end roads within the Project site that exceed 150 feet.

5.1.5 Grade

The Project complies with the Los Angeles County grade requirements. Fire apparatus access roads shall not exceed 15 percent in grade.

5.1.6 Surface

All fire apparatus access and vehicle roadways shall be asphalt or concrete and designed and constructed in accordance with County Public Works standards and be designed to accommodate a minimum of a 75,000-pound fire apparatus load.

5.1.7 Vertical Clearance

Fire apparatus access roads shall have an unobstructed width of not less than 20 feet no less than 26-feet where hydrants are provided, exclusive of shoulders, and except for approved security gates in accordance with Section 503.6, and an unobstructed vertical clearance clear to the sky to allow aerial ladder truck operation. Exception: A minimum vertical clearance of 13 feet 6 inches may be allowed for protected tree species adjacent to access roads. Any applicable tree-trimming permit from the appropriate agency is required.

5.1.8 Premise Identification

Identification of roads and structures will comply with Los Angeles County Fire Code Title 32, as follows:

- All structures shall be identified by street address. Numbers shall be 6 inches high with a 1/2-inch stroke. Numbers will contrast with the background.
- Multiple structures having entrance doors not visible from the street or road shall have approved numbers grouped for all units within each structure and positioned to be plainly visible from the street or road. Said numbers may be grouped on the wall of the structure or on a mounting post independent of the structure.
- Streets will have street names posted on non-combustible street signposts. Letters/numbers will be per County standards.

Premise identification will be installed, street signs and building numbers, prior to the occupancy of structures.

5.2 Ignition Resistant Construction and Fire Protection

As only the northern portion of the Project site (north of Placerita Creek) is designated as a VHFHSZ, only structures within the designated VHFHSZ would be built utilizing the most current construction methods intended to mitigate wildfire exposure, required by LACoFD, at the time of construction. Within the limits established by law, construction methods intended to mitigate wildfire exposure will comply with the wildfire protection building construction requirements contained in the Los Angeles County Building Code including the following:

1. Los Angeles County Building Code, Chapter 7A
2. Los Angeles County Referenced Standards Code, Chapter 12-7A

Construction practices respond to the requirements of the LACoFD Fire Code Title 32 and the Los Angeles County Building Code (Title 26, Chapter 7A), "Construction Methods for Exterior Wildfire Exposure" These requirements include the ignition resistant requirements found in Chapter 12-7A of the Los Angeles County Referenced Standards Code. While these standards will provide a high level of protection to structures in this development and should reduce or eliminate the need to order evacuations, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

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

1. The 7A Materials and Construction Methods for Exterior Wildfire Exposure chapter details the ignition resistant requirements for the following key components of building safely in wildland urban interface and fire hazard severity zones:

    a. Roofing Assemblies (covering, valleys and gutters)
    b. Vents and Openings
    c. Exterior wall covering
    d. Open Roof Eaves
    e. Closed Roof Eaves and Soffits
    f. Exterior Porch Ceilings
    g. Floor projections and underfloor protection
    h. Underfloor appendices
    i. Windows, Skylights and Doors
    j. Decking
    k. Accessory structures

2. Class-A fire rated roof and associated assembly. With the proposed class-A fire rated roof, areas where there will be attic or void spaces requiring ventilation to the outside environment, the attic spaces will require either ember-resistant roof vents or a minimum 1/16-inch mesh (smaller sizes restrict air flow) and shall not exceed 1/8-inch mesh for side ventilation (recommend BrandGuard, O'Hagin or similar vents). All vents used for the Project will be approved by LACoFD.

3. Multi- pane glazing with a minimum of one tempered pane, fire-resistance rating of not less than 20 minutes when tested according to NFPA 257 (such as SaftiFirst, SuperLite 20-minute rated glass product), or be tested to meet the performance requirements of State Fire Marshal Standard 12-7A-2

4. Automatic, Interior Fire Sprinkler System to code by occupancy type for all habitable structures

5. Modern infrastructure, access roads, and water delivery system.

5.3 Infrastructure and Fire Protection Systems Requirements

The following infrastructure components are made to comply with the Los Angeles County requirements, the 2019 California Fire Code, LACoFD's Fire Code Standards, and nationally accepted fire protection standards, as well as additional requirements to assist in providing reasonable on-site fire protection.

5.3.1 Water Supply

The Santa Clarita Valley Water Agency (SCVWA), or other public utility district (PUD), would be the water purveyor to provide domestic water supplies and fire flows to the Project. Approval from the California Public Utility Commission would be required prior to construction improvements to the water system. New water infrastructure would be required to provide service to the Project site. The water needs of Blackhall Studios-Santa Clarita will be met through various water resource management strategies and secure water sources throughout the buildout of the Project. This Water Service Plan will provide a flexible, reliable water supply throughout Project development without adversely affecting other local groundwater users or other users of critical SWP resources.

The Project will be consistent with County Title 20, Section 20.16.060 for fire flow and fire hydrant requirements within a VHFHSZ. These internal waterlines will also supply sufficient fire flows and pressure to meet the demands for required onsite fire hydrants and interior fire sprinkler systems for all structures. Water supply must meet a 2-hour fire flow requirement of 2,500 gpm with 20-psi residual pressure, which must be over and above the daily maximum water requirements for this development. Water utilities will be connected prior to any construction.

5.3.2 Fire Hydrants

Fire Hydrants shall be located along fire access roadways as determined by LACoFD Fire Chief or Fire Marshal and current fire code requirements to meet operational needs. As describes in LACOFC Appendix C, the required fire hydrant spacing for industrial land uses shall be 300 feet (91.44 m). No portion of lot frontage shall be more than 200 feet (60.96 m) from, via vehicular access, a public hydrant. No portion of a building shall be more than 400 feet (121.92 m) from, via vehicular access, a properly spaced public hydrant.

Fire Hydrants will be consistent with applicable County Design Standards. Hydrants will have one 2.5-inch outlet and one 4- inch outlet and be of bronze construction per the LACoFD fire code. Reflective blue dot hydrant markers shall be installed in the street to indicate location of the hydrant. Crash posts will be provided where needed in on-site areas where vehicles could strike fire hydrants or fire department connections. Prior to issuance of building permits, the appropriate number of fire hydrants and their specific locations will be approved by LACoFD.

5.3.3 Automatic Fire Sprinkler Systems

All structures, of any occupancy type, will be protected by an automatic, interior fire sprinkler system. All structures automatic internal fire sprinklers would be in accordance with National Fire Protection Association (NFPA) 13 and LACoFD installation requirements as required based on structure type, use and size. Actual system design is subject to final building design and the occupancy types in the structure. Fire sprinkler plans for each structure will be submitted and reviewed by LACoFD for compliance with the applicable fire and life safety regulations, codes, and ordinances.

5.4 Ongoing Building Infrastructure Maintenance

The Project's Owner and/or property management agency shall be responsible for long term maintenance of private roads and fire protection systems, including fire sprinklers and private fire hydrants, per National Fire Prevention Association (NFPA) standards in California Fire Code Chapter 80.

5.5 Pre-Construction Requirements

Per Los Angeles County Fire Code, 4908.1, A fuel modification plan shall be submitted and have preliminary approval prior to any subdivision of land; or, have final approval prior to the issuance of a permit for any permanent structure used for habitation; where, such structure is located within areas designated as a Fire Hazard Severity Zone within State Responsibility Areas or Very High Fire Hazard Severity Zone within the Local Responsibility areas, applicable Fire Hazard Zone maps, and Appendix P of this code at the time of application. An on-site inspection must be conducted by the personnel of the Forestry Division of the Fire Department and a final approval of the fuel modification plan issued by the Forestry Division prior to a certificate of occupancy being granted by the building code official.

As an additional consultant recommendation, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established.

5.6 Activities in a Hazardous Fire Area

The Project will comply with LACoFD requirements for activities in Hazardous Fire Areas. It is recommended that a construction fire prevention plan (CFPP) be prepared for the Project prior to commencement of construction activities, which will designate fire safety measures to reduce the possibility of fires during the construction phase. The CFPP may include the following measures: fire watch/ fire guards during hot works and heavy machinery activities, hose lines attached to hydrants or a water tender, Red Flag Warning weather period restrictions, required on-site fire resources, and others as determined necessary.

The proposed structures will be built utilizing the most current construction methods intended to mitigate wildfire exposure, required by LACoFD, at the time of construction. Within the limits established by law, construction methods intended to mitigate wildfire exposure will comply with the wildfire protection building construction requirements contained in the Los Angeles County Building Code including the following:

1. Los Angeles County Building Code, Chapter 7A
4. Los Angeles County Referenced Standards Code, Chapter 12-7A

Construction practices respond to the requirements of the LACoFD Fire Code Title 32 and the Los Angeles County Building Code (Title 26, Chapter 7A), "Construction Methods for Exterior Wildfire Exposure" These requirements include the ignition resistant requirements found in Chapter 12-7A of the Los Angeles County Referenced Standards Code. While these standards will provide a high level of protection to structures in the development and should reduce or eliminate the need to order evacuations, there is no guarantee of assurance that compliance with these standards will prevent damage or destruction of structures by fire in all cases.

5.7 Defensible Space and Vegetation Management

5.7.1 Defensible Space and Fuel Modification Zone (FMZ) Requirements

An important component of a fire protection system for the Project is the provision for fire-resistant landscapes and modified vegetation buffers. FMZs are designed to provide vegetation buffers that gradually reduce fire intensity and flame lengths from advancing fire by strategically placing thinning zones, restricted vegetation zones, and irrigated zones adjacent to each other on the perimeter of the WUI exposed structures.

Perimeter structures will be located adjacent to FMZ areas that separate the Project from naturally vegetated open space areas surrounding the Project site. Based on the modeled extreme weather flame lengths for the Project site pre-development, wildfire flame lengths are projected to be approximately 19.5 feet high in areas of Development Footprint-adjacent coastal scrub fuels, and up to 36.4 feet with 40 mph peak gusts. The fire behavior modeling system used to predict these flame lengths was not intended to determine sufficient FMZ widths, but it does provide the average predicted length of the flames, which is a key element for determining "defensible space" distances for providing firefighters with room to work and minimizing structure ignition. For the Project site, the FMZs range between 50 and 100 feet wide with the majority of the site's FMZ achieving 100 feet widths, which is approximately 5 times the modeled flame lengths based on the fuel type represented adjacent to the Development Footprint. The FMZs will be constructed from the structure outwards towards undeveloped areas.

Figure 6 illustrates the FMZ Plan proposed for the Blackhall Studios-Santa Clarita Project site, including a 5-foot ember resistant zone (Zone A), and a minimum 95-foot wide paved/irrigated landscaping zone (Zone B). With incorporation of the Chapter 7A requirements for structures within the VHFHSZ in the northern portion of the Project site and the proposed infrastructure improvements across the Project site, the proposed FMZ, although not 100 feet for all structures on-site would provide sufficient fire protection, given the types of structures proposed are highly ignition resistant and would not be constructed within a designated FHSZ.

Although FMZs are very important for setting back structures from adjacent unmaintained fuels, the highest concern is considered to be from firebrands or embers as a principal ignition factor. To that end, the Project 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 LACoFD and County's Fire and Building Codes (e.g., Chapter 7A) for on-site structures within the VHFHSZ.

Los Angeles County Fuel Modification Zone Standards

An FMZ is a strip of land where combustible vegetation has been removed and/or modified and partially or completely replaced with more adequately spaced, drought-tolerant, fire-resistant plants to provide a reasonable level of protection to structures from wildland fire. The purpose of the section is to document LACoFD'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. Los Angeles County Fire Code (Title 32, Fire, Section 4908) is consistent with the 2019 California Fire Code (Section 4907 — Defensible Space), Government Code 51175 – 51189, and Public Resources Code 4291, which require that fuel modification zones be provided around every building that is designed primarily for human habitation or use within a VHFHSZ.

A typical landscape/fuel modification installation per the County's Fire Code consists of a 30-foot-wide Zone A and a 70-foot-wide Zone B for a total of 100 feet in width. An additional 100-foot-wide Zone C may be required for the areas adjacent to natural-vegetated, open space areas. The Project will consist of a 5-foot-wide Ember Resistant Zone, and a 95-foot-wide Zone A, paved/irrigated landscaping zone. A Fuel Modification Plan shall be reviewed and approved by the Forestry Division of the LACoFD for consistency with defensible space and fire safety guidelines. Figure 6 conceptually displays FMZs for the Project site.

It is the recommendation of this FPP that the FMZs be maintained on at least an annual basis or more often as needed to maintain the fuel modification buffer function. An on-site inspection will be conducted by staff of the Forestry Division of the LACoFD upon completion of landscape install before a certificate of occupancy being granted by the County's building code official.

Project Fuel Modification Zone Treatments

Ember Resistant Zone – from structure outward to minimum 5 feet

The ember-resistant zone is currently not required by law, but science has proven it to be the most important of all the defensible space zones. This zone requires the most stringent wildfire fuel reduction. The ember-resistant zone is designed to keep fire or embers from igniting materials that can spread the fire to structures. The following provides guidance for this zone, which may change based on the regulation developed by the Board of Forestry and Fire Protection.

1. Use hardscape like gravel, pavers, concrete and other noncombustible mulch materials. No combustible bark or mulch
2. Remove all dead and dying weeds, grass, plants, shrubs, trees, branches and vegetative debris (leaves, needles, cones, bark, etc.), Check roofs, gutters, decks, porches, stairways, etc.
3. Limit plants in this area to low growing, nonwoody, properly watered and maintained plants
4. Limit combustible items (outdoor furniture, planters, etc.) on top of decks
5. Replace combustible fencing, gates, and arbors attach to the structure with noncombustible alternatives
6. Consider relocating garbage and recycling containers outside this zone

Zone A: Paved/Irrigated Landscaping Zone – from the outer edge of the Ember Resistant Zone up to 100 feet from structure

Approved plan description: Extends from the outermost edge of Zone A up to 100 feet from a structure or as noted on the plan. Automatic or manual irrigation systems are required for this zone unless it consists entirely of native plants.

1. Irrigated by the automatic or manual system to maintain healthy vegetation and fire resistance
2. Landscaping and vegetation in this zone shall consist primarily of green lawns, ground covers (not exceeding 6 inches in height), and spaced shrubs.
3. Plants in Zone A shall be inherently highly fire-resistant and on the approved fuel modification plant list (Appendix D-1)
4. Trees are not recommended for Zone A unless they are dwarf varieties or mature trees of small stature.
5. Prohibited plant species (Appendix E) shall not be within 30 feet or more of the structures.
6. Vines and climbing plants shall not be allowed on any structure.
7. In all cases, the overall characteristics of the landscape provide adequate defensible space in a fire environment.

Fire Access Road Zone

Approved plan description: Extends a minimum of 10 feet from the edge of any public or private roadway that may be used as access for fire-fighting apparatus or resources. Clear and remove flammable growth for a minimum of 10 feet on each side of the access roads. (Fire Code 325.10) Additional clearance beyond 10 feet may be required upon inspection. Required on all areas of Project.

1. Required clearance extends a minimum of 10 feet from the edge of any public or private roadway as well as an unobstructed vertical clearance to the sky.

2. Landscaping and native plants shall be appropriately spaced and maintained.

3. Trees found in Appendix D-1 can be planted, if they are far enough from structures and Fire Department accesses, and do not overhang any structures or access at maturity.

Roadside fuel modification for the Project consists of maintaining ornamental landscapes, including trees, clear of dead and dying plant materials. Roadside fuel modification shall be maintained by the Project's Owner and/or property management agency.

Roadway Clearance

Per section 325.10 of the County Fire Code, LACoFD may require additional removal and clearance of flammable vegetation or combustible growth along roadsides. Vegetation clearance would be a minimum of 10-feet on each side of the roadway whether public or private road. The minimum clearance of 10-feet may be increased if the fire code official determines additional distance is required to provide reasonable fire safety.

Special Fuel Management Issues

On the Project site, tree planting in the fuel modification zones and along roadways is acceptable, as long as they meet the following restrictions as described below and in the County's Fire Code and the LACoFD's Guide to Defensible Space and Fuel Modification Zones spacing requirements:

- For streetscape plantings, trees should be planted 10 feet from the edge of the curb to the center of the tree trunk. Care should be given to the type of tree selected, that it will not encroach into the roadway, or produce a closed canopy effect.

- Crowns of trees located within defensible space shall maintain a minimum horizontal clearance of 15 feet for a single tree. Mature trees shall be pruned to remove limbs one-third the height or six feet, whichever is less, above the ground surface adjacent to the trees.

- Deadwood and litter shall be regularly removed from trees.

- Ornamental trees shall be limited to groupings of 2–3 trees with canopies for each grouping separated horizontally.

Specific Landscaping Requirements

The following requirements are provided for Owner and/or property management agency-maintained fuel modification zones. All landscaping shall be maintained by the Owner and/or property management agency.

Plants used in the fuel modification areas or landscapes will include drought-tolerant, fire-resistive trees, shrubs, and groundcovers, per LACoFD Plant Selection Guidelines (Appendix D-1). The planting list and spacing will be reviewed and approved by LACoFD, included on submitted landscape plans. The suggested plant reference guide intends to provide examples of plants that are less prone to ignite or spread flames to other vegetation and combustible structures during a wildfire. Additional Plants can be added to the landscape plant material palette with approval from LACoFD.

Pre-Construction Requirements

- Perimeter fuel modification areas must be implemented and approved by the LACoFD before combustible materials are brought on site.
- Existing flammable vegetation shall be reduced by 50% on vacant lots upon commencement of construction.
- Dead fuel, ladder fuel (fuel which can spread fire from the ground to trees), and downed fuel shall be removed, and trees/shrubs shall be properly limbed, pruned, and spaced per the plan.

Undesirable Plants

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be physical (structure promotes ignition or combustible) or chemical (volatile chemicals increase flammability or combustion characteristics). The plants included in the FMZ Undesirable Plan List (refer to Appendix D-2) are unacceptable from a fire safety standpoint and shall not be planted or allowed to establish opportunistically within the FMZs or landscape areas.

5.7.2 FMZ Vegetation Management

It is the recommendation of this FPP that all fuel modification area vegetation management within the FMZs shall be completed annually by May 1 of each year and more often as needed for fire safety, as determined by the LACoFD.

The Owner and/or property management agency shall be responsible for all fuel modification vegetation management in compliance with the plan and the LACoFD requirements. The Project Owner and/or property management agency shall be responsible for all fuel modification vegetation management for all common areas of the Project site, including roadsides clearance and fuel modification zones. Los Angeles Building Code Chapter 7A requirements for ongoing maintenance of fire-resistive building materials and fire sprinkler systems will be provided by the Project Owner and/or property management agency for the Project. The Project Owner and/or property management agency shall also be responsible for ensuring long-term funding and ongoing compliance with all provisions of the FPP, including vegetation planting, fuel modification on the perimeter, and maintenance requirements on all common areas and roadsides.

Maintenance of FMZ's and Defensible Space is an important component for the long-term fire safety of the Project. maintenance obligations will be as follows:

- All future plantings shall be in accordance with LACoFD Fuel modification Guidelines.
- The Project will be required to submit plans to the Fuel Modification Unit prior to landscaping being installed.
- Changing landscaping in common areas or individual lots will be reviewed by the Fuel Modification Unit and approved prior to installation.

Project Owner and/or property management agency:

- The Project Owner and/or property management agency will maintain the access roads, including a minimum of 10 feet clearance on each side of the road(s) within the Development Footprint adjacent to open space areas.
- The Project Owner and/or property management agency will be required to annually maintain the FMZs (or as needed).
- The Project Owner and/or property management agency will maintain all common areas, including trees planted along roadways and in other areas throughout Project.

5.7.3 Annual FMZ Compliance Inspection

It is the recommendation of this FPP, to confirm that the Project's FMZs and landscape areas are being maintained in accordance with this FPP and the LACoFD's fuel modification guidelines, the Project Owner and/or property management agency will obtain an FMZ inspection and report from a qualified LACoFD-approved 3rd party inspector in May/June of each year certifying that vegetation management activities throughout the Project site have been performed. If the FMZ areas are not compliant, the Project Owner and/or property management agency will have a specified period to correct any noted issues so that a re-inspection can occur, and certification can be achieved. Annual inspection fees are subject to the current Fire Department Fee Schedule.

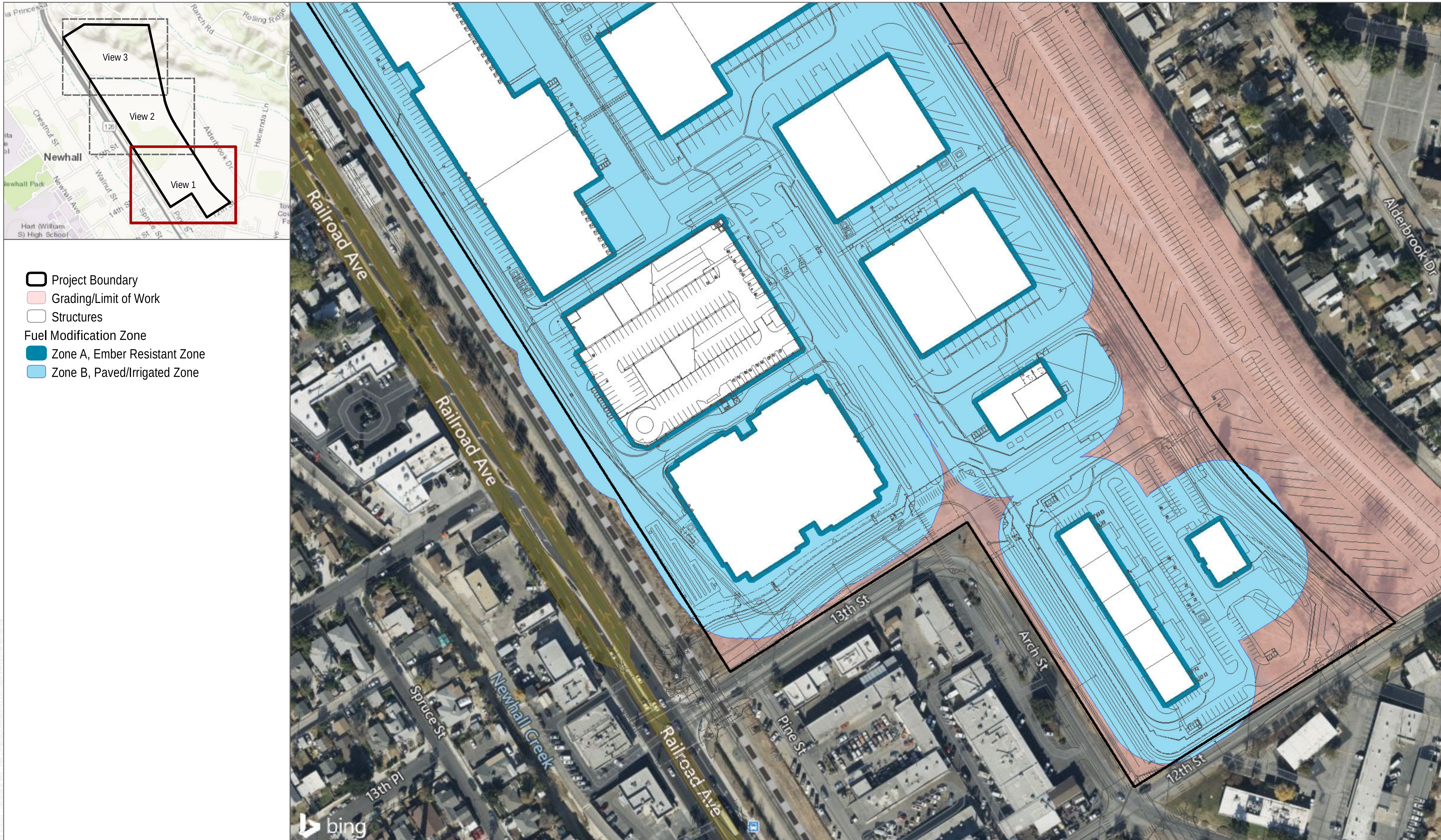
5.7.4 Construction Phase Vegetation Management

Vegetation management requirements shall be implemented at commencement and throughout the construction phase. Vegetation management for the Project area shall be performed pursuant to the FPP and LACoFD requirements on all building locations prior to the start of work and prior to any import of combustible construction materials. Fuel breaks shall be created around all grading, site work, and other construction activities in areas where there is flammable vegetation. LACoFD will be contacted prior to combustible materials being brought onsite to confirm that the appropriate fuel modification has been provided..

In addition to the requirements outlined above, the Project will comply with the following important risk-reducing vegetation management guidelines:

- All-new power lines shall be installed underground for fire safety purposes. Temporary construction power lines may be allowed in areas that have been cleared of combustible vegetation.

- Caution must be used not to cause erosion or ground (including slope) instability or water runoff due to vegetation removal, vegetation management, maintenance, landscaping, or irrigation.



SOURCE: AERIAL-BING MAPPING SERVICE 2022

DUDEK

0 75 150 Feet

FIGURE 6

Fuel Modification Plan - View 1

Fire Protection Plan for the Blackhall Studios

Project Boundary
Grading/Limit of Work
Structures
Fuel Modification Zone
Zone A, Ember Resistant Zone
Zone B, Paved/Irrigated Zone

SOURCE: AERIAL-BING MAPPING SERVICE 2022

DUDEK

0 75 150 Feet

FIGURE 6

Fuel Modification Plan - View 2

Fire Protection Plan for the Blackhall Studios

SOURCE: AERIAL-BING MAPPING SERVICE 2022

DUDEK

0 75 150 Feet

FIGURE 6

Fuel Modification Plan - View 3

Fire Protection Plan for the Blackhall Studios

5.8 Pre-Construction Requirements

It is the recommendation of this FPP that a fuel modification plan should be submitted and have preliminary approval prior to any subdivision of land; or, have final approval prior to the issuance of a permit for any permanent structure; where, such structure or subdivision is located within areas designated as a Fire Hazard Severity Zone within State Responsibility Areas or Very High Fire Hazard Severity Zone within the Local Responsibility areas, applicable Fire Hazard Zone maps, and Appendix M of the code at the time of application. An onsite inspection must be conducted by the personnel of the Forestry Division of the Fire Department and final approval of the fuel modification plan issued by the Forestry Division prior to a certificate of occupancy being granted by the building code official.

As an additional consultant recommendation, prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established.

5.9 Activities in High Fire Hazard Severity Zone

The Project will comply with LACoFD requirements for activities in Hazardous Fire Areas. It is recommended that a construction fire prevention plan (CFPP) be prepared for the Project prior to commencement of construction activities that will designate fire safety measures to reduce the possibility of fires during the construction phase. The CFPP should include the following measures: fire watch/ fire guards during hot works and heavy machinery activities, hose lines attached to hydrants or a water tender, Red Flag warning weather period restrictions, required on-site fire resources, and others as determined necessary.

6 Wildfire Education Program

Early evacuation for any type of wildfire emergency at the Project site is the preferred method of providing for occupant safety, consistent with the LACoFD's current approach within Los Angeles County. As such, it is the recommendation of this FPP, that the Project's Owner and/or property management agency formally adopt, practice, and implement a "Ready, Set, Go!" approach to evacuation[3]. The "Ready, Set, Go!" concept is widely known and encouraged by the State of California and most fire agencies. Pre-planning for emergencies, including wildfire emergencies, focuses on being prepared, having a well-defined plan, minimizing the potential for errors, maintaining the Project site's fire protection systems, and implementing a conservative (evacuate as early as possible) approach to evacuation and Project area activities during periods of fire weather extremes.

Project occupants would be provided ongoing education regarding wildfires and the FPP's requirements. The educational information must include maintaining the landscape and structural components according to the appropriate standards designed for the Project. Informational handouts, website page, mailers, fire-safe council participation, inspections, and seasonal reminders are some methods that would be used to disseminate wildfire and relocation awareness information. LACoFD would review and approve all wildfire educational material/programs before printing and distribution.

[3] https://www.fire.lacounty.gov/rsg/

7 Conclusion

The requirements and recommendations set forth in this FPP meet fire safety, building design elements, infrastructure, fuel management/modification, and landscaping recommendations of the applicable codes. The recommendations provided in the FPP have also been designed specifically for the proposed construction of structures within areas designated as VHFHSZ. When properly implemented on an ongoing basis, the fire protection strategies proposed in this FPP should significantly reduce the potential fire threat to the structures posed by vegetation, as well as assist LACoFD in responding to emergencies within the Project site. The fire protection system provided for the Project site includes a redundant layering of code-compliant, fire-resistant construction materials and methods that have been shown through post-fire damage assessments to reduce the risk of structural ignition. Additionally, modern infrastructure would be provided, and all structures are required to include interior, automatic fire sprinklers consistent with the County's regulatory standards. Further, the proposed fuel modification for structures adjacent to the open space areas would provide a buffer between fuels in the open space and structures within the Project site.

Note that this is a conceptual plan, which provides enough detail for LACoFD approval. Detailed plans, such as improvement plans and building permits, demonstrating compliance with the concepts in the FPP and with County Fire Code requirements, would be submitted to LACoFD at the time they are developed.

Fire is a dynamic and somewhat unpredictable occurrence and as such, this FPP does not guarantee that a fire will not occur or will not result in injury, loss of life, or loss of property. There are no warranties, expressed or implied, regarding the suitability or effectiveness of the recommendations and requirements in this FPP, under all circumstances.

The Project's developers, contractors, engineers, and architects are responsible for the proper implementation of the concepts and requirements set forth in the FPP. The Project operator and/or property owner or managers are also responsible for maintaining their structures and lots, including fuel modification and landscape, as required by this FPP, the LACoFD, and as required by the County Fire Code. Alternative methods of compliance with this FPP can be submitted to the fire authority and for consideration.

It will be extremely important for the Project operator and/or property owner or managers to comply with the recommendations and requirements described and required by the FPP. The responsibility to maintain the fuel modification and fire protection features required for the Project site lies with the Project operator and/or property owner or managers. The Project operator and/or property owner or managers or similar entity would be responsible for ongoing education and maintenance of the Project site, and the LACoFD would enforce the vegetation management requirements detailed in this FPP.

It is recommended that the occupants who may work within the Blackhall Studios-Santa Clarita Project adopt a conservative approach to fire safety. The approach must include embracing a "Ready, Set, Go" stance on evacuation.

The Project is not to be considered a shelter-in-place development. However, the fire agencies and/or law enforcement officials may, during an emergency, as they would for any new development providing the layers of fire protection as the Project, determine that it is safer to temporarily refuge residents on-site. When an evacuation is ordered, it will occur according to pre-established evacuation decision points or as soon as notice to evacuate is received, which may vary depending on many environmental and other factors. It is important for anyone working in 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 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 a 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 the proposed Blackhall Studios-Santa Clarita Project based on the site-specific fire environment.

Based on the results of this FPP's analysis and findings, the FPP implementation measures presented in Table 9 summarize code-required measures and Table 10 summarizes measures offered that are code exceeding or mitigating through alternative means and methods.

Table 9. Code-Required Fire Safety Features

Feature No.	Features Description
1	**Ignition-Resistant Construction.** Project buildings would be constructed of ignition-resistant construction materials based on the latest Building and Fire Codes.
2	**Interior Fire Sprinklers.** All structures over 500 square feet, or what the current adopted code requires, would include interior fire sprinklers.
3	**Fuel Modification Zones.** Provided throughout the perimeter of the Development Footprint and would consist of a 5-foot-wide non-combustible area and the remainder of the Development Footprint would be irrigated landscape or paved area (Zone A).
4	**Fire Apparatus Access.** Provided throughout the community and would vary in width and configuration but would all provide at least the minimum required unobstructed travel lanes, lengths, turnouts, turnarounds, and clearances required by the applicable code.
5	**Firefighting Improvements.** Firefighting staging areas and temporary refuge areas are available throughout the Project's developed areas and along roadways and open space.
6	**Water Availability.** Water capacity and delivery would provide for a reliable water source for operations and during emergencies requiring extended fire flow.

Table 10. Code Exceeding or Alternative Materials and Methods Fire Safety Measures

Measure No.	Code Exceeding or Alternative Material or Method Measure
1	**Construction Fire Prevention Plan.** Details the important construction phase restrictions and fire safety requirements that would be implemented to reduce risk of ignitions and pre-plans for responding to an unlikely ignition.
2	**Pre-Construction.** Prior to bringing lumber or combustible materials onto the Project site, improvements within the active development area shall be in place, including utilities, operable fire hydrants, an approved, temporary roadway surface, and fuel modification zones established.

Table 10. Code Exceeding or Alternative Materials and Methods Fire Safety Measures

Measure No.	Code Exceeding or Alternative Material or Method Measure
3	**Wildfire Education and Outreach.** The Project Owner and/or property management agency would ensure fire safety measures detailed in this FPP have been implemented, and educate employees on and prepare facility-wide "Ready, Set, Go!" plans.
4	**Vegetation Management.** Fuel modification area vegetation management within the FMZs shall be completed annually by May 1 of each year and more often as needed for fire safety, as determined by the LACoFD.
5	**Fuel Modification Zone Inspections.** Maintenance and inspections would be managed by the Project Owner and/or property management agency and occur as needed. The Project Owner and/or property management agency would annually hire a third party, LACoFD-approved, FMZ inspector to provide annual certification that it meets the requirements of this FPP.

8 List of Preparers

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Appendix A
Photograph Log

Photograph 1. View looking east across the Project site from the central portion of the western boundary. (6)

Photograph 2. View looking northeast across the Project site from the central portion of the western boundary. (6)

Photograph 3. View looking east across the Placerita Creek stream bed from the western boundary of the Project site. (8)

Photograph 4. View looking northeast from the Placerita Creek stream bed from the western boundary of the Project site. (8)

Photograph 5. View looking north from the Placerita Creek stream bed along the western boundary of the Project site. (8)

Photograph 6. View looking east across the Project site from the northern portion of the western boundary. (9)

Photograph 7. View looking northeast across the Project site from the northern portion of the western boundary. (9)

Photograph 8. View looking north across the Project site from the northern portion of the western boundary. (9)

Photograph 9. View looking northwest across the Project site from the northern portion of the western boundary. (9)

Photograph 10. View looking west across the Project site from the northern portion of the western boundary. (9)

Photograph 11. View looking northwest offsite across the western boundary from the western edge of the Project site. (9)

Photograph 12. View looking west offsite across the western boundary from the western edge of the Project site. (9)

Photograph 13. View looking east from the central portion of the Placerita Creek stream bed. (10)

Photograph 14. View looking north from the central portion of the Placerita Creek stream bed. (10)

Photograph 15. View looking northeast from the central portion of the Placerita Creek stream bed. (10)

Photograph 16. View looking northeast from the central portion of the Placerita Creek stream bed. (10)

Photograph 17. View looking east from the central portion of the Placerita Creek stream bed. (10)

Photograph 18. View looking east from the central portion of the Placerita Creek stream bed. (10)

Photograph 19. View looking north from the northeast portion of the Project site from the eastern boundary. (11)

Photograph 20. View looking north from the northeast portion of the Project site from the eastern boundary. (11)

Photograph 21. View looking northeast from the northern portion of the Project site from the eastern boundary. (11)

Photograph 22. View looking east from the northern portion of the Project site from the eastern boundary. (11)

Photograph 23. View looking east from the northern portion of the Project site from the eastern boundary. (11)

Photograph 24. View looking northwest from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 25. View looking west from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 26. View looking west from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 27. View looking southeast from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 28. View looking east from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 29. View looking northeast from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 30. View looking north from the Placerita Creek streambed east of the Project site's eastern boundary. (12)

Photograph 31. View looking north from south of the Placerita Creek stream bed from the eastern Project boundary. (13)

Photograph 32. View looking west from south of the Placerita Creek stream bed from the eastern Project boundary. (13)

Photograph 33. View looking west from south of the Placerita Creek stream bed from the eastern Project boundary. (13)

Photograph 34. View looking east from south of the Placerita Creek stream bed from the eastern Project boundary. (13)

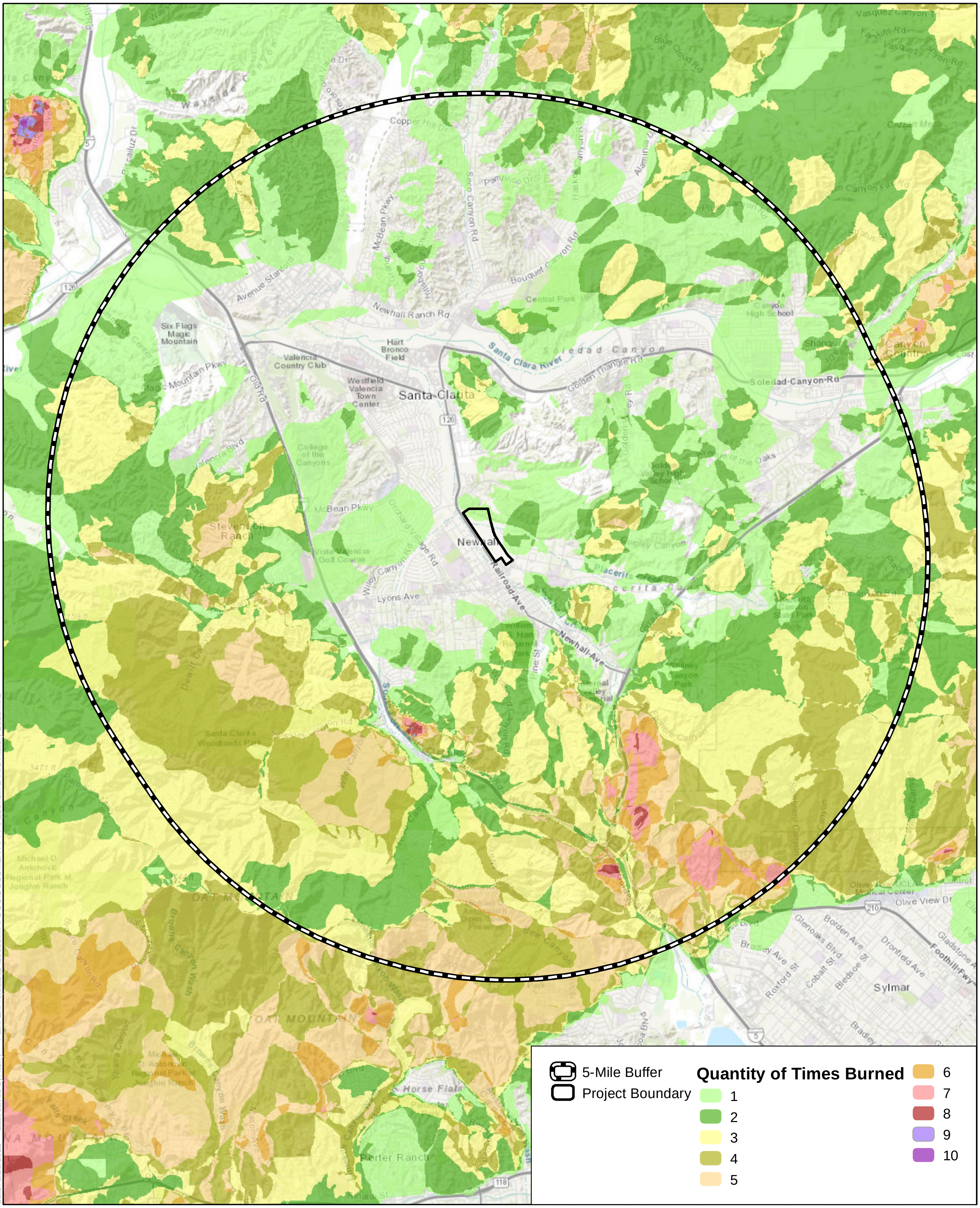
Photograph 35. View looking northwest across from the central portion of the eastern boundary. (14)

Photograph 36. View looking north across from the central portion of the eastern boundary. (14)

Photograph 37. View looking north across from the central portion of the eastern boundary. (14)

Photograph 38. Photograph of an on-site Oak.

Appendix B
Fire History



Date: 3/23/2022 - Last saved by: lterry - Path: Z:\Projects\j1426900\MAPDOC\DOCUMENT\FPP\Appendix B Fire History 2020.mxd

SOURCE: BASE MAP- ESRI MAPPING SERVICE; FIRE DATA-CALFIRE 2020

DUDEK

0 1 2 Miles

APPENDIX B

Fire History Map

Fire Protection Plan for Blackhall Studios

Appendix C
Fire Behavior Analysis

1 FIRE BEHAVIOR MODELING HISTORY

Fire behavior modeling has been used by researchers for approximately 50+ years to predict how a fire will move through a given landscape (Linn 2003). The models have had varied complexities and applications throughout the years. One model has become the most widely used as the industry standard for predicting fire behavior on a given landscape. That model, known as "BEHAVE", was developed by the U. S. Government (USDA Forest Service, Rocky Mountain Research Station) and has been in use since 1984. Since that time, it has undergone continued research, improvements, and refinement. The current version, BehavePlus 6.0, includes the latest updates incorporating years of research and testing. Numerous studies have been completed testing the validity of the fire behavior models' ability to predict fire behavior given site specific inputs.

One of the most successful ways the model has been improved has been through post-wildfire modeling (Brown 1972, Lawson 1972, Sneeuwjagt and Frandsen 1977, Andrews 1980, Brown 1982, Rothermel and Rinehart 1983, Bushey 1985, McAlpine and Xanthopoulos 1989, Grabner, et. al. 1994, Marsden-Smedley and Catchpole 1995, Grabner 1996, Alexander 1998, Grabner et al. 2001, Arca et al. 2005). In this type of study, BehavePlus is used to model fire behavior based on pre-fire conditions in an area that recently burned. Real-world fire behavior, documented during the wildfire, can then be compared to the prediction results of BehavePlus and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling conducted for project sites includes a relatively high-level of detail and analysis which results in reasonably accurate representations of how wildfire may move through available fuels on and adjacent to the property. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, the analysis incorporates predominant fuel characteristics, slope percentages, and representative fuel models observed on site. The BehavePlus fire behavior modeling system is used to analyze anticipated fire behavior within and adjacent to key areas just outside of the project boundaries.

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 generally classified as grass, brush, timber (forest) litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone/defensible space widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

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

2 MODELING INPUTS

2.1 Fuel model descriptions

Fire behavior can be predicted largely by analyzing the characteristics of these fuels and is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties. The seven fuel characteristics help define the 13 standard fire behavior fuel models[1] and the five custom fuel models developed for Southern California[2].

According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the

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

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

fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

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

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

- 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 is used in order to evaluate potential fire behavior; existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

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

2.2 Fuel model selection

Dudek utilized the BehavePlus software package to analyze fire behavior potential for the Blackhill Studios Project site in Santa Clarita, California.

Vegetation Types

To support the fire behavior modeling efforts conducted, the different vegetation types (fuels) observed on and adjacent to the project site were classified into the aforementioned fuel models. 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 determined from a site visit that was conducted on March 22, 2022 by a Dudek Fire Protection Planner. Based on the site visit, four different fuel models were used in the fire behavior modeling effort to represent the observed vegetation types. Fuel model attributes are summarized in Table 1. Modeled vegetation types include coastal sage scrub (Fuel Model SH2) and mature coastal sage scrub (Fuel Model SH5) that occurs along and adjacent to the Placerita Creek stream channel and in patches on the bluff hillsides in the northern portion of the site; short grass and forbs (Fuel Model GS1) occurs in the meadow areas on site and on the bluff hillsides both onsite and offsite.

As is customary for this type of analysis, four fire scenarios were evaluated, including two scenarios approaching the site - one offshore (northeast) and one onshore (west) weather condition and two scenarios originating at the site – both offshore (south and west) weather conditions. Fuels and terrain at and beyond this distance can produce flying embers that may affect the project and the vicinity, but defenses have been built into the structures to prevent ember penetration and to extinguish fires that may result from ember penetration. It is the fuels adjacent to and within fuel modification zones that would have the potential to affect the project's structures from a radiant and convective heat perspective as well as from direct flame impingement. 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.

Table 1: Fuel Model Characteristics

Fuel Model	Model Description	Vegetation Type / Location	Fuel Bed Depth (Feet)
GR1	Short, sparse dry climate grass	Low growing or mowed grass and forbs. Existing maintained meadow areas throughout the majority of the project site south of Placerita Creek.	1.0 ft.
GS2	Moderate Load, Dry Climate Grass-Shrub	Primarily moderate height grass with scattered small shrubs. Existing meadow areas onsite and offsite in the vicinity of Placerita Creek and on the bluff hillsides.	<2.0 ft.
SH2	Moderate load, Dry Climate Grass-Shrub	Coastal sage scrub. Occurs within and adjacent to the Placerita Creek stream channel, in the northwest portions of the project site and patches on the bluff hillsides.	<3.0 ft.
SH5	High Load, Dry Climate Shrub	Mature coastal sage scrub. Occurs within and adjacent to the Placerita Creek stream channel and in northwest portions of the project site.	>4.0 ft.
FM8	Compact litter	Irrigated Landscape. Occurs post development within irrigated landscaping and fuel modification zones.	<1.0 ft.

2.3 Slope

Slope is a measure of the angle 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 level to 30% were estimated around the perimeter of the proposed project site from the site assessment visit and available maps.

2.4 Weather

Historical weather data for the region was utilized in determining appropriate fire behavior modeling inputs for the Proposed Project area fire behavior evaluations. To evaluate different scenarios, analyses were conducted for both the 50th percentile weather (summer, on-shore winds) and the 97th percentile weather (fall, off-shore winds) conditions. Fuel moisture and wind speed information data was incorporated into the BehavePlus modeling runs. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. Table 2 summarizes the input variables used in the BehavePlus modeling efforts.

Table 2: Input Variables Used For Fire Behavior Modeling

Model Variable	Summer Weather (50th Percentile)	Peak Weather (97th Percentile)
Fuel Models	8, GS2, SH2	8, GR1, SH2 and SH5
1 h fuel moisture	5%	2%
10 h fuel moisture	6%	3%
100 h fuel moisture	9%	5%
Live herbaceous moisture	40%	30%
Live woody moisture	80%	60%
20 ft. wind speed	20 mph	40 mph
Wind Directions from north (degrees)	180, 225 and 270	45
Wind adjustment factor	0.4	0.4
Slope (uphill)	0 to 30%	10%

3 FIRE BEHAVIOR ANALYSIS

As mentioned, the BehavePlus fire behavior modeling software package was utilized in evaluating anticipated fire behavior adjacent to the Proposed Project site.

Four focused analyses were completed, each assuming worst-case fire weather conditions. Two scenarios were for a fire approaching the project site from the northeast and west; two scenarios were for a fire originating on the project site and moving north and northeast.

- Scenario 1. Fire flaming front approaching from the northeast around the vicinity of Placerita Creek through the existing grassland (Fuel Model GS2), sage scrub (Fuel Models SH2 and SH5), and mowed grass (Fuel Model GR1) vegetation adjacent to and on the northern portion of the project, with strong northeastern Santa Ana winds. Post-development includes the irrigated landscaping (Fuel Model 8) and paved parking areas.

- Scenario 2. Fire flaming front approaching from the west towards the northwestern portion of the project, entering the site through the grassland and sage scrub vegetation (Fuel Models GS2 and SH2), with moderate westerly onshore winds. Post-development includes landscaped water quality basin (Fuel Model 8) and paved parking area.

- Scenario 3. Fire flaming front originating on the project site and moving to the north towards the bluff on the northernmost portion of the project site, through the existing grassland vegetation (Fuel Model GS2), with moderate southerly onshore winds. Post-development includes the existing native grassland vegetation (Fuel Model GS2) on the bluff that will be maintained as open space.

- Scenario 4. Fire flaming front originating on the project site and moving to the northeast towards the offsite bluff northeast of the project site, through sage scrub vegetation (Fuel Models SH2 and SH5) and grassland (Fuel Model GS2), with moderate southwesterly onshore winds. Post-development includes irrigated landscaping (Fuel Model 8), paved drive and parking area, irrigated landscaping and grassland (Fuel Model GS2).

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)). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2008). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts (Rothermel and Rinehart 1983). Spotting distance is the distance a firebrand or ember can travel down wind and ignite receptive fuel beds.

4 FIRE BEHAVIOR MODELING RESULTS

The results presented in Tables 3 and 4 depict values based on inputs to the BehavePlus software and are not intended to capture changing fire behavior as it moves across a landscape. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. For planning purposes, the averaged worst-case fire behavior is the most useful information for conservative fuel modification design. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

Based on the Fire Behavior Modeling analysis for existing conditions (Table C-4), worst-case fire behavior is expected in untreated, surface shrub and chaparral fuels northeast of the proposed Project site under peak weather conditions (represented by Fall Weather, Scenario 1). The fire is anticipated to be a wind-driven fire from the northeast during the fall. Under such conditions, expected surface flame lengths reach 36.4 feet with wind speed of 40 mph. Under this scenario, fireline intensities reach 14,081 BTU/feet/second with spread rates of 4.7 mph and could have a spotting distance up to 1.8 miles away.

Based on the Fire Behavior Modeling analysis for post development (Table C-5), fire behavior is expected in irrigated and replanted with plants that are acceptable with Los Angeles County Fire Department (LACFD) (Zone A – FM8 and Zone B – FM8) under peak weather conditions (represented by Fall Weather, Scenario 1). Under such conditions, expected surface flame length is expected to be significantly lower, with flames lengths reaching approximately 2.6 feet with wind speed of 40 mph. Under this scenario, fireline intensities reach 46 BTU/feet/second with relatively slow spread rates of 0.1 mph and could have a spotting distance up to 0.3 mile away. Therefore, the minimum 200-foot wide Irrigated landscaping and paved parking areas and roadways serving as Fuel Modification Zones (FMZ) for the Project provide equivalent protection for the worst case fire scenario under peak weather conditions and would provide adequate defensible space to augment a wildfire approaching the perimeter of the Project site.

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

Fire Scenarios	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Fuel Model SH5	36.4	14,081	4.7	1.8
Fuel Model SH2	13.1	1,529	0.7	0.9
Fuel Model GR1	3.1	67	0.5	0.3
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Fuel Model GS2	7.6	473	0.7	0.4
Fuel Model SH2	6.3	309	0.2	0.3
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Fuel Model SH5	19.5	3,604	1.5	0.7
Fuel Model GS2	7.9	505	0.7	0.4
Fuel Model SH2	6.5	333	0.2	0.3

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

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Scenario 1: sage scrub, 10% downhill slope, 40 mph wind from NE				
Irrigated landscaping (FM8)	2.6	46	0.1	0.3
Pavement (FM-NB)	0	0	0	0
Scenario 2: Sage scrub, 5% uphill slope, 20 mph wind from W				
Irrigated landscaping/Water Quality Basin (FM8)	1.6	16	0.1	0.1
Pavement (FM-NB)	0	0	0	0
Scenario 3: grass and sage scrub, 30% uphill slope, 20 mph wind from S				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model GS2	7.9	505	0.7	0.4
Scenario 4: grass and sage scrub, 30% uphill slope, 20 mph wind from SW				
Pavement (FM-NB)	0	0	0	0
Irrigated landscaping (FM8)	1.6	16	0.1	0.1
Fuel Model SH2	6.5	333	0.2	0.3

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

Scenario	Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Spread Rate (mph)	Spotting Distance (miles)
Fuel Model GS2	7.9	505	0.7	0.4

The following describes the fire behavior variables (Heisch and Andrews 2010) as presented in Tables 3 and 4:

- 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 six feet of the ground.

5 SUMMARY

As shown in Table C-4 (Fire Behavior Modeling Results for Existing Conditions), wildfire behavior in mature sage scrub, presented as Fuel Model SH5, represents the most extreme conditions during a Santa Ana wind event. In this case, flame lengths can be expected to reach up to approximately 36.4 feet with 40 mph winds (extreme fire weather conditions) and 19.5 feet with 20 mph wind speeds (onshore winds). Spread rates for sage scrub fuel beds range from 1.5 mph (summer onshore winds) to 4.7 mph (extreme offshore winds). Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.7 mile to 1.8 miles. In comparison, a grass fuel type (Fuel Model GR1) could generate flame lengths up to 3.1 feet high with a spread rate of 0.5 mph with a Santa Ana wind condition. The fire could potentially be spotting for a distance of 0.3 mile.

As shown in Table C-5 (Fire Behavior Modeling Results for Post-Project Conditions), modeling of the site was conducted for post-development fuel recommendations for this project. Fuel modification includes paved parking lots, paved streets and irrigated landscaping on the periphery of the Project as well as maintenance of vegetation within 20 feet of the Project perimeter on an as needed basis where applicable. For modeling the post-development condition, fuel model assignments were re-classified for the irrigated landscaping (Fuel Model 8). Fuel model assignments for all other areas remained the same as those classified for the existing condition. The landscaped and irrigated FMZ areas experience a significant reduction in flame length and intensity. The 36.4-foot and 19.5-foot tall flames predicted during pre-development modeling during extreme weather conditions for mature sage scrub fuel bed are reduced to less than 3.0 feet tall due to the higher live and dead fuel moisture contents; in the paved areas there would be no combustible materials to support a fire.

It should be noted that the results presented in Tables C-4 and C-5 depict values based on inputs to the BehavePlus software. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis, but models provide a worst-case wildfire condition as part of a conservative approach. Further, this modeling analysis assumes a correlation between the project site vegetation and fuel model characteristics. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

The information in Table 5 presents an interpretation of the outputs for five fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Tables 3 and 4. Identification of modeling run locations is presented graphically in Figure 5 of the FPP.

Table 5: 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.

Summary

6 REFERENCES

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Appendix D-1

LACoFD Suggested Plant Reference Guide

Appendix D:
Acceptable Plant List by Fuel Modification Zone

Botanical Name	Common Name	Zone[1]	Minimum Distance from Structure[2]
Ground Cover			
Acacia redolens 'Desert Carpet'/'Low Boy'	Desert Carpet Acacia	B	30
Achillea tomentosa	Woolly Yarrow	A	
Ajuga reptans	Carpet Bugle	A	
Arctostaphylos (Prostrate Varieties)	Manzanita	B	
Artemisia californica (Cultivars)	Sagebrush - Prostrate Forms	B	30
Artemesia 'Powis Castle'	NCN	B	
Baccharis pilularis 'Pigeon Point'/'Twin Peaks'	Prostrate Coyote Brush	B	
Campanula poscharkyana	Serbian Bellflower	A	
Ceanothus gloriosus	Point Reyes Ceanothus	B	
Cerastium tomentosum	Snow-In-Summer	A	
Chamaemelum nobile	Chamomile	A	
Cistus salviifolius 'Prostratus'	Sageleaf Rockrose	B	
Coprosma kirkii	Mirror Plant	B	
Coreopsis auriculata 'Nana'	Tickseed	A	
Cotoneaster (Prostrate Varieties)	Cotoneaster	B	
Dalea greggii	Trailing Indigo Bush	B	
Delosperma alba	White Training Ice Plant	A	
Dichondra micrantha	Dichondra	A	
Drosanthemum floribundum	Rosea Ice Plant	A	
Duchesnea indica	Indian Mock Strawberry	A	
Dymondia margaretae	NCN	A	
Erigeron glaucus	Seaside Daisy	A	
E. karvinskianus	Santa Barbara Daisy	B	
Euonymus fortunei 'Colorata'	Purple-Leaf Winter Creeper	B	
Festuca cinerea(ovina'Glauca')	Blue Fescue	A	
F. rubra	Red Fescue	A	
Fragaria chiloensis	Wild Strawberrry	A	
Gazania Hybrids	Trailing Gazania	A	
Geranium incanum/sanguineum	Cranesbill	A	
Glechoma hederacea	Ground Ivy	A	
Helianthemum nummularium	Sunrose	A	
Herniaria glabra	Green Carpet	A	
Heuchera species and Cultivars	Coral Bells	A	
Hypericum calycinum/coris	Aaron's Beard	B	
Iberis sempervirens	Evergreen Candytuft	A	
Iva hayesiana	Poverty Weed	B	30
Juniperus (Prostrate species/cultivars)		B	
Laurentia fluviatilis	Blue Star Creeper	A	
Lysimachia nummularia	Moneywort	A	
Liriope spicata	Creeping Lily Turf	A	

Liriope muscari	Lily Turf	A	
Mahonia repens	Creeping Mahonia	B	
Myoporum 'Pacificum' & 'Putah Creek'	Pacific Myoporum	B	
M. parvifolium	NCN	A	
Oenothera berlandieri	Mexican Evening Primrose	B	
O. stubbei	Baja Evening Primrose	A	
Ophiopogon japonicus	Mondo Grass	A	
Pachysandra terminalis	Japanese Spurge	A	
Pelargonium peltatum/tomentosum	Ivy Geranium	A	
Persicaria capitata	Pink Clover	A	
Phlox subulata	Moss Pink	A	10
Phyla nodiflora (Lippia repens)	Lippia	A	
Potentilla tabernaemontanii	Spring Cinquefoil	A	
Ribes viburnifolium	Catalina Perfume	B	
Rosmarinus officinalis (Prostrate Varieties)	Prostrate Rosemary	B	30
Scaevola 'Mauve Clusters'	NCN	A	
Salvia sonomensis	Creeping Sage	B	
Sedum species	Stonecrops	A	
Senecio mandraliscae/serpens	Kleinia/Blue Chalksticks	A	
Soleirolia soleirolii	Baby's Tears	A	
Teucrium cossonii majoricum	Germander	A	
T. X lucidrys 'Prostratum'	Prostrate Germander	A	
Thymus species	Mother of Thyme	A	
Trachelospermum jasminoides	Star Jasmine	A	
Trifolium fragiferum	White Clover	A	
Verbena species (Prostrate Varities)	Garden Verbena	A	
Vinca minor	Dwarf Periwinkle	A	
Viola odorata	Sweet Violet	A	
Wedelia trilobata	Yellow Dot	B	
Zoysia tenuifolia	Korean Grass	A	
Miscellaneous Perennials, Grasses, Ferns etc.			
Acorous gramineous and Cultivars	Sweet Flag	A	
Agapanthus africanus	Lily of the Nile	A	
Alstroemeria cooperi	Peruvian Lily	A	
Armeria species	Thrifts	A	
Bamboos	Bamboo	B	30
Bergenia cordifolia	Heart Leaf Bergenia	A	
Cycas species	Cycads	A	
Cyrtomium falcatum	Holly Fern	A	
Davalia tricomanoides	Rabbits Foot Fern	A	
Epilobium canum	California Fuchia	B	
Helictotrichon sempervirens	Blue Oat Grass	A	15
Hemerocallis hybrids	Daylily	A	
Iris douglassiana	Coastal Iris	A	
Iris germanica	Bearded Iris	A	

Kalanchoe species	Kalanchoe	A	
Leymus condensatus 'Canyon Prince'	Canyon Prince Wild Rye	B	
Lobelia laxiflora		A	10
Pelargonium species	Geranium	A	
Penstemon species	Beard Tongue	A	
Plumeria	Plumeria	A	
Phlebodium aureum	Rabbits Foot Fern	A	
Tulbaghia violacea	Society Garlic	A	
Zephyranthes candida	Zephyr Lily	A	
Shrubs			
Abelia grandiflora (Prostrata)	Glossy Abelia	A	10
Abutilon hybridum	Flowering Maple	A	10
Acanthus mollis	Bear's Breech	A	
Agave species	Agave	A	
Aloe species	Aloe	A	
Alyogyne huegelii	Blue Hibiscus	A	10
Arbutus unedo (Dwarf Cultivars)	Dwarf Strawberry Tree	A	10
Arctostaphylos species	Manzanita	B	
Aucuba japonica	Japanese Aucuba	A	
Baccharis species	Various	B	
Berberis thunbergii	Japanese Barberry	B	
B. thunbergii ' prostrate cultivars'		A	10
Bougainvillea sp.	Bougainvillea	B	
Buddleja davidii	Butterfly Bush	B	
Buxus microphylla japonica	Japanese Boxwood	A	10
Caesalpinia (Shrub Forms)	Bird of Paradise Bush	A	10
Camellia species	Camellia	A	10
Calliandra californica/eriophylla	Baja Fairy Duster	B	
Callistemon citrinus	Lemon Bottlebrush	B	
C. viminalis "Little John"	NCN	A	10
Calycanthus occidentalis	Western Spice Bush	B	
Carissa macrocarpa and Cultivars	Natal Plum	A	10
Carpenteria californica	Bush Anemone	A	10
Cassia artemisioides	Feathery Cassia	A	30
Ceanothus species	Wild Lilac	B	30
Cercocarpus betuiloides	Mountain Mahogany	B	30
Choisya ternata	Mexican orange	B	
Cistus species	Rockrose	B	
Comarostaphylis diversifolia	Summer Holly	B	
Convolvulus cneorum	Bush Morning Glory	B	
Coprosma pumila/repens	Mirror Plant	B	
Cotoneaster species & cultivars	Cotoneaster	B	
Crassula species	NCN	A	
Cuphea hyssopifolia	False Heather	A	
Cycas revoluta	Sago Palm	A	

Dasylirion quadrangulatum/wheeleri	Mexican Grass Tree	A	10
Dendromecon harfordii	Island Bush Poppy	B	
Dietes bicolor/irioides	Fortnight Lily	A	
Dodonaea viscosa (Purpurea)	Hopseed Bush	B	
Elaeagnus pungens & cultivars	Silverberry	B	
Encelia californica	Coast Sunflower	A	10
E. farinosa	Brittle Bush	B	
Erigonum giganteum	St. Catherine's Lace	B	
Escallonia species	Escallonia	A	10
Euonymus japonica & cultivars	Evergreen Euonymus	A	10
Euphorbia species		A	
Euryops pectinatus	NCN	A	
Fatsia japonica	Japanese Aralia	A	
Fouquieria splendens	Ocotillo	A	
Fremontodendron species & cultivars	Flannel Bush	B	
Gardenia jasminoides	Gardenia	A	
Garrya elliptica	Coast Silktassel	B	
Grevillea species & cultivars	Grevillea	B	
Grewia occidentalis	Lavender Starflower	B	
Hakea suaveolens	Sweet Hakea	B	
Hebe species & cultivars	Hebe	A	10
Hesperaloe parviflora	Red Yucca	A	
Hibiscus rosa - sinensis	Chinese Hibiscus	A	10
Ilex species	Holly	B	
Juniperus species	Juniper	B	
Justicia brandegeana	Shrimp Plant	A	10
J. californica	Chuparosa	B	
Keckiella cordifolia	Heart-Leaved Penstemon	B	
Kniphofia uvaria	Red-Hot Poker	A	
Lantana Camara & hybrids	Lantana	A	10
Larrea tridentata	Creosote Bush	B	
Lavandula species	Lavender	A	10
Lavatera assurgentiflora/maritima	California Tree Mallow	B	
Leonotis leonrus	Lion's Tail	B	
Leptospermum scoparium & varities	New Zealand Tea Tree	B	
Leucophyllum species		B	
Ligustrum japonicum	Wax-leaf Privet	A	10
Lupinus species	Lupine	B	
Mahonia aquifolium ('Compacta')	Oregon Grape	A	10
M. fremontii	Desert Mahonia	B	
M. 'Golden Abundance'	NCN	B	
M. lomariifolia	Venetian Blind Mahonia	A	
Malosma - See Rhus			
Malva species	Mallow	A	10
Melaleuca nesophila	Pink Melaleuca	A	10
Mimulus species (Diplacus)	Monkey Flower	A	10
Myrica californica	*Pacific Wax Myrtle*	*B*	

Myrsine africana	*African Boxwood*	*A*	*10*
Myrtus communis 'Compacta'	Dwarf Myrtle	A	10
Nandina domestica (including dwarf varieties)	Heavenly Bamboo	A	
Nerium oleander	Oleander	B	
N.o. 'Petite Salmon'	NCN	A	10
Opuntia species	Prickly Pear, Cholla etc.	A	
Phlomis fruticosa	Jerusalem Sage	A	
Phoenix roebelenii	Pygmy Date Palm	A	
Phormium tenax and Cultivars	New Zealand Flax	A	
Photinia fraseri	Photinia	B	
Pittosporum tobira ('Variegata')	Tobira	B	
P.t.'Wheeler's Dwarf'	Dwarf Pittosporum	A	
Punica granatum 'Nana'	Dwarf Pomegranate	A	10
Prunus ilicifolia	Hollyleaf Cherry	B	
Pyracantha species	Firethorn	B	
Rhamnus california/crocea	Coffeeberry	B	
Rhaphiolepis indica and Cultivars	India Hawthorn	A	10
Rhus integrifolia/laurina	Lemonade Berry	B	40
R. ovata	Sugar Bush	B	30
Ribes species	Currant/Gooseberry	A	10
Romneya coulteri	Matilija Poppy	B	
Rosa species (except R. californica)	Rose	A	
Rosmarinus officinalis & cultivars	Rosemary	B	
Salvia species - native varieties	Sage	B	
S. greggii/leucantha	Autumn Sage	A	10
Santolina chamaecyparissus/rosmarinifolius	Lavender Cotton	A	10
Simmondsia chinensis	Jojoba	B	
Strelitzia nicolai/regina	Bird of Paradise	A	
Tagetes lemmonii	Copper Canyon Daisy	B	
Tibouchina urvilleana	Princess Flower	A	10
Trichostema lanatum	Wooly Blue Curls	B	
Viburnum species	Viburnum	A	10
Westringia fruticosa	Coast Rosemary	A	10
Xylosma congestum	Shiny Xylosma	B	
X.c. 'Compacta'	Compact Xylosma	A	10
Yucca species	Yucca	B	
Trees			
Acacia farnesiana	Sweet Acacia	A	15
A. greggii	Catclaw Acacia	B	
A. salicina	Willow Acacia	A	15
A. smallii	NCN	A	15
A. stenophylla	Shoestring Acacia	A	15
Acer negundo	Box Elder	B	
A. palmatum	Japanese Maple	A	
A. saccharinum	Silver Maple	B	30

Aesculus californica	California Buckeye	B	
Agonis flexuosa	Peppermint Tree	B	
Albizia julibrissin	Silk Tree	B	
Alnus rhombifolia	Alder	B	
Arbutus unedo ('Marina')	Strawberry Tree	A	15
Archontophoenix cunninghamiana	King Palm	A	
Bauhinia variegata	Purple Orchid Tree	B	
Betula pendula	European White Birch	A	10
Brachychiton acerifolius/populneus	Flame Tree/Bottle Tree	B	
Brahea armata/edulis	Blue Hesper Palm	A	10
Butia capitata	Pindo Palm	A	10
Callistemon citrinus	Lemon Bottlebrush	B	
C. viminalis	Weeping Bottlebrush	A	15
Calocedrus decurrens	Incense Cedar	B	
Calodendrum capense	Cape Chestnut	B	
Cedrus deodara	Deodar Cedar	B	30
Ceratonia siliqua	Carob	B	30
Cercidium floridum/microphyllum	Blue Palo Verde	A	
Cercis occidentalis/canadensis	Western Redbud	A	10
Chamaerops humilis	Mediterranean Fan Palm	A	10
Chilopsis linearis	Desert Willow	A	15
Chionanthus retusus	Chinese Fringe Tree	A	10
Chitalpa X tashkentensis	Chitalpa	A	10
Chorisia speciosa	Floss Silk Tree	B	
Cinnamomum camphora	Camphor Tree	B	30
Citrus species	Citrus	A	10
Cocculus laurifolius	Laurel Leaf Snail Seed	B	
Cordyline australis	Giant Dracaena	A	
Cyathea cooperi	Australian Tree Fern	A	
Dicksonia antarctica	Tazmanian Tree Fern	A	
Dracaena draco	Dragon Tree	A	
Eriobotrya deflexa/japonica	Bronze Loquat/Loquat	A	10
Erythrina species	Coral Tree	B	
Feijoa sellowiana	Pineapple Guava	A	10
Ficus species	Fig	B	50
Fraxinus species	Ash	B	30
Geijera parviflora	Australian Willow	A	15
Ginkgo biloba	Maidenhair Tree	A	15
Gleditsia triacanthos	Honey Locust	A	15
Grevillea robusta	Silk Oak	B	
Heteromeles arbutifolia	Toyon	A	15
Hymenosporum flavum	Sweetshade Tree	A	15
Jacaranda mimosifolia	Jacaranda	B	
Juglans californica	Black Walnut	B	
Koelreuteria bipinnata/paniculata	Chinese Flame Tree	B	
Lagerstroemia indica	Crape Myrtle	A	10
Laurus nobilis	Sweet Bay	B	

Leptospermum laevigatum	Australian Tea Tree	A	15
Liquidambar formosana	Chinese Sweet Gum	A	15
L. styraciflua	American Sweet Gum	B	
Liriodendron tulipfera	Tulip Tree	B	
Lithocarpus densiflorus	Tanbark Oak	B	
Lophpstemon confertus (Tristania)	Brisbane Box	A	15
Lyonothamnus floribundus	Catalina Ironwood	A	15
Magnolia grandiflora	Southern Magnolia	B	
M. X soulangeana	Saucer Magnolia	A	10
Maytenus boaria	Mayten Tree	A	10
Melaleuca quinquenervia	Cajeput Tree	A	15
Metasequoia glypstroboides	Dawn Redwood	A	15
Metrosideros excelsus	New Zealand Christmas Tree	A	10
Morus alba	White Mulberry	B	
Olea europea	Olive - Fruitless only	A	15
Parkinsonia aculeata	Jerusalem Thorn	A	10
Phoenix dactylifera	Date Palm	B	
Pinus species	Pine	B	75
Pistacia chinensis	Chinese Pistache	B	
Pittosporum phillyraeoides	Willow Pittosporum	A	10
P. rhombifolium	Queensland Pittosporum	B	
Platanus racemosa	California Sycamore	B	
Podocarpus gracilior/macrophyllus	Fern Pine/Yew Pine	B	
Populus fremontii	Fremont Cottonwood	B	
Prosopis chilensis	Chilean Mesquite	B	
P. glandulosa	Honey Mesquite	A	15
Prunus cerasifera 'Atropurpurea'	Purple-leaf Plum	A	10
Punica granatum	Pomegranate	B	
Pyrus calleryana/kawakamii	Ornamental Pear	A	15
Quercus species	Oak	B	30
Rhus lancea	African Sumac	B	
Robinia ambigua	Locust	B	
Sapium sebiferum	Chinese Tallow Tree	B	
Schefflera actinophylla	Queensland Unbrella Tree	A	
Sophora japonica	Japanese Pagoda Tree	B	
Stenocarpus sinuatus	Firewheel Tree	A	10
Syagrus romanzoffianum	Queen Palm	A	
Tabebuia species	Trumpet Tree	A	15
Tipuana tipu	Tipu Tree	B	
Tupidanthus calyptratus	Tupidanthus	A	
Trachycarpus fortunei	Windmill Palm	A	
Umbellularia californica	California Bay	B	
Washingtonia filifera	California Fan Palm	B	30
Zelkova serrata	Sawleaf Zelkova	B	

Source: Los Angeles County Fire Department, Fuel Modification Unit.

Notes:

1. The plant list above is intended to be a representative sample of which plants are appropriate in Zones A or B considering their size, moisture content, leaf litter production, and chemical

composition.

2. Plants with certain physical and chemical characteristics make them more flammable and should not be planted close to structures in fire hazard areas. These trees should be spaced to allow a minimum canopy clearance at maturity from the structure as specified in the above table.
3. Landscape Designers may choose plants that are not on this list and may be acceptable if their plant characteristics are fuel modification zone appropriate.
4. Additionally, selecting regionally appropriate plants and the consideration of climate and microclimate adaptability is the responsibility of the Landscape Designer.

Appendix D-2

LACoFD Undesirable Plant List

Botanical Name	Common Name	Comment*
Adenostoma fasciculatum	Chamise	F
Adenostoma sparsifolium	Red Shank	F
Artemesia californica	California Sagebrush	F
Carpobrotus edulis	Hottentot-fig	F, I
Cortaderia spp.	Pampas Grass	F, I
Cupressus spp.	Cypress	F
Eriogonum fasciculatum	Common Buckwheat	F
Eucalyptus spp.	Eucalyptus	F
Jasminum humile	Italian Jasmine	F
Plumbago auriculata	Cape Plumbago	F
Tecoma capensis	Cape Honeysuckle	F

*F = flammable, I = Invasive

Notes:

1. Certain plants are considered to be undesirable in the landscape due to characteristics 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” since their complete or partial removal from the landscape is a critical part of hazard reduction. Therefore, any plant listed in the above table is not allowed as part of an acceptable Fuel Modification Plan.
2. Plants on this list that are considered invasive are a partial list of commonly found plants. There are many other plants considered invasive that should not be planted in a fuel modification zone and they can be found on The California Invasive Plant Council’s Website www.cal-ipc.org/ip/inventory/index.php. Other plants not considered invasive at this time may be determined to be invasive after further study.
3. 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.
4. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
5. All vegetation used in Fuel Modification Zones and elsewhere within the Chadwick Ranch Estates Project site shall be subject to approval of the L.A. County Fire Department’s Fuel Modification Unit or Fire Code official.

APPENDIX N-2
TRAFFIC EVACUATION ASSESSMENT

MEMORANDUM

TO: Mike Hennawy, City of Santa Clarita

FROM: Patrick A. Gibson, P.E., PTOE
Richard Gibson, LEED Green Associate
David Roachford

DATE: January 24, 2022
Revised January 20, 2023

RE: Traffic Evacuation Assessment for
Shadowbox Studios Evacuation Shed
Santa Clarita, California **Ref:** J1814a

Gibson Transportation Consulting, Inc., (GTC) was asked to assess, in relation to the proposed Shadowbox Studios (Project) within the Placerita Canyon area of the City of Santa Clarita, California (City), the anticipated performance along Dockweiler Drive, Arch Street, and 13th Street (Dockweiler Corridor) in the event of an emergency evacuation. The assessment includes the determination of the approximate vehicular delays that would be experienced during an evacuation at each intersection within the Dockweiler Corridor under Existing Conditions, Future with Project with Dockweiler (Roundabout) Conditions, and Future with Project with Dockweiler (Traffic Signal) Conditions, as defined in *Transportation Assessment for the Shadowbox Studios Project, Santa Clarita, California* (GTC, January 2023) (Transportation Study).

For the purposes of this assessment, the Dockweiler Corridor includes the following intersections:

- Railroad Avenue & 13th Street (Intersection 5 in the Transportation Study)
- Arch Street & 13th Street & Project Driveway #1 & Project Driveway #2 (Intersection 16 in the Transportation Study)
- EXISTING: Arch Street & 12th Street & Placerita Canyon Road (Intersection 17 in the Transportation Study)
- FUTURE: Arch Street & 12th Street & Dockweiler Drive (Intersection 17 in the Transportation Study)[1]

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[1] In this analysis, Railroad Avenue and Dockweiler Drive are considered north-south roadways and 12th Street and 13th Street are considered east-west roadways.

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This evacuation analysis is based on a similar evacuation analysis prepared for a residential project on the same site as the proposed Shadowbox Studios. The previous evacuation analysis (the 2020 Evacuation Analysis) was approved by the City and included in the Placerita Meadows DEIR.[2]

EVACUATION SHED

The 2020 Evacuation Analysis assumed that the area to be evacuated was the Placerita Canyon Area, defined as the existing developments to the east of Railroad Avenue. This includes the single-family residential neighborhoods and industrial and commercial areas, as well as The Master's University. Currently, the primary access point to the Placerita Canyon Area is at Railroad Avenue & 13th Street.

In general, the Evacuation Shed is bounded by the area south of Parvin Drive on the north, Quigley Canyon Road and Melody Movie Ranch on the east, The Master's University campus and Placerita Canyon Road on the south, and Railroad Avenue on the west.

The 2020 Evacuation Analysis assumed that this evacuation shed would require a total of 1,340 cars to evacuate the area based on one vehicle per dwelling unit plus vehicles associated with students and faculty/staff at The Master's University. This assumption was utilized for this analysis.

METHODOLOGY

The evacuation analysis is based on a worst-case assumption that the emergency (fire, earthquake, etc.) occurs to the east and south of the Evacuation Shed and that all evacuations must exit the area through the intersection of Railroad Avenue & 13th Street to the west. To the extent that evacuation routes to the east and/or access from 12th Street to southbound Dockweiler Drive were available, the evacuation times in this analysis would be lessened.

Using a similar methodology to that described in the 2020 Evacuation Analysis, the following assumptions were made:

- Baseline traffic volumes were derived from the afternoon peak hour (i.e., the busiest hour of the day). Figures 1, 2, and 3 show the traffic volumes for the Exiting Conditions, Future with Project with Dockweiler (Traffic Signal) Conditions, and Future with Project with Dockweiler (Roundabout) Conditions, respectively.

- A travel demand increase of 1,340 vehicles for the existing residential, commercial, and university uses in the Placerita Canyon Area during an evacuation.

- A travel demand increase of 75 vehicles for the commercial and industrial uses south of 13th Street in the Placerita Canyon Area during an evacuation.

[2] *Placerita Meadows Environmental Impact Report Traffic Evacuation Estimate*, Stantec, July 16, 2020

- A vehicular flow rate of 600 vehicles per lane per hour through an intersection, representing the conditions that could occur if power to the traffic signals was lost during the emergency and all traffic had to treat the traffic control devices effectively as stop signs. It also assumes that emergency personnel were not available to control evacuating traffic and create free-flow situations. If emergency personnel were available to direct traffic, the effective lane capacities would increase and the evacuation times could lessen.

- All vehicular traffic from the Placerita Canyon Area would evacuate via 13th Street at Railroad Avenue, making either left turns onto southbound Railroad Avenue or right turns onto northbound Railroad Avenue.

- The Existing Conditions volumes utilize the existing afternoon peak hour volumes for north-south traffic on Railroad Avenue and assume that, under emergency evacuation conditions, the traffic on Railroad Avenue and Dockweiler Drive would be prohibited from entering the area. The volumes leaving the Evacuation Shed are the evacuation demand volumes described above.

- The Future Conditions volumes include the Evacuation Shed demand volumes described above plus the exiting volumes from Shadowbox Studios and the north-south volumes along Railroad Avenue generated by the Related Projects described in the Transportation Study.

- The roadway lane configurations, shown in Figure 4 for the roundabout alternative and in Figure 5 for the traffic signal alternative, were based on the lane configurations as discussed in the Transportation Study.

The analysis considered both the average vehicle travel time through the Dockweiler Corridor and the total time needed to evacuate the Placerita Canyon Area. Travel time, which combines the movement delay at intersections and street segments along the evacuation route, is calculated using the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016) (HCM) methodology. The total time for evacuation was calculated by dividing the total number of vehicles by the flow rate of 600 vehicles per lane per hour. The critical point of congestion was presumed to be the movement that would take the longest for traffic to clear.

Under true evacuation conditions, there are many variables the City may utilize that would change the assumptions in this assessment. These include, but are not limited to, traffic control officers stationed at intersections, signal timing changes, turning movement restrictions, and strategically rerouting traffic away from the area. The time of day, whether school is in session, and the location of the evacuation areas may also affect this analysis. However, this assessment presumes the worst-case, peak traffic scenario during an evacuation.

The average vehicle travel time results are shown in Table 1. The total evacuation times for vehicles leaving the Placerita Canyon Area under Existing Conditions, Future with Project (Traffic Signal) Conditions, and Future with Project (Roundabout) Conditions are displayed in Tables 2A, 2B, and 2C, respectively.

The HCM worksheet calculations and results for all evacuation conditions is provided in the Attachment.

EXISTING CONDITIONS

Based on the Existing Conditions for the afternoon peak hour, as established in the Transportation Study, travel time through the Dockweiler Corridor would be approximately 27 minutes for vehicles traveling northbound or southbound from the Placerita Canyon Area to Railroad Avenue under the evacuation scenario.

Table 2A shows that the current evacuation conditions are controlled by the signalized intersection of Railroad Avenue & 13th Street. The capacity constraints of the existing intersection configuration would result in severe congestion for traffic exiting the Placerita Canyon Area, with a total duration of 154 minutes (2.6 hours). This congestion is the result of having only one westbound lane serving exiting Placerita Canyon Area traffic at the intersection. The current design of the Arch Street & 12th Street & Placerita Canyon Road intersection is also a chokepoint for exiting traffic, with a severe congestion duration of 134 minutes (2.2 hours).[3]

FUTURE WITH PROJECT (TRAFFIC SIGNAL) CONDITIONS

Based on the Future with Project (Traffic Signal) Conditions for the afternoon peak hour, as established in the Transportation Study, travel time through the Dockweiler Corridor would be approximately seven minutes for vehicles traveling from the Placerita Canyon Area to northbound Railroad Avenue and approximately 16 minutes for vehicles traveling to southbound Railroad Avenue. This is a reduction in travel time of 20 minutes for northbound vehicles and 11 minutes for southbound vehicles compared to Existing Conditions.

Table 2B shows that even with the additional traffic generated by the Project, the widening of 13th Street and the improvement of the Railroad Avenue & 13th Street intersection will reduce that congested condition by more than half, from 154 minutes (2.6 hours) to 67 minutes (1.1 hours). Under Future with Project (Traffic Signal) Conditions, the congestion point for exiting Placerita Canyon Area traffic will be the northbound Arch Street turn onto westbound 13th Street, which will experience 87 minutes (1.5 hours) of congestion. With the intersection of Arch Street & 12th Street & Dockweiler Drive operating under the lane design provided for the traffic signal control, the evacuation could be completed with 67 minutes (1.1 hours) of congestion.

FUTURE WITH PROJECT (ROUNDABOUT) CONDITIONS

Based on Future with Project (Roundabout) Conditions for the afternoon peak hour, as established in the Transportation Study, travel time through the Dockweiler Corridor would be approximately 9.5 minutes for vehicles traveling from the Placerita Canyon Area to northbound Railroad Avenue and approximately 18 minutes for vehicles traveling to southbound Railroad Avenue. This is a reduction in travel time of 17.5 minutes for northbound vehicles and 9.0 minutes

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[3] Tables 2A-2C show both the Approach Delay for each intersection movement through the Dockweiler Corridor and the Minutes of Congestion for each movement. The Approach Delay is calculated using the HCM methodology, assuming that the traffic signals or stop/yield signs in place are operating under normal operations. These are the calculations used to determine the overall level of service for the intersection. The Approach Delays shown in Tables 2A-2C are for comparative informational purposes only. The actual Evacuation Delay is based on the overall Evacuation Demand constrained by a lane capacity of 600 vehicles per hour as described in the Methodology Assumptions.

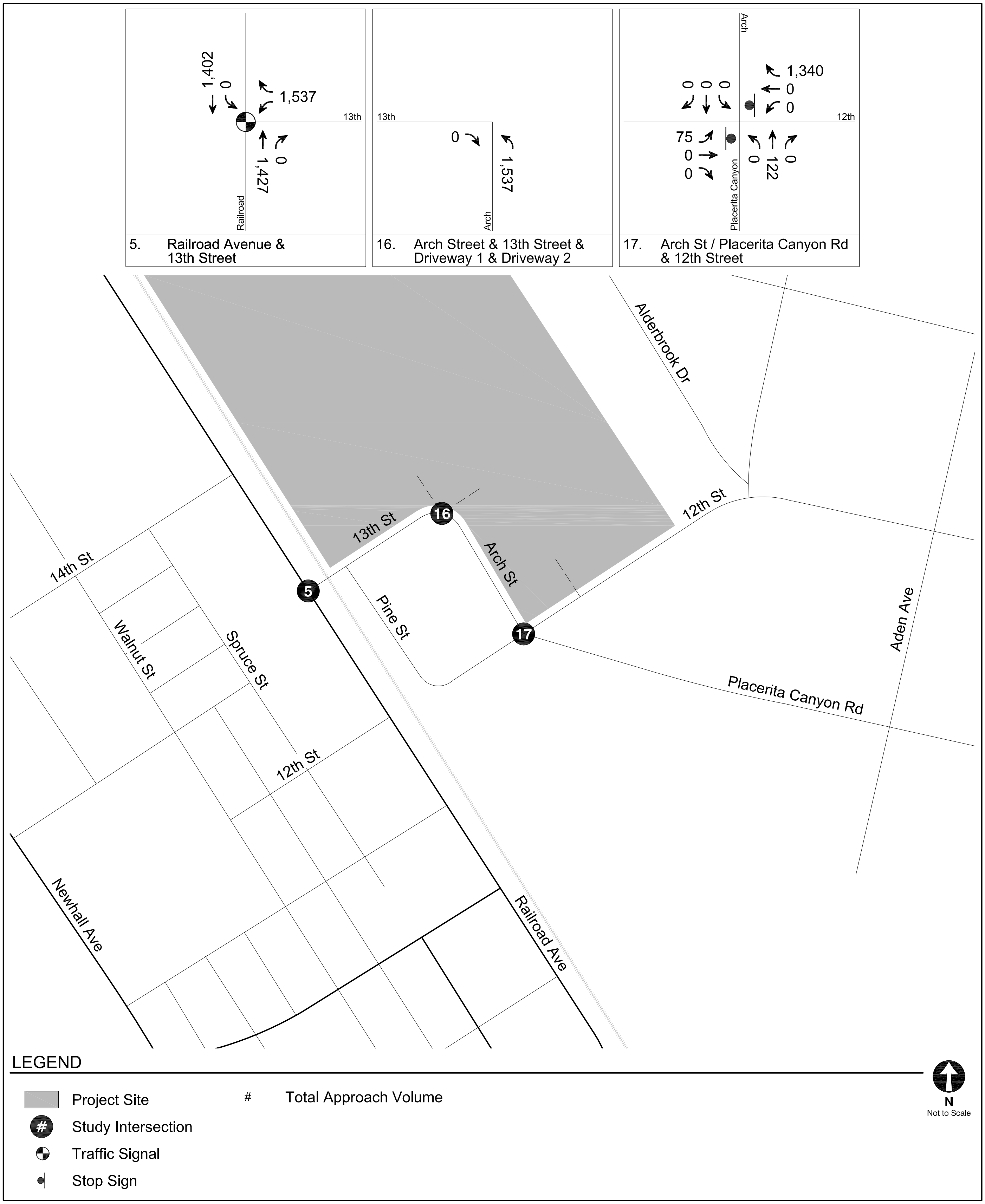
for southbound vehicles compared to Existing Conditions, but an increase in travel time from the Future with Project with Traffic Signal Conditions.

Table 2C shows that if Arch Street & 12th Street & Dockweiler Drive operated as a roundabout, the intersection would still reduce the congestion from Existing Conditions. However, the reduction would not be as great as under the traffic signal intersection design condition. Under Future with Project (Roundabout) Conditions, the congestion point for exiting Placerita Canyon Area traffic will shift from the Arch Street & 13th Street & Project Driveway #1 & Project Driveway #2 intersection to the Arch Street & 12th Street & Dockweiler Drive intersection, due to the lane reduction with the roundabout. Exiting traffic under the roundabout conditions would experience congestion related to evacuation for 134 minutes (2.2 hours).

CONCLUSION

As shown in Figure 6, the improved Dockweiler Corridor would facilitate the evacuation of the Placerita Canyon Area by reducing the evacuation congestion period at Arch Street & 12th Street & Dockweiler Drive from 2.6 hours under Existing Conditions to 2.2 hours under Future with Project (Roundabout) Conditions and 1.5 hours under Future with Project (Traffic Signal) Conditions. Further, average travel times through the Dockweiler Corridor would be greatly reduced for vehicles evacuating the Placerita Canyon Area, from 27 minutes under Existing Conditions to under 18 minutes under Future with Project (Roundabout) Conditions and under 16 minutes in the Future with Project (Traffic Signal) Conditions.

Thus, the traffic signal intersection design would provide for the most efficient traffic operations under an evacuation scenario.



SUMMARY OF EVACUATION DELAY
EXISTING CONDITIONS

FIGURE
1

Gibson transportation consulting, inc.

LEGEND

- Project Site
- Study Intersection
- Traffic Signal
- Stop Sign

\# Total Approach Volume

* With the Dockweiler Dr Extension, Intersection 17A would be controlled by a traffic signal and Intersection 17B would be controlled by a roundabout and all-way stop

N
Not to Scale

PEAK TRAFFIC FLOW DURING EVACUATION
FUTURE WITH PROJECT CONDITIONS - TRAFFIC SIGNAL

FIGURE 2

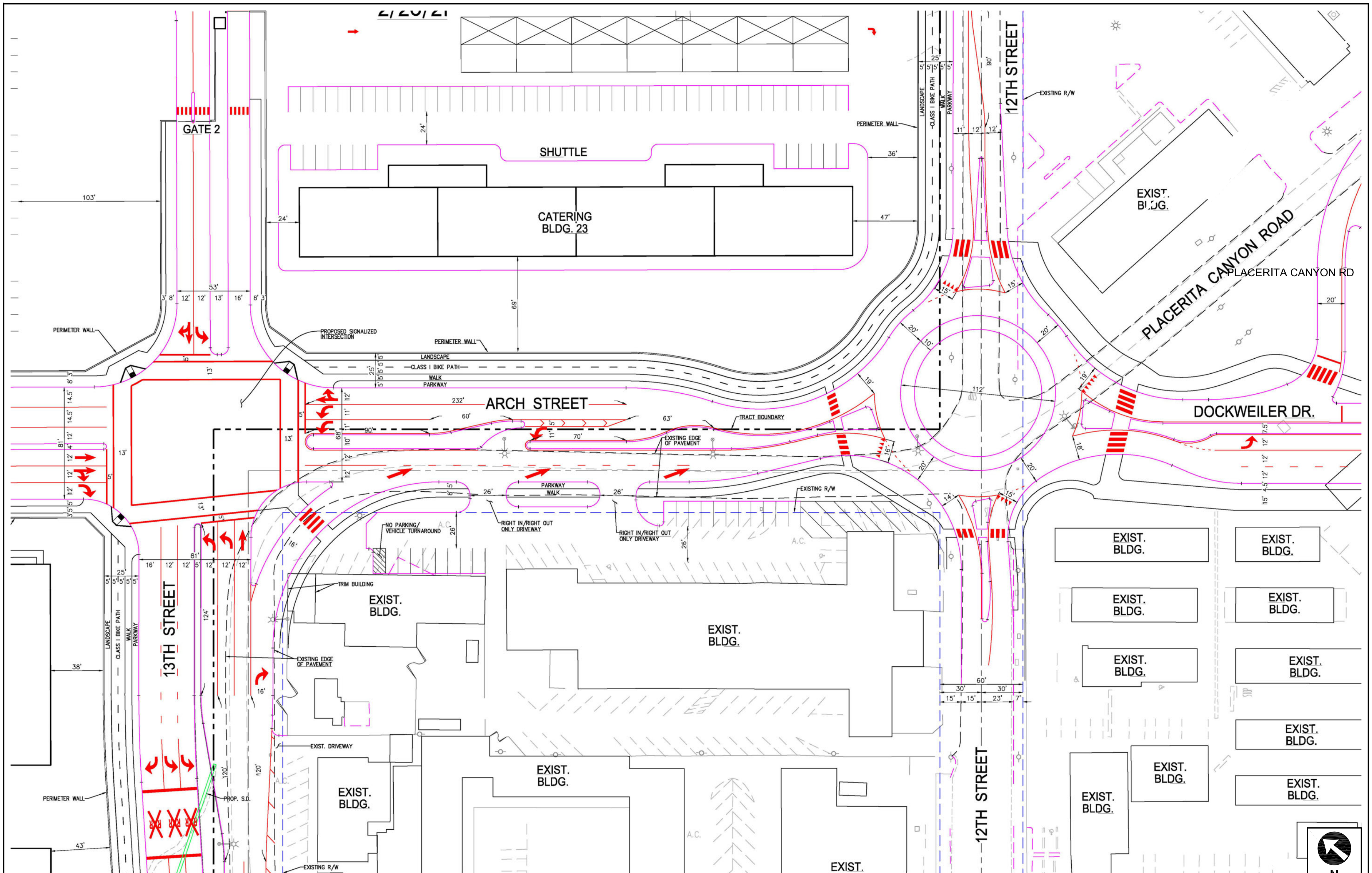
LEGEND

	Project Site	#	Total Approach Volume
#	Study Intersection	*	With the Dockweiler Dr Extension, Intersection 17A would be controlled by a traffic signal and Intersection 17B would be controlled by a roundabout and all-way stop
	Traffic Signal		
	Stop Sign		

N
Not to Scale

PEAK TRAFFIC FLOW DURING EVACUATION
FUTURE WITH PROJECT CONDITIONS - ROUNDABOUT

FIGURE 3

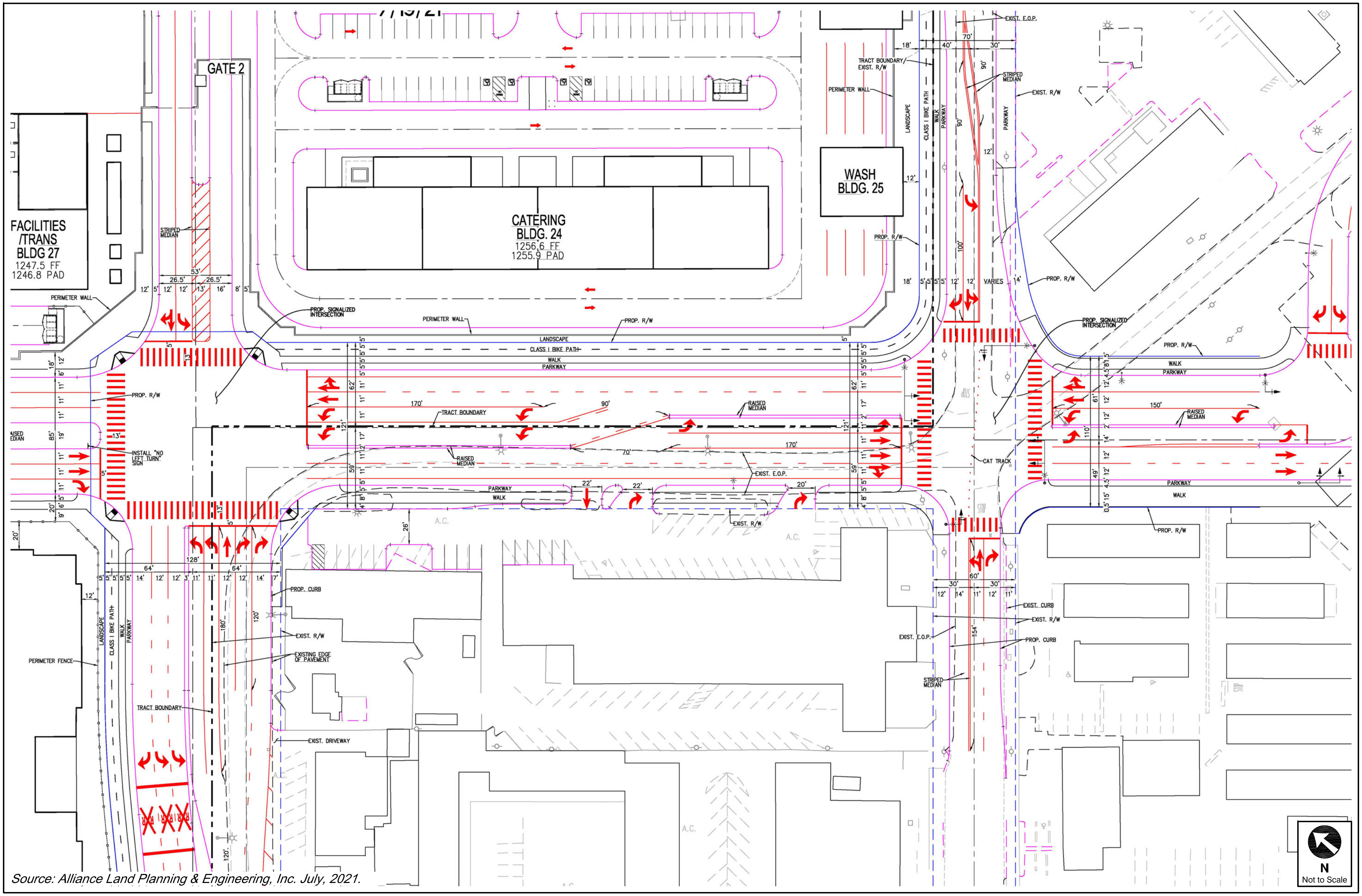


Source: Alliance Land Planning & Engineering, Inc. March, 2021.

ROADWAY CONFIGURATION CONCEPT
ROUNDABOUT ALTERNATIVE

FIGURE 4

transportation consulting, inc.

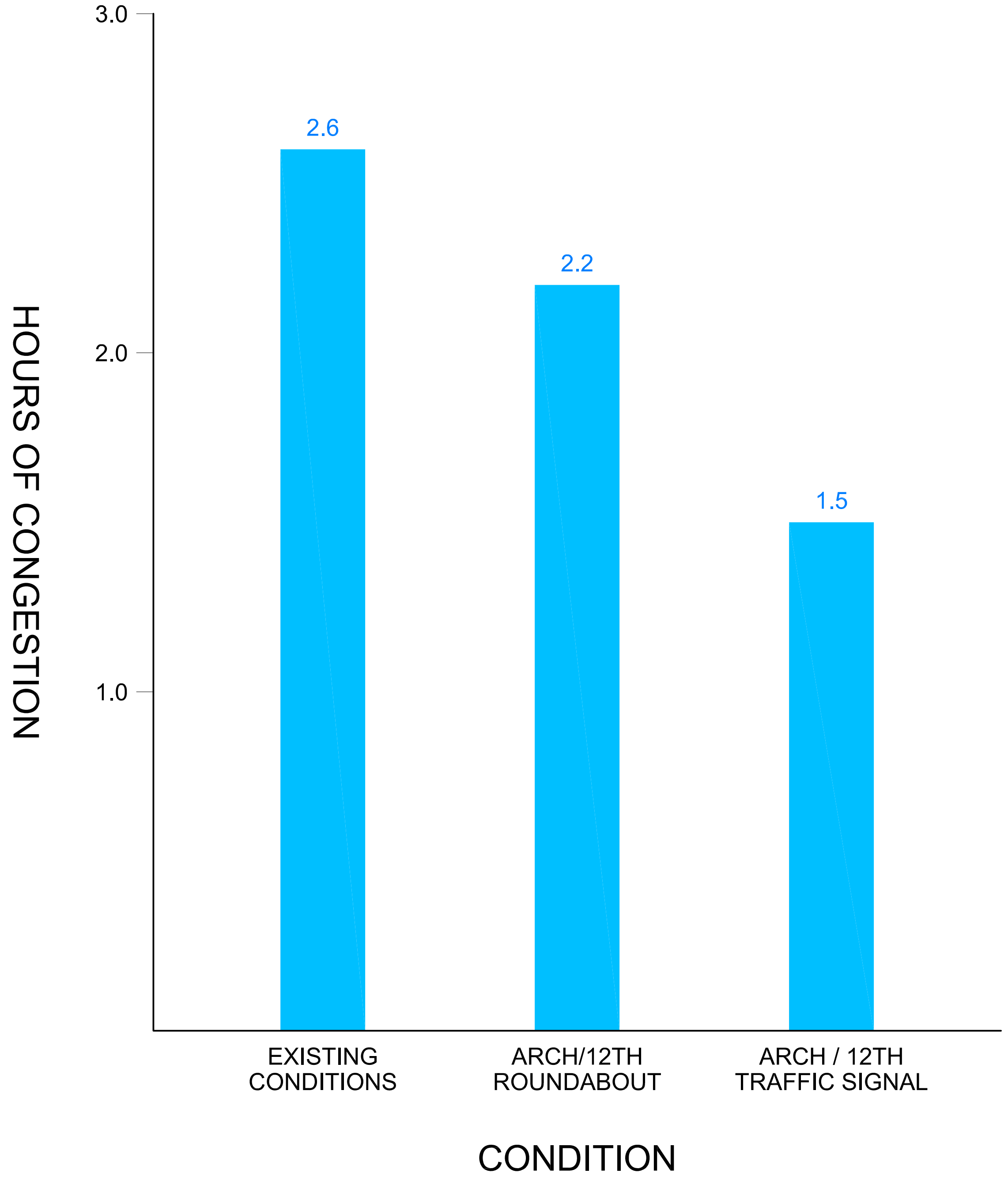


Source: Alliance Land Planning & Engineering, Inc. July, 2021.

ROADWAY CONFIGURATION CONCEPT
TRAFFIC SIGNAL ALTERNATIVE

FIGURE 5

Gibson transportation consulting, inc.



HOURS OF SEVERE CONGESTION
LEAVING THE CANYON DURING EVACUATION

FIGURE 6

TABLE 1
TRAVEL TIMES THROUGH DOCKWEILER CORRIDOR

Trip Type	Evacuation Scenario		
	Existing Conditions	Future with Project Conditions (Traffic Signal)	Future with Project Conditions (Roundabout)
Neighborhood to Northbound Railroad			
Segment: 12th Street (s)	23	23	23
Intersection #17: Arch Street & 12th Street & Dockweiler Drive - WBR (s)	284.7	287	425.2
Segment: Arch Street (s)	11.5	6.4	6.4
Intersection #16: Arch Street & 13th Street & Driveway 1 & Driveway 2 - NBL (s)	0	70.1	70.1
Segment: 13th Street (s)	17.1	17.1	17.1
Intersection #5 Railroad Avenue & 13th Street - WBR (s)	1244.8	4.4	4.4
Segment: Railroad Avenue north of 13th Street (s)	16.3	16.3	16.3
Sum WBR (Minutes)	***26.6***	***7.1***	***9.4***
TOTAL DELAY TO NB RAILROAD (HRS)	***449.7***	***156.8***	***207.6***
Neighborhood to Southbound Railroad			
Segment: 12th Street (s)	23	23	23
Intersection #17: Arch Street & 12th Street & Dockweiler Drive - WBR (s)	284.7	287	425.2
Segment: Arch Street (s)	11.5	6.4	6.4
Intersection #16: Arch Street & 13th Street & Driveway 1 & Driveway 2 - NBL (s)	0	70.1	70.1
Segment: 13th Street (s)	17.1	17.1	17.1
Intersection #5: Railroad Avenue & 13th Street - WBL (s)	1244.8	521	521
Segment: Railroad Avenue south of 13th Street (s)	18.4	18.4	18.4
Sum WBL (Minutes)	***26.7***	***15.7***	***18***
TOTAL DELAY TO SB RAILROAD (HRS)	***232.5***	***178.7***	***204.9***
TOTAL DELAY LEAVING CANYON (HRS)	***682.2***	***335.5***	***412.5***

Notes:
(s): in seconds
NBL: Northbound Left
WBL: Westbound Left
WBR: Westbound Right

TABLE 2A
SUMMARY OF EVACUATION DELAY
AFTERNOON PEAK HOUR (WORST-CASE CONDITIONS)

Existing Conditions						
No.	**Intersection**	**Approach**	**Approach Lanes**	**Evacuation Demand**	**Approach Delay [a]**	**Minutes of Congestion [b]**
5	Railroad Avenue & 13th Street	Northbound	2	1427	9.7	71
		Southbound	2	1402	7.5	70
		Westbound	1	1537	1244.8	154
16	Arch Street & 13th Street & Driveway 1 & Driveway 2	Northbound	1	1537	N/A	
		Southbound	N/A			
		Eastbound	1	0	N/A	
		Westbound	N/A			
17	Arch Street & 12th Street & Placerita Canyon Road	Northbound	1	122	0	12
		Southbound	1	0	N/A	
		Eastbound	1	75	0	8
		Westbound	1	1340	284.7	134
SEVERE CONGESTION = 154 MINUTES (2.6 HOURS)						

Notes:
[a] Approach Delay determined by using HCM 6th Edition methodology
[b] Minutes to Clear determined by using an assumed vehicular flow of 600 vehicles per lane per hour
Indicates highest congestion for exiting Canyon traffic

TABLE 2B
SUMMARY OF EVACUATION DELAY
AFTERNOON PEAK HOUR (WORST-CASE CONDITIONS)

Future with Project Conditions with Traffic Signal [a]						
No.	**Intersection**	**Approach**	**Approach Lanes**	**Evacuation Demand**	**Approach Delay [b]**	**Minutes of Congestion [c]**
5	Railroad Avenue & 13th Street	Northbound	2	1740	13.1	87
		Southbound	2	1940	22.5	97
		Westbound	3	2008	365.9	67
16	Arch Street & 13th Street & Driveway 1 & Driveway 2	Northbound	2	1740	70.1	87
		Southbound	2	169	35.6	8
		Eastbound	1	0	N/A	
		Westbound	1	99	68.3	10
17 [d]	Arch Street & 12th Street & Dockweiler Drive(traffic signal)	Northbound	2	328	53.3	16
		Southbound	2	0	N/A	
		Eastbound	1	75	32.7	8
		Westbound	2	1340	287	67
SEVERE CONGESTION = 87 MINUTES (1.5 HOURS)						

Notes:

[a] Future Conditions represent Year 2028 with full Shadowbox Studio Project in place and Related Projects open and operating

[b] Approach Delay determined by using HCM 6th Edition methodology used in Level of Service calculations

[c] Minutes to Clear determined by using an assumed vehicular flow of 600 vehicles per lane per hour. Intersection control by emergency personnel could increase the capacity of each lane.

[d] With the Dockweiler Dr Extension, Intersection #17 would be controlled by a traffic signal

Indicates highest congestion for exiting Canyon traffic

TABLE 2C
SUMMARY OF EVACUATION DELAY
AFTERNOON PEAK HOUR (WORST-CASE CONDITIONS)

Future with Project Conditions with Roundabout [a]						
No.	**Intersection**	**Approach**	**Approach Lanes**	**Evacuation Demand**	**Approach Delay [b]**	**Minutes of Congestion [c]**
5	Railroad Avenue & 13th Street	Northbound	2	1740	13.1	87
		Southbound	2	1940	22.5	97
		Westbound	3	2008	365.9	67
16	Arch Street & 13th Street & Driveway 2 & Driveway 1	Northbound	2	1740	70.1	87
		Southbound	2	169	35.6	8
		Eastbound	1	0	N/A	
		Westbound	1	99	68.3	10
17B [d]	Arch Street & 12th Street & Dockweiler Drive (roundabout)	Northbound	1	328	21.9	33
		Southbound	1	0	N/A	
		Eastbound	1	75	12.6	8
		Westbound	1	1340	425.2	134
SEVERE CONGESTION = 134 MINUTES (2.2 HOURS)						

Notes:
[a] Future Conditions represent Year 2028 with full Shadowbox Studio Project in place and Related Projects open and operating
[b] Approach Delay determined by using HCM 6th Edition methodology used in Level of Service calculations
[c] Minutes to Clear determined by using an assumed vehicular flow of 600 vehicles per lane per hour. Intersection control by emergency personnel could increase the capacity of each lane.
[d] With the Dockweiler Dr Extension, Intersection #17 would be controlled by a traffic signal
Indicates highest congestion for exiting Canyon traffic

Attachment

HCM Analysis Worksheets Evacuation Scenario

Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1009	0	528	0	1427	0	0	1402	0
Future Volume (vph)	0	0	0	1009	0	528	0	1427	0	0	1402	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		570	140		0
Storage Lanes	0		0	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt					0.954							
Flt Protected					0.968							
Satd. Flow (prot)	0	0	0	0	1720	0	1863	3539	1863	1863	3539	0
Flt Permitted					0.968							
Satd. Flow (perm)	0	0	0	0	1720	0	1863	3539	1863	1863	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					107							
Link Speed (mph)		30			25			45			45	
Link Distance (ft)		273			628			1217			3340	
Travel Time (s)		6.2			17.1			18.4			50.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1097	0	574	0	1551	0	0	1524	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1671	0	0	1551	0	0	1524	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1	2	1	1	2	
Detector Template				Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)				20	100		20	100	20	20	100	
Trailing Detector (ft)				0	0		0	0	0	0	0	
Detector 1 Position(ft)				0	0		0	0	0	0	0	
Detector 1 Size(ft)				20	6		20	6	20	20	6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)				0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)				0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases				7	7		1	6	7	5	2	
Permitted Phases									6			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				7	7		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		9.0	10.0	10.0	9.0	10.0	
Minimum Split (s)				33.0	33.0		14.0	23.5	33.0	14.0	23.5	
Total Split (s)				33.0	33.0		14.0	67.0	33.0	32.0	85.0	
Total Split (%)				25.0%	25.0%		10.6%	50.8%	25.0%	24.2%	64.4%	
Maximum Green (s)				28.0	28.0		9.0	61.5	28.0	27.0	79.5	
Yellow Time (s)				4.0	4.0		4.0	4.5	4.0	4.0	4.5	
All-Red Time (s)				1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)					0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)					5.0		5.0	5.5	5.0	5.0	5.5	
Lead/Lag							Lead	Lead		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode				None	None		None	C-Max	None	None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)					28.0			93.5			93.5	
Actuated g/C Ratio					0.21			0.71			0.71	
v/c Ratio					3.72			0.62			0.61	
Control Delay					1244.8			9.7			7.5	
Queue Delay					0.0			0.0			0.0	
Total Delay					1244.8			9.7			7.5	
LOS					F			A			A	
Approach Delay					1244.8			9.7			7.5	
Approach LOS					F			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 132

Actuated Cycle Length: 132

Offset: 60 (45%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow

Natural Cycle: 150

Control Type: Actuated-Coordinated

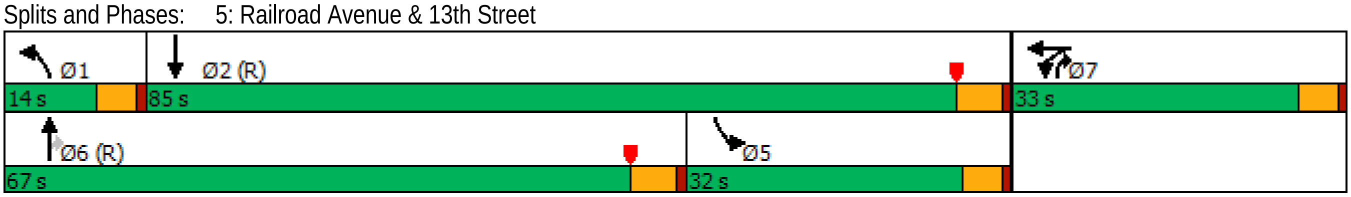
Maximum v/c Ratio: 3.72

Intersection Signal Delay: 443.9 Intersection LOS: F

Intersection Capacity Utilization 136.4% ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 5: Railroad Avenue & 13th Street



Lane Group	WBT	NBT	SBT
Lane Group Flow (vph)	1671	1551	1524
v/c Ratio	3.72	0.62	0.61
Control Delay	1244.8	9.7	7.5
Queue Delay	0.0	0.0	0.0
Total Delay	1244.8	9.7	7.5
Queue Length 50th (ft)	~2529	153	161
Queue Length 95th (ft)	#2798	416	270
Internal Link Dist (ft)	548	1137	3260
Turn Bay Length (ft)			
Base Capacity (vph)	449	2506	2506
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	3.72	0.62	0.61

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	75	0	0	0	0	1340	0	122	0	0	0	0
Future Volume (vph)	75	0	0	0	0	1340	0	122	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865							
Flt Protected		0.950										
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Flt Permitted		0.950										
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		391			842			1231			423	
Travel Time (s)		10.7			23.0			24.0			11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	0	0	0	0	1457	0	133	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	82	0	0	1457	0	0	133	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 96.1%	ICU Level of Service F
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	248

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	0	0	0	0	1340	0	122	0	0	0	0
Future Vol, veh/h	75	0	0	0	0	1340	0	122	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	82	0	0	0	0	1457	0	133	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	863	134	1	134	134	133	1	0	0	133	0	0
Stage 1	1	1	-	133	133	-	-	-	-	-	-	-
Stage 2	862	133	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	275	757	1084	838	757	~ 916	1622	-	-	1452	-	-
Stage 1	1022	895	-	870	786	-	-	-	-	-	-	-
Stage 2	350	786	-	1022	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	757	1084	838	757	~ 916	1622	-	-	1452	-	-
Mov Cap-2 Maneuver	-	757	-	838	757	-	-	-	-	-	-	-
Stage 1	1022	895	-	870	786	-	-	-	-	-	-	-
Stage 2	-	786	-	1022	895	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		284.7	0	0
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	-	916	1452	-	-
HCM Lane V/C Ratio	-	-	-	-	1.59	-	-	-
HCM Control Delay (s)	0	-	-	-	284.7	0	-	-
HCM Lane LOS	A	-	-	-	F	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	74.9	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Future with Project Conditions with Traffic Signal

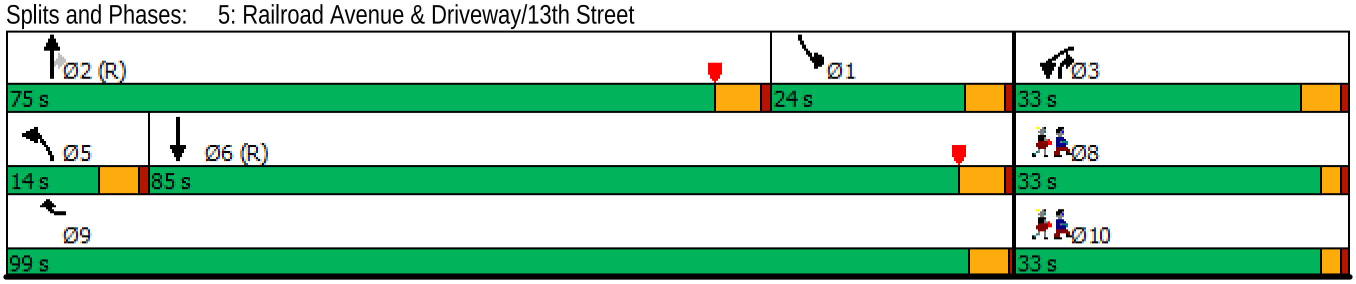
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1405	0	603	0	1740	0	0	1940	0
Future Volume (vph)	0	0	0	1405	0	603	0	1740	0	0	1940	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		0	100		570	140		0
Storage Lanes	0		0	2		1	1		1	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	0.95
Frt						0.850						
Flt Protected				0.950								
Satd. Flow (prot)	0	0	0	3433	0	1583	1863	3539	1863	3614	3539	0
Flt Permitted				0.950								
Satd. Flow (perm)	0	0	0	3433	0	1583	1863	3539	1863	3614	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						655						
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		337			628			1217			3340	
Travel Time (s)		9.2			17.1			18.4			50.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1527	0	655	0	1891	0	0	2109	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	1527	0	655	0	1891	0	0	2109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1		1	1	2	1	1	2	
Detector Template				Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)				20		20	20	100	20	20	100	
Trailing Detector (ft)				0		0	0	0	0	0	0	
Detector 1 Position(ft)				0		0	0	0	0	0	0	
Detector 1 Size(ft)				20		20	20	6	20	20	6	
Detector 1 Type				Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)								94			94	
Detector 2 Size(ft)								6			6	
Detector 2 Type								Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)								0.0			0.0	
Turn Type				Prot		Prot	Prot	NA	pm+ov	Prot	NA	
Protected Phases				3		9!	5	2!	3	1	6	
Permitted Phases									2			

Lane Group	Ø8	Ø10
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	8	10
Permitted Phases		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				3		9	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)				10.0		4.0	9.0	10.0	10.0	9.0	10.0	
Minimum Split (s)				33.0		14.0	14.0	23.5	33.0	14.0	23.5	
Total Split (s)				33.0		99.0	14.0	75.0	33.0	24.0	85.0	
Total Split (%)				25.0%		75.0%	10.6%	56.8%	25.0%	18.2%	64.4%	
Maximum Green (s)				28.0		94.5	9.0	69.5	28.0	19.0	79.5	
Yellow Time (s)				4.0		4.0	4.0	4.5	4.0	4.0	4.5	
All-Red Time (s)				1.0		0.5	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)				5.0		4.5	5.0	5.5	5.0	5.0	5.5	
Lead/Lag							Lead	Lead		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)				3.0		3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode				None		None	None	C-Max	None	None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)				28.0		94.5		93.5			93.5	
Actuated g/C Ratio				0.21		0.72		0.71			0.71	
v/c Ratio				2.10		0.50		0.75			0.84	
Control Delay				521.0		4.0		13.1			22.5	
Queue Delay				0.0		0.4		0.0			0.0	
Total Delay				521.0		4.4		13.1			22.5	
LOS				F		A		B			C	
Approach Delay					365.9			13.1			22.5	
Approach LOS					F			B			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 2.10	
Intersection Signal Delay: 140.8	Intersection LOS: F
Intersection Capacity Utilization 101.6%	ICU Level of Service G
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 5: Railroad Avenue & Driveway/13th Street



Lane Group	Ø8	Ø10
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	31.0	16.0
Total Split (s)	33.0	33.0
Total Split (%)	25%	25%
Maximum Green (s)	30.0	30.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	7.0	7.0
Flash Dont Walk (s)	21.0	6.0
Pedestrian Calls (#/hr)	0	0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	WBL	WBR	NBT	SBT
Lane Group Flow (vph)	1527	655	1891	2109
v/c Ratio	2.10	0.50	0.75	0.84
Control Delay	521.0	4.0	13.1	22.5
Queue Delay	0.0	0.4	0.0	0.0
Total Delay	521.0	4.4	13.1	22.5
Queue Length 50th (ft)	~1080	39	256	979
Queue Length 95th (ft)	#1204	m191	480	1060
Internal Link Dist (ft)			1137	3260
Turn Bay Length (ft)	110			
Base Capacity (vph)	728	1319	2506	2506
Starvation Cap Reductn	0	257	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	2.10	0.62	0.75	0.84

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

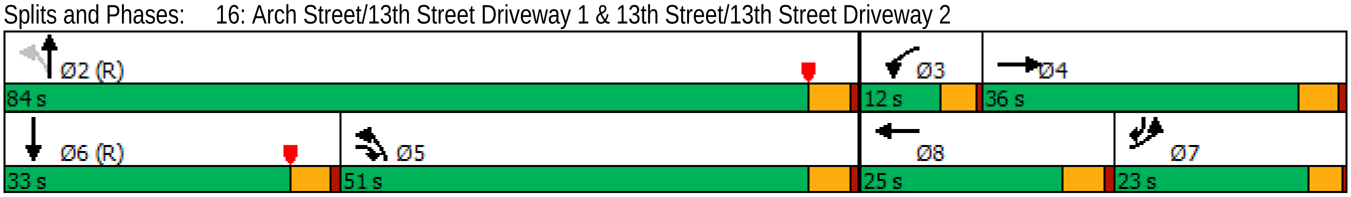
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑	↱↱	↰	↑↱		↰↰	↑↑↱			↑↑	↱
Traffic Volume (vph)	0	0	0	0	99	0	1740	0	0	0	0	169
Future Volume (vph)	0	0	0	0	99	0	1740	0	0	0	0	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		0	100		0	0		0
Storage Lanes	2		2	1		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	0.88	1.00	1.00	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Frt												0.850
Flt Protected							0.950					
Satd. Flow (prot)	3614	1863	3278	1863	1863	0	3433	3539	0	0	3539	1583
Flt Permitted							0.757					
Satd. Flow (perm)	3614	1863	3278	1863	1863	0	2736	3539	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												132
Link Speed (mph)		45			30			45			30	
Link Distance (ft)		628			448			423			442	
Travel Time (s)		9.5			10.2			6.4			10.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	108	0	1891	0	0	0	0	184
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	108	0	1891	0	0	0	0	184
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			36	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2			2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru			Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100			100	20
Trailing Detector (ft)	0	0	0	0	0		0	0			0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0			0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6			6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot		Over	Prot	NA		pm+pt					Over
Protected Phases	7	4	5	3	8		5	2			6	7
Permitted Phases							2					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	5	3	8		5	2			6	7
Switch Phase												
Minimum Initial (s)	4.0	10.0	9.0	4.0	10.0		9.0	10.0			10.0	4.0
Minimum Split (s)	8.0	20.0	14.0	8.0	23.0		14.0	23.0			30.0	8.0
Total Split (s)	23.0	36.0	51.0	12.0	25.0		51.0	84.0			33.0	23.0
Total Split (%)	17.4%	27.3%	38.6%	9.1%	18.9%		38.6%	63.6%			25.0%	17.4%
Maximum Green (s)	19.0	31.0	46.0	8.0	20.0		46.0	79.0			28.0	19.0
Yellow Time (s)	3.5	4.0	4.0	3.5	4.0		4.0	4.0			4.0	3.5
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0		1.0	1.0			1.0	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0			5.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag				Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes				Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max			C-Max	None
Walk Time (s)					7.0			7.0			7.0	
Flash Dont Walk (s)					11.0			11.0			18.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)					13.3		93.9					10.8
Actuated g/C Ratio					0.10		0.71					0.08
v/c Ratio					0.57		0.86					0.74
Control Delay					68.3		23.2					35.6
Queue Delay					0.0		46.9					0.0
Total Delay					68.3		70.1					35.6
LOS					E		E					D
Approach Delay					68.3			70.1			35.6	
Approach LOS					E			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 132
Actuated Cycle Length: 132
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 67.1 Intersection LOS: E
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 16: Arch Street/13th Street Driveway 1 & 13th Street/13th Street Driveway 2



Lane Group	WBT	NBL	SBR
Lane Group Flow (vph)	108	1891	184
v/c Ratio	0.57	0.86	0.74
Control Delay	68.3	23.2	35.6
Queue Delay	0.0	46.9	0.0
Total Delay	68.3	70.1	35.6
Queue Length 50th (ft)	90	468	43
Queue Length 95th (ft)	147	#891	119
Internal Link Dist (ft)	368		
Turn Bay Length (ft)		100	
Base Capacity (vph)	282	2188	340
Starvation Cap Reductn	0	569	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.38	1.17	0.54

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	0	0	0	0	1340	0	328	0	0	0	0
Future Volume (vph)	120	0	0	0	0	1340	0	328	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	180		0
Storage Lanes	0		1	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91
Frt						0.850						
Flt Protected		0.950										
Satd. Flow (prot)	0	1770	1863	0	1863	1583	1863	3539	0	1863	5085	0
Flt Permitted		0.757										
Satd. Flow (perm)	0	1410	1863	0	1863	1583	1863	3539	0	1863	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						558						
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		391			842			206			423	
Travel Time (s)		10.7			23.0			3.1			6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	0	0	0	0	1457	0	357	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	130	0	0	0	1457	0	357	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm			Perm	Prot	NA		Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	8	8	8	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	31.0	31.0	31.0	20.0	20.0	20.0	9.0	23.0		9.0	23.0	
Total Split (s)	51.0	51.0	51.0	51.0	51.0	51.0	13.0	47.0		34.0	68.0	
Total Split (%)	38.6%	38.6%	38.6%	38.6%	38.6%	38.6%	9.8%	35.6%		25.8%	51.5%	
Maximum Green (s)	46.0	46.0	46.0	47.0	47.0	47.0	8.0	42.0		29.0	63.0	
Yellow Time (s)	4.0	4.0	4.0	3.5	3.5	3.5	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	0.5	0.5	0.5	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		4.0	4.0	5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		7.0			7.0	
Flash Dont Walk (s)	21.0	21.0	21.0	11.0	11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0			0	
Act Effct Green (s)		46.0				47.0		42.0				
Actuated g/C Ratio		0.35				0.36		0.32				
v/c Ratio		0.26				1.58		0.32				
Control Delay		32.7				287.0		35.1				
Queue Delay		0.0				0.0		18.3				
Total Delay		32.7				287.0		53.3				
LOS		C				F		D				
Approach Delay		32.7			287.0			53.3				
Approach LOS		C			F			D				

Intersection Summary	
Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.58	
Intersection Signal Delay: 227.1	Intersection LOS: F
Intersection Capacity Utilization 110.4%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 17: Dockweiler Drive/Arch Street & 12th Street

Lane Group	EBT	WBR	NBT
Lane Group Flow (vph)	130	1457	357
v/c Ratio	0.26	1.58	0.32
Control Delay	32.7	287.0	35.1
Queue Delay	0.0	0.0	18.3
Total Delay	32.7	287.0	53.3
Queue Length 50th (ft)	80	~1456	121
Queue Length 95th (ft)	133	#1727	165
Internal Link Dist (ft)	311		126
Turn Bay Length (ft)			
Base Capacity (vph)	491	922	1126
Starvation Cap Reductn	0	0	756
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.26	1.58	0.96

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Future with Project Conditions with Roundabout

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1405	0	603	0	1740	0	0	1940	0
Future Volume (vph)	0	0	0	1405	0	603	0	1740	0	0	1940	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		0	100		570	140		0
Storage Lanes	0		0	2		1	1		1	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	0.95
Frt						0.850						
Flt Protected				0.950								
Satd. Flow (prot)	0	0	0	3433	0	1583	1863	3539	1863	3614	3539	0
Flt Permitted				0.950								
Satd. Flow (perm)	0	0	0	3433	0	1583	1863	3539	1863	3614	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						655						
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		337			628			1217			3340	
Travel Time (s)		9.2			17.1			18.4			50.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1527	0	655	0	1891	0	0	2109	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	1527	0	655	0	1891	0	0	2109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1		1	1	2	1	1	2	
Detector Template				Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)				20		20	20	100	20	20	100	
Trailing Detector (ft)				0		0	0	0	0	0	0	
Detector 1 Position(ft)				0		0	0	0	0	0	0	
Detector 1 Size(ft)				20		20	20	6	20	20	6	
Detector 1 Type				Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)								94			94	
Detector 2 Size(ft)								6			6	
Detector 2 Type								Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)								0.0			0.0	
Turn Type				Prot		Prot	Prot	NA	pm+ov	Prot	NA	
Protected Phases				3		9!	5	2!	3	1	6	
Permitted Phases									2			

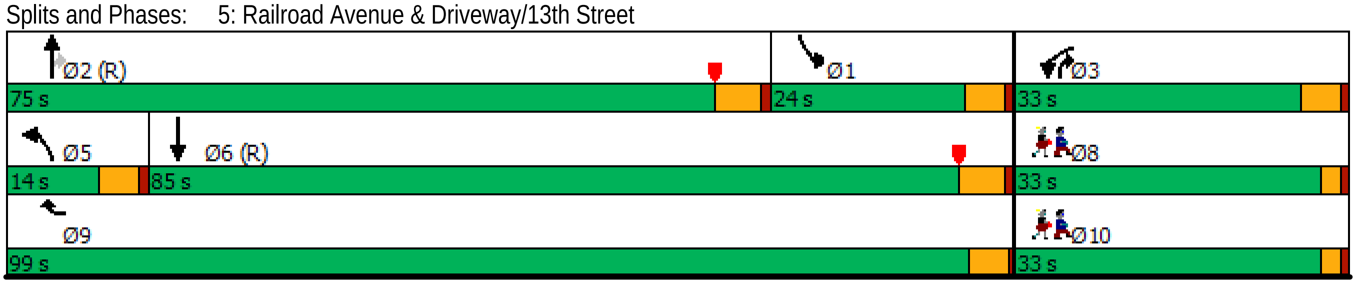
Lane Group	Ø8	Ø10
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	8	10
Permitted Phases		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				3		9	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)				10.0		4.0	9.0	10.0	10.0	9.0	10.0	
Minimum Split (s)				33.0		14.0	14.0	23.5	33.0	14.0	23.5	
Total Split (s)				33.0		99.0	14.0	75.0	33.0	24.0	85.0	
Total Split (%)				25.0%		75.0%	10.6%	56.8%	25.0%	18.2%	64.4%	
Maximum Green (s)				28.0		94.5	9.0	69.5	28.0	19.0	79.5	
Yellow Time (s)				4.0		4.0	4.0	4.5	4.0	4.0	4.5	
All-Red Time (s)				1.0		0.5	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)				5.0		4.5	5.0	5.5	5.0	5.0	5.5	
Lead/Lag							Lead	Lead		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)				3.0		3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode				None		None	None	C-Max	None	None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)				28.0		94.5		93.5			93.5	
Actuated g/C Ratio				0.21		0.72		0.71			0.71	
v/c Ratio				2.10		0.50		0.75			0.84	
Control Delay				521.0		4.0		13.1			22.5	
Queue Delay				0.0		0.4		0.0			0.0	
Total Delay				521.0		4.4		13.1			22.5	
LOS				F		A		B			C	
Approach Delay					365.9			13.1			22.5	
Approach LOS					F			B			C	

Intersection Summary

Area Type: Other
Cycle Length: 132
Actuated Cycle Length: 132
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.10
Intersection Signal Delay: 140.8 Intersection LOS: F
Intersection Capacity Utilization 101.6% ICU Level of Service G
Analysis Period (min) 15
! Phase conflict between lane groups.

Splits and Phases: 5: Railroad Avenue & Driveway/13th Street



Lane Group	Ø8	Ø10
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	31.0	16.0
Total Split (s)	33.0	33.0
Total Split (%)	25%	25%
Maximum Green (s)	30.0	30.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	7.0	7.0
Flash Dont Walk (s)	21.0	6.0
Pedestrian Calls (#/hr)	0	0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	WBL	WBR	NBT	SBT
Lane Group Flow (vph)	1527	655	1891	2109
v/c Ratio	2.10	0.50	0.75	0.84
Control Delay	521.0	4.0	13.1	22.5
Queue Delay	0.0	0.4	0.0	0.0
Total Delay	521.0	4.4	13.1	22.5
Queue Length 50th (ft)	~1080	39	256	979
Queue Length 95th (ft)	#1204	m191	480	1060
Internal Link Dist (ft)			1137	3260
Turn Bay Length (ft)	110			
Base Capacity (vph)	728	1319	2506	2506
Starvation Cap Reductn	0	257	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	2.10	0.62	0.75	0.84

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

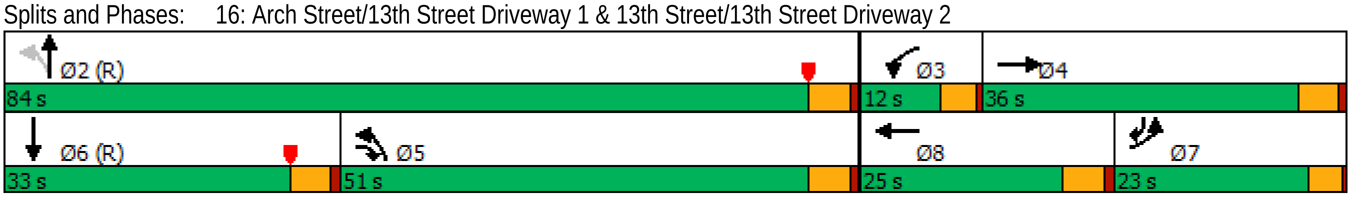
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	99	0	1740	0	0	0	0	169
Future Volume (vph)	0	0	0	0	99	0	1740	0	0	0	0	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		0	100		0	0		0
Storage Lanes	2		2	1		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	0.88	1.00	1.00	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Frt												0.850
Flt Protected							0.950					
Satd. Flow (prot)	3614	1863	3278	1863	1863	0	3433	3539	0	0	3539	1583
Flt Permitted							0.757					
Satd. Flow (perm)	3614	1863	3278	1863	1863	0	2736	3539	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												132
Link Speed (mph)		45			30			45			30	
Link Distance (ft)		628			448			423			442	
Travel Time (s)		9.5			10.2			6.4			10.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	108	0	1891	0	0	0	0	184
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	108	0	1891	0	0	0	0	184
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			36	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2			2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru			Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100			100	20
Trailing Detector (ft)	0	0	0	0	0		0	0			0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0			0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6			6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot		Over	Prot	NA		pm+pt					Over
Protected Phases	7	4	5	3	8		5	2			6	7
Permitted Phases							2					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	5	3	8		5	2			6	7
Switch Phase												
Minimum Initial (s)	4.0	10.0	9.0	4.0	10.0		9.0	10.0			10.0	4.0
Minimum Split (s)	8.0	20.0	14.0	8.0	23.0		14.0	23.0			30.0	8.0
Total Split (s)	23.0	36.0	51.0	12.0	25.0		51.0	84.0			33.0	23.0
Total Split (%)	17.4%	27.3%	38.6%	9.1%	18.9%		38.6%	63.6%			25.0%	17.4%
Maximum Green (s)	19.0	31.0	46.0	8.0	20.0		46.0	79.0			28.0	19.0
Yellow Time (s)	3.5	4.0	4.0	3.5	4.0		4.0	4.0			4.0	3.5
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0		1.0	1.0			1.0	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0			5.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag				Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes				Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max			C-Max	None
Walk Time (s)					7.0			7.0			7.0	
Flash Dont Walk (s)					11.0			11.0			18.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)					13.3		93.9					10.8
Actuated g/C Ratio					0.10		0.71					0.08
v/c Ratio					0.57		0.86					0.74
Control Delay					68.3		23.2					35.6
Queue Delay					0.0		0.0					0.0
Total Delay					68.3		23.2					35.6
LOS					E		C					D
Approach Delay					68.3			23.2			35.6	
Approach LOS					E			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 132
Actuated Cycle Length: 132
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 26.5 Intersection LOS: C
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 16: Arch Street/13th Street Driveway 1 & 13th Street/13th Street Driveway 2



Lane Group	WBT	NBL	SBR
Lane Group Flow (vph)	108	1891	184
v/c Ratio	0.57	0.86	0.74
Control Delay	68.3	23.2	35.6
Queue Delay	0.0	0.0	0.0
Total Delay	68.3	23.2	35.6
Queue Length 50th (ft)	90	468	43
Queue Length 95th (ft)	147	#891	119
Internal Link Dist (ft)	368		
Turn Bay Length (ft)		100	
Base Capacity (vph)	282	2188	340
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.38	0.86	0.54

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	0	0	0	0	1340	0	328	0	0	0	0
Future Volume (vph)	120	0	0	0	0	1340	0	328	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	180		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865							
Flt Protected		0.950										
Satd. Flow (prot)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Flt Permitted		0.950										
Satd. Flow (perm)	0	1770	0	0	1611	0	0	1863	0	0	1863	0
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		391			842			206			423	
Travel Time (s)		10.7			23.0			3.1			6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	0	0	0	0	1457	0	357	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	130	0	0	1457	0	0	357	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary		
Area Type:	Other	
Control Type: Roundabout		
Intersection Capacity Utilization 116.9%		ICU Level of Service H
Analysis Period (min) 15		

Intersection	
Intersection Delay, s/veh	323.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	0	0	0	0	1340	0	328	0	0	0	0
Future Vol, veh/h	120	0	0	0	0	1340	0	328	0	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	130	0	0	0	0	1457	0	357	0	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.6	425.2	21.9	0
HCM LOS	B	F	C	-

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	100%	0%	0%
Vol Thru, %	100%	0%	0%	100%
Vol Right, %	0%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	328	120	1340	0
LT Vol	0	120	0	0
Through Vol	328	0	0	0
RT Vol	0	0	1340	0
Lane Flow Rate	357	130	1457	0
Geometry Grp	1	1	1	1
Degree of Util (X)	0.601	0.228	1.906	0
Departure Headway (Hd)	7.806	7.403	4.712	9.129
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	467	488	772	0
Service Time	5.806	5.403	2.76	7.129
HCM Lane V/C Ratio	0.764	0.266	1.887	0
HCM Control Delay	21.9	12.6	425.2	12.1
HCM Lane LOS	C	B	F	N
HCM 95th-tile Q	3.9	0.9	91.6	0