Appendix K

Fire Safe Plan and Evacuation Analysis

Fire Safe Plan

VERSION (DRAFT)

Fire Safe Plan

COSTCO WHOLESALE PROJECT

SEPTEMBER 2025

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AHJ	Authority Having Jurisdiction
APN	Assessor's Parcel Number
RAWS	Remote Automated Weather Station
Costco	El Dorado Hills Costco Wholesale Project
FSP	Fire Safe Plan
HFHSZ	High Fire Hazard Severity Zone
EDHFD	El Dorado Hills Fire Department
EID	El Dorado Irrigation District
MFHSZ	Moderate Fire Hazard Severity Zone
Project	El Dorado Hills Costco Wholesale Project
VHFHSZ	Very High Fire Hazard Severity Zone
WUI	Wildland Urban Interface
SRA	State Responsibility Area
LRA	Local Response Area

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1 Executive Summary

New developments in moderate, high, and very high fire hazard severity zones (FHSZ) in El Dorado County are required to submit a Wildland Urban Interface Fire Protection Plan, known as a Fire Safe Plan (FSP), to identify the wildfire risks present within the project area and provide recommendations to address these risks. The proposed Costco Wholesale project (project) is located in a moderate fire hazard severity zone (MFHSZ)[1] and is submitting this FSP to the El Dorado Hills Fire Department as part of their building permit application package to the County.

The Costco project is a commercial development located in El Dorado County, California, near the county line between El Dorado and Sacramento counties. The project is located just north of California State Highway 50 and is accessible from the Silva Valley Parkway. The project is located on both the north and south sides of Silva Valley Parkway. The site is currently vacant and covered with California Annual Grasslands with scattered woodland and riparian vegetation along the wet drainages that cross the site. Adjacent properties are a mix of developed and undeveloped areas, with vegetation similar to that of the two project sites. In its current state, the project site and several adjacent properties could sustain the spread of a wildfire due to the continuous fuel bed provided by the annual grasslands.

This Fire Safe plan aims to describe the site conditions that could contribute to the intensity and spread of a wildfire, potentially causing it to transmit to buildings, endanger life, overwhelm fire suppression capabilities, or result in significant property losses. Then, describe the actions the property owner or responsible party is taking to address these conditions, including removing flammable vegetation, using ignition-resistant materials in the project's development, and installing features on the site and in the proposed building that will aid firefighters.

Dudek prepared this Fire Safe Plan by analyzing the following: the physical environmental conditions in the vicinity of the project and the local fire environment, the project's impact on wildfire risk, the project's impact on evacuation and emergency access, and the elements incorporated into the project to mitigate the risk of wildfire.

Dudek concludes that the project, as proposed, will not exacerbate the risk of wildfire in the area.

[1] A discussion of the updates to the FHSZ maps is presented in Section 4.3.4

Plan Signature Page

Preparer:

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Authorized Representative for the AHJ:

2 Introduction

This Fire Safe Plan (FSP) has been prepared for the Costco project, located in El Dorado Hills, California, specifically for the El Dorado Hills Costco warehouse project on the South Site of the property, a proposed commercial development in El Dorado County, California. The project is located in an area designated as a moderate fire hazard severity zone by CAL FIRE, with existing site conditions that can sustain the growth of a wildfire due to the continuous fuel bed provided by the annual grasslands that cover the site.

The El Dorado Hills Fire Department requires that new development in moderate, high, and very high fire hazard severity zones create a Fire Safety Plan (FSP). The specific requirements for the FSP are described in the El Dorado Hills Fire Department (EDHFD) standard #W-002.

The purpose of this FSP is to meet the requirements of the EDHFD standards, to identify the wildfire risks present at the site and the project's impact on those risks, and to provide recommendations to address these risks through vegetation management, ignition-resistant construction, providing adequate water supply, and fire department access. Appendix A contains a list of the EDHFD Fire Safe Plan requirements.

This FSP has assessed the property's location, topography, surrounding combustible vegetation (including fuel types), climatic conditions, and fire history. The plan addresses water supply, access, structural ignitability, and fire-resistant building features, as well as fire protection systems and equipment, impacts on existing emergency services, community evacuation routes, defensible space, and vegetation management. The following tasks were performed toward the completion of this plan:

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

3 Regulatory Setting

The Project site and the surrounding area are within a CAL FIRE-designated Fire Hazard Severity Zone (FHSZ). They are required to meet local and state regulations that provide for a minimum level of wildfire safety and ignition risk reduction. Appendix B contains a detailed list of the applicable fire prevention regulations that apply to new development in the Project area. The requirement to prepare this Fire Safe Plan is authorized by the El Dorado County General Plan Public Health, Safety, and Noise Element, *Policy 6.2.2.2.* El Dorado Hills Fire Department standard #W-002 communicates the minimum fire safe regulations of the State of California, County of El Dorado (EDC), and the local Fire Code Official for the formation, implementation, and ongoing use of a Wildland Urban Interface Fire Protection Plan (Fire Safe Plan) for new developments and special use permits.

According to EDHFD standard #W-002, Fire Safe Plans (FSPs) are required for the following types of development projects:

A. The creation of a Specific Plan or similar large-scale project.

B. The creation of five (5) or more parcels as part of a parcel or subdivision map.

C. A change in zoning or issuance of a discretionary permit that proposes to increase intensity or density.

D. New commercial or industrial uses located in High or Very-High Fire Hazard Severity Zones.

E. Where, in the opinion of either CAL FIRE or the local Fire Code Official, it is deemed necessary due to the fire risk or fire hazard associated with the property.

The preparation of this FSP is required under condition E. This FSP demonstrates compliance with the requirements for an FSP in standard #W-002 shown in Appendix A and with the codes, laws, and regulations listed in Appendix B.

4 Site Description

4.1 Project Location

The Project site is located north of US 50 and Tong Road, east of Clarksville Crossing. It is bisected by the Silva Valley Parkway in El Dorado County, California.

The northern portion of the property (North Site) is approximately 24.83 acres and includes APNs: 122-720-0019, 20, and 21. All the parcels are undeveloped, and 122-720-21 (6.57 of 7.75 acres) is primarily reserved for the future extension of County Club Drive to Silva Valley Parkway, which is not part of the project. The southern portion of the property (South Site) is approximately 18.42 acres and includes APNs: 122- 720- 018, 02, and 03. A portion of 122-720-003 and a portion of the unused former Tong Road right-of-way between Silva Valley Parkway and Clarksville Crossing are proposed for use as site access. The 1.38-acre portion of 122-720-018, located west of Clarksville Crossing on the South Site, will not be developed as part of the project site, resulting in a net development site of 17.05 acres. Figure 1 shows the Project site and the surrounding area.

4.2 Project Description

The Project includes a new Costco Member Warehouse, Fuel Facility, and associated site improvements. The North Site contains the Fuel Facility and Costco employee parking lot, while the South Site contains the Costco Member Warehouse. The remainder of the North Site would include an out parcel that is not planned for development at this time. The maximum building area for the Member Warehouse on the South Site will be approximately 165,000 square feet and includes, without limitation, a Costco warehouse retail center, tire sales and installation, optical exams and optical sales, hearing aid testing and sales, food service preparation and sales, a pharmacy, meat preparation and sales, bakery and sales of baked goods, and alcohol sales. Temporary outdoor sales may occur within the parking field adjacent to the warehouse for seasonal sales, such as Christmas trees from late November through December. The members-only Fuel Facility on the North Site will include a maximum of 13,000 square feet of open canopy and a 200-square-foot controller enclosure. Figure 2 contains the site layout plans for the Project.

4.3 Site Conditions

The following sections discuss the project site characteristics, including the local climate and fire history within and surrounding the site. Evaluating conditions at the project scale is intended to understand the local fire environment, which is helpful for predicting how a wildfire may spread across the site and for estimating wildfire risk for the project site. Appendix C includes photos of the project site showing the conditions of the local fire environment.

4.3.1 Adjacent Properties

Adjacent to the project site are residential communities on the east and west, composed of single-family dwellings, an elementary school to the north, and the Highway to the south. Between these developed areas and the project site is vacant, undeveloped land.

4.3.2 Fuels (Vegetation)

The Costco South site is predominantly covered with California Annual Grasslands. The grasslands extend continuously across both developments, north and south of Silva Valley Parkway. This fuel continuity continues onto adjacent properties and is only interrupted by the roads that border the project boundaries (e.g., Tong Road, Clarksville Road). Fuel heights in these grasslands are between two and three feet. Vegetation cover transitions to riparian woodlands surrounding the drainage near the intersection of Clarksville Road and Silva Valley Parkway, as well as in the small drainage that runs from Oak Meadow Elementary School to Silva Valley Parkway. Valley Oak woodlands are present in the drainage that crosses the Costco South development from north to south. Annual grass continues to be a significant part of the surface fuels, even in areas where vegetation cover changes. This grass is anticipated to be the primary carrier of any wildfire spreading through the project site. The exception to this is the perennially wet area near the storm drain.

4.3.3 Terrain

The general terrain of the Costco South Site is composed of a southwest-facing slope with an average slope of 6% and slopes that range from 0 to 37 degrees. Elevations range from 693 feet at the southwest corner of the Costco South development near Clarksville Road to 791 feet above mean sea level (AMSL) along the north boundary of the North Site. The general terrain on the site is broken up by a north-to-south-oriented drainage that crosses through the center of the project and a depression for a storm drain at the northern tip of the project site.

In the absence of strong winds, a terrain-driven wildfire is expected to move upslope following the general terrain of the two units. The drainages are not deep enough to create or funnel winds that would be significantly different from the prevailing wind conditions expected across the rest of the project site. There are no terrain features present on either side that would be expected to significantly increase fire intensity or rate of spread.

4.3.4 Weather

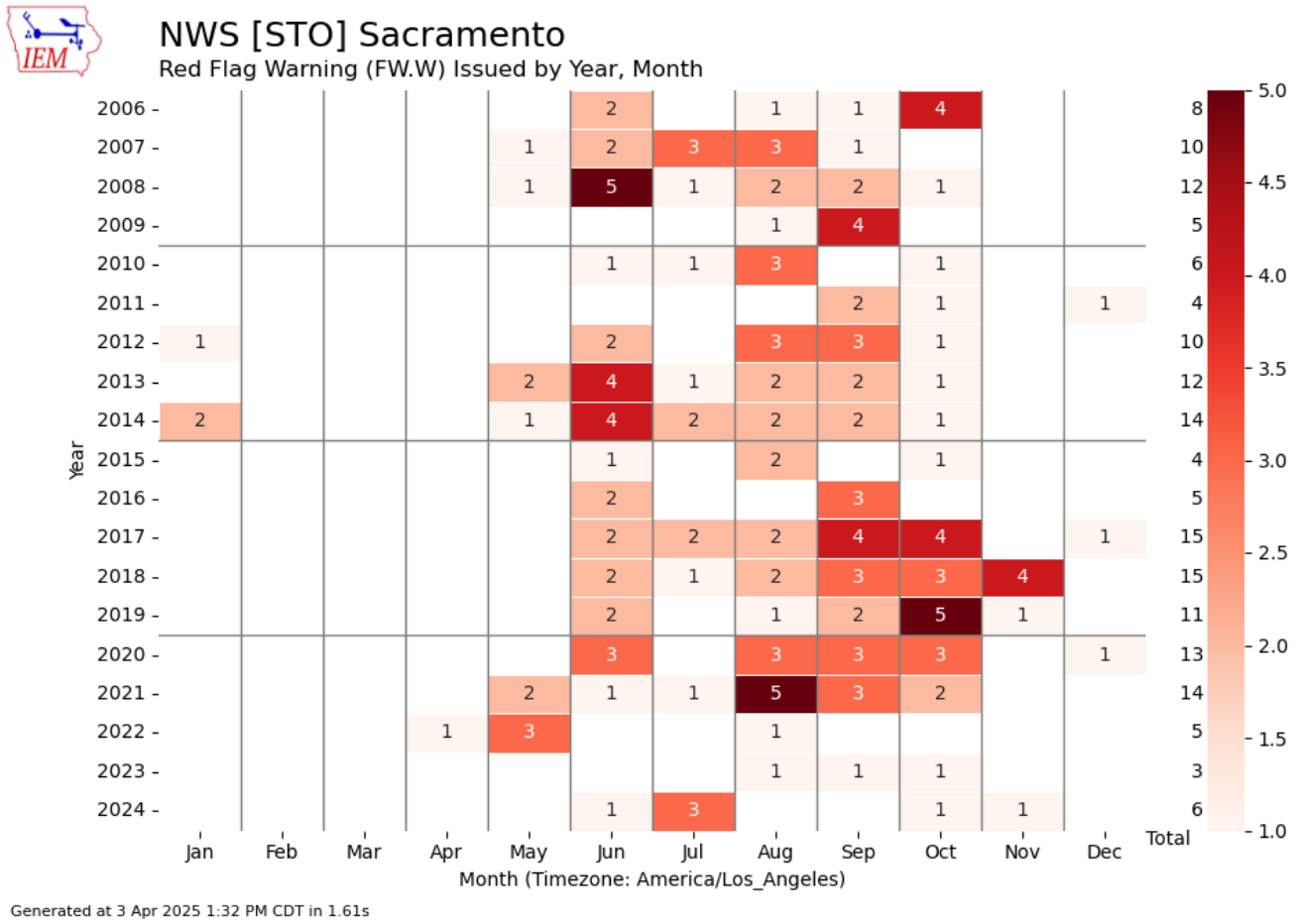
The climate in the El Dorado Hills community is Mediterranean, characterized by wet, cool winters and dry, hot summers. Weather data from the nearest remote automated weather station (RAWS) at Ben Bolt describes the following weather conditions for the area. Average temperatures range from 40°F to 58°F in the winter months and 60°F to 98°F in the summer. The hottest months, May through October, can have maximum daily temperatures over 100 degrees Fahrenheit. The driest months coincide with the hottest months; precipitation during an average year is minimal from May to October, and the average minimum relative humidity from May to October is less than 10%.

Prevailing winds in the community vary based on the time of year; from December to February, prevailing winds are, on average, out of the east-northeast. From March to November, prevailing winds are on average from the west-northwest. Throughout the year, winds averaged 0 to 5 miles per hour (mph), but the maximum wind gusts occurred on average from November to April, with maximum wind speeds of 40 mph and greater. From May to October, average maximum wind gusts range between 20 and 30 mph. It is important to note that the prevailing winds for most of the year and during the hottest and driest time of year are aligned with the general terrain of the two project sites (e.g., prevailing winds would push a fire upslope).

The National Weather Service (NWS) issues wildfire forecast warnings when conditions are ideal for wildfire combustion and high rates of fire spread. The NWS issues two types of these forecasts, Red Flag Warnings (RFW) and Fire Weather Watches. Both indicate that dangerous fire weather conditions will occur in the forecast area.

Based on historical records from the NWS, Red Flag Warnings and Fire Weather Watches can occur from May to November, with these warnings being issued most frequently between August and October (NWS Sacramento 2025). Exhibit 1 shows the historical occurrence of RFWs in the project area (IEMS 2025).

Exhibit 1: Red Flag Warnings Issued by Year, Month



4.3.5 Fire History and Fire Severity Zones

Fire Hazard Severity Zones

The project is located in the CAL FIRE state responsibility area (SRA), which has been designated as a Moderate Fire Hazard Severity zone (MFHSZ). The CAL FIRE adopted updated SRA Fire Hazard Severity Zone maps in April 2024, and the designated fire hazard severity zone for the project site was unchanged. Adjacent lands to the north are within the Local Responsibility Area (LRA) and are designated as a Moderate Fire Hazard Severity Zone. The SRA Moderate Fire Hazard Severity Zone continues to the east. To the south, the SRA transitions to the High Fire Hazard Severity Zone south of Highway 50. To the west is the LRA Moderate Fire Hazard Severity Zone. Figure 3 contains the CAL FIRE Fire Hazard Severity Zone map for the project area.

Fire History

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

Figure 3, Project Fire History Map, presents a graphical view of the project area's recorded fire history. As presented in the exhibit, there have been 28 fires recorded since 1935 by CALFIRE in their FRAP database (FRAP 2024)[2] Within 5 miles of the project site. Three of these fires occurred within 1 mile of the project. Based on the fire perimeters mapped in Figure 4, many of the recorded wildfires in the vicinity of the project were primarily slope-driven (uphill) and wind-driven by the prevailing winds.

Based on an analysis of the CAL FIRE FRAP fire history data set, specifically the years in which the fires burned, the average interval between wildfires in the five-mile radius area was calculated to be 3 years, with intervals ranging between zero and 18 years. Based on this analysis, it is expected that a wildfire that could burn in available unmaintained landscapes may occur, if weather conditions coincide, possibly every two to three years, with the realistic possibility of longer interval occurrences, as observed in the fire history records, and considering the recent past and ongoing development of the region.

2 Based on polygon GIS data from CAL FIRE's FRAP, which includes data from CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies. The data set is a comprehensive fire perimeter GIS layer for public and private lands throughout the state and covers fires 10 acres and greater between 1878–2018.

5 Adjoining Property Conditions

The following sections discuss the site characteristics for the properties adjacent to the project site. The Costco Project is similar in terms of topography, vegetative cover, and access to adjacent residential areas, but it differs in planned use and proximity to buildings. The following sections discuss the characteristics of the project area at the community scale. The intent of evaluating conditions at this macro-scale is to provide a better understanding of the regional fire environment, which is not constrained by property boundary delineations.

5.1 Current Land Uses

North

To the north of the project site is Silva Valley Parkway, a 4-lane divided road. North of the road is a vacant lot that covers the lower portion of the hillside, between Silva Valley Parkway and the residential community, and Oak Meadow Elementary School, further up the slope. The vacant lot is predominantly covered with annual grasslands except for a strip of riparian woodland along the drainage that ends at the intersection of Silva Valley Parkway and Clarksville Road. The residential community to the north consists of single-family homes on approximately 0.25-acre lots, with approximately 20 feet of space between homes. This community is accessed by a circuit of residential streets connected to Silva Valley Parkway. Oak Meadow Elementary School is located to the north of the project site on the uphill side of the vacant lot. The school consists of a cluster of nine buildings in the center of the property and two separate buildings along the east border of the school property. The north, south, and west sides of the school property contain a large, paved driveway and parking lot. The school is accessed from Silva Valley Parkway.

East

The Silva Valley Parkway continues along the east side of the project, and on the other side of the road, vacant land on the hillside north of the project site continues to the east of the project site. Annual grassland remains the dominant vegetation cover type, transitioning to woodlands only in the wetter drainages. There is little development east of the project site. Tong Road connects to Silva Valley Parkway near the westbound Highway 50 off-ramp and runs east. Along Tong Road is a church and several widely spaced home sites (>400 feet). The church and home sites are accessible from Tong Road/Old Bass Road. Approximately 600 feet east of the Capital Korean Presbyterian Church on Tong Road, the road narrows and is no longer compliant with fire code regulations.

South

Immediately south of the project site is Highway 50, a six-lane divided freeway. The westbound on-ramp and eastbound on and off-ramps are also located south of the project site. Between the freeway and the ramps are areas of maintained grasslands. South of the freeway are several roads: White Rock Road, Clarksville Road, Joerger Cut-off Road, and Old White Rock Road. There is little development south of the project site, with most of the land covered with continuous grasslands on the drier sites or riparian woodlands on the wetter sites. The nearest development to the south is an electrical substation approximately 1300 feet to the southwest, and then another 700 feet beyond the substation until the outskirts of the developed areas off Latrobe Road.

West

Clarksville Road, a 2-lane road, is located immediately west of the project site. Across the road is a vacant, undeveloped creek and hillside. The creek bottom is perennially wet and covered with riparian vegetation. Slopes immediately adjacent to the creek bed are covered with a mix of riparian forest that transitions to oak woodland. Further from the creek, the tree cover thins out and transitions to annual grasslands with scattered trees. The property across Clarksville Road from the project site is not entirely vacant. Near the southwest corner of the project site, there is a single utility building on a concrete pad. West of the undeveloped creek and hillside is a residential community. This community consists of single-family homes on 0.25-acre lots with approximately 20 feet between homes on the same street. Homes situated between streets are separated by more than 100 feet, and a strip of undeveloped hillside that lies between them. This residential community is accessible by a circuit of residential streets connected to Serrano Parkway.

5.2 Planned Construction

There are no projects under review with the El Dorado Hills Area Planning Advisory Committee (EDHAPAC 2025) or the El Dorado County Planning Division (El Dorado County 2025) on the lands immediately adjoining the project site. The nearest projects under review are located 1.1 miles southeast of the project site on Latrobe Road (Montano De El Dorado), 1.34 miles east of the project site on Bass Lake Road (Town and Country Village), 1.7 miles east of the project site, south of Highway 50 (Village of Marble Valley), and 1.7 miles south of the project site on Latrobe Road (Gateway El Dorado). To the north of the Project site is the Serrano Village residential community, an approved project comprising several phases of construction, some of which have been completed. Phase A14 is located south of the intersection between Village Green Drive and Russi Ranch Drive, approximately 1,200 feet east of Silva Valley Parkway, on the hilltop/ridgeline on the adjacent property to the north (El Dorado County 2025). At the time of Dudek's site visit for this FSP, grading work was underway.

At the time of the site visit, a vacant property near the corner of Silva Valley Parkway and Tong Road was being graded. No other planned construction was identified.

5.3 Vegetation (Fuels)

Adjoining properties contain a mix of vegetation covers depending on location and land use.

Developed areas are predominantly covered with maintained landscaping, including ornamental ground covers, shrubs, and shade trees. Within the boundaries of the developed areas, both single-family homes and the elementary school, there is very little natural and unmanaged vegetation. Typical vegetation cover consists of turfgrass and low-growing ornamental plants, with scattered individual or clusters of shade trees. Generally, there is adequate separation between the tree crowns and the surface vegetation.

Undeveloped, vacant properties are covered predominantly with annual grasslands on the drier upland and hillside areas. Annual grasslands are generally continuous with fuel heights of 2 to 3 feet. Wetter areas in drainages and along creeks are covered with oak woodland on the slopes adjacent to the creek or drainage that transitions to riparian woodlands and riparian vegetation at the drainage bottom or creek bed. Vegetation in woodland areas is generally dense, with small trees and shrubs in the understory and no separation between the tree crowns and the

tops of the understory vegetation. In the wettest areas, year-round standing water, tree cover is scattered, and vegetation is limited to riparian vegetation.

5.4 Environmental Restoration Plans

There are no known environmental restoration plans for the properties adjoining the project.

6 Recommendations for Reducing Wildfire Risk

The project will incorporate a series of complementary fire protection features that will reduce the risk of a wildfire igniting on the project site and the risk that a wildfire spreading on the adjacent properties can spread onto the Project site. This section of the FSP summarizes all fire risk reduction recommendations for the Project, including building construction and fire protection features, signage, access, water supply, and vegetation management.

6.1.1 Building Construction

The Project's structures and facilities will be similar in layout, building materials, and appearance to those of other nearby Costco facilities in Elk Grove and Folsom, California. The Costco Warehouse on the Costco South site will be built to meet Type V B construction. It will incorporate non-combustible materials throughout the structure, including steel for the main building structure, metal panels, concrete and masonry on the building exterior walls, and metal studs and structural steel for interior elements. The roof covering on both the Costco Warehouse and the fuel facility will have flat Class A roof coverings composed of a metal joist system for structure and a standing seam metal roof on vapor barrier/batt insulation for the roof coverings.

These building materials comply with the ignition-resistant building requirements in Chapter 7a of the California Building Code.

No accessory structures are proposed for construction on the Costco South site.

6.1.2 Fire Protection and Life Safety Systems

The Costco Warehouse building and the fueling facility will incorporate CFC-required fire detection, notification, and protection systems. The Costco Warehouse contains a bakery and food preparation area, a tire center, and a floor shopping area. To meet CFC and local fire code requirements and protect occupants, the Costco Warehouse will have the following fire protection systems installed.

- An automatic fire sprinkler system will be installed to provide coverage throughout the occupiable portions of the structure. Pipe layout, size, and composition, as well as the type and number of sprinkler heads, will comply with the requirements of the 2022 El Dorado Hills Fire Code, the 2022 California Fire Code, and NFPA 13. The building's fire flow is 3,000 gallons per minute for a duration of two hours. Sprinkler head K-factor and activation temperatures will be customized to match the use or materials stored throughout the building.

- A Fire Alarm System installed that meets the requirements of the 2022 El Dorado Hills Fire Code and the 2022 California Fire Code, as well as the provisions in the National Fire Protection Association 72 standard. The fire alarm system will be connected directly through and monitored by a UL. approved central station service, which gives audible and visual signals at a constantly attended location.

- A Type 1 Commercial Cooking Exhaust Hood that meets the requirements of the 2022 California Fire Code, California Mechanical Code, and the provisions of Underwriters Laboratories 610 standard. The commercial cooking exhaust hood will contain the required ventilation and fire suppression systems.

- The layout of the Tire Center will meet Fire Protection requirements in CFC Chapter 32, 34, and NFPA 13. Adequate water supply to meet these requirements would be provided by the building's fire sprinkler system and on-site fire hydrants.

The fire sprinkler riser(s) and the Fire Alarm Control Panel (FACP) will be located in a fire control room that is accessible from the exterior of the building and used only for fire protection systems. The room will be clearly labeled on the door “FIRE CONTROL ROOM.”

The Costco fueling facility will install the following fire protection systems to meet CFC Chapter 23 and local fire code requirements and protect occupants.

- Vehicle impact protection for the fuel dispensing devices for each of the four fueling bays.

- An emergency disconnect switch within 20 feet of the fuel pumps.

- Portable fire extinguishers meeting CFC Section 906 requirements and having a minimum rating of 2-A:20-B: C would be provided so that one fire extinguisher is within 75 feet of any pumps, dispensers, or storage tank fill pipe opening.

- The underground fuel storage tank for the fueling facility will comply with CFC Chapter 57.

- Dispenser equipment, including pumps, hoses, and nozzles, will be composed of UL-listed equipment.

Both the Costco warehouse and the fuel facility will incorporate CFC-compliant fire and life safety features that minimize the risk of explosion, fire, and accidental spill of flammable liquids. While these features are intended to protect occupants and minimize the risk of a structure fire, they also address the Project’s wildfire risk by reducing the likelihood of a fire occurring on the property that can spread onto the adjacent wildlands and by reducing the risk that the Project structures will ignite during a wildfire.

6.1.3 Access

The Costco South site is accessible from four driveways; three are connected to Clarksville Road on the west side of the south project site, and one is connected to Silva Valley Parkway on the east side of the south project site. Access to the south side of the building is from the road connecting the southwest corner of the building to Clarksville Road. Access to the north side of the building is from two roads, one connecting to Clarksville Road and the other to Silva Valley Parkway. The exterior of the building is accessible on all sides. The Warehouse is surrounded by a road on three sides of the building and is connected to the driveways that lead to the adjacent public streets. A walkway is located on the east side of the building.

Both the North Site and the South Site will be accessible by two or more connections to the adjacent public streets. The North Site is accessible from two connections to the adjacent public streets. Both are connected to Silva Valley Parkway on the west side of the North Site. The two driveways are located on the northwest and southeast boundaries of the fueling facility.

The internal access system consists of roads and driveways that surround both the fueling facility on the North Site and the Costco Warehouse on the South Site. For the North site, the internal road system consists of a loop that begins at Silva Valley Parkway, wraps around the north side of the fueling facility, and reconnects to Silva Valley Parkway on the other side of the fueling facility. Access to the fueling bays, fueling facility attendant structure, and the Costco employee parking lot is from driveways connected to the internal access loop. Traffic flow for the internal road system for the North Site will be one-way starting at the Silva Valley Parkways connection on the northwest side of the fueling facility. For the South Site, the internal road system consists of one access road that traverses the north half of the site from Silva Valley Parkway to Clarksville Road. This access road is connected to multiple driveways that allow access to the parking lot, the Costco warehouse store front, the parking garage, and the tire center. A more direct access to the parking garage is provided by a short internal road section that connects to Clarksville Road along the west side of the site. At the southwest corner of the Costco South site, an access road provides direct access to the rear of the Costco warehouse building, the tire center, and the south side of the parking garage. The internal access roads for both sites are interconnected; it is possible to drive around both sites using any access point.

For the South Site, the access point and access road at the southwest corner are the designated truck routes for delivery trucks. This access road provides the shortest path to the loading docks at the southwest corner of the Costco warehouse. There is a hammerhead ‘T’ at the rear of the Costco warehouse for fire trucks to turn around.

The access road connections and the internal access roads will meet the fire department access requirements in Chapter 5 of the 2022 CFC and the CCR Title 14 minimum fire-safe regulations. Internal access roads, not including driveways and parking lot alleys, will exceed 20 feet in width (approximately 30 feet in width), with the exception of the access on the east side of the structure, which is reduced to 15’ because of topographical constraints. Driveways and parking lot alleys will be a minimum of 15 feet wide. Internal access roads will be designed and maintained to support the weight of a fully loaded fire apparatus and surfaced to provide all-weather driving conditions. No traffic calming features will be installed on interior access roads that will impact emergency vehicle access. Designated Fire Apparatus Access Roads will be marked appropriately and have signage that contains the words “NO PARKING-FIRE LANE”. Designated Fire Apparatus Access Roads include the main access road loop around the fueling facility on the North Site, the access road that traverses the Costco South Site from Silva Valley Parkway to Clarksville Road, and the truck route at the southwest corner of the South Site.

There are no dead ends or gates at either the North Site or South Site.

6.1.4 Water Supply

The project site is located within the El Dorado Irrigation District (EID) service territory; however, the EID is not currently servicing the property. As part of the Project approval, the Project will apply for annexation into the EID and will connect to the 18-inch water line located along the west side of the project in Clarksville Crossing. The project proposes to install a looped water line extension to the EID water line for water service, including water for firefighting purposes, to both the North Site and the South Site. According to the project's Facility Improvement

Letter, the existing water system can deliver the required 3000 gallons per minute fire flow demand to the project site (El Dorado Irrigation District 2022).

Dry barrel fire hydrants will be installed on the project site to provide water for fire protection. The nearest hydrant, according to EID maps, is located approximately 75 feet from the southwest corner of the project site in front of the utility building on the west side of Clarksville Crossing. The project would install at least five fire hydrants for the Costco South site, with no more than 450 feet on average between fire hydrants. These fire hydrants will be spaced out evenly around the Costco warehouse opposite the structure in parking lot islands on the north and west sides, and in the landscape areas across the access roads around the east and south sides. No new fire hydrants will be installed at the North Site fueling facility.

All fire hydrants will be painted with safety white enamel and marked with a blue reflective marker on the adjacent public street or access road.

6.1.5 Signage

Both the North Site and the South Sites would be appropriately signed to meet address identification requirements in the 2022 CFC, the CCR Title 14 Minimum Fire Safe Standards, and local fire codes. Address identification will be provided either on the structure or on a sign near each structure.

In addition to address signage, fire protection features such as Fire Department Connections, Fire Alarm Control Panels, Fire Sprinkler Rooms, Emergency Disconnects, and Electrical rooms will be signed as required by the 2022 CFC. Fire hydrants would be identified with a reflective blue marker in the middle of the street adjacent to the hydrant.

6.1.6 Housekeeping

The Costco project would, as a part of everyday business, generate and store combustible materials on-site, including cardboard boxes and rubbish containers or dumpsters. Stored outside, these materials can be ignited by an approaching wildfire or embers cast ahead of the main body of the fire. Combustible waste generated during the operations of the Costco Warehouse and the Fueling Facility will be disposed of on a regular basis. Combustible waste materials (such as stacks of cardboard boxes) and rubbish bins will not be stored within five feet of the exterior of the Costco Warehouse, Fueling Facility Attendant Station, or within 30 feet of the fueling bays. Costco utilizes an all-metal trash compactor for handling cardboard and solid, non-hazardous trash generated by the store. Combustible materials and debris will be placed in the compactor, compacted, and then stored until picked up by a trash disposal service. Inside the metal compactor, the combustible material and debris will be protected from direct flame contact and embers from a nearby fire.

6.1.7 Other

Electrical lines and utility connections servicing the project will be installed underground. Above-ground transformers and pull boxes (located on the south side of the Costco Warehouse) will be constructed of non-combustible materials and placed more than 10 feet away from combustible vegetation.

6.2 Vegetation Management

The Fuel Facility on the North Site does not occupy the entire North Site. To the north, east, and south, the North Project Site will be enveloped by a 30-foot-wide non-combustible surface service road. Silva Valley Parkway is a 100-foot-wide non-combustible surface bordering the North Site Project to the west.

The development footprint, including structures, access roads, and other built non-combustible facilities of the Costco project, occupies a portion of both sites. The remainder of both sites will be covered with landscaping or a mix of landscaping and natural vegetation (California Annual Grasslands). The development footprint for the Fuel Facility on the North Site covers less than ½ of the north site parcel. Outside of the development footprint, the site would remain covered in continuous annual grasslands. Within the development footprint and the area immediately around it, vegetation cover will be composed entirely of maintained landscaping. The development footprint for the Costco warehouse on the South site covers the entire parcel, and there will be no areas of natural vegetation.

For both sites, vegetation maintenance and careful landscaping layout and installation are necessary to minimize the risk of wildfire spreading onto the property and extreme fire behavior igniting the structures, thereby placing occupants at risk. Based on the anticipated post-development conditions, vegetation management for the Project to minimize wildfire will be divided into two activities: defensible space and fire-resistant landscaping.

6.2.1 Defensible Space

Defensible space refers to the design and maintenance of natural and/or landscaped areas around structures to mitigate the danger from an approaching wildfire. Defensible space is intended to reduce the threat of wildfire spreading from the wildland to adjacent structures. It is also intended to provide firefighters with access for fire suppression actions and a safe zone for them to work. State and local agencies generally define the defensible space area as a 100-foot-wide area that begins at the structure exterior (including an appendage such as a combustible deck or covering). The 100-foot-wide defensible space area is divided into three zones. EDHFD defines the three zones as:

- Zone 0 – 0 feet to 5 feet; Ember Resistant Zone
- Zone 1 – 5 feet to 30 feet; Lean, Clean and Green Zone
- Zone2 – 30 feet to 100 feet; Reduced Fuel Zone

The defensible space zone for the fueling facility on the North Site encompasses the areas within the development footprint around the fueling bays, the adjacent parking lot to the northwest, the landscaping surrounding the fueling bays, and a portion of the undeveloped hillside to the northeast of the fueling facility. The defensible space zone for the Costco Warehouse on the Costco South site encompasses the parking lots and access roads on the northwest, southwest, and southeast sides of the structure. On the northeast side of the Costco warehouse, the defensible space zone includes the landscaped area on the grounds between the building and Silva Valley Parkway. A portion of the defensible space area for both sites overlaps with Silva Valley Parkways, which is outside of the project boundaries. For both the Fueling Facility and the Costco Warehouse, Zone 0 and Zone 1 of the defensible space area are generally covered with roads, walkways, and other non-combustible surfaces. Vegetation in these two zones for both the Fueling Facility and the Costco Warehouse is limited to irrigated landscaping. A portion of Zone 2 for the Fueling Facility on the northeast side of the fuel bays extends onto the undeveloped hillside. The

remainder of Zone 2 for the Fueling Facility and all of Zone 2 for the Costco Warehouse is covered with either non-combustible surfaces (e.g., roads, walkways, parking lots, etc.) or irrigated landscaping. Figure 5 shows the 100-foot defensible space zone around both sites and includes the boundaries of Zones 0, 1, and 2.

6.2.2 Defensible Space Standards

Zone 0– Immediate Zone (0 to 5 feet from the structure)

Zone 0 reduces the likelihood of structure ignition by reducing the potential for direct ignition of the structure from flame contact, embers that accumulate at the base of a wall, and/or indirect ignitions when embers ignite vegetation, vegetation debris, or other combustible materials located close to the structure, resulting in either radiant heat and/or direct flame contact exposure to the structure.

Zone 0 is the horizontal area within the first five feet around the structure, garage, any outbuildings, attached decks, and stairs. Zone 0 is measured from the edge of a structure, attached decks, patio covers, balconies, and floor projections above grade. The zone also includes the area under attached decks and stair landings.

The Immediate Zone is the most vulnerable and should be the most aggressively maintained for fire resistance through the following practices:

- Clean roofs and gutters of dead leaves, debris, and pine needles that could catch embers.
- Replace or repair any loose or missing shingles or roof tiles to prevent ember penetration.
- Clean debris from exterior attic vents and install 1/8 inch metal mesh screening to block embers.
- Repair or replace damaged or loose window screens and any broken windows.
- Remove combustible materials from beneath decks or porches. Screen or box-in areas below patios and decks with wire mesh to prevent debris and combustible materials from accumulating.
- Move any flammable material away from wall exteriors – lumber, cardboard, and combustible debris.
- Leaf litter should be cleaned up and disposed of regularly. Dead plants should be removed promptly.
- Trim back tree and large shrub branches that grow into the Immediate Zone to a minimum of 5 feet from the structure and 10 feet from a chimney.
- Minimize vegetation in this Zone. Do not plant trees or woody shrubs in this Zone.
- No annual grasses or plants are permitted in this zone.
- Irrigate and maintain the existing landscape so that plants are healthy with minimal dead material.
- Minimize the use of combustible mulches.
- Maintain shrubs to 18 inches in height or less and with 10 feet of horizontal separation between shrubs.

Note: As required by State Law, regulations for the Immediate Zone are under development by the State Board of Forestry and were initially scheduled to take effect January 1, 2023, for all new buildings and January 1, 2024, for all existing buildings; however, as stated, these regulations are still under development with no set date of enforcement. Any State regulation more restrictive than this standard will apply.

Zone 1 - Intermediate Zone (5 to 30 feet from the structure)

Zone 1 reduces the likelihood of fire burning directly to the structure. This is accomplished by modifying fuels and creating a discontinuity between planting groups that limits the pathways for fire to burn to the structure and reduces the potential for near-to-building ember generation and radiant heat exposures. This zone shall consist of planting low-growth, drought-tolerant, and fire-resistant plant species. An additional purpose of this zone is to provide a defendable area for fire personnel to stage and take direct action.

Zone 1 is an area within 5 to 30 feet of structures. The vegetation within the Intermediate Zone will be maintained to break up fuel pathways to structures and to minimize fire behavior through the following practices:

- Remove all dead plants, grass, and weeds (vegetation).
- Remove dead or dry leaves and pine needles from your yard, roof, and rain gutters.
- Trees and shrubs will be maintained to create 10 feet of horizontal space between tree or shrub crowns.
- Lower branches will be removed from trees to create a minimum of 6 feet of clearance between the lowest branches and the surface vegetation (or 1/3 of the tree height for trees less than 10 feet in height).
- Do not install woody shrubs beneath trees. Remove existing shrubs and small trees growing beneath mature trees.
- Remove branches that hang over your roof and keep dead branches 10 feet away from your chimney.
- Irrigate and maintain landscaping in this Zone to keep plants healthy with minimal dead material.

Landscaping installed in this zone will be based on the characteristics of the plants found on the fire-resistant plant species in the Project landscape plans.

Zone 2 – Extended Zone (30 to 100 feet from the structure)

The Extended Zone is designed to interrupt the fire's path to the structures and minimize fire behavior by keeping flame heights low and minimizing the risk of extreme fire behavior. The vegetation within the Extended Zone will be maintained to minimize fire behavior through the following practices:

- Cut or mow annual grass down to a maximum height of 4 inches.
- Remove all dead plants, grass, and weeds.
- Landscaping installed in this zone will be based on the characteristics of the plants found on the fire-resistant plant species in the Project landscape plans.

- Trees and shrubs will be maintained to create 15 feet of horizontal space between tree or shrub crowns.
- Lower branches will be removed from trees to create a minimum of 6 feet of clearance between the lowest branches and the surface vegetation (or 1/3 of the tree height for trees less than 10 feet in height).
- Do not install woody shrubs beneath trees. Remove existing shrubs and small trees growing beneath mature trees.

6.2.3 Fire Resistant Landscaping

The landscaping on the project site will be composed of shade trees with ground cover beneath. No natural areas of unmanaged vegetation will be present. The species composition, planting density, continuity, and plant life form type will be varied across the property and will be dependent on the primary function of the landscaping. Shade trees will be planted individually or in open clusters throughout the project site, with the exception of the very steep slopes between the Costco and the Silva Valley Parkway. For the ground cover, a mix of shrub and herbaceous plants will be installed throughout the project site. Shrubs will compose a more significant portion of the species installed on the steepest slopes to stabilize the slope and minimize erosion. In the bioretention basins, ground cover will consist of grass and perennial herbaceous plants only.

Landscaping will comply with each standard defensible space zone, based on distance from structures. There will be no dead plants, grass, or weeds within the landscaped area. There will be no flammable material on the wall exteriors. Trees and shrubs will not be planted within 5 feet of structures, and trees and shrubs will be trimmed to have 5 5-foot spacing with structures. Needle and leaf litter will be cleaned up on a regular basis. Tree branches will be removed to create 6 feet of clearance between the tree's lowest branch and ground vegetation or a clearance of 1/3 the height of the tree if the tree is less than 10 feet in height. Woody shrubs and volunteer trees will not occupy the space below a mature tree's crown. Within Zone 1, trees and shrubs will maintain a minimum of 10 feet of horizontal space between their crowns. Landscaped area will be irrigated, and the vegetation within the landscaped areas will maintain a higher level of fuel moisture than the undeveloped areas on the surrounding hillsides, even in dry conditions.

These actions in landscaping surrounding structures will significantly tame fire behavior approaching structures, making structures safer and easier to defend in potential wildfire conditions.

Table 1 below contains a list of the shade trees and ground cover proposed for installation on the project site by the project's conceptual landscape plan.

Table 1 Proposed Plants for Landscape Areas and Defensible Space Zone[3]

Species	Expected Height at Maturity (in feet)	Expected Width at Maturity (in feet)
Trees		
Acer platanoides 'Crimson King' /Crimson King Norway Maple	45	40
Acer rubrum 'Redpointe' / Redpointe Red Maple	45	35
Cedrus deodora / Deodar Cedar	80	40
Lagerstroemia hyb. 'Muskogee'/Muskogee (Lavender) Crape Myrtle	25	15
Lagerstroemia hyb. 'Tuscarora' /Pink/Red Flowering Crape Myrtle	25	15
Zelkova serrata 'Green Vase' /Green Vase Zelkova	65	65
Quercus ilex /Holly Oak	60	60
Quercus lobata /Valley Oak	70	70
Quercus virginiana 'Sky Climber' / Sky Climber Live Oak	80	80
Shrubs/Perennials/Grasses/Ground Covers/Vine		
Arbutus unedo 'Compacta' /Compact Strawberry Tree	8	8
Ceanothus 'Concha' /Concha Ceanothus	8	8

[3] Plant characteristic information obtained from San Marco Growers, Monrovia Nursery Company, Gardenia.net, Urban Forest Ecosystem Institute (UFEI), and USDA PLANTS database

Species	Expected Height at Maturity (in feet)	Expected Width at Maturity (in feet)
Cotoneaster dammeri 'Lowfast' /Lowfast Bearberry Cotoneaster	1	10
Dietes grandiflora 'Variegata' /Striped Fortnight Lily	4	3
Dianella revolute 'Little Rev' /Little Rev Dianella	4	2
Eleagnus x ebbingei 'Gilt Edge' /Gilt Edge Silver Berry	5	5
Juniperus chinensis 'Mint Julep' /Mint Julep Juniper	6	8
Juniperus horizontalis 'Blue Chip' /Blue Chip Juniper	1	8
Phlomis fruticosa /Jerusalem Sage	4	4
Rosa 'Meidrifora' /Coral Drift Rose	2	2
Rosa banksiae 'Lutea' /Yellow Lady Banks Climbing Rose	Climbing Vine	Climbing Vine
Salvia leucantha 'Santa Barbara' /Santa Barbara Sage	4	6
Rosmarinus o. 'Huntington Blue' /Huntington Blue Rosemary	2	8
Juncus patens 'Elk Blue' /Elk Blue Gray Rush	2	2
Muhlenbergia rigens /Deer Grass	5	4
Nepeta racemosa 'Walker's Low' /Walker's Low Catmint	2	3

Species	Expected Height at Maturity (in feet)	Expected Width at Maturity (in feet)
Chondropetalum tectorum /Cape Rush	3	4
Festuca mairei /Atlas Fescue	3	3
Muhlenbergia capillaris 'Regal Mist' /Regal Mist Muhly Grass	3	3
Pennisetum orientale /Oriental Fountain Grass	2	3
Verbena lilacina 'De la Mina' / Purple Cedros Island Verbena	3	3

Figure 6 contains the Project landscape plans with an overlay of the defensible space zones.

6.3 Fire Prevention During Construction

During the development of the Project, the site will transition from an open grassland to a developed commercial property on a portion of the North Site and all of the South Site. During this period, the wildfire risk will vary. Dropping as the existing land is cleared, including the removal of natural vegetation, is completed. Then, when combustible building materials are transported to the site and activities with ignition potential, such as hot work, are performed, the risk of fire increases. Fire risk, including the risk that construction activities ignite a wildfire, can be mitigated by adhering to CFC and local fire prevention requirements during construction and by modifying construction activities when there is a high risk of wildfire occurrence. This section describes the 2022 CFC Chapter 33 and the El Dorado Hills Fire Department's requirements for fire safety during construction. Adhering to the CFC and the El Dorado Hills Fire Department's requirements reduces the risk that construction activities will result in a new wildfire. It minimizes the risk that a fire spreading onto the Project site from an adjacent property will ignite the structures or building materials.

6.3.1 Precautions Against Fire

Smoking

- Smoking will be prohibited except in approved areas. A designated smoking area where smoking is permitted will be signed.

Combustible Debris, Rubbish, and Waste

- Combustible debris will not be left in structures.
- Combustible Debris, Rubbish, and Waste will be removed from buildings at the end of each work shift.

- Rubbish containers will be constructed of noncombustible materials or materials that meet a peak rate of heat release not exceeding 300 kW/m^2 when tested in accordance with ASTM E1354.
- Combustible Debris, Rubbish, and Waste will not be disposed of by burning on the site.

Electrical

- Temporary wiring for electrical power and lighting will comply with the California Electrical Code.

Storage of Flammable and Combustible Liquids and Gases

- Storage of flammable and combustible liquids and gases will be in accordance with CFC Section 5704 and Chapter 58.
- Flammable and combustible liquids and materials storage areas will be maintained clear of combustible vegetation and waste materials.
- Sources of ignition and smoking will be prohibited in flammable and combustible liquid and gas storage areas.

Vehicles and Equipment

- When not in use, Project vehicles and equipment will be parked in a designated parking or storage area with at least 30 feet of separation between the parking area and any unmanaged flammable vegetation.
- Vehicle and equipment fueling will be conducted in designated locations and at least 10 feet from combustible debris or building material storage areas.
- Vehicle and equipment fueling and servicing areas will be located at least 30 feet from any hot work areas.

6.3.2 Access For Firefighting

- Fire Apparatus access for firefighting will be provided to all construction and demolition sites.
- Fire Apparatus access for firefighting will be provided within 100 feet of temporary or permanent fire department connections, including fire hydrants.
- Fire Apparatus access must be maintained until fire apparatus access roads are available.
- Fire Apparatus access roads will be a minimum of 20 feet wide and have a vertical clearance of 13 feet 6 inches.
- Fire Apparatus access roads will be of an all-weather surface capable of supporting a minimum of 75,000 lbs. gross vehicle weight (minimum of 3 inches of AC over 8 inches of Compacted AB rock).
- Fire Apparatus access roads will be designed to meet the turning radius requirements of forty (40) feet inside and fifty-six (56) feet outside.

- Any dead-end roadway in excess of 150 feet in length will be provided with not less than a fifty-six (56) foot outside turning radius.
- Key boxes will be provided as required by CFC Chapter 5.

As soon as construction begins, Fire Department access roads will be provided for both the North Site and the South Site.

6.3.3 Water Supply

An approved water supply, either temporary or permanent, will be available for firefighting as soon as combustible building materials arrive on-site. The water supply during the Project construction will provide a minimum flow rate of 500 gallons per minute. The fire hydrant that provides this fire flow will be within 500 feet of the combustible materials and adjacent to a fire apparatus access road.

6.3.4 Fire Protection Features

- Automatic fire sprinkler systems will be tested and approved prior to occupancy of the Costco Warehouse.
- Fire extinguishers will be installed and ready for use at both the North Site and South Site near combustible material storage, flammable liquids and gases, and areas where hot work is occurring.

6.3.5 Hot Work

These requirements are primarily from California Fire Code (CFC) Chapter 35, Welding and other Hot Work, and NFPA 51B, Fire Prevention During Welding, Cutting and other Hot Work. Hot work is defined in the CFC as operations involving cutting, welding, thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, or other similar operations. Hot work areas are defined as the areas exposed to sparks, hot slag, radiant heat, or convective heat because of the hot work.

Hot work will only be done in designated fire-safe areas and will comply with the following:

- All personnel involved in Hot Work shall be trained in the safe operation of the equipment. This will include providing training at "tailgate safety meetings." They shall also be made aware of the risks involved and emergency procedures, such as how to transmit an alarm and who is responsible for calling 9-1-1.
- Signage required in areas where workers may enter, indicating "Caution; Hot Work in progress; Stay Clear" would be posted on site.
- Hot work would not be done on any containers containing or having contained flammable liquids, gases, or solids until they have been thoroughly cleaned, purged, or inerted.
- A dry chemical fire extinguisher with a minimum rating of 4A:80BC, a 5-gallon backpack pump or water fire extinguisher, and a 46-inch round point shovel shall be readily accessible within 25 feet of the hot work area.
- The safety manager shall inspect the hot work area before issuing a permit and shall then make daily inspections.
- Welding and cutting would comply with 2022 CFC Chapter 35- Welding and Hot Work.
- Electric arc hot work would comply with CFC Chapter 35.

- Piping manifolds and Hose Systems for Fuel Gases and Oxygen would comply with CFC Section 3509.
- Cylinder use and storage shall comply with 2022 CFC Chapter 53, "Compressed Gases."
- Personal Protective Clothing would be selected to minimize the potential for ignition, burning, trapping hot sparks, and electric shock.
- A fire watch will be in place for a minimum of 30 minutes, or longer as considered necessary.
- Any ignitions would be immediately extinguished (as much as possible) by site personnel, and the fire department would be notified of the incident.

6.3.6 Fuel Modification

Prior to the start of construction, both the North Site and South Site development footprints would be cleared of all existing vegetation. This will result in the removal of all of the vegetation on the South Ste and the North Site, except for a strip along the northeast side of the development footprint. During construction, the CFC chapter 49 and PRC 4291 required a 100-foot defensible space area to be maintained around each structure. Fuel modification would also be performed within 20 feet of a site access road and along Silva Valley Parkway and Clarksville Crossing.

Within the development footprint for both sites, fuel modification would include removing or mowing to a height of less than four inches any vegetation that grows in the graded areas. For the North site, a 50— to 70-foot-wide strip of the annual grasslands on the hillsides northeast of the development footprint will be mowed to a height of four inches or less prior to May 1st.

Prior to the start of any vegetation management activities, it is recommended that the developer have a certified biologist survey the project site to identify any areas containing protected species or habitats, and have the biologist mark the areas with sensitive species and habitats so vegetation management crews can avoid those areas. If sensitive species or habitats are identified, the California Department of Fish and Wildlife (CDFW) should be contacted at least ten days prior to beginning work.

6.3.7 Red Flag Warning Protocol

The National Weather Service issues Red Flag Warnings, indicating that conditions are such that wildfire ignitions and spread are likely to occur (e.g., low humidity, high winds). The Red Flag Warning protocol is intended to raise on-site construction crews' awareness of the fire danger and limit activities that pose a high risk of igniting a wildfire.

During Red Flag Warning or Watch periods, no hot work or open flames will be performed unless the El Dorado Hills Fire Department has been consulted to discuss the type of hot work activity and the precautions that will be taken. Other construction, operation, maintenance, and decommissioning activities may proceed during these periods under heightened awareness conditions.

To ensure compliance with Red Flag Warning restrictions, the National Weather Service website will be monitored daily during normal conditions or 2 to 3 times a day during Red Flag Warnings at the Project site during construction and decommissioning (National Weather Service 2024).

6.4 Timing and Responsible Parties

Table 2 below summarizes all project recommendations, including the timing for implementation and the responsible party for completion.

Table 2. Summary of Project Fire Risk Mitigation Recommendations

Recommendation	Responsible Party	Timing
Construction Fire Safety		
Fire Apparatus Access	Project Manager	After the Completion of grading and site clearing
Permanent or Temporary Water Supply	Project Manager	Prior to the delivery of combustible materials
Hot Work	Project Manager, Staff performing Hot Work	During hot work operations
Fire Extinguishers	Project Manager	Prior to the delivery of combustible materials
Precautions Against Fire	Project Manager	Set up at the beginning of construction and maintained throughout the entire project.
Fire Protection Features	Project Manager	Prior to occupation
Fuel Modification	Project Manager	Completed prior to May 1st
Red Flag Warning (RFW) Protocol	Project Manager	When NWS issues RFW
Fire and Life Safety Features		
Fire Apparatus Access Roads	On-site Costco Manager	Inspect annually, repair or replace as needed.
Water Supply	On-site Costco Manager	Inspect and certify every 12 months
Fire and Life Safety Systems (Fire Alarm, Fire Sprinklers, etc.)	On-site Costco Manager	Inspect and certify every 12 months
Fire Alarm	On-site Costco Manager	Inspect and certify every 12 months
Fire Extinguishers	On-site Costco Manager	Inspect and certify every 12 months
Housekeeping	On-site Costco Manager, all staff	Daily
Signage	On-site Costco Manager	Inspect annually, repair or replace as needed.
Defensible Space		

Recommendation	Responsible Party	Timing
Landscaping, installation	Project Manager	Inspect and confirm the functioning of the irrigation system and the proper plant layout prior to project completion.
Landscaping, maintenance	On-site Costco Manager	Weekly inspections of the vegetation for maintenance needs should be conducted, and the irrigation system should be inspected annually.
Hillside Vegetation Management	On-site Costco Manager	Completed prior to May 1st

7 Project Impacts to Adopted Emergency Response Plans or Emergency Evacuation Plans

All development proposed for the Project would be designed, constructed, and maintained to comply with applicable local, regional, state, and/or federal requirements related to emergency access, fire protection, and evacuation. The El Dorado Hills Fire Department and CAL FIRE would perform a fire and life safety review, respectively, prior to approval of the Project plans and documents.

An emergency plan describes a comprehensive emergency management system that provides for the planned response to disaster situations associated with natural disasters, technological incidents, terrorism, and nuclear-related incidents. The County of El Dorado and the community of El Dorado Hills utilize the following documents to respond to major emergencies and disasters.

- 2024 El Dorado County Multi-Jurisdictional Hazard Mitigation Plan.
- El Dorado County - Emergency Operations Plan
- El Dorado County - Local Hazard Mitigation Plan

The El Dorado County Emergency Operations Plan identifies a broad range of potential hazards and a general response plan (County of El Dorado 2023). While evacuation routes for the Project area are not identified in the Emergency Operations Plan, typically, evacuation routes consist of the major interstates, highways, and prime arterials. Nearby potential evacuation routes nearest to the Project area include the Silva Valley Parkway, which is immediately adjacent to the Project, and State Highway 50, with the nearest on ramp several hundred feet south of the Project., However, specific evacuation routes would be determined based on the location and extent of the incident.

The El Dorado County Emergency Operations Plan establishes the emergency organization, assigns tasks, specifies policies and general procedures, and provides for the coordination of planning efforts of the various emergency staff and service elements of the county. The El Dorado County Emergency Operations Plan is an all-hazards plan that establishes a comprehensive framework for the management of emergency events that occur in the county or can have a significant impact on the county. The plan is designed to integrate with the plans of El Dorado County's response partners. It is consistent with the mandates of the Federal Emergency Management Agency and the California Office of Emergency Services. While the El Dorado County Emergency Operations Plan and the El Dorado County Multi-Jurisdictional Hazard Mitigation Plan address evacuation, they do not provide specific guidance on establishing evacuation routes, trigger points, or other details that describe how an evacuation would be conducted in the Project area. No officially adopted emergency evacuation plan in El Dorado County applies to the Project area.

Appendix D, El Dorado Hills Costco Warehouse- Evacuation Analysis, May 2025, details the Evacuation Analysis of the project site, which is also discussed thoroughly in Section 12, Project Impact to Community Evacuation Routes.

Overall, the Project would not impair implementation of or physically interfere with the El Dorado County Emergency Operations Plan or the county hazard mitigation plans, as it would not have any effect on the framework or procedural guidance in these plans or otherwise affect plans for wildfire mitigation or preparedness.. Therefore, the Project Plan would not interfere with adopted emergency response plans, and the impact would be **less than significant.**

8 Project Impacts to Wildfire Risk

The Project is located entirely within a CAL FIRE-designated Moderate Fire Hazard Severity Zone. Figure 3 shows the CAL FIRE Fire Hazard Severity Zone map for the Project area. The Project site and surrounding areas contain fuels (annual grasslands and woodlands) and terrain (southwest-facing hillsides) that can sustain the spread of a wildfire when weather conditions permit fire growth (May to October) and a suitable ignition source is present. Wildfires have historically happened in the area due to a variety of ignition sources, including equipment use and electrical equipment.

Construction

As noted, the Project area is partially located within a Moderate Fire Hazard Severity Zone. Heat or sparks from construction equipment or vehicles, as well as the use of flammable materials, have the potential to ignite adjacent vegetation and start a fire, especially during weather events that include low humidity and high wind speeds that are typically experienced in the fall, but can occur from May to October in the region. The following construction-related equipment and practices have the potential to generate heat or sparks that could result in wildfire ignition:

- Earthmoving and excavating equipment, chainsaws, and other small gas-powered equipment and tools can cause sparks that serve as a source of fire ignition.
- Tractors, graders, mowers, bulldozers, backhoes, cranes, excavators, trucks, and vehicles may result in heated exhaust, which, if they come into contact with vegetation, may result in fire ignition.
- Welders consist of an open heat source that may result in metallic sparks, which could ignite vegetation.

The risk of potential ignitions resulting from construction activities is very low for the vast majority of the Project development footprint. Both the North Site and the South Site will be cleared and graded during the first phases of construction. This work would remove combustible vegetation from the area where there is a risk of construction-related ignition. All of the Costco South site will be cleared and graded, so it is anticipated that there will be no combustible vegetation on site to be ignited. The development footprint of the Fuel Facility on the North Site only covers a portion of the site, and during construction, the annual grasslands on the adjacent hillside will remain intact. There is an increased ignition potential resulting from construction equipment and related activities at the North Site due to the proximity of native vegetation communities to construction activities. Therefore, the construction impacts of the proposed Master Plan related to wildfire risks would be **potentially significant.** Implementation of the Construction Fire Prevention measures in Section 6.3 would avoid significant wildfire risks associated with the construction of the project.

Operation

After the completion of the project, the area within the development footprint on both the North Site and South Site would be converted to a mix of non-combustible surfaces, ignition-resistant buildings, and maintained landscaping. Project structures, infrastructure, and landscaping would comply with the requirements in the CBC for ignition-resistant construction, and the CFC and Title 14 Minimum Fire Safe Regulations for access, water supply, and vegetation management. Structural hardening requirements address roofs, eaves, exterior walls, vents, appendages, windows, and doors, and result in hardened structures that have been proven to perform at high levels

(resist ignition) during the typically short duration of exposure to burning vegetation from wildfires. There are two primary concerns for structure ignition: 1) radiant and/or convective heat and 2) burning embers (NFPA 1144, 2008; IBHS, 2008). Burning embers have been a focus of building code updates for at least the last decade, and structures built to these codes have proven to be very ignition-resistant. Likewise, radiant and convective heat impacts on structures have been minimized through the exterior fire ratings for walls, windows, and doors. Additionally, provisions for defensible space (described below) separating wildland fuels from structures and requirements for interior sprinklers have proven to reduce the number of structure losses in WUI areas. Project structures would be required to maintain a defensible area around the entire structure and be consistent with state and local level 100-foot defensible space standards (California Public Resources Code Section 4291, EDH #W-002), As shown on Figure 5, the Project is able to achieve a 100 foot defensible space area around structures at both sites through a combination of non-combustible surfaces, fire smart landscaping, and maintenance of the adjacent annual grasslands. Therefore, with adherence to the CBC and CFC, the impacts of the Project post-development related to wildfire risks would be **less than significant.**

9 Installation or maintenance of associated infrastructure that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.

As described in Section 6.2, it would maintain defensible space around the structures at both the North Site and South Site, consistent with California Public Resources Code 4291 and El Dorado Hills Fire Department standards (#W-001 and # W—002), given its location within the CAL FIRE designated Moderate Fire Hazard Severity Zone. The Project structures and infrastructure would comply with the CBC and CFC requirements for development in an SRA Fire Hazard Severity, including adequate fire department road access and suitable water supply, given the structure's construction and size. Project components, including structures, infrastructure, and vegetation, would also comply with the CCR Title 14 Minimum Fire Safe Standards. The Project improvements, including access road construction and the installation of on-site fire hydrants and automatic fire sprinklers, would facilitate site access for responding fire agency personnel and reduce the risk of structure ignition. None of the Project components, including the Fueling Facility, is expected to exacerbate wildfire risk or result in additional temporary or permanent impacts beyond those identified in this FSP. Finally, the Project proposes to convert all of the South Site and all of the development footprint of the North Site from a hillside covered with combustible vegetation (annual grasslands) to a combination of maintained landscaping, non-combustible surfaces, and ignition-resistant structures. For these reasons, impacts to the environment resulting from the installation and maintenance of infrastructure would be **less than significant.**

Development of the Project and the resulting conversion of the lands within the development footprint from combustible vegetation to maintained vegetation, ignition-resistant construction, and non-combustible surfaces would reduce the overall wildfire risk on the Project site. A portion of both the North Site and South Site is adjacent to Silva Valley Parkway, an important transportation corridor between Highway 50 and the residential areas to the north. The development of the Project site would protect the portions of Silva Valley Parkway within the Project boundaries from being overrun during a wildfire. Fire smart landscaping, annual vegetation management, and regular irrigation as described in Section 6.2 would ensure that the emergency access roads within the Project site, as well as the important adjacent public streets, would remain open during a fire and would not likely be impacted by extreme fire behavior anticipated in unmanaged fuels.

10 Project Influence on the Risk of Post-Fire Downslope or Downstream Flooding as a Result of Run-off, Slope Instability, or Drainage Changes

Slope failures, mudflows, and landslides are common in areas with steep hillsides and embankments, and such conditions would be exacerbated in a post-fire environment where vegetative cover has been removed. The project site is located in a valley bottom at the lower end of a watershed that passes under Highway 50 (Stier PE 2021). There is minimal development downslope to or downstream from the project site. Slopes exceed 20% on the steepest parts of the Project site, but these occur on short sections of the hillside. The average slope across the Project site is approximately 4%, and therefore, it is not at a high risk for slope failures, mudflows, or landslides. Further, the entire Costco South site will be developed, and post-development will be unlikely to sustain a wildfire that could remove all of the vegetation on the site and lead to post-fire soil instability.

Increases in surface runoff and erosion are also possible in a post-fire environment where surface vegetation has been removed, and steep slopes can lead to increased runoff flow velocity. As presented in Section 4.10, Hydrology and Water Quality, all near-term project development and redevelopment that introduces new impervious surfaces or replaces existing impervious surfaces would be required to include stormwater control features to reduce the potential for increased runoff and associated erosion. Finally, the irrigated and maintained landscaping in Voorhis Ecological Reserve and the Agricultural Field Laboratories are not expected to be burned (removed) entirely should a fire occur on the near-term project sites, unlike post-fire conditions in native vegetation, where complete removal is common. Considering these near-term project site features and characteristics, post-fire conditions are not expected to increase risks associated with runoff and erosion. Therefore, potential impacts associated with runoff, post-fire slope instability, or drainage changes due to the near-term projects would be **less than significant**.

11 Local Fire Protection Capability and Water Supply for Fire Suppression

The El Dorado Hills Costco project is located within the jurisdiction of the El Dorado Hills Fire Department (EDHFD); however, the project does not have agreement with the EDHFD yet to provide emergency services to site and the property is still described on CAL FIRE Fire Hazard Severity Maps as being located in the State Responsibility Area (SRA) with CAL FIRE having the responsibility to provide emergency services to the project site (CAL FIRE 2024). Water service in the area of the project site is provided by the El Dorado Irrigation District (EID), but the site is not currently in EID's service area.

At this time, the project does not have 'Will-Serve' agreements with either agency; however, will serve agreements are a condition of project approval, and for this report, it is assumed that both agencies will annex the project into their service territories.

11.1 Fire Protection Capability

The El Dorado Hills Fire Department is an ISO rated Class 3/3x Fire Department with seven fire stations serving the communities of El Dorado Hills, Latrobe, and Rescue. The project site is located at approximately equal distances and travel times to three EDHFD fire stations. Station 86 is located east of the project site on Bass Lake Road, approximately 2.8 road miles from the project site, with a projected travel time of 5 minutes. Station 85 is located west of the project site on El Dorado Hills Boulevard, approximately 2.7 road miles from the project site, with a projected travel time of 6.5 minutes. Station 87 is located south of the project on Golden Foothill Parkway, approximately 2.8 miles from the project site, with a projected travel time of 6.5 minutes.

The EDHFD has sufficient staffing and equipment to provide emergency fire protection services to the project site and meets the requirements for fire protection response and capacity described in Chapters 5 and 6 of the El Dorado County General Plan [Policies 5.7.1.1, 5.7.4.1, 5.7.4.2, and 6.2.3.1].

Table 3 lists the three closest El Dorado Hills Fire stations, along with their respective travel distances and travel times to the Project site.

Table 3 Location and Response Times for the Nearest Fire Stations to the Project

Station Name	Fire Station Address	Maximum Travel Distance[4]	Maximum Travel Time**
El Dorado Hills Fire Station 85	1050 Wilson Blvd, El Dorado Hills, CA 95762	2.7 mi.	6 minutes and 20 seconds
El Dorado Hills Fire Station 86	3670 Bass Lake Rd, El Dorado Hills, CA 95762	2.8 mi.	6 minutes and 35 seconds
El Dorado Hills Fire Station 87	4680 Golden Foothill Pkwy, El Dorado Hills, CA 95762	2.8 mi.	6 minutes and 35 seconds

[4] Maximum Travel Distance from the fire station to the Costco Warehouse entrance on Silva Valley Parkway

Travel distances are derived from Google road data. In contrast, travel times are calculated using response speeds of 35 mph, consistent with the nationally recognized National Fire Protection Association (NFPA) 1710 and Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard formula (Time=0.65 + 1.7(Distance). The ISO response travel time formula discounts speed for intersections, vehicle deceleration, and acceleration, and does not include turnout time.

11.2 Water Supply

The El Dorado Irrigation District (EID) will provide water service to the project. There is an existing EID water main located in Clarksville Crossing that the Project's new water mains would connect to. Based on the requirements in Chapter 5, Appendix B, and Appendix C of the 2022 CFC, it meets the requirements for fire protection response and capacity described in Chapters 5 and 6 of the El Dorado County General Plan [Policies 5.7.1.1 and 6.2.3.1]. The project would be required to meet a minimum fire flow rate of 3000 gallons per minute for a duration of two hours and install a minimum of five fire hydrants around the Costco Warehouse.

12 Project Impact on Community Evacuation Routes

12.1 Background

Appendix D, Evacuation Analysis, a technical memorandum prepared by Kittelson and Associates, created in May 2025, provides an evacuation transport analysis and is summarized in this section. The Evacuation Analysis provides estimates of roadway capacity constraints during wildfire evacuations, potential impacts to the roadway network under wildfire evacuation scenarios, and changes in travel times associated with the proposed Project. The Evacuation Analysis describes two different wildfire event scenarios for both existing and near-term (2034) conditions at the Project site and the surrounding residential communities. The two different wildfire event scenarios include one fire igniting in the northeast of the Project site and one fire igniting southwest of the Project site.

12.2 Analysis

12.2.1 Scenarios

The Evacuation Analysis evaluates the transportation-related impacts of the Project during the two wildfire evacuation scenarios, which are summarized in Table 4. To maintain consistency with the Traffic Impact Analysis (TIA), the Evacuation Analysis examines potential evacuation effects under the Existing and Near-Term (2034) conditions. To account for the worst-case scenario, all the scenarios are analyzed during the afternoon peak hour, which represents the peak traffic volume during a typical week: the sum of background traffic in the area plus traffic from the Project development, assuming Costco members and employees are in the warehouse and residents in the evacuation area are at home. Accordingly, this study evaluates transportation-related impacts during the afternoon peak hour for the two wildfire scenarios under the following conditions: existing no project, existing plus project, near-term (2034) no project, and near-term (2034) plus project. The near-term (2034) no project and plus project conditions include the projected land use development and trip generation for the remainder area, which is the approximately 13.79-acre portion of the Project site that is not proposed for development. Thus, the remainder area is not considered in the existing plus project conditions.

Table 4. Evacuation Analysis Wildfire Scenarios

	Wildfire Scenario #1	Wildfire Scenario #2
Ignition Location	Northeast of the Project site	Southwest of the Project site
Wind Direction	North-northeast	Southwest
Direction of Fire Spread	Southwest towards the Project site	Northeast towards the Project site
Time to reach the Project site	~143 minutes (2 hours 23 minutes)	Does not reach the Project site due to fire breaks, including riparian vegetation and a paved roadway west of the Project site

12.2.2 Evacuation Assumptions

Transportation activity was modeled for the worst-case scenario under which people in the surrounding areas would evacuate. This period is assumed to be the afternoon peak hour when the sum of background traffic in the area plus traffic from the Project development is greatest during a typical week.

Baseline travel represents normal travel patterns during the afternoon peak hour, as included in the El Dorado County travel demand model. Evacuation travel represents the estimated number of evacuation trips and the travel time from each evacuating Traffic Analysis Zone (TAZ) to an evacuation destination. TAZs are assigned a combination of Baseline travel and Evacuation travel (25% and 75%, respectively), based on their presence in the designated evacuation area.

For each of the two wildfire evacuation scenarios analyzed in this study, the following are the evacuation area boundaries: For wildfire Scenario #1, the evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/Old White Rock Road on the south, Silva Valley Parkway on the west, and Bass Lake Road on the east. For wildfire scenario #2, the evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/White Rock Road on the south, El Dorado Hills Boulevard on the west, and areas surrounding Tong Road between Silva Valley Parkway and Bass Lane Road.

The El Dorado County auto ownership information by Census Tract is obtained from the American Community Survey (ACS) 2023 five-year estimates. Based on this data, there are an average of 2.03 vehicles per household in El Dorado County. Therefore, the number of evacuating households is multiplied by two (rounded) to estimate the number of evacuating residential vehicles. Each evacuating employee is assumed to use one vehicle.

The evacuation analysis conservatively assumes that 75 percent of residents and 75 percent of employees would need to evacuate during a wildfire event. This is due to most residents being at home during the night and fewer being at home during the day, while most employees will be at work during the day and are much less likely to be at work at night.

65% of Costco members and employees will evacuate eastward towards Placerville, while 35% will evacuate westward towards Folsom. 80% of residents and employees outside the project area will evacuate westward towards Folsom, while twenty percent will evacuate eastward towards Placerville. Those evacuating will use US 50 to evacuate to the east or west. All Costco employees and members will evacuate during the peak hour for both scenarios. Additionally, 65% of residents and employees outside the project area will evacuate during the peak hour when under an evacuation order, and 25% will evacuate under an evacuation warning.

12.3 Results

The El Dorado County travel demand model was used to estimate travel times and volume-to-capacity ratios (V/C) ratios for each analysis scenario to understand how the Project would impact residents, employees, and Costco members in the evacuation area for each wildfire scenario. The following sections present the congestion locations and comparison of travel times for baseline conditions (no evacuation), existing conditions, and near-term (2034) conditions in No Project and Plus Project conditions for the two wildfire scenarios. The analysis is run assuming no manual traffic control is in place during the evacuation. The congestion on a roadway segment is determined based on the V/C ratio of the segment derived from the El Dorado County travel demand model. Congestion locations are classified as shown in Table 5.

Table 5. Congestion Classification based on Volume-to-Capacity (V/C) ratio

Volume to Capacity Ratio	Congestion Classification
≤ 0.9	Under Capacity
0.9 to 1.0	Near Capacity
≥ 1.0	Over Capacity

12.3.1 Scenario #1, Existing Conditions

The Project will increase travel time in traffic with a variation between 0.1 and 1.0 minutes (0-5% increase). Although the volume-to-capacity ratio increases along US 50 towards Folsom and Placerville, the volume-to-capacity ratio changes with the addition of Project traffic are minimal. The overall roadway capacity is expected to remain under full capacity (v/c < 1.0).

12.3.2 Scenario #1, Near Term (2034) Conditions

The Project will increase travel time in traffic with a variation between 0.1 and 0.8 minutes (1-4% increase). Volume-to-capacity ratio increases along US 50 towards Folsom and Placerville, and along Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard. The overall roadway capacity is expected to remain under full capacity (v/c < 1.0). The change in roadway capacity is estimated to be minimal.

12.3.3 Scenario #2, Existing Conditions

The Project will increase travel time in traffic with a variation between 0 and 1.2 minutes (0-6% increase). Although volume-to-capacity ratio increases along US 50 towards Folsom and Placerville, and along Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard, the volume-to-capacity ratio changes with the addition of Project traffic are minimal. The Overall roadway capacity is expected to remain under full capacity (v/c < 1.0) for most of US-50 near the project site, but some segments are estimated to have a roadway capacity over capacity (v/c > 1.0).

12.3.4 Scenario #2, Near Term (2034) Conditions

The Project will increase travel time in traffic with a variation between 0.1 and 0.6 minutes (0-3% increase). Overall roadway capacity is expected to remain under full capacity (v/c < 1.0) for most US-50 near the project site, but some segments are estimated to have a roadway capacity over capacity (v/c > 1.0). Although the volume-to-capacity ratio increases along US 50 towards Folsom and Placerville, and along Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard. The change in roadway capacity is estimated to be minimal.

13 Conclusion

The El Dorado Hills Costco project proposes to construct a Costco retail center, parking facilities, and a fuel facility on a vacant site in the El Dorado Hills community. The project site is located just north of Highway 50 and next to Silva Valley Parkway. The project site and surrounding area have been designated as a Moderate Fire Hazard Severity Zone. Since 1935, the project's general area has experienced 20 large wildfires. Current conditions on the site and on the adjacent properties would sustain the spread of a wildfire. Because of this risk, the El Dorado Hills Fire Department has required the developer of this project to create a Fire Safe Plan as a condition of approval for the project. This Fire Safe Plan is intended to document the conditions present on the site that could contribute to the ignition or spread of a wildfire and the elements of the project that help mitigate this risk of a new wildfire igniting or spreading on the project site.

This Fire Safe Plan describes the current wildfire environment for the project site, including the elements required for a wildfire to grow, such as fuels, terrain, and weather. Also described is the existing road system and the adjacent land uses. The report then describes the elements that the developer intends to incorporate into the Costco building, the parking lot, and the surrounding landscaping that will reduce the risk of a new fire starting on the site, limit the ability of a wildfire to spread on the site, and allow firefighters to engage a nearby wildfire safely.

Upon completion of the proposed project, the site will lack terrain and fuels that can sustain the rapid growth of a wildfire. The Costco building, located on a large bench in the middle of the site, will have an exterior constructed out of ignition-resistant and non-combustible materials, so it would not be at an increased risk of ignition. The entire site will be easily accessible for fire apparatus from multiple points. In addition to not increasing the risk of starting or spreading a wildfire, the project can be served by the existing roads, water supply, and fire department without requiring an upgrade to public facilities. Finally, the project would not substantially impact the evacuation of the surrounding residential communities.

This plan concludes that the project does not exacerbate the wildfire risk in the project area.

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INTENTIONALLY LEFT BLANK

Figure 1 Project Vicinity Map

SOURCE:

DUDEK

0 125 250 Feet

FIGURE 1

Project Location

EDH 52 and Costco South Fire Safe Plan

Figure 2 Project Site Plan

SOURCE: Bing Imagery 2024; OpenStreetMaps 2019

DUDEK

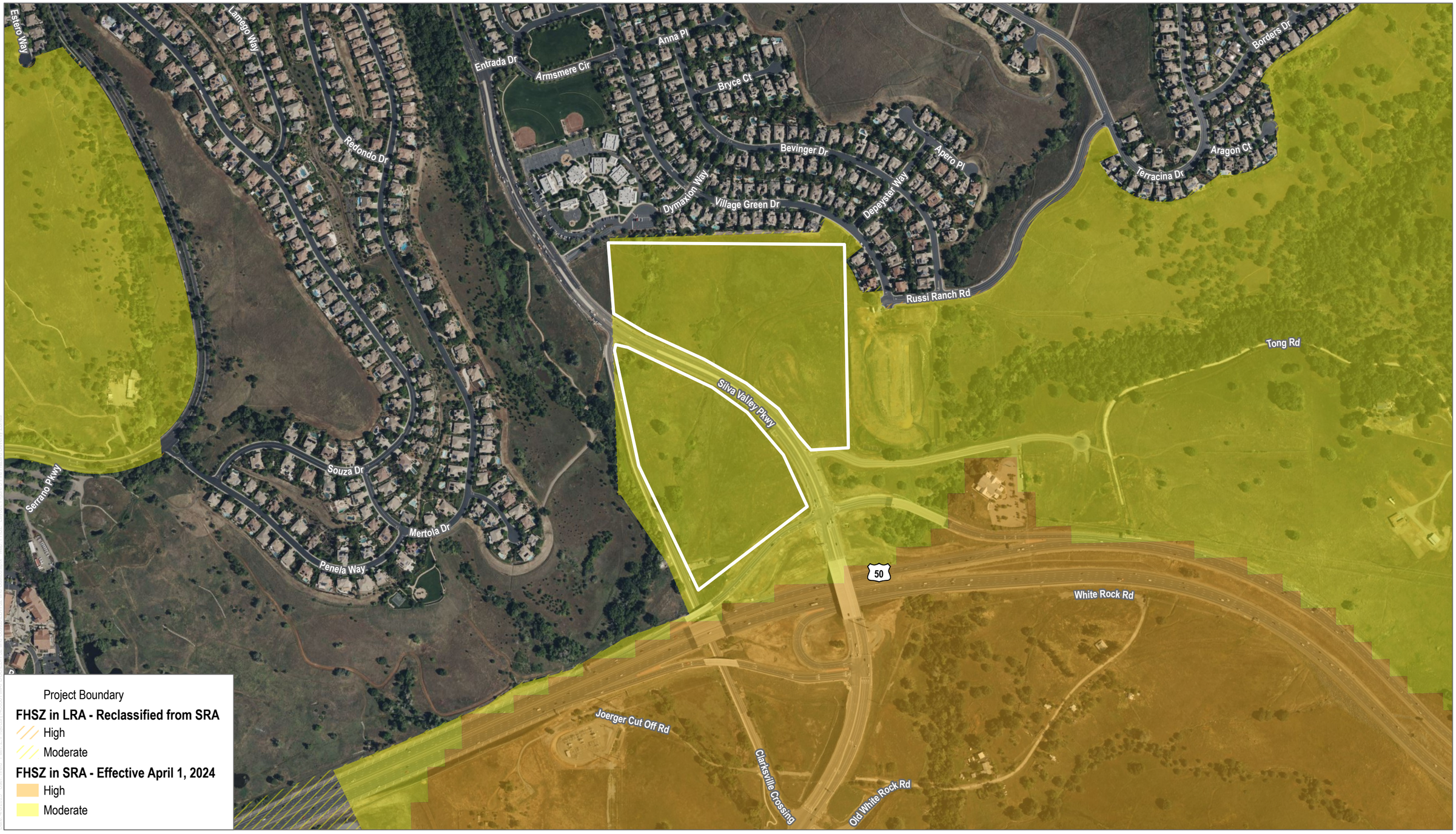
0 140 280 Feet

FIGURE 2

Site Plan

EDH 52 and Costco South Fire Safe Plan

Figure 3 CAL FIRE Fire Hazard Severity Zone Map



SOURCE: Bing Imagery 2024; OpenStreetMaps 2019; CalFire 2024

DUDEK

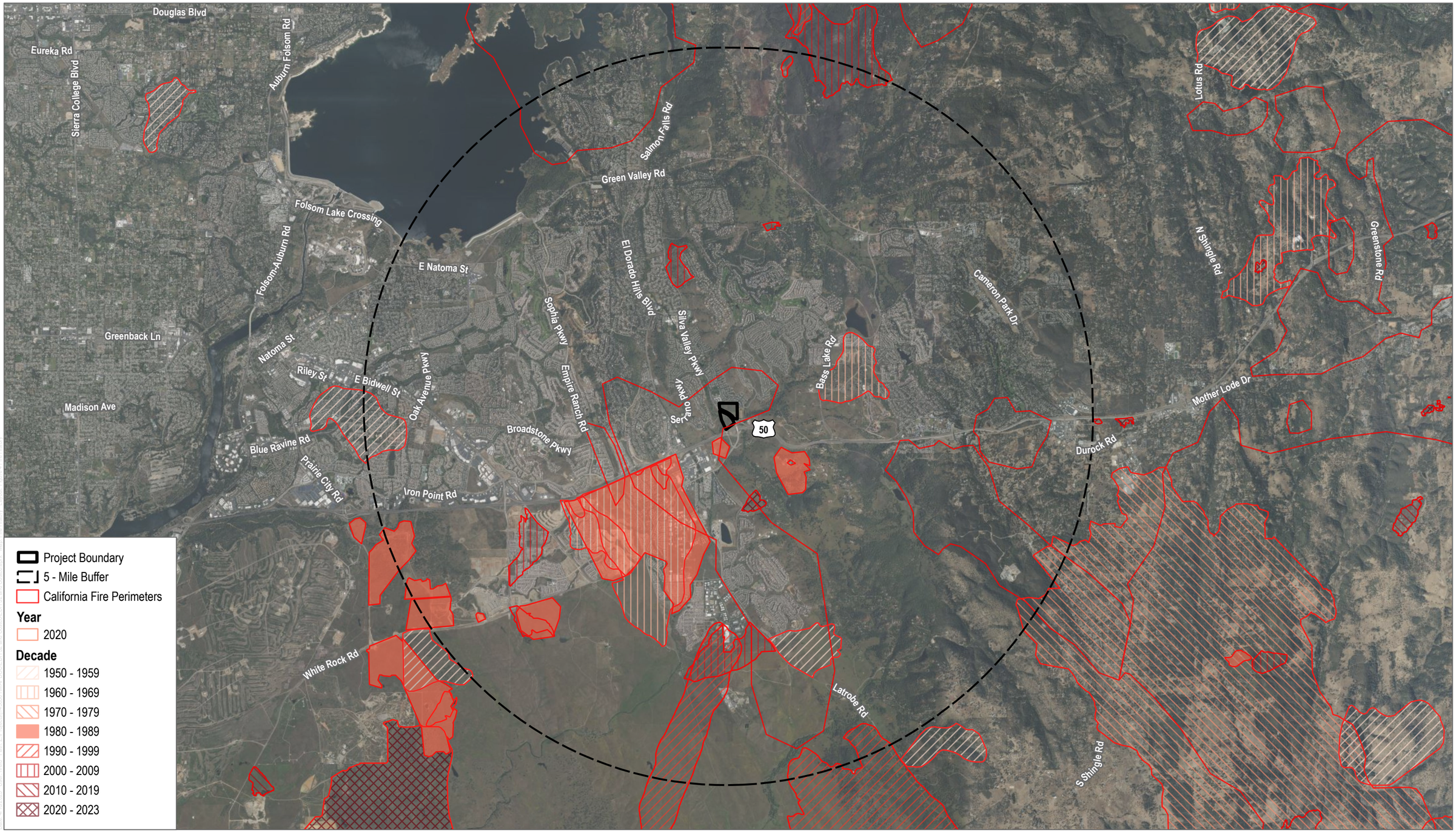
0 245 490 Feet

FIGURE 3

Fire Hazard Severity Zone

EDH 52 and Costco South Fire Safe Plan

Figure 4 Fire History Map



SOURCE: Bing Imagery 2024; OpenStreetMaps 2019; CalFire 2024

DUDEK

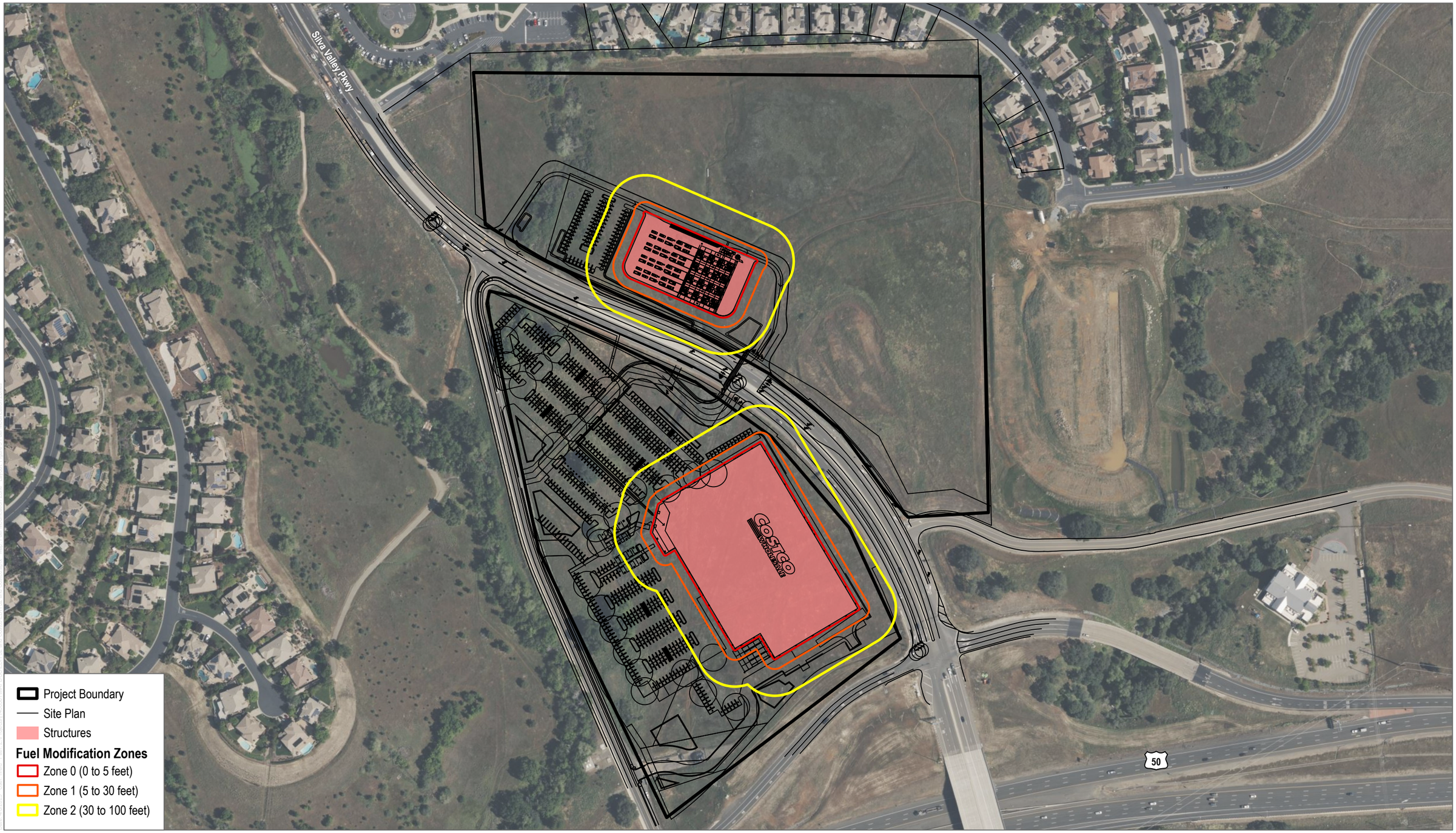
0 0.5 1 Miles

FIGURE 4

Fire History

EDH 52 and Costco South Fire Safe Plan

Figure 5 Defensible Space Zones Map



SOURCE: Bing Imagery 2024; OpenStreetMaps 2019

DUDEK

0 115 230 Feet

FIGURE 5

Fuel Modification Zones

EDH 52 and Costco South Fire Safe Plan

Figure 6 Landscape Plans with Defensible Space Zones Overlay

Fuel Modification Zones

- Zone 0 (0 to 5 feet)
- Zone 1 (5 to 30 feet)
- Zone 2 (30 to 100 feet)

IRRIGATION DESIGN STATEMENT:

The irrigation system will be a water efficient low flow, point source system designed to provide adequate watering to support plant growth and insure deeply rooted plant material while avoiding excess water application. The system will be programmable, allowing operation during late night and or early morning hours, with multiple start times and cycles. The system will interface with a weather based sensor that will adjust the amount of water applied to the plant material based on daily weather conditions. Irrigation materials specified for the site will be selected on the basis of durability and ease of maintenance. Landscape irrigation will comply with the California Department of Water Resources Model Water Efficient Landscape Ordinance (MWELO).

Note: All landscape areas will be irrigated.

LANDSCAPE DATA:

Costco Site Coverage

Costco Warehouse Site Area:	17.04 AC	(742,282 SF)
Costco Fuel Site Area:	3.25 AC	(143,261 SF)
Total Costco Site Area:	20.33 AC	(885,523 SF)
Landscape Area Provided:	318,349 SF	(35.95%)

Shading Requirements:
Required: 50% parking lot shading at 15 years
Provided: 55.8%

Upper Level Parking:
Provides 100% shading of lower level parking

WUCOLS LEGEND:

L Low Water Use

M Moderate Water Use

Plant Legend

Symbols	Botanical/ Common Name	Size	WUCOLS (Water Use Classification or Landscapes Species)	Qty.	Comments
	Trees				
	Acer platanoides 'Crimson King' / Crimson King Norway Maple	24" box	M	77	Matched Standards
	Acer rubrum 'Redpointe' / Redpointe Red Maple	24" box	M	85	Matched Standards
	Lagerstroemia hyb. 'Muskogee' / Muskogee (Lavender) Crape Myrtle	24" box	L	30	Matched Standards
	Lagerstroemia hyb. 'Tuscarora' / Pink/Red Flowering Crape Myrtle	24" box	L	9	Matched Standards
	Zelkova serrata 'Green Vase'/ Green Vase Zelkova	24" box	L	58	Matched Standards
	Quercus ilex/ Holly Oak	24" box	L	29	Matched Standards
	Quercus lobata / Valley Oak	24" box	L	36	Matched Standards
	Cedrus deodara / Deodar Cedar	24" box	L	37	Matched in Size
	Shrubs, Perennials, Ornamental Grasses, Ground Covers and Vine				
	Arbutus unedo 'Compacta' / Compact Strawberry Tree	15 gal.	L		
	Ceanothus 'Concha' / Concha Ceanothus	5 gal.	L		
	Cotoneaster dammeri 'Lowfast' / Lowfast Bearberry Cotoneaster	1 gal.	M		
	Dietes grandiflora 'Variegata' / Striped Fortnight Lily	1 gal.	L		
	Dianella revolute 'Little Rev'/ Little Rev Dianella	1 gal.	L		
	Eleagnus x ebbingei 'Gilt Edge' / Gilt Edge Silver Berry	15 gal.	L		
	Festuca matrei / Atlas Fescue	1 gal.	L		
	Muhlenbergia capillaris 'Regal Mist' / Regal Mist Muhly Grass	1 gal.	L		
	Muhlenbergia rigens / Deer Grass	1 gal.	L		
	Pennisetum orientale / Oriental Fountain Grass	1 gal.	L		
	Juniperus chinensis 'Mint Julep'/ Mint Julep Juniper	5 gal.	L		
	Juniperus horizontalis 'Blue Chip' / Blue Chip Juniper	1 gal.	L		
	Phlomis fruticosa / Jerusalem Sage	1 gal.	L		
	Rosa 'Meidiforo' / Coral Drift Rose	5 gal.	M		
	Rosa banksiae 'Lutea'/ Yellow Lady Banks Climbing Rose	15 gal.	M		
	Salvia leucantha 'Santa Barbara' / Santa Barbara Sage	5 gal.	L		
	Rosmarinus o. 'Huntington Blue' / Huntington Blue Rosemary	1 gal.	L		
	Stormwater Treatment Planter				
	Tree				
	Quercus Virginiana 'Sky Climber' / Sky Climber Live Oak	24" box	L	13	Matched Standards
	Perennials and Grasses				
	Chondropetalum tectorum / Cape Rush	5 gal.	L		
	Epilobium septentrionale 'Select matlole' / Select Matlole California Fuchsia	1 gal.	L		On slope embankment only
	Juncus patens 'Elk Blue' / Elk Blue Gray Rush	1 gal.	M		
	Muhlenbergia rigens / Deer Grass	1 gal.	L		
	Nepeta racemose 'Volker's Low' / Walker's Low Catmint	1 gal.	L		On slope embankment only
	Verbena lilacina 'Del La Mina' / Purple Cedros Island Verbena	1 gal.	L		On slope embankment only

0 40' 80' 160'
1" = 80'

COSTCO WHOLESALE
EL DORADO HILLS, CA

DB+A

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DBA# P.290
NOVEMBER 27, 2024

PRELIMINARY LANDSCAPE PLAN
L-1

COSTCO WHOLESALE
EL DORADO HILLS, CALIFORNIA

PRELIMINARY LANDSCAPE PLAN
NOVEMBER 27, 2024

SOURCE: Costco 2025

FIGURE 6
Landscape Plans
EDH 52 and Costco South Fire Safe Plan

Appendix A
EDHFD Fire Safe Plan Requirements (From #W-002)

EL DORADO HILLS FIRE DEPARTMENT
FIRE PROTECTION STANDARD

Wildland Urban Interface Fire Protection Plans
STANDARD #W-002 EFFECTIVE 6-6-2022 REVISED 6-6-22

I. PURPOSE:

The purpose of this standard is to communicate the minimum fire safe regulations of the State of California, County of El Dorado (EDC) and the local Fire Code Official for the formation, implementation and on-going use of a *Wildland Urban Interface Fire Protection Plan* (Fire Safe Plan) for new developments and special use permits hereafter created.

II. BACKGROUND:

The California Fire Code (CFC) Section 4903.1 (Where Required), amended by ordinance in EDC by each local fire authority, states: *The fire code official of the fire district may require development projects located in Moderate, High and Very-High Fire Hazard Severity Zones to submit a fire protection plan. This plan shall be approved by both the fire code official and the authorized representative for the local CAL FIRE Unit Chief, if located in the State Responsibility Area (SRA), prior to the recording of the final map for the project by the County of El Dorado.*

III. SCOPE:

This standard identifies when a Fire Safe Plan is required, common definitions associated with the plan creation, who is qualified to prepare plans, the framework for a plan, and how the plan is to be implemented by the property owner or responsible party to mitigate conditions that might cause a wildfire to transmit fire to buildings, threaten to destroy life, overwhelm fire suppression capabilities, or result in large property losses. This standard does not supersede the

fire code official's authority to require more restrictive requirements than those described in this document.

IV. WHERE REQUIRED:

An approved Fire Safe Plan shall be prepared for the following types of development projects:

A. The creation of a Specific Plan or similar large-scale project.

B. The creation of five (5) or more parcels as part of a parcel or subdivision map.

C. A change in zoning or issuance of a discretionary permit which proposes to increase intensity or density.

D. New commercial or industrial uses located in High or Very-High Fire Hazard Severity Zones.

E. Where in the opinion of either CAL FIRE or the local Fire Code Official it is deemed necessary due to the fire risk or fire hazard associated with the property.

EXCEPTIONS:

1. Accessory and junior accessory dwelling units.
2. Roads used solely for agricultural, mining, or the management and harvesting of wood products.

V. AUTHORITY CITED:

A. County of El Dorado General Plan 6.2.2.2 (Limitations to Development).

B. 2019 California Fire Code (CFC), Chapter 4, Chapter 4 (Emergency Planning & Preparedness).

C. 2020 Local Fire District Ordinance, Chapter 49, Section 4903.1 (WUI Fire Protection Plans).

D. 2021 Title 14 of the California Code of Regulations, Division 1.5, Chapter 7, Subchapter 2, Articles 1-5 (Fire Safe Regulations).

E. 2019 California Building Code (CBC) Chapter 7A (Materials & Construction Methods for Exterior Wildfire Exposure)

F. Fire Hazard Planning Technical Advisory Guide (2020) – Governor's Office of Planning & Research

VI. DEFINITIONS:

A. **Access –** The roads on a route from a building to the nearest collector road.

B. **Authority Having Jurisdiction (AHJ) -** A fire department, agency, division, district, or other governmental body responsible for regulating and/or enforcing minimum fire safety standards.

C. **Building –** Any structure utilized or intended for supporting or sheltering any occupancy.

D. **Biomass** – Refers to "green waste" materials generated during the defensible space clearing project. This includes grass, weeds, and tree trimming materials.

E. **CAL FIRE** – Refers to the California Department of Forestry and Fire Protection.

F. **CWPP –** Refers to the El Dorado County Community Wildfire Protection Plan.

G. **Defensible Space** – Is the design and maintenance of natural and/or landscaped areas around a structure to reduce the danger from an approaching wildfire. Defensible space is intended to reduce the threat of wildfire spread from the wildland threat area to adjacent structures. It is also intended to provide access to firefighters for fire suppression actions and to provide a safe zone for them to work. Defensible space is based on three general concepts:

1. Zone 0 - 0-5'; Ember Resistant Zone
2. Zone 1 – 5'-30'; Lean, Clean and Green Zone
3. Zone 2 – 30'-100'; Reduced Fuel Zone
4. Fuel removal or reduction within 100' of structures in all directions
5. Thinning, pruning and removal of dead vegetation and continuous dense uninterrupted layers of vegetation
6. Removal of ladder fuels within 6'-10' to prevent fire spread from surface fuels into tree canopies.

H. **Development –** means the uses to which the land which is the subject of a map shall be put, the buildings to be constructed on it, and all alterations of the land and construction incident thereto.

I. **Emergency Vehicle/Evacuation Access Road (EVA)** - A road or other connection designed to connect directly to a through road and used to comply with 14CCR §1273.08 (Maximum Length of New Dead-end Roads). The road shall serve as a secondary means of emergency vehicle access and civilian evacuation for the project.

J. **Fire Code Official –** The fire chief or other designated authority charged with the administration and enforcement of the code, or a duly authorized representative.

K. **Firefighting Water Supply –** Water supply that is dedicated to the use of the fire department for the suppression of any type of fire.

L. **Fire Hazard –** Is the dangerous accumulation of flammable fuels in open space areas and other wildland urban interface areas. It is typically described at the landscape (area) level. Usually referring to the density of live or dead vegetation that may be ignited by the various fire risks or causes that can increase a fires intensity or rate of spread. Fire hazard is based on the vegetation types likely to be present over the next 50 years that contribute to fire severity and ember production, the topography of the area and the average fire weather conditions present in the area.

M. **Fire Resistant Vegetation** – Plants, shrubs, trees, and other vegetation which exhibit properties, such as high moisture content, little accumulation of dead vegetation, and low sap or resin content, that make them less likely to ignite or contribute heat or spread flame in a fire than native vegetation typically found in the region. **Note**: The following sources contain examples of vegetation that can be considered fire resistant vegetation. (Fire Resistant Plants for Home Landscapes, A Pacific Northwest Extension publication; Home Landscaping for Fire, University of California Division of Agriculture and Natural Resources; Sunset Western Garden Book).

N. **Fire Risk** – Is the potential damage a fire can cause to buildings, critical assets/infrastructure and other values at risk in individual open space areas and other

wildland urban interface areas. Fire risk does consider modification that may affect susceptibility of property to damage such as defensible space, fire sprinkler systems and building construction that can reduce the risk of burning embers igniting buildings. Fire hazard does not equal fire risk but is an important factor in determining fire risk.

O. **Fuel Break** – A strategically located area where the volume and arrangement of vegetation has been managed to limit fire intensity, fire severity, rate of spread, crown fire potential and/or ember production.

P. **Greenbelts** – Agricultural lands, open space, parks, wildlands, or a combination thereof, as designated by a local jurisdiction, which surround or are adjacent to a city or urbanized area, and restrict or prohibit development.

Q. **Greenways** – Linear open spaces or corridors that link parks and neighborhoods within a community through natural or manmade trails and paths.

R. **Local Responsibility Area (LRA)** – Those areas of land not classified by the State Board of Forestry where the financial responsibility of preventing and suppressing wildfires is that of the State or Federal government, PRC §4125.

S. **Public Temporary Refuge Area** – A gathering point for residents if they are temporarily evacuated from their residence, or when evacuation routes are obstructed by smoke, incoming emergency equipment, or directly threatened by fire as a last resort.

T. **Shaded Fuel Break** – Is a strategy used whereby a strip of land containing fuel (for example, living trees and brush, and dead branches, needles, or downed logs) has been modified to reduce the amount of combustible materials to act as a "strategic landscape" to limit the fire's ability to spread rapidly. Constructing a shaded fuel break is the process of selectively thinning and removing more flammable understory vegetation while leaving the majority of larger tree species in place. Along roadways, shaded fuel breaks create safer ingress and egress routes for fire personnel and citizens.

U. **Shelter in Place**[i] – Is a community approach to protecting neighborhood and individual homes from the imminent threat of a wildfire when residents are unable to evacuate. The communities are built to specific fire safety standards adopted by the AHJ that may allow

the residents who are unable to evacuate to remain inside their ignition-resistant home until the immediate emergency is over.

V. **State Responsibility Area (SRA)** – Areas of the State in which the financial responsibility of preventing and suppressing fires has been determined by the State Board of Forestry and Fire Protection, to be primarily the responsibility of the State, PRC §4102.

W. **Wildfire** – Any uncontrolled fire spreading through vegetative fuels that threatens to destroy life, property, or resources, PRC §4103 and 4104.

X. **Wildland-Urban Interface (WUI)** – A geographical area identified by the State as a "Fire Hazard Severity Zone" in accordance with the PRC §4201 through 4204 and Government Code §51175 through 51189, or through the Healthy Forest Restoration Act of 2003 (Public Law 108-148), as an area within or adjacent to an at-risk community that is identified to be at a significant risk from wildfires.

VII. REQUIRED PERMITS:

A. Concurrent with the submission of an application for a Parcel Map or Tentative Subdivision Map that would result in a total of five (5) or more parcels, or other entitlement application for projects described in Section IV, to the County of El Dorado, the project applicant shall submit the required Fire Safe Plan to the AHJ and CAL FIRE - Amador-El Dorado- Unit (AEU) for approval.

B. Prior to the approval of a certificate of occupancy for a building the project shall demonstrate to the satisfaction of the AHJ and CAL FIRE that the project complies with all applicable provisions found in the Fire Safe Plan.

C. Prior to the recording of a Parcel Map or approval of a Final Subdivision Map, or other entitlement for projects described in Section IV, by the County of El Dorado, the project shall adequately demonstrate that all provisions of the Fire Safe Plan, including the maintenance of green belts, greenways, fuel breaks, shaded fuel breaks and other vegetation management requirements, have either [1] been met to the satisfaction of the

AHJ and CAL FIRE; or [2] that a development agreement or bonding of the required infrastructure has been agreed to by the AHJ and CAL FIRE.

D. Prior to June 1st each year the property owner or their representative shall demonstrate to the satisfaction of the AHJ and CAL FIRE that the project [1] complies with all relevant provisions of the Fire Safe Plan; and [2] that all fire hazards in the development have been mitigated.

E. Fire Safe Plans shall be reviewed and updated by the property owner no less than once every five calendar years after its original approval to ensure that the project complies with all current regulations and requirements for existing developments. The AHJ and CAL FIRE shall review and approve this plan update prior to its use.

VIII. QUALIFICATIONS & LICENSES REQUIRED FOR PLAN DEVELOPMENT:

The following persons and / or concerns are qualified to prepare and submit Fire Safe Plans on behalf of the development projects described in Section IV.

A. California licensed foresters, landscape architects and arborists with fire behavior experience.

B. Certified Wildfire Mitigation Specialists.

C. Subject matter experts deemed qualified by the fire code official and CAL FIRE.

D. A AHJ or other approved federal, state or local agency.

IX. FIRE SAFE PLAN REQUIREMENTS:

A. Fire Safe Plans shall be based on a site-specific wildfire risk assessment that includes considerations of location, topography, aspect, flammable vegetation, climatic conditions, and fire history. The plan shall address water supply, emergency vehicle access, building ignition and fire-resistance factors, fire protection systems and equipment, defensible space, fuel breaks, buffer zones and vegetation management to

reduce hazard severity and risk. Fire Safe Plans shall be formatted in the following areas to ensure consistency:

1. A cover sheet that identifies the name of the project, the County of El Dorado Planning Permit Number (if applicable), the date prepared and the name of the concern that prepared the plan.
2. A plan signature page that includes the name and organization of the plan preparer, CAL FIRE – Amador & El Dorado Unit (AEU) representative and the authorized representative for the AHJ.
3. A section of the plan shall identify the following features of the project:
   a. Total size of the project
   b. Information on the adjoining properties on all sides, including current land uses, and, if known, existing structures and densities, planned construction, natural vegetation, environmental restoration plans, roads and parks.
   c. A map with all project boundary lines, slope contour lines, proposed structure foundation footprints, and proposed roads and driveways. The map shall also identify fuel modification zones and methods of identifying the fuel modification zone boundaries.

4. A section of the plan shall summarize all recommendations for the project, the timing in which the recommendations are to be implemented, and who the responsible party is to complete these recommendations.

B. The plan shall evaluate whether the project will substantially impair an adopted emergency response plan or emergency evacuation plan. The plan shall identify potential mitigation measures that can be adequately employed to reduce the impacts caused to the existing response or evacuation plan.

C. The plan shall evaluate whether the project exacerbates the wildfire risk due to slope, prevailing winds and other factors. The plan shall identify potential mitigation measures that can be adequately employed to reduce the overall wildfire risk due to the factors identified.

D. The plan shall identify the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or on-going impacts to the environment. The plan shall identify potential mitigation measures for vegetation reduction around emergency access, evacuation routes and associated infrastructure that can be implemented to ensure that this infrastructure is installed and maintained by the project and successor parties.

E. The plan shall identify whether the project will expose people or structures to significant risks, including downslope or downstream flooding or landscape, as a result of runoff, post-fire slope instability, or drainage changes.

F. The plan shall evaluate [1] the local fire protection capabilities; and [2] fire suppression water supply capabilities to adequately serve the project and make recommendations to improve or mitigate deficiencies identified during the analysis of the project.

G. The plan shall evaluate community wildfire evacuation routes required for the project for their capacity, safety, and viability under a range of scenarios and to ensure consistency with CAL FIRE, CAL OES and AHJ requirements.

H. The plan shall provide legally binding statements regarding community responsibility for the maintenance of fuel modification zones. The legally binding statements shall be

incorporated into the project covenants, conditions, and restriction regarding property owner responsibilities for vegetation maintenance.

I. The plan shall include a map identifying all proposed plants in the fuel modification zones with a legend that includes a symbol for each proposed plant species. The plan shall include specific information on each species proposed, including but not limited to:

1. The plant life-form
2. Scientific and common name; and
3. Expected height and width of mature growth

The map shall identify irrigated and non-irrigated zones. The map shall identify all points of access for equipment and personnel to maintain vegetation in common areas.

J. The cost of fire safe plan preparation and review shall be the responsibility of the project applicant.

K. The use of alternative materials, designs and methods of construction and equipment proposed within a FSP shall be approved by the AHJ in accordance with CFC §104.9.

L. Applications for appeal of provisions found in a FSP shall be heard by the AJH Board of Appeals in accordance with CFC §109.

M. The approved fire safe plan shall be retained by both the AHJ and CAL FIRE for future use. The plan shall also be provided to the project applicant and successor parties for use in implementing the plan provisions.

Approved By:

Ronald A. Phillips, Project Management Specialist

Maurice Johnson, Fire Chief

HOW TO DISTINGUISH CHANGES TO THIS STANDARD FROM PRIOR STANDARD PROVISIONS

Indicates a new standard section has been added.

RED indicates language changes have been made since the previous version of this standard.

[i] The shelter in place concept is normally associated with new communities and developments where fire protection features such as defensible space, home hardening, Class A roofs, automatic fire sprinkler systems, etc.... are present.

Appendix B
Regulatory Environment: Wildfire Prevention Codes, Laws, and Regulations Relevant to the Costco Project

The Costco project will be consistent with the following codes and regulations:

- **2019 California Building Code, Ch. 7A** – Materials and Construction Methods for Exterior Wildfire Exposure: minimum standards for a new building located in a WUI area to resist the intrusion of flame or burning embers projected by a vegetation fire.
- **2019 California Fire Code, Chapter 49** – Requirements for Wildland-Urban Interface Fire Areas: minimum standards to increase the ability of a building to resist the intrusion of flame or burning embers being projected by a vegetation fire.
- **2019 California Code of Regulations, Title 14, Div. 1.5, Ch. 7, Sub-Ch. 2** – SRA/VHFHSZ Fire Safe Regulations: minimum wildfire protection standards in conjunction with building, construction, and development in the SRA and VHFHSZ.
- **California Public Resources Code, Div. 4, Part 2, Ch. 3, Sec. 4290**: minimum fire safety standards related to defensible space in Hazardous Fire Areas; **Sec. 4291**: Defensible space maintenance on Mountainous, Forest-, Brush- and Grass-Covered Lands.
- **California Government Code, Title 5, Div. 1, Part 1, Ch. 6.8, Sec. 51175-51189**: Very High Fire Hazard Severity Zones.
- **California Government Code, Title 7, Div. 2, Ch. 4, Sec. 66474.02**: requirements for tentative map approval in a very high fire hazard severity zone.

- **El Dorado County General Plan, Public Health, Safety, and Noise Element, Policy 6.2.3.1:** The project proponent and the responsible fire protection district must provide the County with evidence of adequate emergency water flow, fire access, and firefighting personnel and equipment in accordance with applicable State and local fire district standards.

- **El Dorado County General Plan, Public Health, Safety, and Noise Element, Policy 6.2.3.2:** The project proponent must demonstrate to the County that adequate emergency access exists at the site and private vehicles can safely evacuate the area.

- **El Dorado County General Plan, Public Services and Utilities Element, Policy 5.2.1.2:** An adequate quantity and quality of water for all uses, including fire, shall be provided for with discretionary development.

- **El Dorado County General Plan, Public Health, Safety, and Noise Element, Policy 5.7.2.1:** The responsible fire protection district shall be requested to determine the ability of the district to provide protection at acceptable levels because of the new development.

Appendix C
Reference Photos

Photo Number 1. Looking south from the intersection of Silva Valley Parkway and Clarksville Road

Photo Number 2- Looking north at the riparian vegetation in the storm drain at the north end of the project site.

Photo Number 3- Looking south across the project site, Silva Valley Parkway is the roadway on the left side of the image.

Photo Number 4- Looking at the east side of the small drainage that runs through the project site.

Photo Number 5. Looking at the west side of the small drainage that runs through the project site.

Photo Number 6- Looking north across the project site from the intersection of Silva Valley Parkway and Highway 50

Photo Number 7- Looking northeast across the project site toward Oak Meadow Elementary school.

Photo Number 8- Looking south along Silva Valley Parkway. The paved and gravel areas combined are approximately 10 feet wide.

Appendix D
El Dorado Hills Costco Warehouse - Evacuation Analysis

KITTELSON & ASSOCIATES
155 Grand Avenue, Suite 505
Oakland, CA 94612
P 510.839.1742

TECHNICAL MEMORANDUM

August 20, 2025 Project# 26783

To: Ande Flower & Cameron Welch, County of El Dorado Planning

From: Grace Carsky, Sravya Kamalapuram, Amy Lopez

CC: Lt. Troy Morton, El Dorado County Office of Emergency Services; Chief Chrishana Fields, El Dorado Hills Fire; Chief Jeff Hoag, CAL FIRE

RE: El Dorado Hills Costco Warehouse - Evacuation Analysis

Introduction

Kittelson & Associates, Inc. (Kittelson) is providing an evacuation transportation analysis for the environmental impact report (EIR) of the proposed El Dorado Hills Costco warehouse development (Project) at the Silva Valley Parkway, El Dorado Hills site. This assessment provides estimates of roadway capacity constraints during wildfire evacuations, potential impacts to the roadway network under wildfire evacuation scenarios, and changes in travel times associated with the proposed Project. The assessment will cover two different wildfire event scenarios for both existing and near-term (2034) conditions. This memorandum presents the evacuation analysis methodology, results, and considerations for the County of El Dorado (County) and emergency responders including Cal FIRE, El Dorado Hills Fire Department, and El Dorado County Office of Emergency Services.

PROJECT DESCRIPTION

The proposed Project is a commercial development in El Dorado County north of US 50 along Silva Valley Parkway. It is bordered by existing residences and vacant land to the north, vacant land to the east, Clarksville Crossing to the west, and Tong Road and the US 50 westbound ramps to the south. The Project site currently is vacant. Figure 1 presents the Project location.

The Project consists of two sites on either side of Silva Valley Parkway: the North Site and South Site. The North Site will contain a fuel facility with 32 fueling positions. The South Site entails a Costco Warehouse retail center of approximately 165,000 cumulative square feet. Figure 1 presents the location of the proposed Project. Adjacent to the North Site fuel facility, future commercial development is anticipated for the surrounding vacant land (herein referred to as the "Remainder Area").

The Project is expected to generate 442 trips (221 vehicles) in the AM peak hour, 1,277 trips (638 to 639 vehicles) in the PM peak hour, and 1,697 trips (848 to 849 veicles) in the Saturday midday peak hour. During operating hours of the Costco warehouse and gas station, as many as 200 employees are expected to be on-site at any given time.

Figure 1

Costco Project Site
El Dorado Hills Costco
El Dorado County, California

KITTELSON & ASSOCIATES

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Wildfire Scenarios

To evaluate how the proposed development may affect congestion and travel times in the vicinity of the Project during wildfire evacuation scenarios, fire progression and fire behavior modeling was conducted by Dudek for the Project area. This modeling considered wildfire history, ignition sources, fuels/vegetation, and historical weather patterns for the Project site and the surrounding area. The detailed Wildfire Modeling methodology report prepared by Dudek is provided in Appendix A.

While the modeling identified three potential wildfire scenarios impacting the Project site, discussions with El Dorado County, El Dorado County Office of Emergency Services (OES), El Dorado Hills Fire Department, and the California Department of Forestry and Fire Protection (Cal FIRE) (hereby referred as the advisory group) led to the selection of two primary wildfire evacuation scenarios for further analysis. These scenarios assess wildfire behavior and evacuation strategies for area residents and Costco employees and members in the Project vicinity and nearby communities.

The details of the wildfire scenarios analyzed in this study are outlined in Table 1. Figure 2 and Figure 3 show the fire progression and fire spread for wildfire scenarios #1 and #2.

Table 1. Wildfire Scenarios

	Wildfire Scenario #1	Wildfire Scenario #2
Ignition Location	Northeast of the Project site	Southwest of the Project site
Wind Direction[1]	North/Northeast	Southwest
Fire Spread	Southwest towards the Project site	Northeast towards the Project site
Time to reach the Project Site	~143 minutes (2 hours 23 minutes)	Does not reach the Project site due to natural fire breaks including riparian vegetation and a paved roadway west of the Project site

Source: Wildfire Modeling Summary Report, Prepared by Dudek, 2025
Wind direction indicates the direction of where the wind is coming from

El Dorado Costco Project Site

Wildfire Scenario #1 (Hours Since Ignition)

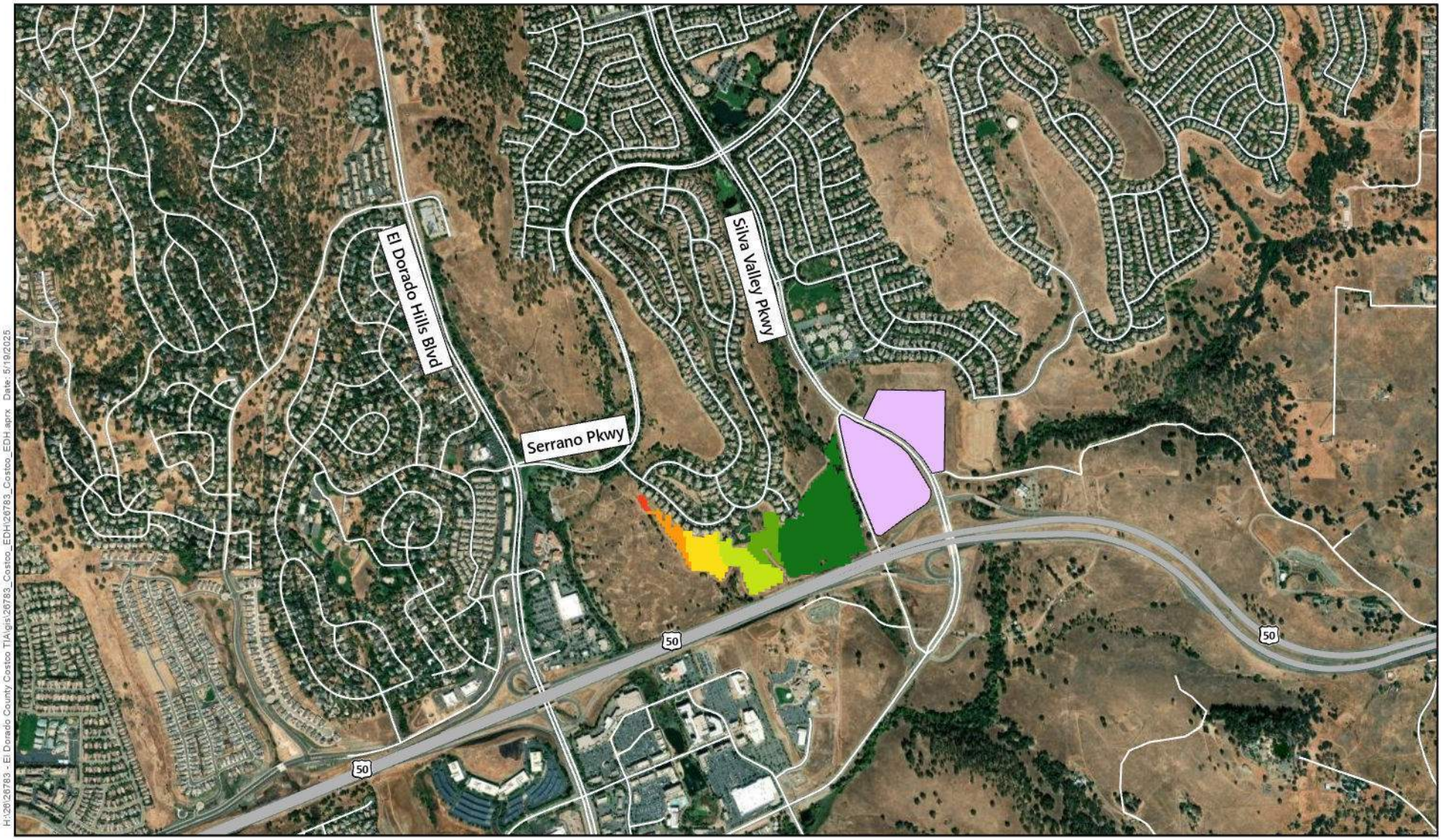
- < 1 hr
- 1 - 2 hr
- 2 - 3 hr
- 3 - 4 hr
- 4 - 5 hr
- 5 - 6 hr
- 6 - 7 hr
- 7 - 8 hr

0 1 Miles

Figure 2

Wildfire Scenario #1
Fire Progression
El Dorado Costco

KITTELSON & ASSOCIATES



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El Dorado Costco Project Site

Wildire Scenario #2 (Hours Since Ignition)

- <1 hr
- 1 - 2 hr
- 2 - 3 hr
- 3 - 4 hr
- 4 - 5 hr
- 5 - 6 hr

0 1 Miles

Figure 3

Wildfire Scenario #2
Fire Progression
El Dorado Costco

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Analysis Scenarios

This study evaluates the transportation related impacts of the Project during the two wildfire evacuation scenarios discussed in Table 1. To maintain consistency with the Traffic Impact Analysis (TIA) conducted by Kittleson & Associates, Inc. for the Project,[1] this study examines potential evacuation effects under the Existing and Near-Term (2034) conditions. To account for the worst-case scenario, all the scenarios are analyzed during the PM peak hour, which represents the peak traffic volume during a typical week: the sum of background traffic in the area plus traffic from the Project development, assuming Costco members and employees are in the warehouse and residents in the evacuation area are at home.

Accordingly, this study evaluates transportation related impacts during the PM peak hour for the two wildfire scenarios under the following conditions:

- Existing No Project
- Existing Plus Project
- Near-Term (2034) No Project
- Near-Term (2034) Plus Project

The Near-Term (2034) No Project and Plus Project conditions include the projected land use development and trip generation for the Remainder Area. The Remainder Area is approximately 13.79 acres and is not proposed for development as part of the current project. Thus, the Remainder Area is not considered in the Existing Plus Project conditions.

Travel Modeling Tools

The evacuation analysis uses the El Dorado County travel demand model to estimate roadway congestion and travel times in an evacuation under No Project and Plus Project conditions. The current travel model is calibrated and validated for a 2018 base year and includes a 2040 future scenario with 2040 land use forecasts and transportation improvement assumptions. Kittelson estimated land use conditions for Near-Term (2034) conditions by a linear interpolation of 2018 and 2040 land use assumptions and assuming the 2040 transportation improvements in the Project vicinity.

Evacuation Assumptions

This section outlines the assumptions made on when the residents, employees, and Costco members in the evacuation area would need to evacuate and the conditions under which they would evacuate.

[1] *EDH Costco TIA – DRAFT, February 2025*

TIME PERIOD

Kittelson modeled transportation activity for the worst-case scenario under which people in surrounding areas would evacuate. This period is assumed to be the PM peak hour when the sum of background traffic in the area plus traffic from the Project development is greatest during a typical week.

TRAVEL TYPE

Baseline travel represents normal travel patterns during the PM peak hour as included in the El Dorado County travel demand model. Evacuation travel represents estimated evacuation trips and travel time from each evacuating Traffic Analysis Zone (TAZ) to an evacuation destination. Kittelson reviewed the model's TAZs and assigned each TAZ a combination of Baseline travel and Evacuation travel (25% and 75%, respectively), based on its presence in the designated evacuation area.

EVACUATION AREA BOUNDARIES

For each of the two wildfire evacuation scenarios analyzed in this study, evacuation area boundaries were determined based on discussions with the advisory group. Accordingly, the following are the evacuation area boundaries assumed in this study.

- **Wildfire Scenario #1:** Evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/Old White Rock Road on the south, Silva Valley Parkway on the west, and Bass Lake Road on the east.
- **Wildfire Scenario #2:** Evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/White Rock Road on the south, El Dorado Hills Boulevard on the west, and areas surrounding Tong Road between Silva Valley Parkway and Bass Lane Road.

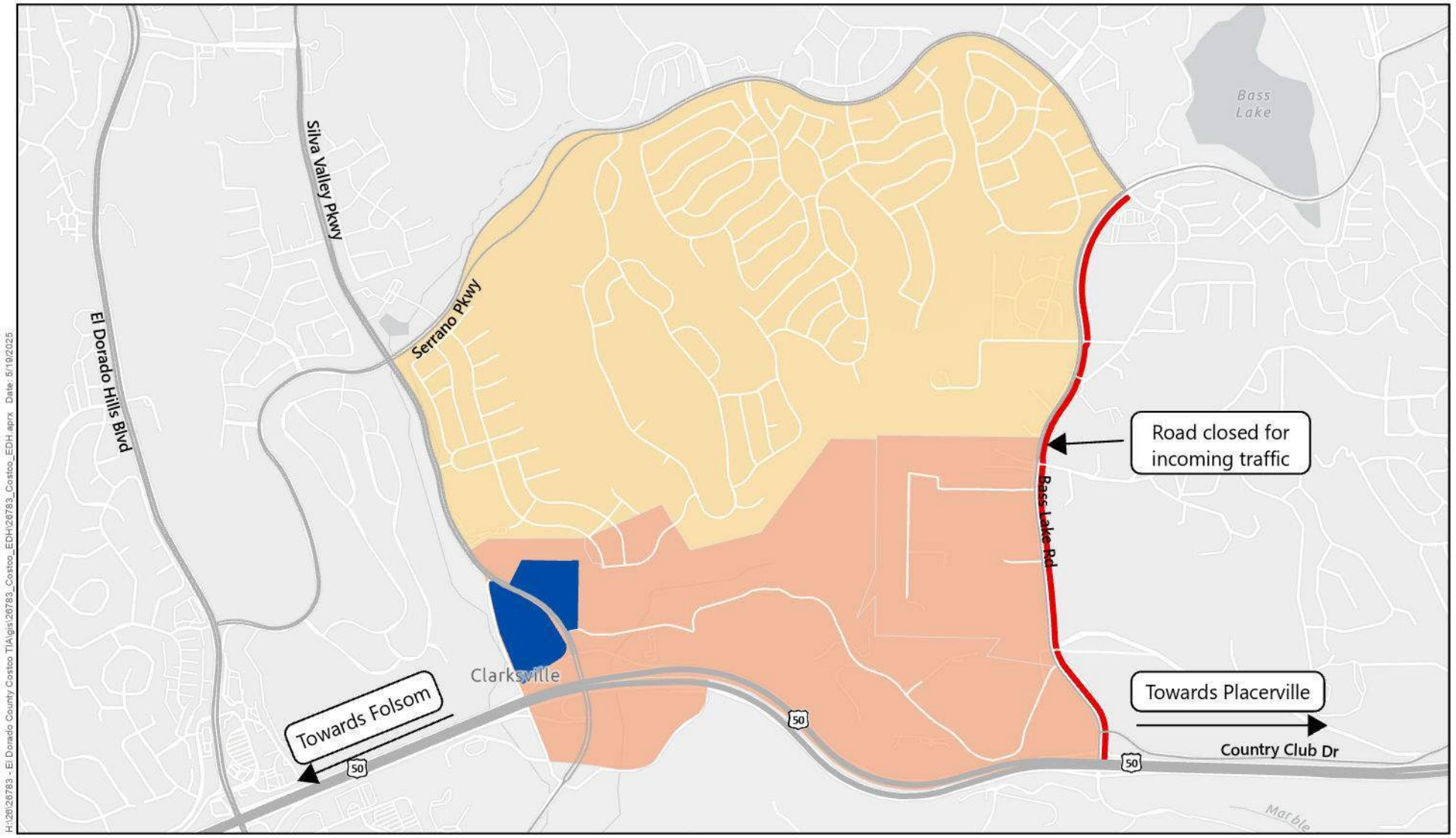
The evacuation areas are overlaid with the El Dorado County travel demand model's Traffic Analysis Zone (TAZ) map to identify the numbers of people that would need to be evacuated.

NUMBER OF EVACUATING TRIPS

Modeled trips are a function of the interactions between geographic patterns, including the land uses in an area, the socio-economic characteristics of the population in the area (e.g., auto ownership, income, and household size), and the type and extent of transportation facilities in an area. Kittelson obtained countywide land use information by TAZ (including households, population, and employment information) from the El Dorado County travel demand model for the Existing and Near-Term (2034) conditions. The land use information for Near-Term (2034) conditions also includes the projected land use for the Reminder Area, based on the County's General Plan.

The El Dorado County auto ownership information by Census Tract is obtained from the American Community Survey (ACS) 2023 five-year estimates. Based on this data, there are an average of 2.03 vehicles per household in El Dorado County. Therefore, the number of evacuating households is multiplied by two (rounded) to estimate the number of evacuating residential vehicles. Each evacuating employee is assumed to use one vehicle.

Kittelson estimated total evacuation trips by calculating the trips generated at household uses and trips generated by employees at non-residential land uses. If a fire occurs during the night, most residents would be home, but most employees would not be at their workplace. If a fire occurs during the workday, most employees would be at their workplace, but many residents would not be at their homes. The evacuation analysis conservatively assumes that 75 percent of residents and 75 percent of employees would need to evacuate during a wildfire event.



Percent Evacuating During Peak Hour*

- 25 percent
- 65 percent

- Road Closures
- El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.

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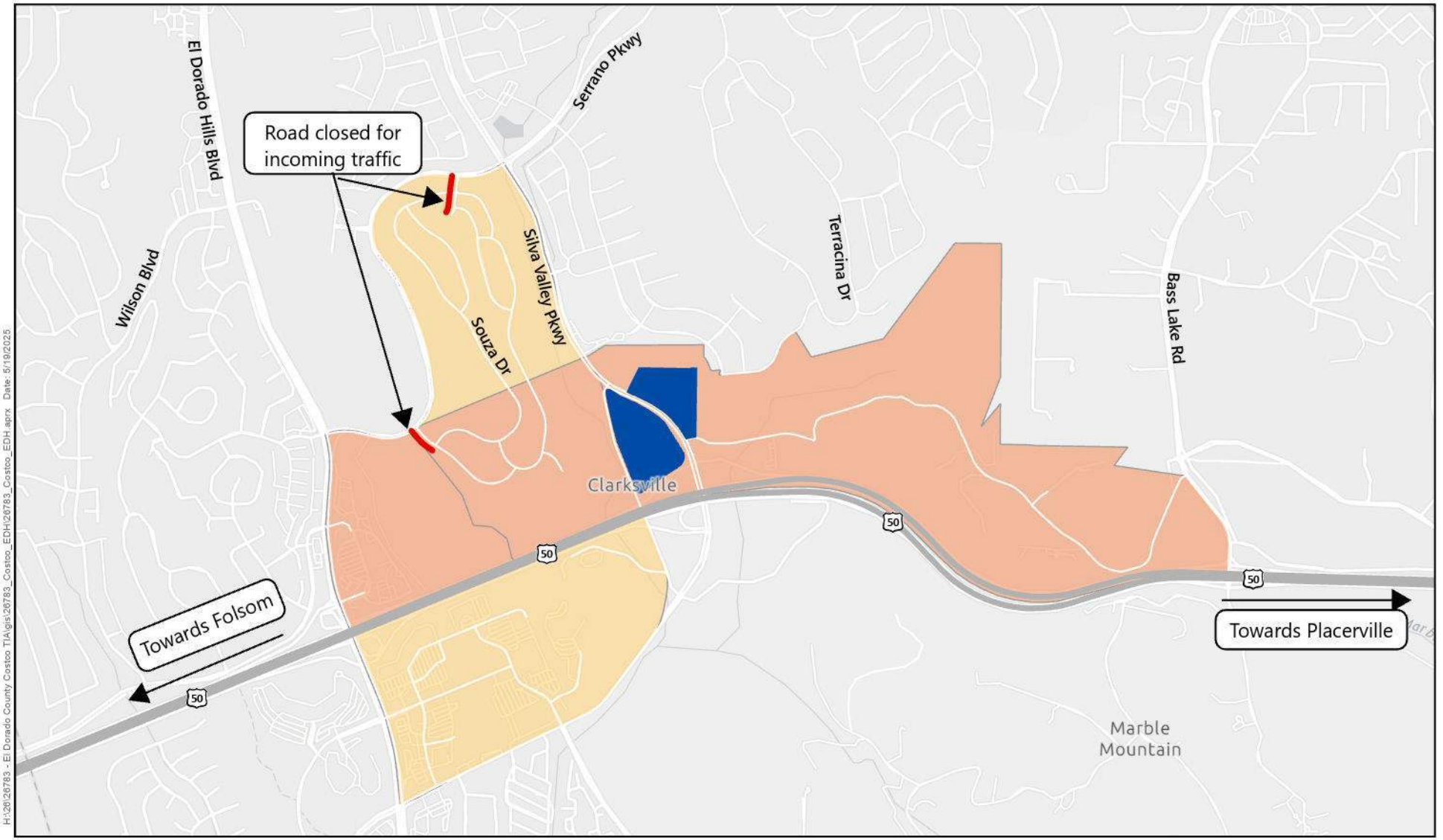
Figure 4

Percent Evacuating During Peak Hour*
Wildfire Scenario #1
El Dorado Costco



Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

- Road Closures
- El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders

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Figure 5

Percent Evacuating During Peak Hour* Wildfire Scenario #2 El Dorado Costco

TRIP DISTRIBUTION

Kittelson considered separate trip distribution for the Costco members and employees and other residents and employees in the evacuation area outside of the Project site. The assumptions are as follows.

- **Costco Members and Employees**: Trip distribution assumptions were based on Costco member transaction data and a market area analysis conducted as part of the Project TIA. The analysis showed that most Costco members are expected to travel from areas east of the Project site, surrounding the City of Placerville and other parts of El Dorado County (Figure 6). Accordingly, the following evacuation trip distribution was assumed for Costco members and employees:
    - 65% evacuate eastward toward Placerville
    - 35% evacuate westward toward Folsom
- **Residents and Employees Outside the Project Site**: For residents and employees in the evacuation area outside of the Project site, trip distribution assumptions were based on existing land use, the location of evacuation destinations, and their relative proximity to the evacuation area. Accordingly, the following evacuation trip distribution was assumed for residents and employees in the evacuation area outside of the Project site:
    - 80% evacuate westward toward Folsom
    - 20% evacuate eastward toward Placerville

The trips were distributed from each of the evacuating TAZs to the evacuation destinations, as appropriate. The trip distribution is not intended to reflect a precise distribution of the routes that would be taken during an evacuation.

ROADWAY CAPACITY AND ROADWAY CLOSURES

Kittelson modeled trip patterns using the typical capacities for each roadway within and outside the evacuation area for roadways otherwise identified for road closures by the advisory group. The scenarios represent conditions without implementation of any evacuation strategies, such as manual traffic control or contraflow lanes, which could increase roadway capacity in one direction versus the other. The roadways identified for roadway closures for each of the scenarios include:

- **Wildfire Scenario #1:** Bass Lake Road is assumed to be restricted to outbound/evacuating traffic only, with no access allowed for inbound traffic.
- **Wildfire Scenario #2:** It is assumed that residential streets in the communities north of the Project site will be closed to incoming traffic and will only remain open for evacuating vehicles.

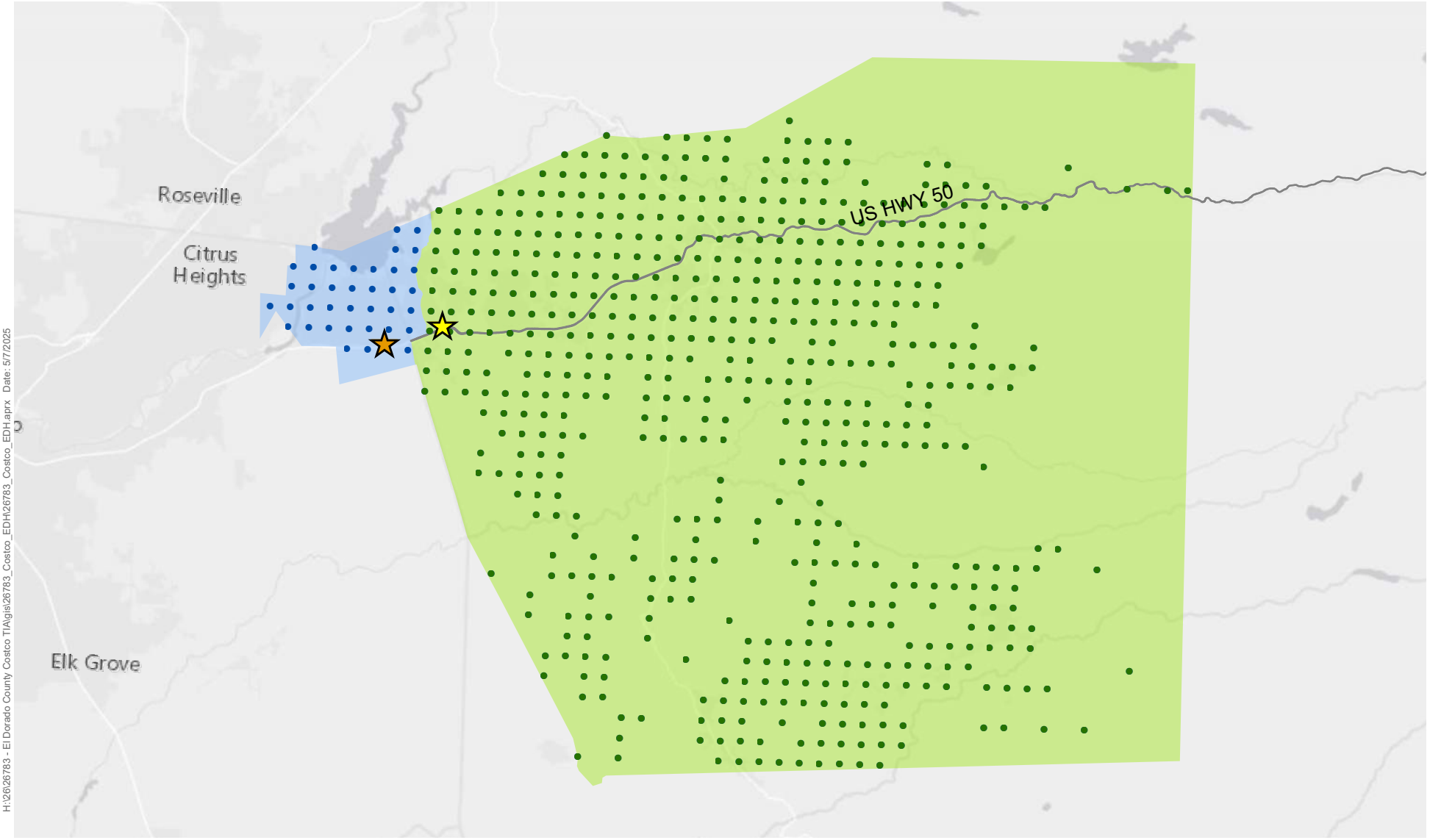


Figure 6

Future Market Areas
El Dorado Hills Costco

KITTELSON & ASSOCIATES

EVACUATION DESTINATION AND ROUTE CHOICE

Based on the conversations with the advisory group, Kittelson modeled evacuating vehicles to use US 50 to evacuate towards Folsom to the west or Placerville to the east.

The number of trips to each evacuation destination was assigned based on the location and direction of the evacuation based on the trip distribution described above. These destinations were selected for each of the evacuation scenarios with a goal of identifying evacuation travel patterns and congestion in the evacuation area and in the region.

EVACUATION ASSIGNMENT

During an evacuation event, residents and employees will receive one of three evacuation assignment orders:

- **No Action** – residents and employees do not need to evacuate or prepare for an evacuation.
- **Evacuation Warning** – residents and employees in a specific evacuation zone are ordered to prepare for an evacuation but do not need to evacuate immediately.
- **Evacuation Order** – residents and employees in a specific evacuation zone are ordered to evacuate immediately.

The peak hour for evacuation, when most vehicles evacuate, is defined differently depending on the wildfire scenario. For both wildfire scenarios, the peak hour is assumed to be the first hour of the evacuation.

The percentage of residents and employees evacuating is considered in two separate groups.

- **Costco Members and Employees:** To account for the worst-case scenario, it is assumed that all Costco members and employees will receive an evacuation order and evacuate during the peak hour in both wildfire scenarios.
- **Residents and Employees Outside the Project Site**: When an area is assigned an evacuation order or warning, it is assumed that 90 percent of residents and employees will evacuate over the duration of an evacuation and approximately 10 percent will remain behind. The estimated factors are based on survey results from people impacted by prior fires in California in UC Berkeley's Review of California Wildfire Evacuations from 2017 to 2019.[2] Based on Kittelson's conversations with the advisory group, it is assumed that evacuation will occur in phases, with different portions of the evacuation area receiving either an evacuation order or an evacuation warning.
    - Areas under an evacuation order are expected to have 65 percent of vehicles evacuating during the peak hour.
    - Areas under an evacuation warning are expected to have 25 percent of vehicles evacuating during the peak hour.

[2] *Wong, S., Broader, J. and Shaheen, P., 2022. Review of California Wildfire Evacuations from 2017 to 2019. [online] Escholarship.org. Available at:* <https://escholarship.org/uc/item/5w85z07g>

Evacuation Results

The El Dorado County travel demand model was used to estimate travel times and volume-to-capacity (V/C) ratios for each analysis scenario to understand how the Project would impact residents, employees, and Costco members in the evacuation area for each wildfire scenario. The following sections present the congestion locations and comparison of travel times for baseline conditions (no evacuation), existing conditions, and near-term (2034) conditions in No Project and Plus Project conditions for the two wildfire scenarios. The analysis is run assuming no manual traffic control is in place during the evacuation.

The congestion on a roadway segment is determined based on the V/C ratio of the segment derived from the El Dorado County travel demand model. Congestion locations are classified as shown in Table 2.

Table 2. Congestion Classification based on Volume-to-Capacity (V/C) ratio

Volume-to-Capacity (V/C) ratio	Congestion Classification
≤ 0.9	Under Capacity
0.9 to 1.0	Near Capacity
≥ 1.0	Over Capacity

Wildfire Scenario #1

This section presents the congestion location and travel times analysis under wildfire scenario #1 for all the analysis scenarios. The origin and destination location are identified based on the evacuation area boundaries identified for this wildfire scenario and likely evacuation destinations in the City of Folsom and City of Placerville. However, evacuation destinations are subject to change during an actual evacuation event based on direction from the Office of Emergency Services or evacuating persons' personal preferences.

EXISTING CONDITIONS

Figure 7 and Figure 8 show the congestion locations during wildfire scenario #1 for Existing Conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Existing Conditions No Project and Plus Project scenarios.

No Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

Plus Project

- Eastbound US 50 toward Placerville including sections adjacent to the evacuation area.
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

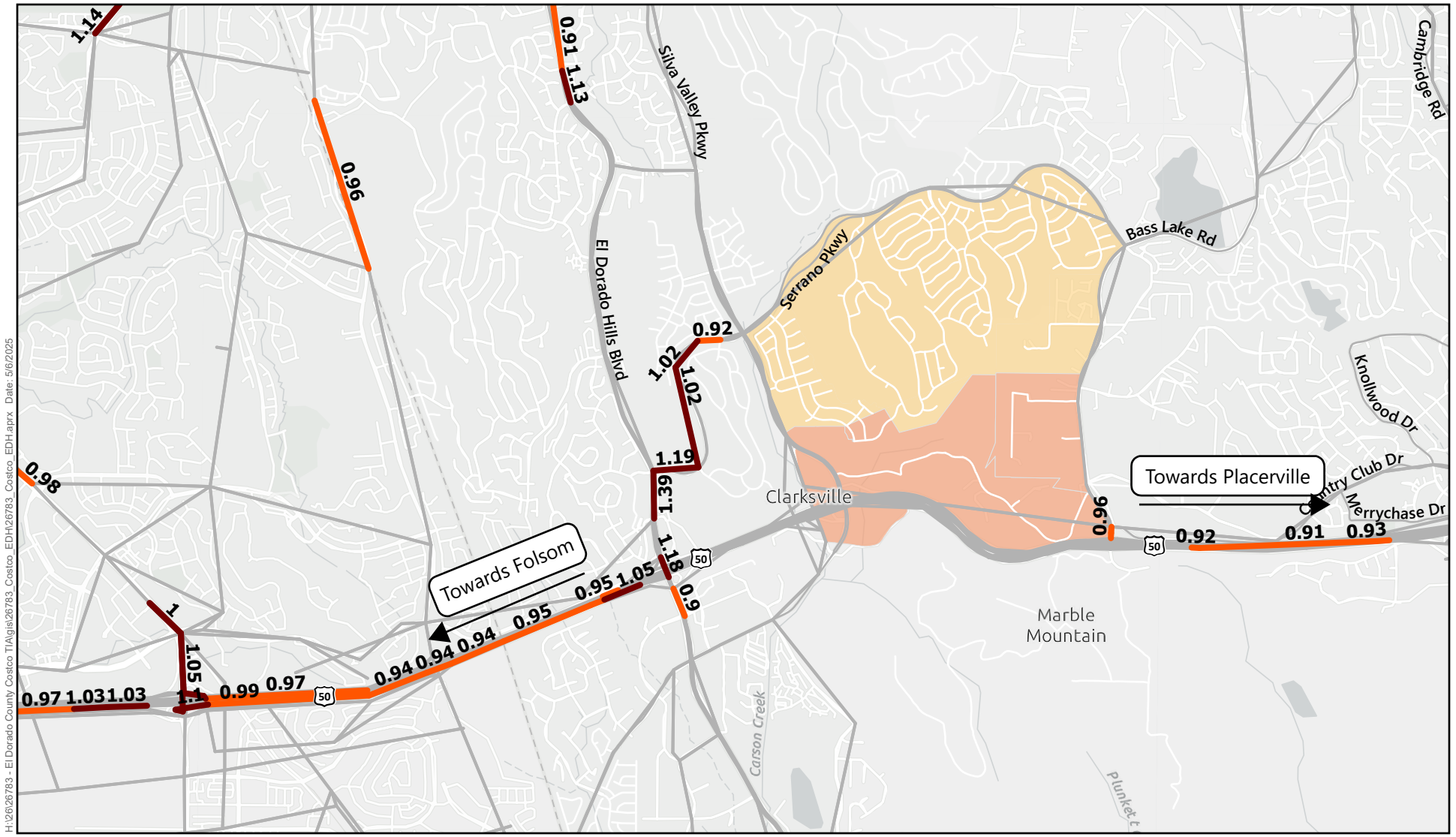
With the addition of Project traffic, volume-to-capacity ratio increases along US 50 towards Folsom and Placerville. Roadway capacity along Serrano Parkway between Silva Valley Parkway and El Dorado Hills operates over capacity under the No Project and Plus Project scenarios, though the volume-to-capacity ratio changes with the addition of Project traffic are minimal.

Table 3 shows the travel times (in minutes) during wildfire scenario #1 for existing conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the increase in travel time with Project traffic varies between 0.1 to 1.0 minutes (0-5% increase).

Table 3. Travel Time (minutes), Wildfire Scenario #1 - Existing Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
S. of Serrano Pkwy.	Folsom	9.5	10.1	10.2	0.1	1%
	Placerville	22.9	23.8	24.7	0.9	4%
W. of Bass Lake Rd.	Folsom	8.0	8.3	8.3	0.0	0%
	Placerville	19.0	19.8	20.6	0.8	4%
Old White Rock Rd.	Folsom	5.4	5.7	5.8	0.1	2%
	Placerville	19.6	20.3	21.1	0.8	4%
Village Green Dr.	Folsom	5.8	6.2	6.4	0.2	3%
	Placerville	20.6	21.3	22.3	1.0	5%
Costco	Folsom	4.6	5.0	5.2	0.2	4%
	Placerville	19.4	20.1	21.0	0.9	4%

Compiled by: Kittelson & Associates, Inc., 2025



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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

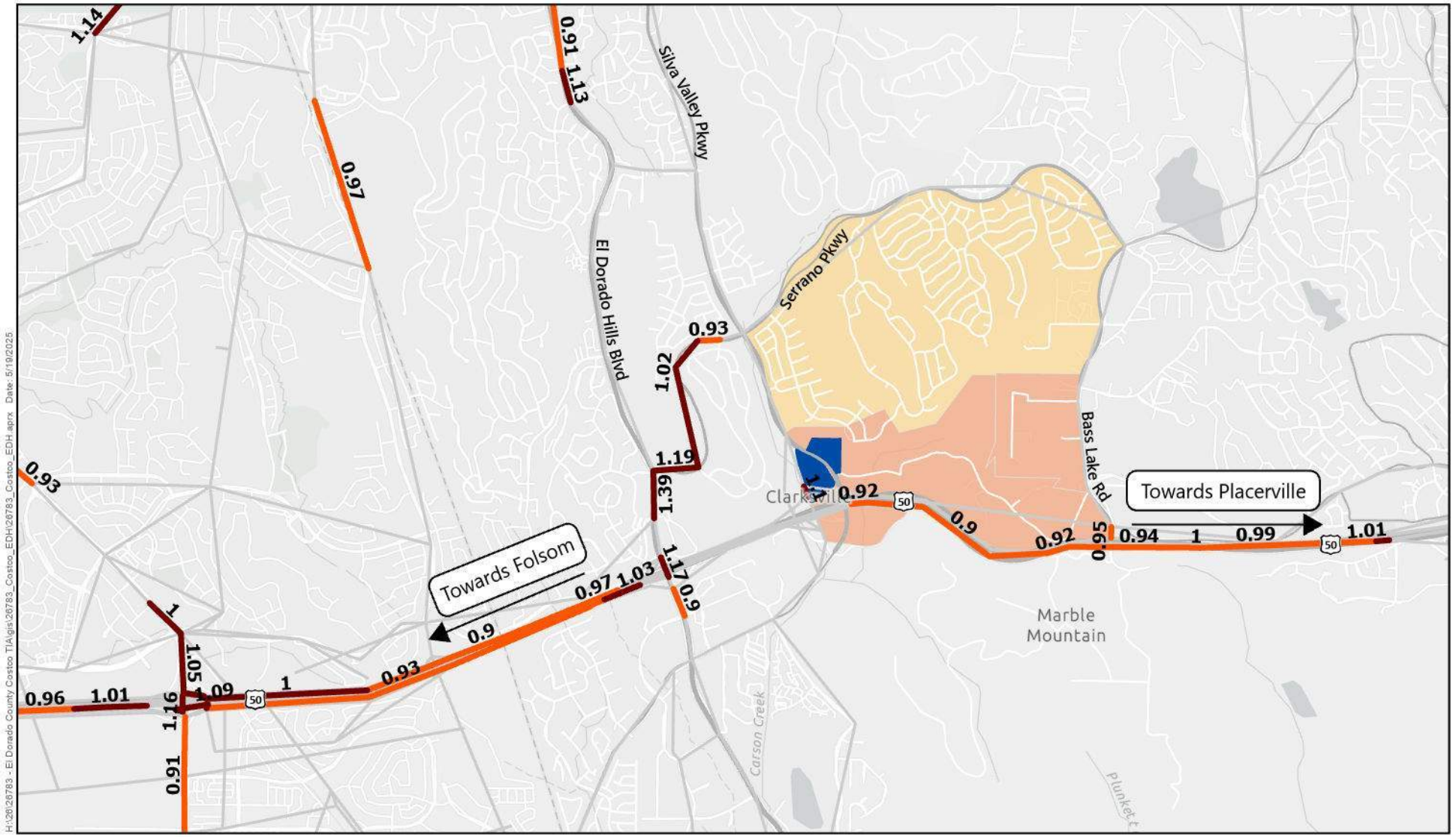
**Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.*

0 1 Miles

KITTELSON & ASSOCIATES

Figure 7

Congestion Locations
Wildfire Scenario #1
Existing Conditions - No Project
El Dorado Costco



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders

KITTELSON & ASSOCIATES

Figure 8

Congestion Locations
Wildfire Scenario #1
Existing Conditions - Plus Project
El Dorado Costco

NEAR-TERM (2034) CONDITIONS

Figure 9 and Figure 10 show the congestion locations during wildfire scenario #1 for Near Term (2034) Conditions under Evacuation No Project and Evacuation Plus Project scenarios. In the No Project and Plus Project scenarios, roadways operating near or over capacity are as follows:

No Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway connecting evacuation area to Bass Lake Road
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

Plus Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway connecting evacuation area to Bass Lake Road
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

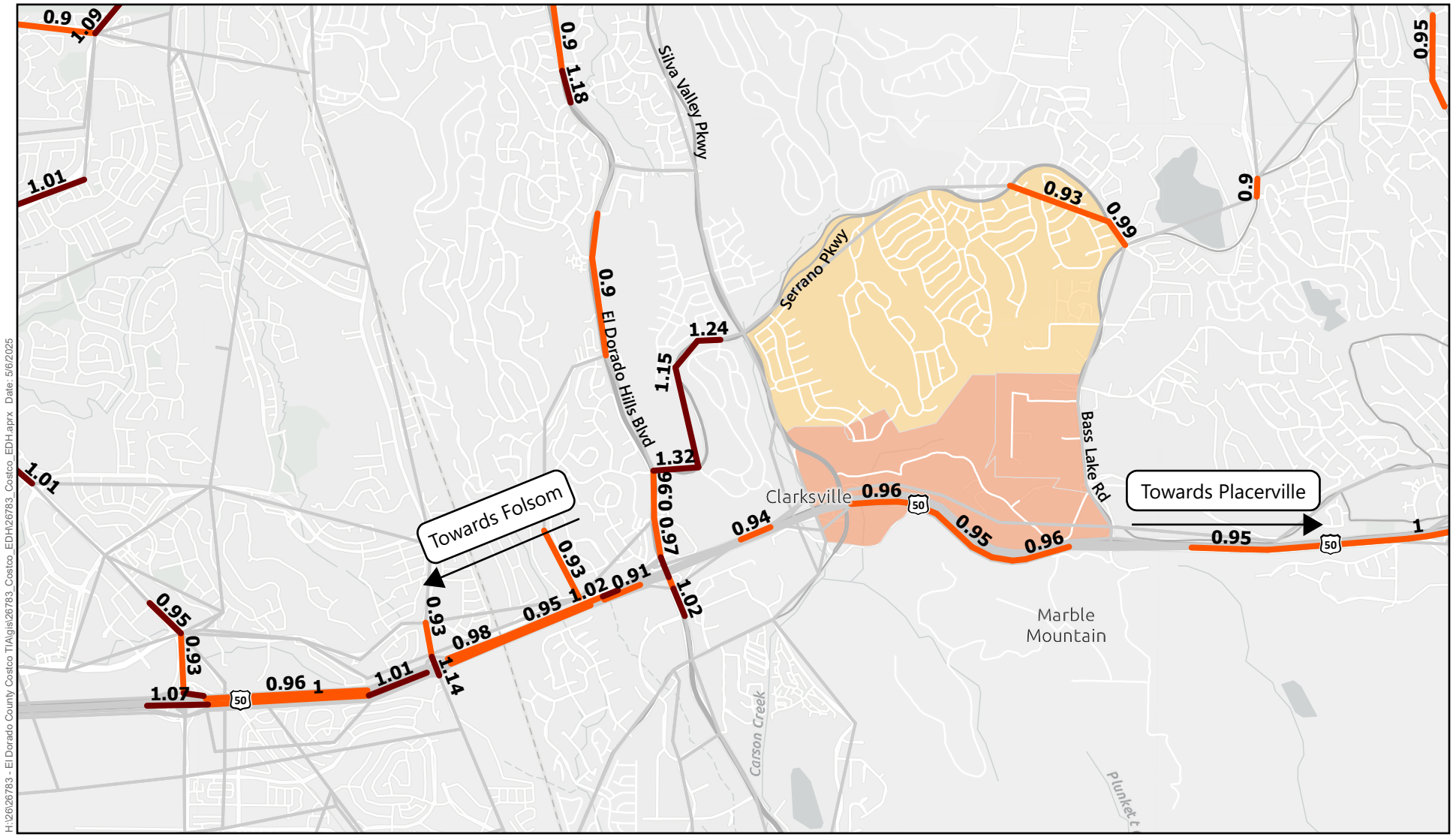
With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project Site, and along Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard.

Table 4 shows the travel times (in minutes) during wildfire scenario #1 for Existing Conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the increase in travel time with Project traffic varies between 0.1 to 0.8 minutes (1-4% increase) with the addition of the Project.

Table 4. Travel Times (minutes), Wildfire Scenario #1 - Near Term (2034) Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
S. of Serrano Pkwy.	Folsom	8.6	9.4	9.6	0.2	2%
	Placerville	22.2	22.9	23.4	0.5	2%
W. of Bass Lake Rd.	Folsom	8.3	9.0	9.1	0.1	1%
	Placerville	18.5	18.8	19.4	0.6	3%
Old White Rock Rd.	Folsom	5.3	5.9	6.0	0.1	2%
	Placerville	18.9	19.0	19.7	0.7	4%
Village Green Dr.	Folsom	4.9	5.5	5.7	0.2	4%
	Placerville	19.0	19.2	20.0	0.8	4%
Costco	Folsom	4.5	5.2	5.3	0.1	2%
	Placerville	18.7	18.9	19.6	0.7	4%

Compiled by: Kittelson & Associates, Inc., 2025



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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

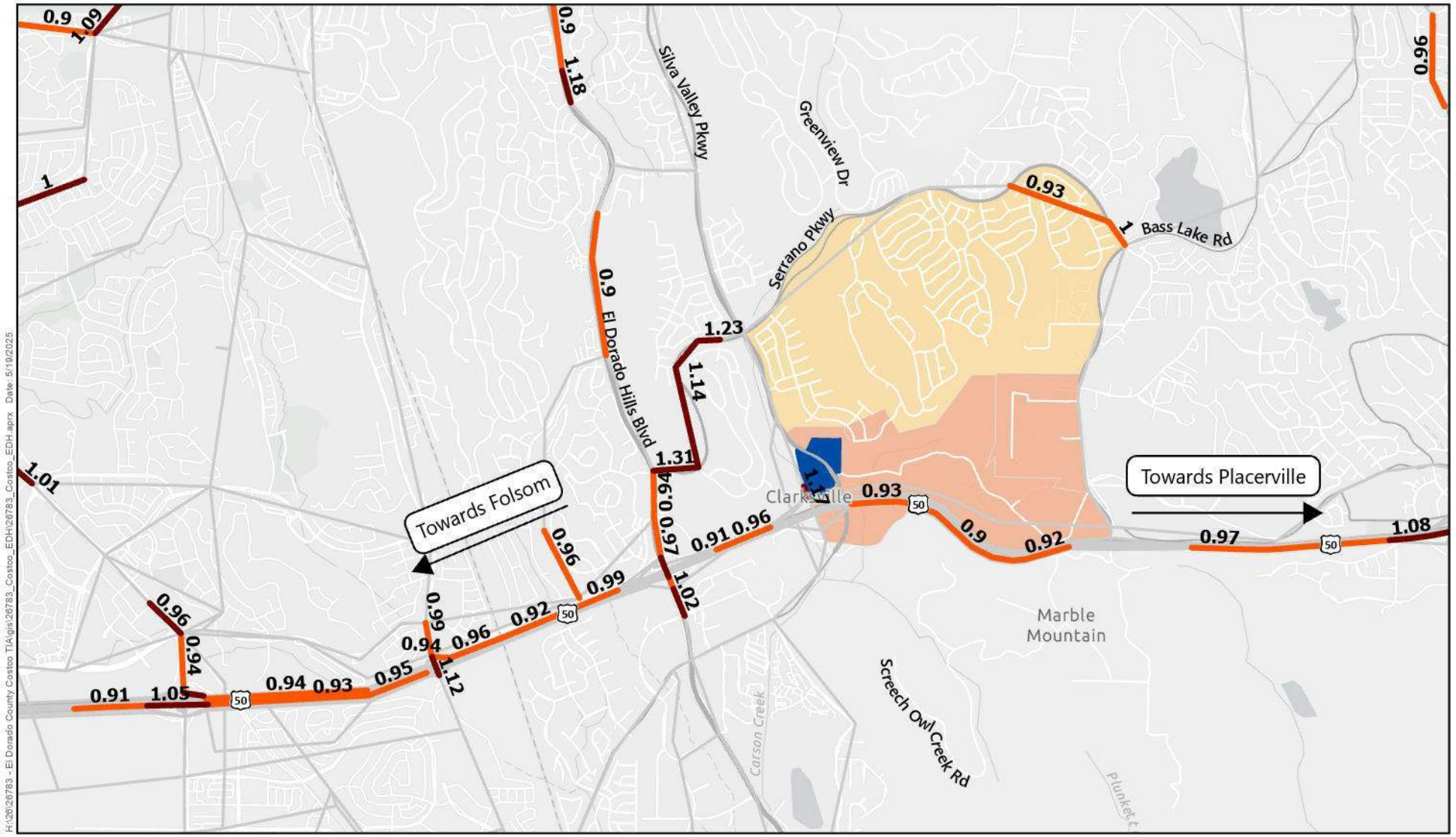
*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.

0 1 Miles

Figure 9

Congestion Locations
Wildfire Scenario #1
Near Term (2034) Conditions - No Project
El Dorado Costco

KITTELSON & ASSOCIATES



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.

Figure 10

Congestion Locations
Wildfire Scenario #1
Near Term (2034) Conditions - Plus Project
El Dorado Costco

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Wildfire Scenario #2

This section presents the travel times and congestion analysis under wildfire scenario #2 for all the analysis scenarios. The origin and destination locations are identified based on the evacuation area boundaries identified for this wildfire scenario and likely evacuation destinations in Folsom and Placerville. However, evacuation destinations are subject to change during an actual evacuation event based on direction from the Office of Emergency Services or evacuating persons' personal preferences.

EXISTING CONDITIONS

Figure 11 and Figure 12 show the congestion locations during the wildfire scenario #2 for Existing Conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Existing No Project and Plus Project scenarios.

No Project

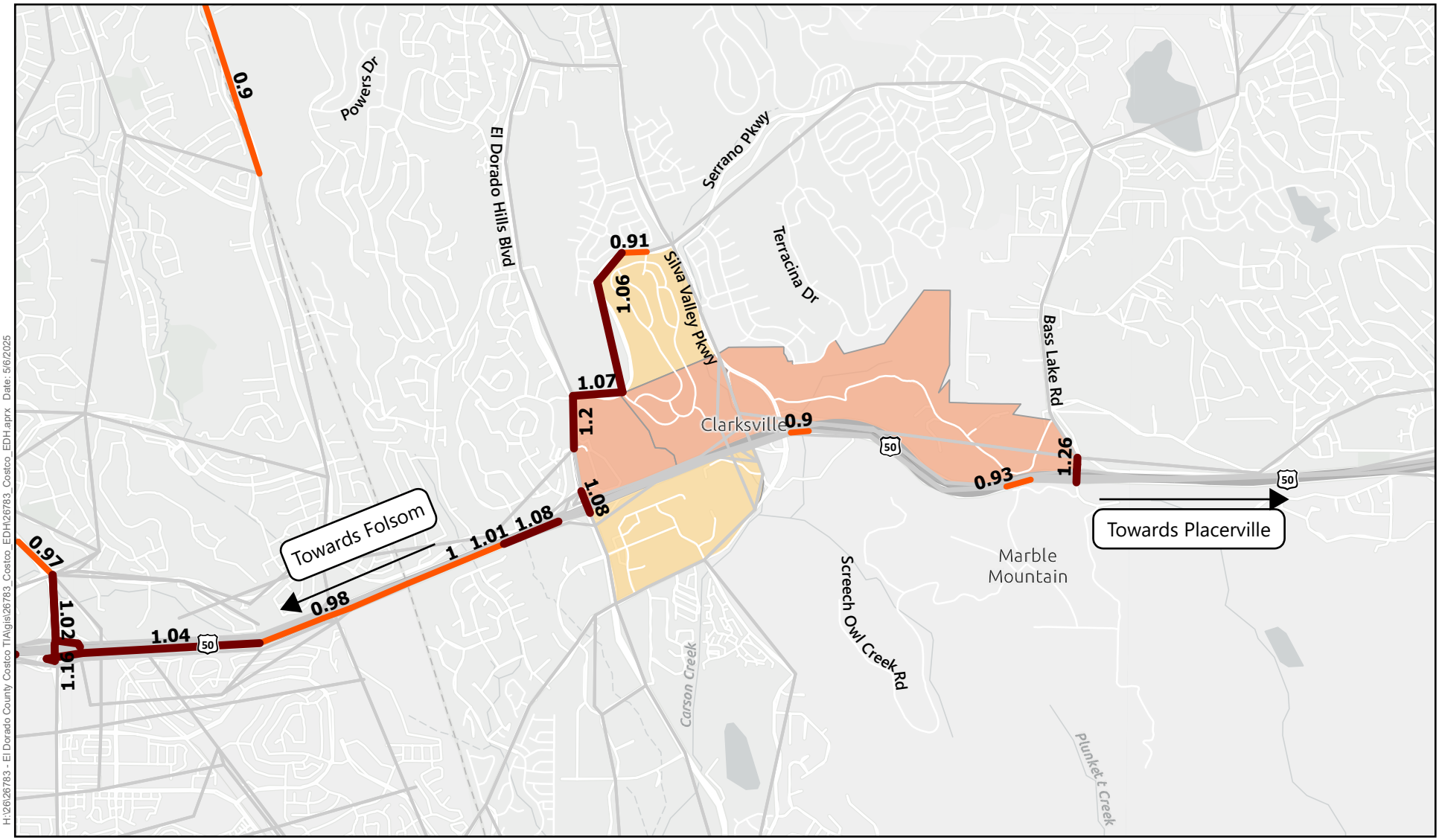
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50
- Eastbound US 50 between Folsom and El Dorado Hills

Plus Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50
- A few sections of Eastbound US 50 between Folsom and Placerville including those adjacent to the Project site.

With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project site. Roadway capacity on Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard operates over capacity in the No Project and Plus Project scenarios, though the volume-to-capacity ratio changes with the addition of the Project are minimal.

Table 5 shows the travel times (in minutes) during wildfire scenario #2 for Existing Conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table, the increase in travel time with Project traffic varies between 0 to 1.2 minutes (0-6% increase).



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

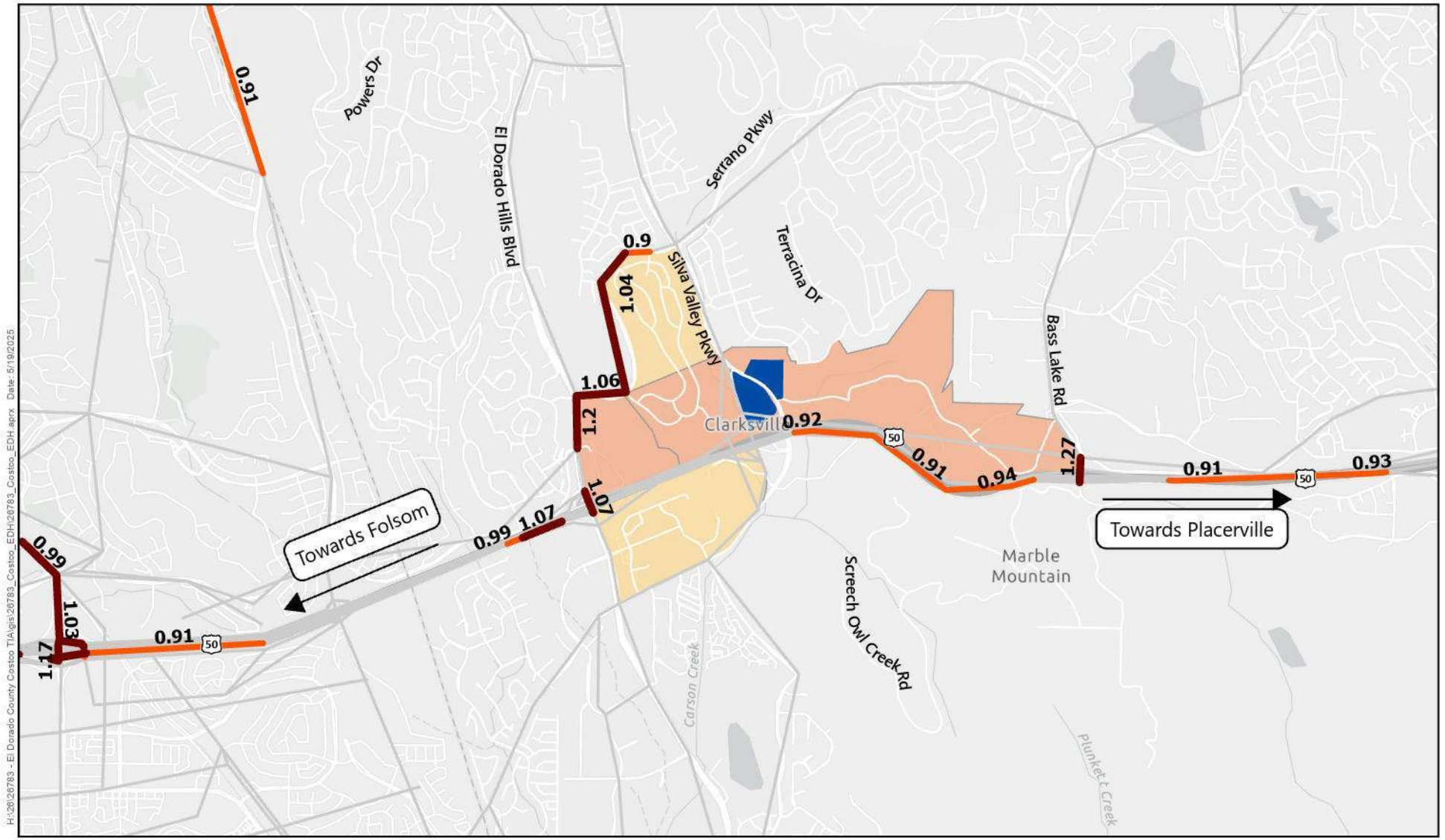
**Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders*

0 1 Miles

Figure 11

Congestion Locations
Wildfire Scenario #2
Existing Conditions - No Project
El Dorado Costco

KITTELSON & ASSOCIATES



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

**Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders*

El Dorado Costco Project Site

0 1 Miles

KITTELSON & ASSOCIATES

Figure 12

Congestion Locations
Wildfire Scenario #2
Existing Conditions - Plus Project
El Dorado Costco

Table 5. Travel Times (minutes), Wildfire Scenario #2, - Travel Times (minutes) - Existing Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
Souza Dr.	Folsom	5.6	5.7	5.8	0.1	2%
	Placerville	21.6	21.8	23.0	1.2	6%
Town Center	Folsom	4.4	4.5	4.6	0.1	2%
	Placerville	20.5	20.7	21.8	1.1	6%
Raley's	Folsom	3.8	3.9	3.9	0.0	0%
	Placerville	20.5	20.7	21.8	1.1	5%
Costco	Folsom	4.6	4.7	4.8	0.1	2%
	Placerville	19.4	19.6	20.8	1.2	6%

Compiled by: Kittelson & Associates, Inc, 2025

NEAR-TERM (2034) CONDITIONS

Figure 13 and Figure 14 show the congestion locations during the wildfire scenario #2 for Near Term conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Near-Term No Project and Plus Project scenarios.

No Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- Eastbound US 50 between El Dorado Hills and Placerville
- Eastbound and Westbound US 50 between El Dorado Hills and Folsom

Plus Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- Eastbound US 50 between El Dorado Hills and Placerville
- Eastbound US 50 and some sections of westbound US 50 between El Dorado Hills and Folsom

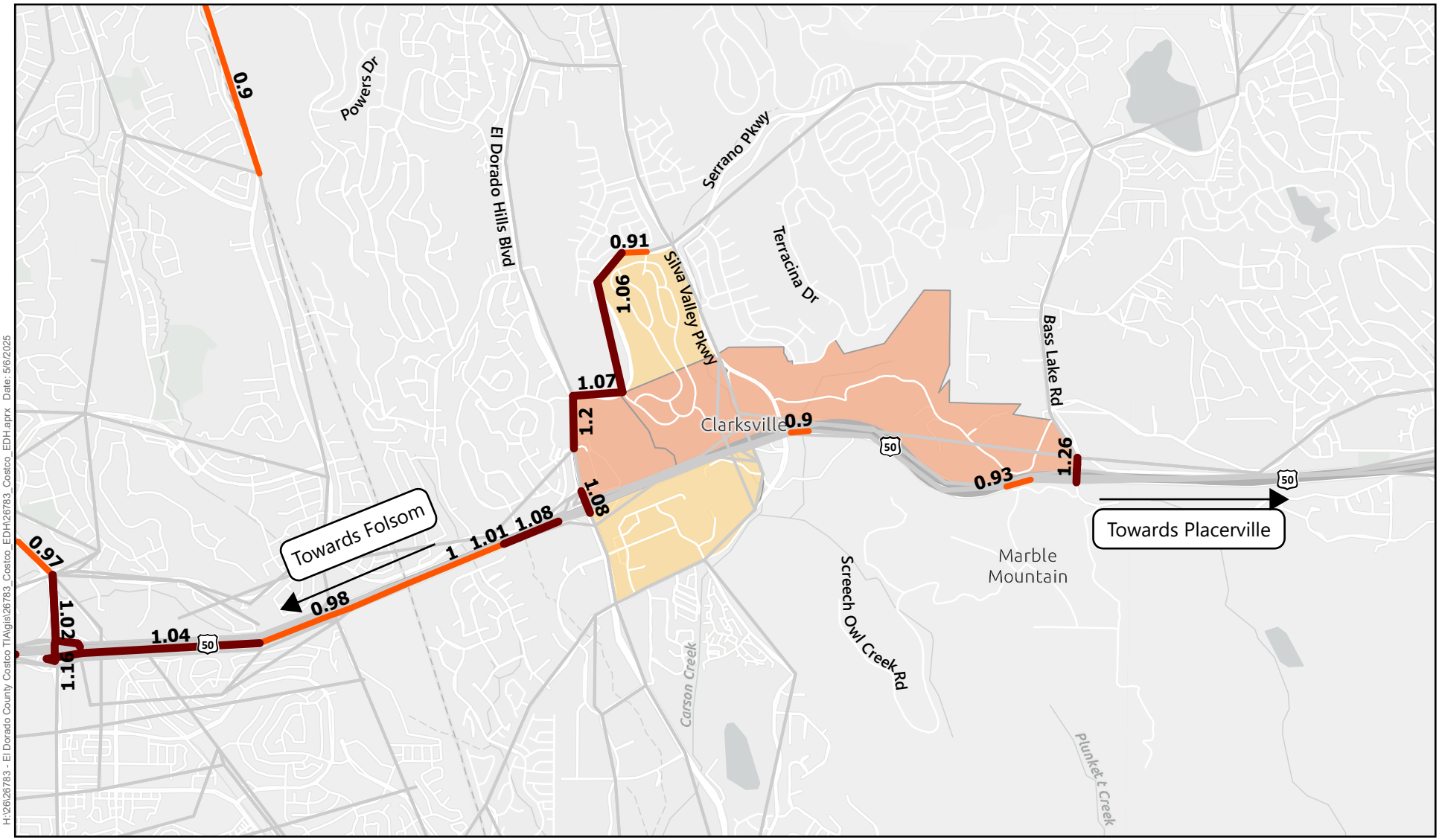
With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project site and Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard.

Table 6 shows the travel times (in minutes) during wildfire scenario #2 for Near Term (2034) conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the change in travel time with Project traffic varies between 0 to 0.6 minutes (0-3% increase).

Table 6. Travel Times (minutes), Wildfire Scenario #2 – Near Term (2034) Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
Souza Dr.	Folsom	5.9	6.0	6.1	0.1	2%
	Placerville	20.1	20.1	20.7	0.6	3%
Town Center	Folsom	4.7	4.8	4.8	0.0	0%
	Placerville	19.9	19.9	20.3	0.4	2%
Raley's	Folsom	4.1	4.2	4.2	0.0	0%
	Placerville	19.9	20.0	20.3	0.3	2%
Costco	Folsom	4.5	4.6	4.7	0.1	2%
	Placerville	18.7	18.7	19.3	0.6	3%

Compiled by: Kittelson & Associates, Inc., 2025



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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

**Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders*

0 1 Miles

Figure 13

Congestion Locations
Wildfire Scenario #2
Near Term (2034) Conditions - No Project
El Dorado Costco

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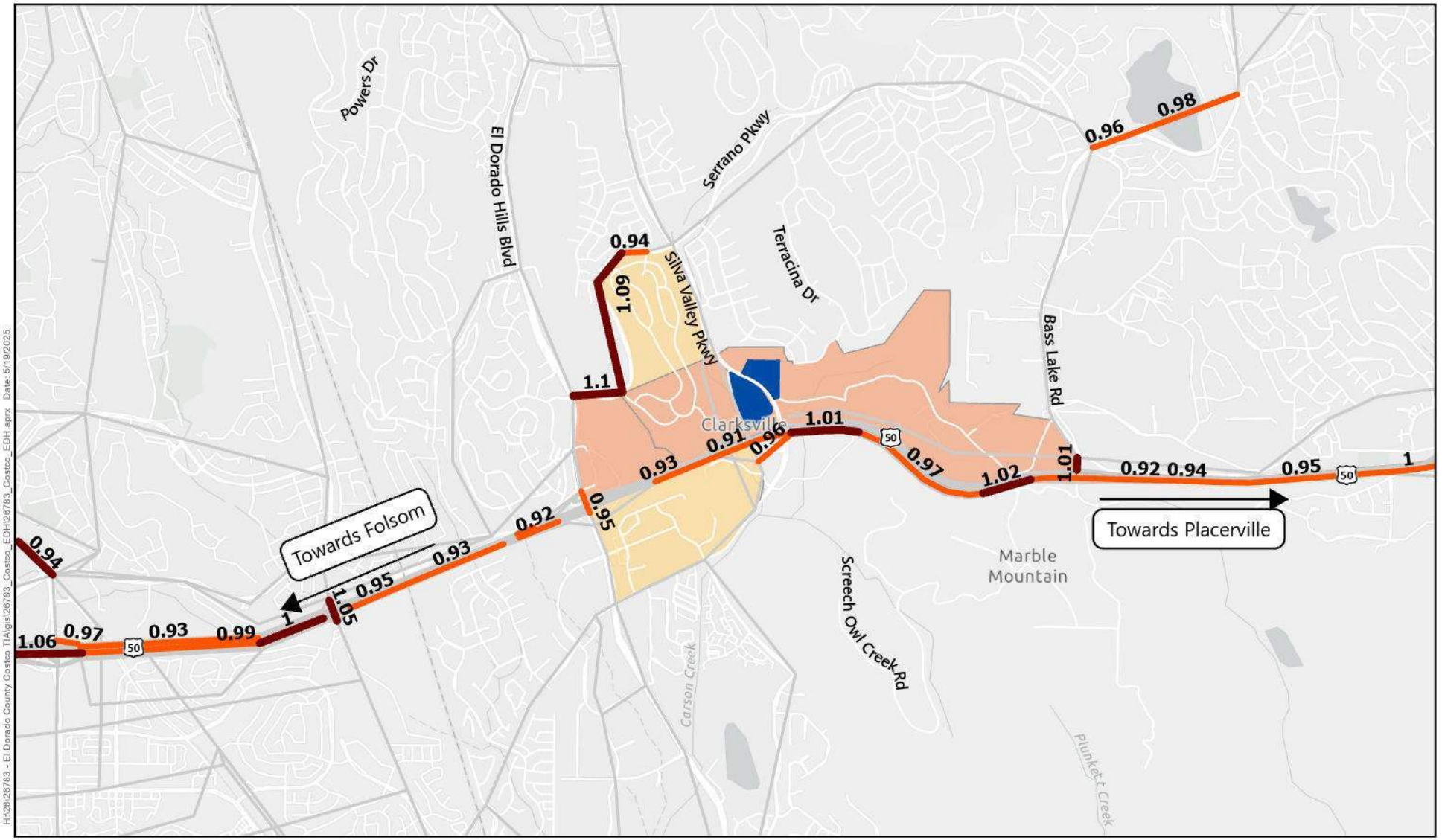

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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

El Dorado Costco Project Site

*Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders

0 1 Miles

KITTELSON & ASSOCIATES

Figure 14

Congestion Locations
Wildfire Scenario #2
Near Term (2034) Conditions - Plus Project
El Dorado Costco

Evacuation Planning Considerations

This section describes evacuation projects and strategies that may be considered to improve the capacity and resilience of the evacuation area and surrounding region's roadway network to support future evacuation events. The projects and strategies were identified based on previous congestion and evacuation studies, review of recent evacuation efforts, and effective evacuation planning practices identified by US Department of Transportation (USDOT) and Federal Highway Administration (FHWA). The strategies are organized into five categories:

1. Roadway Management
2. Communications
3. Vulnerable Populations
4. Public Education
5. Resource Management

ROADWAY MANAGEMENT

This section includes infrastructure-related strategies that may aid in improving the capacity of the evacuation roadway network, which can present constraints or limitations to a successful evacuation. For each infrastructure-related treatment, it is necessary to consider downstream capacity limitations and identify if those limits nullify the potential benefits of the treatment as well as other competing roadway design needs to serve other functions and goals. Table 7 outlines each of these strategies and provides a brief description of the strategy and desired outcomes.

Of these strategies, the most effective for increasing evacuation capacity would be those that involve manual control of traffic combined with contra flow operations that allow evacuation on both inbound and outbound lanes of streets, combined with maintaining clear passages for emergency vehicles.

Table 7: Roadway and Intersection Capacity and Resilience Related Strategies

Strategy	Action Items
Limited contra flow on highways	Reverse one or more lanes of highway to accommodate an increased flow of traffic in one direction.
Unlimited contra flow on highways	Redirect all lanes of a designated evacuation route to accommodate rapid evacuation from a city or region.
Limited/unlimited contra flow on unlimited access arterials	Temporarily close inbound travel lanes on selected unlimited access arterials (such as parkways and boulevards) to allow outbound traffic to utilize these lanes during evacuation.
Closure of inbound lanes on selected roads and highways	Close inbound lanes on highways utilized for evacuation routes to prevent drivers on these routes from entering the evacuation area while evacuation is underway.
Restrict left-turn movements	Minimize left-turn movements along evacuation routes and on roads leading to evacuation routes.

Strategy	Action Items
Stage tow trucks	Consider how to stage tow trucks at bottleneck locations along evacuation routes to help detect and clear minor crashes and maintain traffic flows.
Adjust signal timing	Increase the green time and/or progression band for through movements leading out of an evacuation zone.
Signal operation during power outage	Install signal battery backups in case signal operations need to be maintained during a power outage. Consider using channeling devices, static signs, and coning strategies to manage intersection flow during power outage if signals lack power.
Additional access routes	Identify and communicate with communities that have at least two access points. Prioritize adding additional access to communities that are currently served by only one or two access points.
Public transit	Develop transportation solutions such as the use of a bus system for evacuating individuals with special needs (such as those with mobility limitations) and/or evacuating larger groups of people in fewer vehicles.
Traffic control points	Establish traffic control points (i.e., locations along designated evacuation routes with emergency management personnel) to maintain a greater degree of evacuation management. These locations could enhance the efficiency of an evacuation, reduce public confusion, and allow increased operational flexibility during an evacuation.
Vegetation clearing/management	Maintain evacuation roadways and shoulders, keeping them clear of trees, vegetation, and debris that would block travel lanes and shoulders for people evacuating and for emergency operation vehicles.

COMMUNICATIONS

This section describes communication strategies that address how information may be shared among agencies, organizations, and the general public for evacuations. During an emergency evacuation event, two types of communication take place: (1) communication among entities involved in the management of response, and (2) communication between the County and the general public. Table 8 outlines each of these strategies and provides a brief description of the strategy and desired outcomes.

Table 8. Communication Strategies for Evacuations

Strategy	Description and Outcome
Establish and maintain communications	Strengthen and maintain communication among coordinating emergency event agencies. This could be achieved through systems such as the Public Information Emergency System and Emergency Satellite Communications.

Strategy	Description and Outcome
Variable/Dynamic Message Signage	Use variable message board equipment and targeted installation of permanent dynamic message signs on evacuation routes to improve communication and reduce public confusion.
Traffic Control Center	Implement a traffic control center that would have up-to-the-minute reports on traffic patterns and could communicate directly with emergency officers via broadcast media, social media, and other emergency communications channels (e.g., County Telephone Emergency Notification System) to let drivers know about roadway congestion conditions and direct them to alternate routes.
Traffic counters/CCTV cameras	Install traffic counters and/or CCTV cameras on freeways, which can help assess traffic flow, volume of vehicles evacuating, and monitor incidents during emergency evacuation events.
Highway Advisory Radio	Implement highway advisory radio to provide information regarding primary and secondary evacuation routes and incidents to the public.
Pre-defined evacuation zones	The County could consider implementing a system of pre-defined evacuation zones. Pre-defined evacuation zones can provide a common reference system for first responders and the community.

VULNERABLE POPULATIONS

This section identifies strategies specifically for evacuation of vulnerable populations. The County can use demographic data and U.S. Census data to identify vulnerable population locations and communities. County staff and emergency response teams may work with specialized organizations such as hospitals, medical associations, public service organizations, public health staff, and other providers or community groups to identify and locate relevant population segments and the types of assistance needed. Table 9 outlines considerations by need.

Table 9: Additional Steps for Evacuation of Vulnerable Populations

Special Need	Action Items/Considerations
Visually impaired	May be reluctant to leave familiar surroundings when the request for evacuation comes from a stranger. People who are blind or partially sighted may have to depend on their guide dogs and/or others to lead them to safety.
Hearing impaired	May need to make special arrangements to receive evacuation warnings. Include visual aids such as pictures or maps to reinforce key messages.

Special Need	Action Items/Considerations
Mobility impaired	May need special assistance such as paratransit. Partner with neighboring jurisdictions and/or private/non-profit organizations to provide adequate paratransit services.
People without vehicles	Emphasize the importance of carpooling with neighbors or other community members. Provide information on transit routes and transit stops.
Non-English-speaking persons	Provide bilingual or multilingual materials to support communication with non-English speaking populations during evacuation.
People with medical conditions	Communicate in advance the location and availability of hospitals or facilities with emergency/life-sustaining medical equipment, such as dialysis machines.
Unhoused population	Arrange for food, shelter, and transportation for unhoused population. Offer age-appropriate emergency and evacuation information to unhoused children.

PUBLIC EDUCATION

Sharing information is a critical element to help educate the general public on how to prepare in advance for an evacuation. The public education strategies the County may consider include:

- Defining the meaning of different types of evacuation orders
- Sharing how evacuation orders are declared and communicated to the public
- Providing information on preparations to carry out in advance (such as emergency "go" kits or family evacuation plans)
- Conducting a public affair campaign(s) to distribute easy-to-read evacuation maps with alternate routes
- Providing information on available transportation options, including for vulnerable populations
- Providing information on evacuation shelters and support services offered during evacuation
- Providing regular emergency preparedness trainings in multiple languages at convenient, accessible locations
- Building capacity of resilience hubs, community-based organizations, and other community groups to support community-based disaster preparedness efforts through direct or passthrough funding, grant writing support, information sharing, etc.

RESOURCE MANAGEMENT

Evacuations are resource-intensive events that require significant personnel, facilities, and equipment to implement successfully. The County should determine what resources are available as well as what resources will be needed for staff to perform their responsibilities during an evacuation successfully, which may include the following:

- Clarity on staff roles and expertise available
- Facilities available (e.g., traffic operations center, shelters, etc.)

- Available information systems to support the evacuation (e.g., intelligent transportation systems, computer networks, road sensor loops, ancillary hardware such as cameras, etc.)
- Communication systems (e.g., landline, mobile phones, radio system, email, sirens)
- Vehicles/transports (e.g., staff transport, tow trucks, transit vehicles, heavy equipment)
- Miscellaneous materials to support implementation of evacuation strategies (e.g., traffic cones, channeling devices, static/dynamic message signs)

If critical resource gaps are identified, the County may look to work with other evacuation entities to determine additional resources and needs. The County may also work with private sector entities to expand the resource base. For example, utilities companies may keep cell and internet services running in vulnerable communities during public safety power shutoffs. Private service companies such as ambulance operators and towing companies can provide additional assets during evacuation. These companies can clarify what is expected of them during a potential evacuation event to ensure their services are available, when needed.

Conclusion

This memorandum documents the methodology and results of the evacuation analysis for two wildfire scenarios under Existing and Near-Term Conditions: No Project and Plus Project scenarios. The El Dorado County travel demand model was used to estimate roadway capacity and travel times during evacuations in No Project and Plus Project conditions.

EXISTING CONDITIONS

Under Existing conditions, roadway capacity is estimated to increase along US-50 in the westbound and eastbound directions. Though the roadway capacity is estimated to increase, overall roadway capacity is expected to remain under full capacity (v/c < 1.0).

Roadways near the project site, such as Silva Valley Parkway and Serrano Parkway, are estimated to see an increase in roadway capacity as residents, customers, and employees evacuate. The change in roadway capacity is estimated to be minimal.

NEAR-TERM (2034) CONDITIONS

Under Near-Term (2034) conditions, which include land uses and traffic for the Remainder Area, roadway capacity is estimated to increase along US-50 in the westbound and eastbound directions. Overall roadway capacity is expected to remain under full capacity (v/c < 1.0) for most of US-50 near the project site, but some segments are estimated to have a roadway capacity over capacity (v/c > 1.0).

Roadways adjacent to the project site, such as Silva Valley Parkway and Serrano Parkway, are estimated to see an increase in roadway capacity as residents, customers, and employees evacuate. The change in roadway capacity is estimated to be minimal.

The evacuation planning considerations and strategies identified in this memorandum can help enhance the capacity and resilience of the County's roadway network to support future evacuation events.

Wildfire Modeling Summary Report

El Dorado Hills 52 North and Costco South

MARCH 2025

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APPENDIX

1 Introduction

This report summarizes fire behavior modeling efforts conducted for the El Dorado Hills 52 North and Costco South Project (Project), a proposed commercial development located in El Dorado County, California. Fire progression and fire behavior modeling was conducted for the Project area to evaluate potential fire behavior characteristics and fire spread potential toward the Project site. The following tasks were performed:

- Evaluation of wildfire history, wildfire ignition, and fuels/vegetation mapping data for the Project site and surrounding area.
- A field evaluation of the Project site and surrounding area to better understand fuel (vegetation) conditions and confirm observations made during mapping data review and to refine the fuel model(s) to be used in the wildfire behavior and progression modeling efforts.
- Analysis and processing of local historical weather data to determine appropriate fuel moisture, wind speed, and wind direction inputs for the wildfire behavior and progression modeling runs.
- Creation of a base landscape data set (GIS-based terrain and fuels data) to be used for wildfire behavior and progression modeling efforts.
- Modeling of wildfire behavior (flame length, spread rate, and fireline intensity) and three (3) wildfire progression scenarios to understand the effect of a fire approaching the proposed Project site. Modeling was conducted using FlamMap. A GID-based fire behavior modeling application.
- Preparation of this Wildfire Modeling Summary Report that summarizes our methods, data sources, assumptions, and modeling results.
- Coordination and communication with the California Department of Forestry and Fire Protection (CAL FIRE) and the Project team.

1.1 Location

The Project site is located in El Dorado County, north of US 50 and Tong Road, east of Clarksville Crossing, and is bisected by Silva Valley Parkway. The northern portion of the Project site is approximately 24.83 acres (EDH 52 – North Site) and includes APNs: 122-720-0019, 20, and 21. All the parcels are undeveloped, and 122-720-21 (6.57 of 7.75 acres) is primarily reserved for the future extension of County Club Drive to Silva Valley Parkway, which is not part of the Project. The southern portion of the Project site is approximately 18.42 acres (EDH 52 – South Site) and includes APNs:122-720-018, 02, and 03. A portion of 122-720-003 and a portion of the unused former Tong Road right-of-way between Silva Valley Parkway and Clarksville Crossing are proposed to be utilized for site access. The 1.38-acre portion of 122-720-018 west of Clarksville Crossing on the South Site will not be developed as part of the Project, resulting in a net development site of 20.34 acres.

The modeling analysis area discussed in this report includes the Project site plus the area within 2 miles of the Project site. The Project site and modeling analysis area are presented in Figure 1.

1.2 Project Description

The Project proposes to develop the site as a Costco retail center with the Costco building at the center of the south portion of the site and a fuel facility on the north portion of the site. The maximum building area for the Costco South Site will be approximately 165,000 square feet. Development of this portion of the site includes the main Costco building, site access, and a parking area, including a subterranean parking structure. The fuel facility on the North Site will include a maximum 13,000 square foot open canopy and a 200 square foot controller enclosure. The remainder of the North Site will include Costco employee parking.

1.3 FlamMap Fire Behavior Modeling

The FlamMap software package was used to model potential fire behavior and fire spread in the modeling analysis area. FlamMap utilizes the same fire spread equations built into the BehavePlus software package but allows for a geographical presentation of fire behavior outputs as it applies the calculations to each pixel in an associated geographic information system (GIS) landscape (Finney 2002). The FlamMap software package is a publicly available resource available through the Fire, Fuel, and Smoke Science Program of the U.S. Forest Service. FlamMap is a GIS-based software package that models potential fire behavior and fire spread where weather conditions (wind and fuel moisture) are held constant. FlamMap generates map files of potential fire behavior characteristics (e.g., flame length, spread rate, fireline intensity) and fire progression data (fire growth perimeters, fire flow paths). Model outputs represent fire behavior calculated for each pixel within the analysis area independently and do not calculate fire spread across a landscape. The software requires a minimum of five input variables, including elevation, slope, aspect, fuel model, and canopy cover. Wind and weather data are also critical components to FlamMap modeling efforts. The following section presents a background on fire behavior modeling and this report presents the methods and data sources used in performing the FlamMap fire behavior modeling analysis.

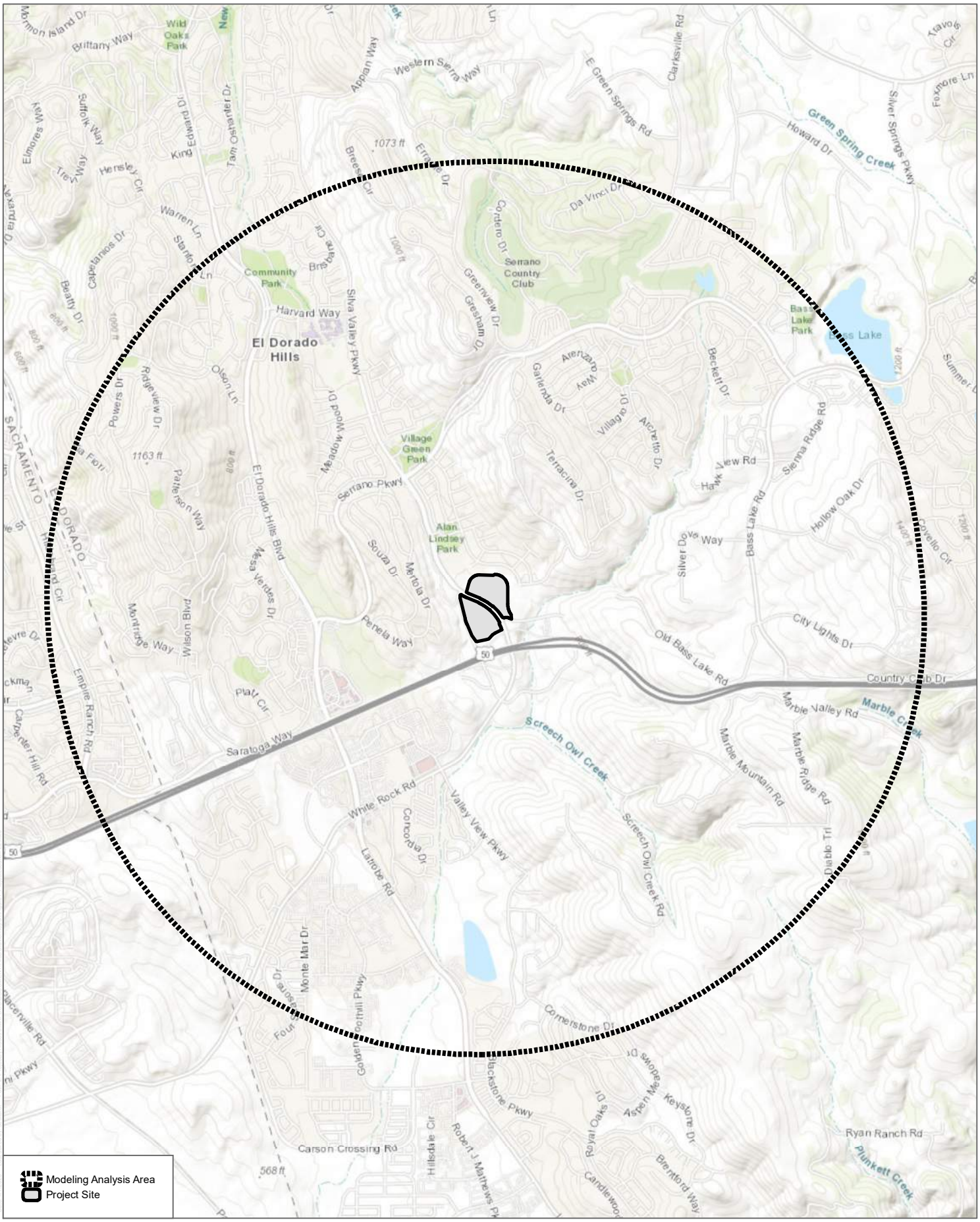
1.4 Fire Behavior Modeling Background

Predicting wildland fire behavior is not an exact science due to the many variables that must be considered. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather, the limits of weather forecasting, and the weather that is often created by firestorms. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire information (Rothermel 1993). To be used effectively, the basic assumptions and limitations of fire behavior modeling applications 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 fuel less than 0.25 inches in diameter. These are the fine fuels that carry fire. Fuels greater than 1 inch in diameter have little effect, while fuels greater than 3 inches in diameter have no effect on fire behavior.
- Second, the model bases surface fire calculations and descriptions on a wildfire spreading through fuels that are within 6 feet of the ground and contiguous to the ground. Surface fuels are classified as grass, grass/shrub, shrub, timber litter, timber understory, or slash.

- Third, the software assumes that weather is uniform. However, because wildfires almost always burn under non-uniform conditions, creating their own weather, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, fire behavior computer modeling systems are not intended for determining sufficient fuel modification zone/defensible space widths. However, results can provide the average length of the flames, which is a key element for determining defensible space distances for minimizing structure ignition.
- Fifth, FlamMap is designed to simulate wildland fire behavior in vegetative fuels (such as grasses, shrubs, and trees), not structures.
- Sixth, FlamMap does not predict ember spotting from non-timber fuel types (e.g., shrubs, grasses).
- Seventh, fire spread modeling does not account for fire suppression efforts and therefore represents a worst-case scenario.

FlamMap can 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. Fuels are made up of the various components of vegetation, both live and dead, that occur in a particular landscape. The type and quantity will depend upon soil, climate, terrain, and management and disturbance (e.g., fire) history. The major fuel groups of grass, grass/shrub, shrub, trees, tree litter, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.



SOURCE: ESRI 2025

FIGURE 1

Project and Modeling Area Location

Wildfire Modeling Summary Report, El Dorado Hills 52 North and Costco South

DUDEK

0 1,625 3,250 Feet

2 Modeling Approach Summary

Three scenarios were evaluated for fire progression modeling, as defined below:

- **Scenario 1:** This scenario represented a fire burning under late summer/early fall north-northwest wind conditions (represented by 97th percentile fire weather conditions). The ignition point for this scenario was located to the northeast of the Project site.
- **Scenario 2:** This scenario represented a fire burning under summer southwest wind conditions (represented by 50th percentile fire weather conditions). The ignition point for this scenario was located to the southwest of the Project site.
- **Scenario 3:** Similar to Scenario 2, this scenario represented a fire burning under summer southwest wind conditions (represented by 50th percentile fire weather conditions). The ignition point for this scenario was located to the southwest of the Project site, though further east than that for Scenario 2.

Additionally, fire behavior modeling was used to evaluate potential fire behavior characteristics in the modeling analysis area. The results of this modeling effort are static outputs representing fire behavior characteristic at a site, given fuel, terrain, and weather inputs. The following fire behavior characteristics were modeled:

- Flame Length
- Spread Rate
- Fireline Intensity

3 Modeling Inputs

3.1 Model Inputs

3.1.1 Elevation

Elevation data were derived from a 1/3 arc-second (10m) resolution National Elevation Dataset (NED), acquired from the U.S. Geological Survey (USGS) National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and projected in the NAD 1983, California State Plane, Zone 2 coordinate system, with units in meters (USGS, 2024a). Elevation values in the modeling area range from 492 feet to 1,460 feet above mean sea level (AMSL). This data was utilized to create an elevation grid file, using units of feet AMSL. Elevation is a required input file for FlamMap runs and are necessary for adiabatic adjustment of temperature and humidity and for conversion of fire spread between horizontal and slope distances.

3.1.2 Slope

Using ArcGIS Spatial Analyst tools, a slope grid file was generated from the elevation grid file described above. Slope measurements utilized values in percent of inclination from horizontal. Slope values in the analysis area range from 0-37 degrees. The slope input file is necessary for computing slope effects on fire spread and solar radiance.

3.1.3 Aspect

Using ArcGIS Spatial Analyst tools, an aspect grid file was generated from the elevation grid file described above. The aspect values utilized were azimuth degrees. Aspect values are important in determining the solar exposure of grid cells.

3.1.4 Fuel Model

Fire Behavior Fuel Models (FBFMs) are standardized classifications used to describe the types of vegetation and other combustible materials that influence wildfire behavior. These models help predict fire spread, intensity, and flame length under various conditions. Fuel model data was created utilizing the 2023 National Land Cover Database (USGS 2024b). This database is a comprehensive dataset that provides detailed land cover and land use information for the United States. It is produced by the United States Geological Survey (USGS) and the Multi-Resolution Land Characteristics Consortium (MRLC) and is used for a wide range of applications in environmental monitoring, land planning, resource management, and research. Land cover data is provided at a 30-meter resolution and classifies landcover into the categories provided in **Exhibit 1**. Fuel model data was further refined to account for roadways and other non-burnable areas not accounted for within the NLCD Land Cover data.

Exhibit: 1: NLCD Land Cover Classifications (USGS 2024b)

This dataset was clipped to the modeling analysis area to derive fuel models in wildlands surrounding the Project site at a 10-meter resolution. A crosswalk was created to assign land cover classifications into unique FBFMs using the Scott and Burgan 2005 40 FBFMs (Scott and Burgan, 2005). Crosswalk values were determined through field observations and through comparison with regional FBFM classification standards as mapped by LANDFIRE. The land cover to FBFM crosswalk is provided in Table 1. As presented, fuels in the analysis area are comprised mainly of developed areas and annual grassland vegetation.

Table 1. Land Cover to Fire Behavior Fuel Model Crosswalk

NLCD Land Cover Classification	Fuel Model Classification	Acres
21-24 Developed 11 Open water	NB1 – Non-burnable/Developed	4,460

Table 1. Land Cover to Fire Behavior Fuel Model Crosswalk

NLCD Land Cover Classification	Fuel Model Classification	Acres
71 Grassland/Herbaceous	GR2 - Low Load, Dry Climate Grass	2,858
52 Shrub/Scrub	SH5 - High Load, Dry Climate Shrub	527
41 Deciduous Forest	TL2 - Low Load Broadleaf Litter	353
42 Evergreen Forest 43 Mixed Forest	TL6 – Moderate Load Broadleaf Litter	146
	Total:	**8,306**

Source: USGS 2024b, LANDFIRE 2023

3.1.5 Canopy Cover

Canopy cover is a required raster file for FlamMap operations. It is necessary for computing shading and wind reduction factors for all fuel models. Canopy cover is measured as the horizontal fraction of the ground that is covered directly overhead by tree canopy. Crown closure refers to the ecological condition of relative tree crown density. Stands can be said to be "closed" to recruitment of canopy trees but still only have 40% or 50% canopy cover. Coverage units are represented as percentage values (0–100).

Canopy cover for the analysis area was derived from NLCD 2023 Canopy Cover Database (MRLC 2023). The 2023 NLCD Canopy Cover dataset quantifies the percentage of forest canopy cover in 10% increments. It provides a spatial representation of canopy cover at a 30-meter resolution ranging from 0% (no canopy) to 100% (complete canopy coverage).

3.1.6 Weather

Historical weather data for the modeling area was utilized in determining appropriate fire behavior modeling inputs. For this analysis, 97th percentile fuel moisture, wind speed, and wind direction values were derived from Remote Automated Weather Station (RAWS) data and utilized in fire behavior and progression modeling efforts. Data from the Ben Bolt RAWS was utilized for modeling fire behavior and progression (approximately 250 feet north of the City-owned Grizzly Peak Open Space parcels). Table 2 summarizes location information and available data ranges for the Ben Bolt RAWS.

Table 2. Ben Bolt Remote Automated Weather Station Characteristics

Station Characteristics	Value
Station ID	42612
Latitude	38.59084
Longitude	-120.93362
Elevation	905 feet
Data Years	2005-2024

To determine weather-related modeling inputs, RAWS data were downloaded, processed, and analyzed using the FireFamily Plus software package (v. 5.0) to determine 97th percentile (Scenario 1) and 5th percentile (Scenarios 2 and 3) fire weather conditions. The RAWS data was evaluated from August 1 through October 15 for each year between 2005 and 2024 (extent of available data record) for the 97th percentile (Scenario 1) and from June 1

through August 31 for each year between 2005 and 2024 (extent of available data record) for the 50th percentile (Scenarios 2 and 3). Data derived from this analysis included values for 1-hour, 10-hour, and 100-hour fuel moistures, live herbaceous moisture, live woody moisture, 20-foot sustained wind speed, and wind direction. The weather data was also evaluated to determine the maximum sustained wind speed.

These weather values were incorporated into the Initial Fuel Moisture file used as an input in FlamMap. Wind direction and wind speed values for the FlamMap run were manually entered during the data input phase. Table 3 presents the wind and weather values used in the FlamMap fire behavior and progression modeling runs.

Table 3. Weather Variables used for Fire Behavior and Progression Modeling

Model Variable	Value Scenario 1 (97th Percentile Fire Weather)	Value Scenarios 2 and 3 (50th Percentile Fire Weather)
20-foot Wind Speed (mph)	10	8
Maximum Wind Speed (mph)	23	19
Wind Azimuth (degrees)	23	225
1-hour Fuel Moisture (%)	3	6
10-hour Fuel Moisture (%)	6	10
100-hour Fuel Moisture (%)	8	11
Live Herbaceous Fuel Moisture (%)	30	30
Live Woody Fuel Moisture (%)	59	59

Note: * Live herbaceous moisture values were lower than 30% so the herbaceous fuels are considered fully cured (Scott and Burgan 2005).

Wind direction (azimuth) for each Scenario was determined by evaluating wind rose outputs for sustained wind speeds, as presented in Exhibits 2 and 3.

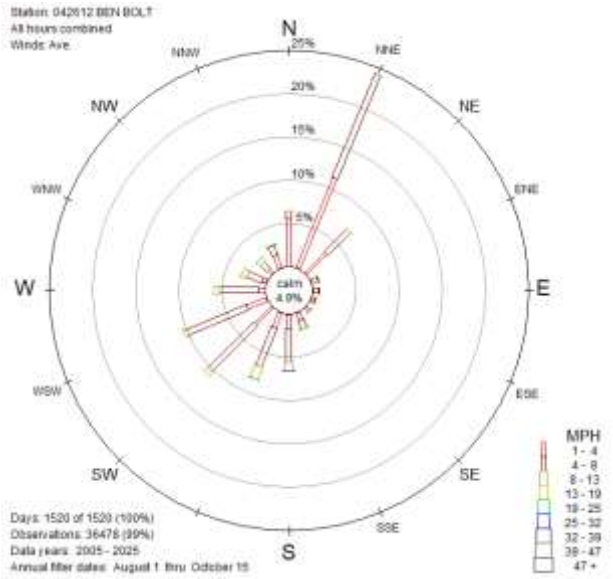


Exhibit 2. Wind rose for 97th percentile wind direction.

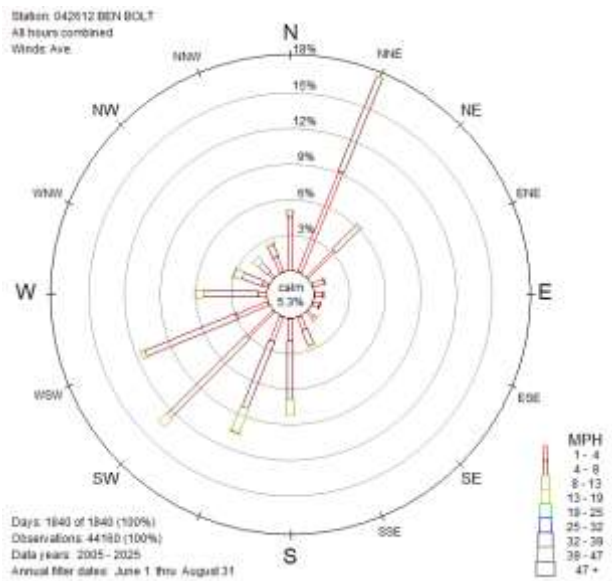


Exhibit 3. Wind rose for 50th percentile wind direction.

Finally, wind vectors were modeled within the FlamMap runs using the WindNinja tool embedded in the FlamMap software. WindNinja models the effect of topography on wind speed and direction and generates wind vector files for use in the modeling runs. The grid resolution for the WindNinja analysis was set at 30 meters.

3.1.7 Ignition Locations

We evaluated historic wildfire ignition point data in GIS format (NIFC 2025) to understand where historic ignitions have occurred and where it is likely that they could occur again. This data, coupled with an evaluation of wildfire history data (CAL FIRE 2024) and vegetation mapping data (USGS 2024b), informed the selection of ignition locations for the fire progression modeling effort. These locations were also evaluated in the field and ignition locations were reviewed with CAL FIRE prior to conducting the modeling runs. The following summarizes each of the ignition locations used for the fire progression modeling runs:

Exhibit 4. Photograph of field conditions located at the ignition point used for Scenario 1 (southwest corner of the intersection of Bass Lake Road and Hawk View Road).

Scenario 1: The ignition point for this scenario represents a roadside ignition occurring along the west side of Bass Lake Road near its intersection with Hawk View Road. This location contains ample roadside grasses that could potentially be ignited from human causes associated with roadways (e.g., cigarettes, dragging chains, molten catalyst material from vehicles, etc.) According to historic ignition data, multiple ignitions have occurred along Bass Lake Road.

Scenario 2: The ignition point for this scenario represents a roadside ignition occurring along the north side of Highway-50 approximately 1,200 feet east of El Dorado Hills Boulevard. An ignition in this location is possible from a vehicle or other human causes. According to historic ignition data, multiple ignitions have occurred along Highway-50 in this region.

Exhibit 5. Photograph of field conditions located near the ignition points used for Scenarios 2 and 3 (north of Highway 50 and east of El Dorado Hills Boulevard).

Scenario 3: The ignition point for this scenario represents a similar roadside ignition to Scenario 2 yet occurring approximately 2,000 feet further to the east and closer to the Project site. According to historic ignition data, multiple ignitions have occurred along Highway 50 in this region.

3.2 Model Outputs

Model outputs for this analysis include three fire progression maps (one for each of the three scenarios) and six landscape fire behavior characteristic maps, which include measurements of flame length, fireline intensity, and rate of spread for 50th and 97th percentile weather conditions. While wildfire progression maps present fire behavior and spread from a unique ignition point, landscape fire behavior models are static and represent wildfire behavior in all vegetated pixels present within the landscape.

Fire progression runs utilized the Minimum Travel Time (MTT) tool in FlamMap. The MTT tool is a two-dimensional fire growth model which calculates fire growth based on calculated fire spread rates from an ignition source (point, line, or polygon). The MTT tool uses fire spread rates to find minimum travel paths between data cells in the GIS landscape, with an output data file representing the number of minutes for a wildfire to reach a particular location from the ignition source. As FlamMap provides a static representation of fire behavior, modeling using the MTT tool holds wind and weather inputs constant over the modeling period. Each MTT simulation was assigned a burn period of 6 hours (360 minutes).

3.2.1 Fire Progression

The output files generated for the three progression runs included one arrival time grid and one line file representing major fire spread paths, considering modeling inputs and ignition location (output maps are presented in Appendix A). Major paths identify the most significant pathways for fire spread. The arrival time data presents time (in minutes) for a modeled fire to reach a specific location. This data was analyzed to determine the time necessary for a fire to burn from its ignition point to the Project site and surrounding communities. For some runs (Scenarios 2 and 3), the modeled fire did not reach the Project. This is due to the classification of non-burnable fuel models associated with roadways that function as barriers to grassland fire spread.

Scenario 1: A wildfire in this scenario spreads in a southwest direction driven by strong 23 mph winds from the north/northeast. Wildfire spreads quickly through herbaceous vegetation in a downslope direction through the Carson Creek drainage. Exiting roadways such as Silver Dove Way and Tong Road function as fuel breaks and prevent the fire from burning away from the drainage to the south. While the main fire front spreads in a southwest direction, the fire's flanks spread towards existing communities along Borders Drive and Archetto Drive. After about 1 hour, the modeled fire reaches riparian woodland vegetation which significantly slows fire spread. This alters the path of the fire front and results in fire spread across the north slope of Carson Creek. The fire front continues to spread southwest and eventually reaches the eastern edge of the Project site in 143 minutes (2 hours, 23 minutes).

Scenario 2: A wildfire in this scenario spreads in a northeast direction through grassland fuels. Fire spread is driven by 19 mph winds from the southwest and follows a slight uphill slope. The fire's northern perimeter is modeled to reach the edge of existing communities along Panela Way within 52 minutes. Spread along the fire's northeastern perimeter is halted by an existing dirt service road (roughly 16 feet wide) which travels across the open space and functions as a fuel break. This feature is modeled to prevent fire from continuing towards the Project site from this ignition location.

Exhibit 6: Aerial image of service road which functions as a fuel break and limits fire spread towards the Project site in Scenario 2.

Scenario 3: In this scenario, similar to Scenario 2, a wildfire spreads northeast across grasslands, driven by 19 mph winds from the southwest. The fire follows a slight uphill path and reaches the western edge of Old Silva Valley Parkway in 36 minutes. However, riparian vegetation and the paved roadway to the west of the Project site act as a natural fire break, preventing the fire from reaching the Project site.

3.2.2 Fire Behavior

Three output grid files for each weather scenario (50th and 97th percentile) were generated for the FlamMap run and represent flame length (feet), fireline intensity (BTU/ft/s), and rate of spread (mph). 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 et al. 2008). It is a somewhat subjective and non-scientific measure of fire behavior but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1993). Flame length values in the resulting grid file are in feet. Table 4 below presents an interpretation of flame length and its relationship to fireline intensity. Fireline intensity is a measure of heat output from the flaming front and affects the potential for a surface fire to transition to a crown fire. Rate of spread measures the horizontal movement of fire spread across the landscape and is useful to determine a fire's behavior and how many resources will be needed to contain the fire, as a faster-moving fire requires more immediate and significant resources. Maps depicting fire behavior in the modeling analysis area are presented in Appendix B (B1-B6).

As presented in B-1 under 50th percentile weather summer conditions, flame lengths within grass fuels (Fuel Model GS2) range from roughly 6-8 feet depending on slope and wind exposure. During peak 97th percentile weather conditions (B-2), flame lengths in grass fuels are modeled to reach upwards of 9-12 feet under sustained wind speeds of 23 miles per hour.

Under extreme weather and wind conditions (B-4), fireline intensity values may exceed 1,000 Btu/foot/second with spread rates greater than 2 miles per hour in grass fuels. While at high risk of ignition, grass fuels are generally less hazardous compared to other fuel types such as shrub and timber. This is largely to lower fuel loads and rapid burn-out times. Grass fuels are typically light, fine fuels, meaning they are composed of thin, dry material that ignites and burns quickly. While wildfires in grass fuels may produce large flame lengths and spread rapidly, these conditions are often sustained for short periods of time. Because of this, grass fires provide more opportunities for direct fire suppression from responding personnel.

Table 4. Fire Behavior Interpretation

Flame Length	Fireline Intensity	Interpretation
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 feet to 8 feet	100–500 BTU/ft/s	Fires are too intense for a 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 feet to 11 feet	500–1,000 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 1,000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at the head of fire are ineffective.

Source: Roussopoulos and Johnson 1975.
Note: BTU/ft/s = British thermal units per foot per second.

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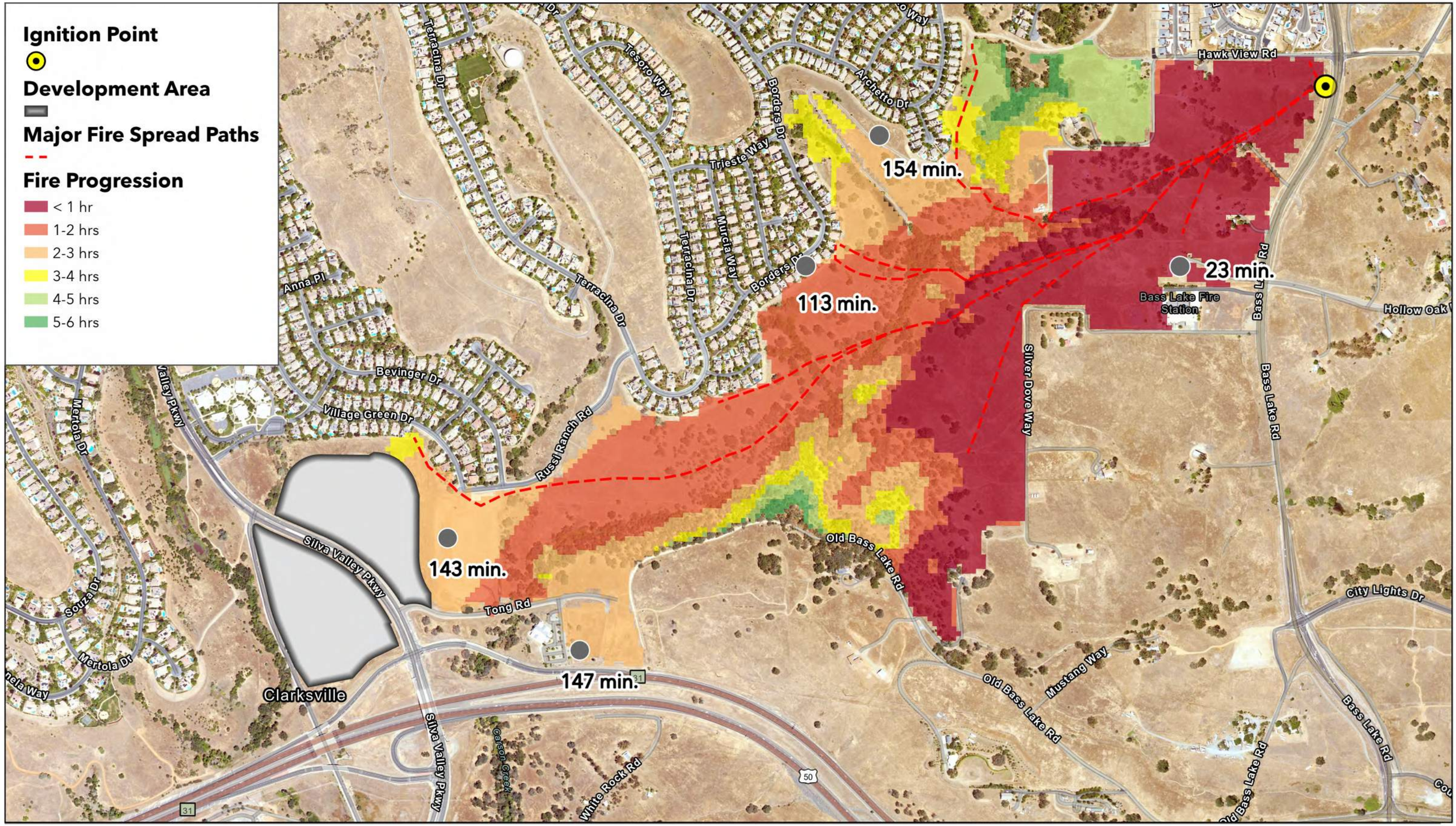
Appendix A

Fire Progression Model Outputs



DUDEK

0 375 750 1,500 Feet

Appendix A-1

Scenario 1: 97th Percentile Weather / NE Ignition

El Dorado Hills 52 North and Costco South Wildfire Modeling

Ignition Point

Development Area

Major Fire Spread Paths

Fire Progression

- < 1 hr
- 1-2 hrs
- 2-3 hrs
- 3-4 hrs
- 4-5 hrs
- 5-6 hrs

52 min.

Serrano Pkwy
Mertola Dr
Souza Dr
Penela Way
Village Green Dr
Silva Valley Pkwy
Tong Rd
Clarksville
Old Silva Valley Pkwy
Carson Creek
Park Dr
Umpqua Bank
Bank of America
Walgreens
Jack in the Box
Starbucks
50
31
30

DUDEK

0 245 490 980 Feet

Appendix A-2

Scenario 3: 50th Percentile Weather / SW Ignition

El Dorado Hills 52 North and Costco South Wildfire Modeling

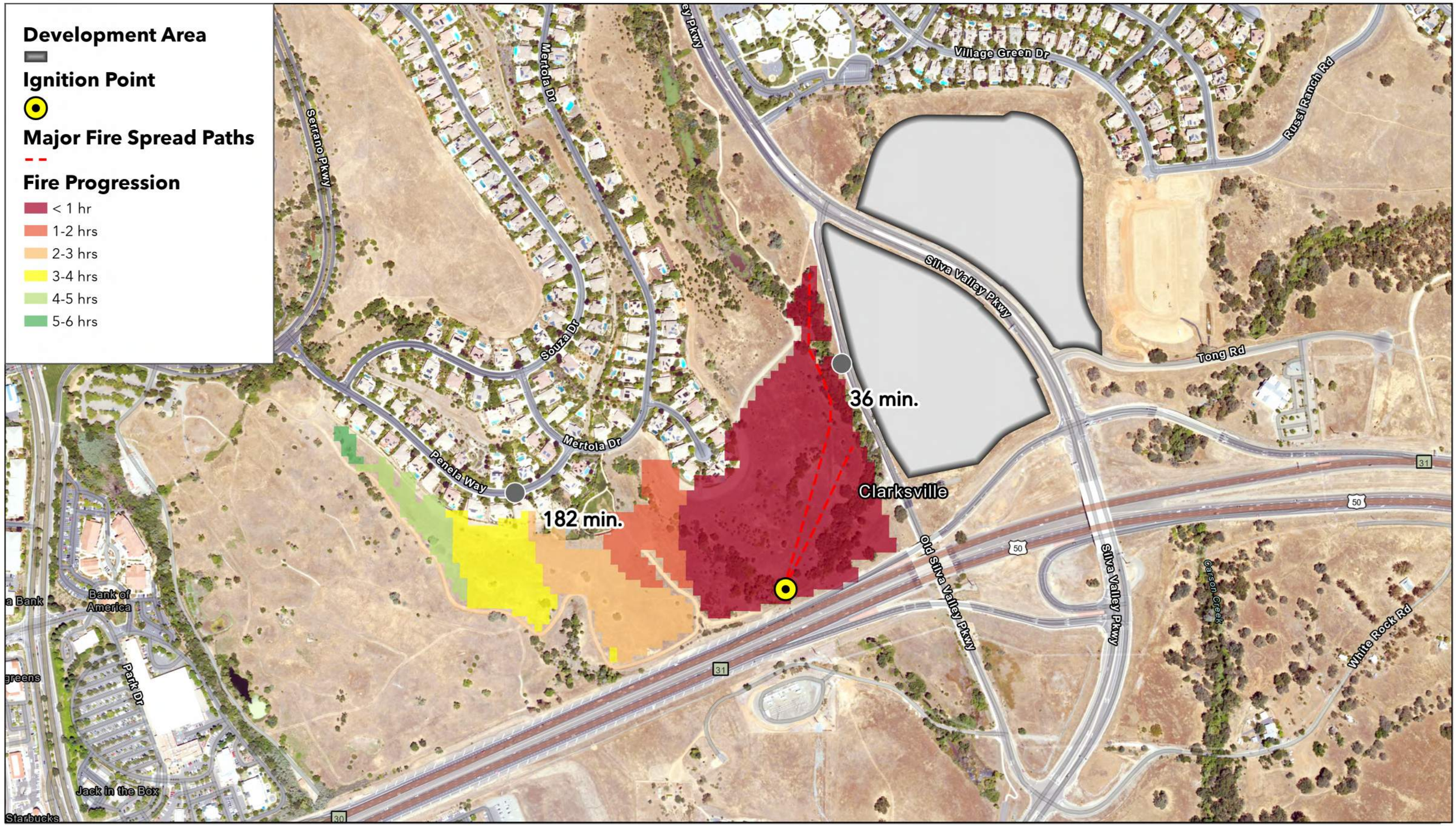
Development Area

Ignition Point

Major Fire Spread Paths

Fire Progression

- < 1 hr
- 1-2 hrs
- 2-3 hrs
- 3-4 hrs
- 4-5 hrs
- 5-6 hrs



DUDEK

0 245 490 980 Feet

Appendix A-3

Scenario 3: 50th Percentile Weather / SW Ignition

El Dorado Hills 52 North and Costco South Wildfire Modeling

Appendix B

Landscape Fire Behavior Model Outputs

Development Area

Flame Length (ft)

- Developed
- <4
- >4-8
- >8-11
- >11-20
- >20

DUDEK

0 500 1,000 2,000 Feet

Appendix B-1

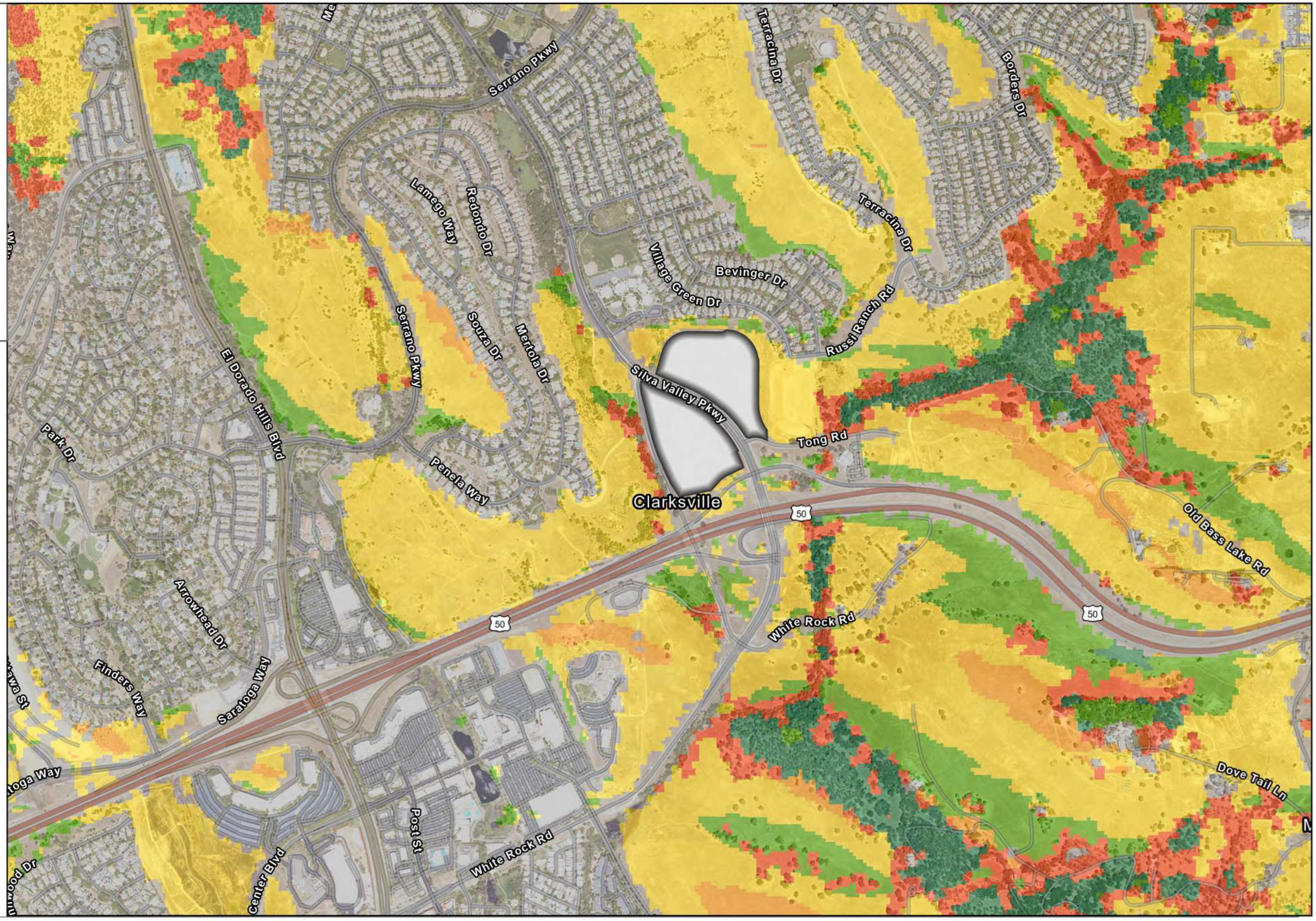
Flame Length - 50th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

Development Area

Flame Length (ft)

- Developed
- <4
- >4-8
- >8-11
- >11-20
- >20



DUDEK

0 500 1,000 2,000 Feet

Appendix B-2

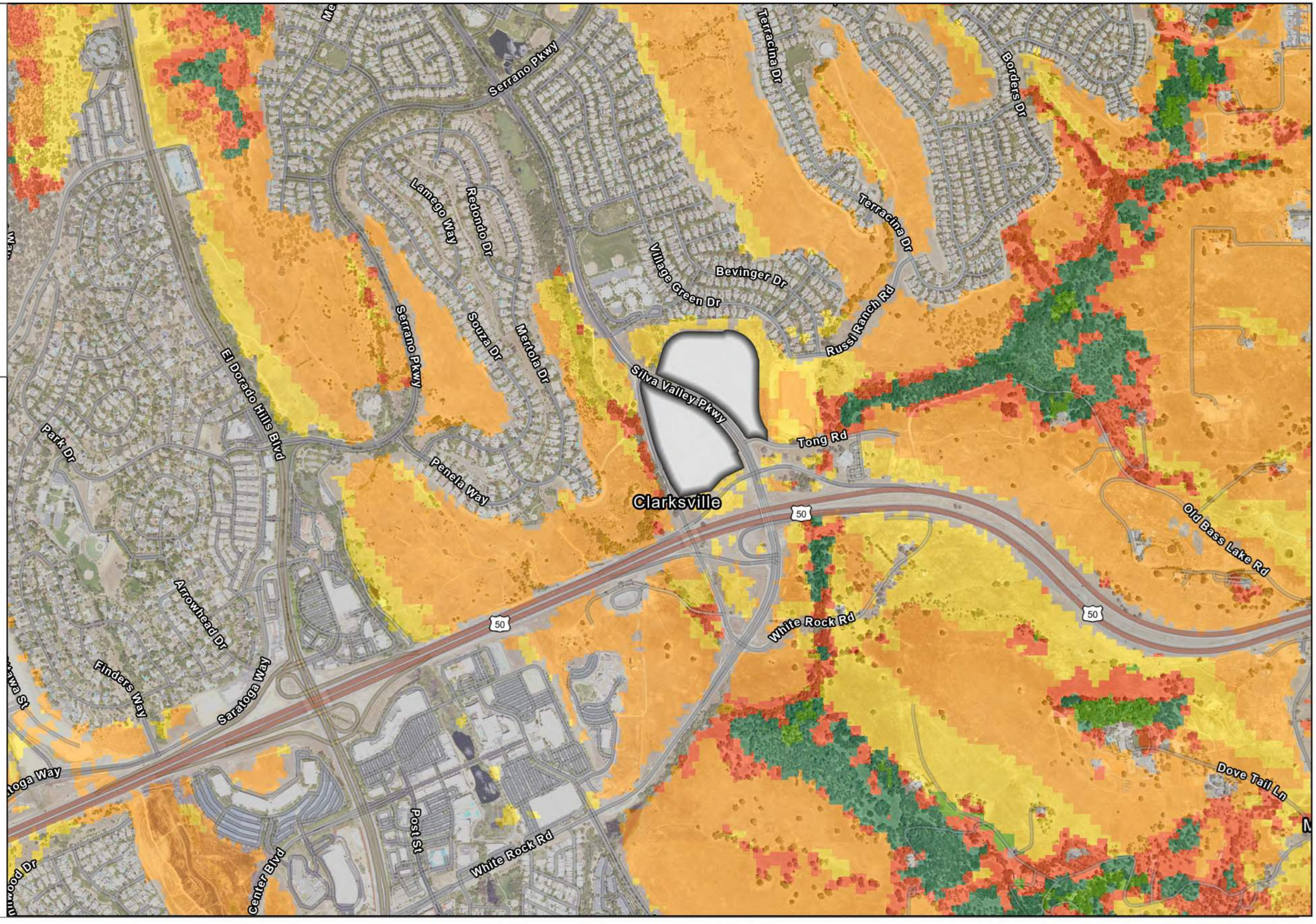
Flame Length - 97th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

Development Area

Fireline Intensity (BTU/ft/s)

- Developed
- <100
- >100-500
- >500-1,000
- >1,000-6,175
- >6,175



DUDEK

0 500 1,000 2,000 Feet

Appendix B-3

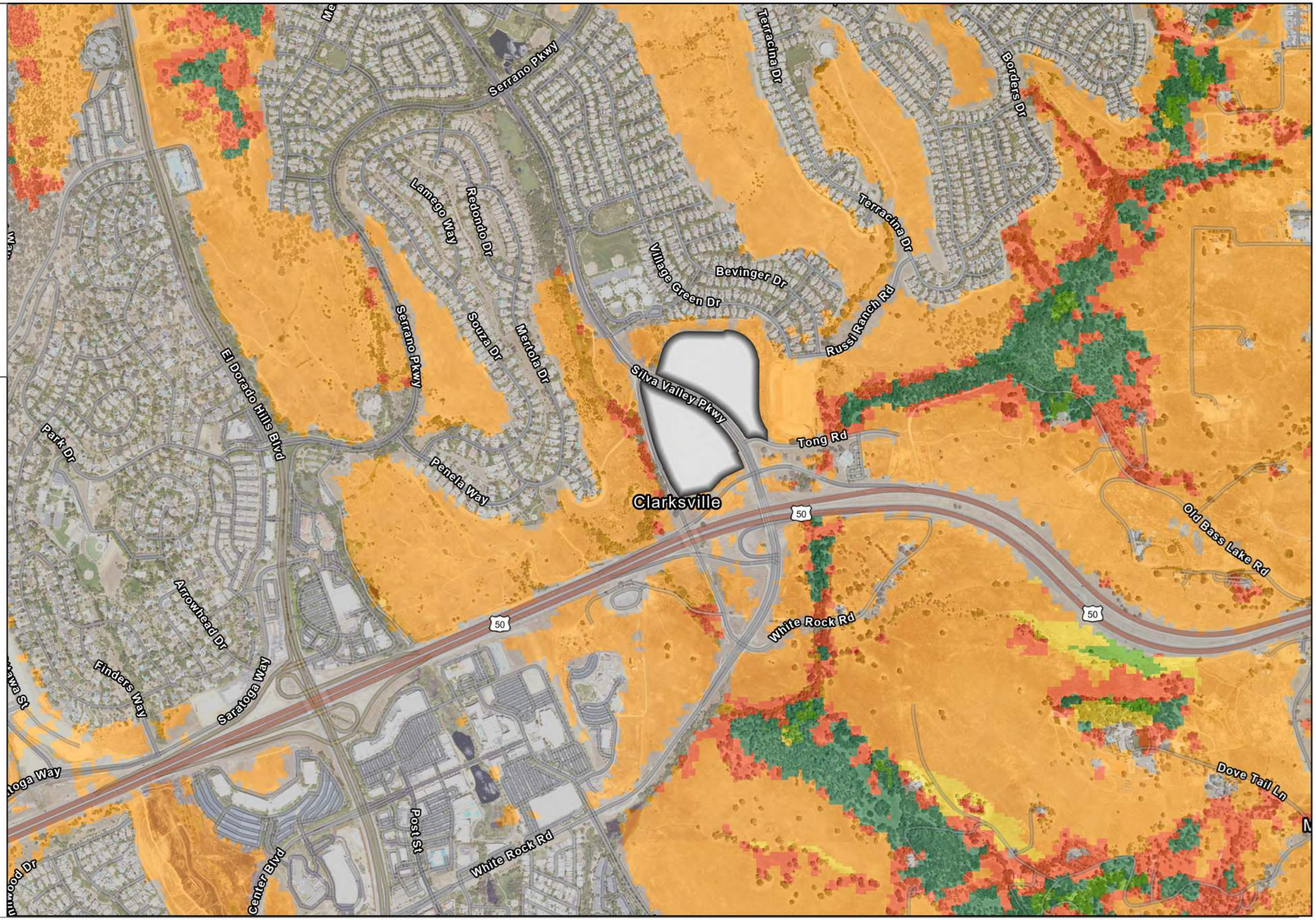
Fireline Intensity- 50th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

Development Area

Fireline Intensity (BTU/ft/s)

- Developed
- <100
- >100-500
- >500-1,000
- >1,000-6,175
- >6,175



Appendix B-4

Fireline Intensity- 97th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

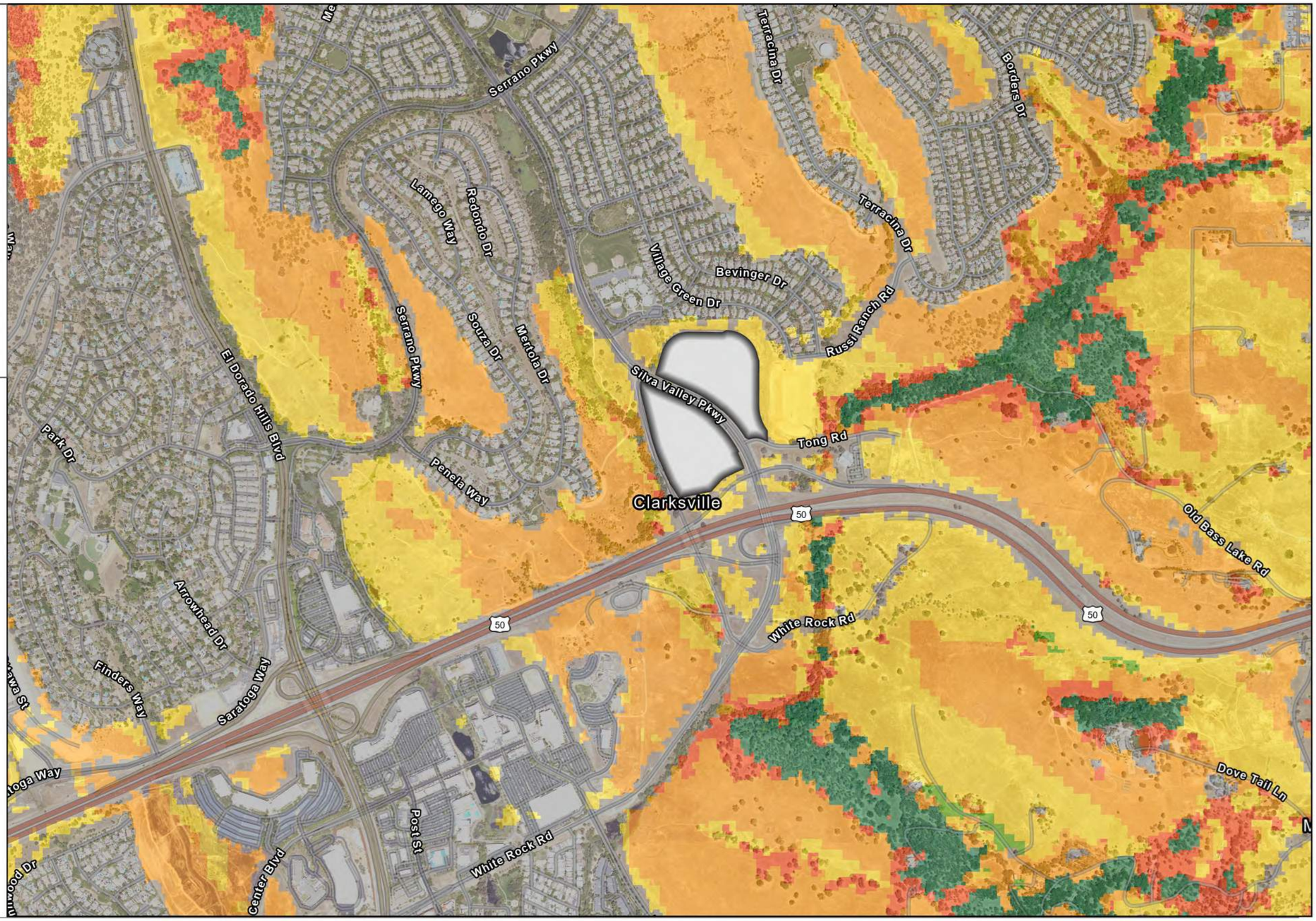
DUDEK

0 500 1,000 2,000 Feet

Development Area

Rate of Spread (mph)

- Developed
- <0.25
- >0.25-0.5
- >0.5-1
- >1-2
- >2



Appendix B-5

Rate of Spread - 50th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

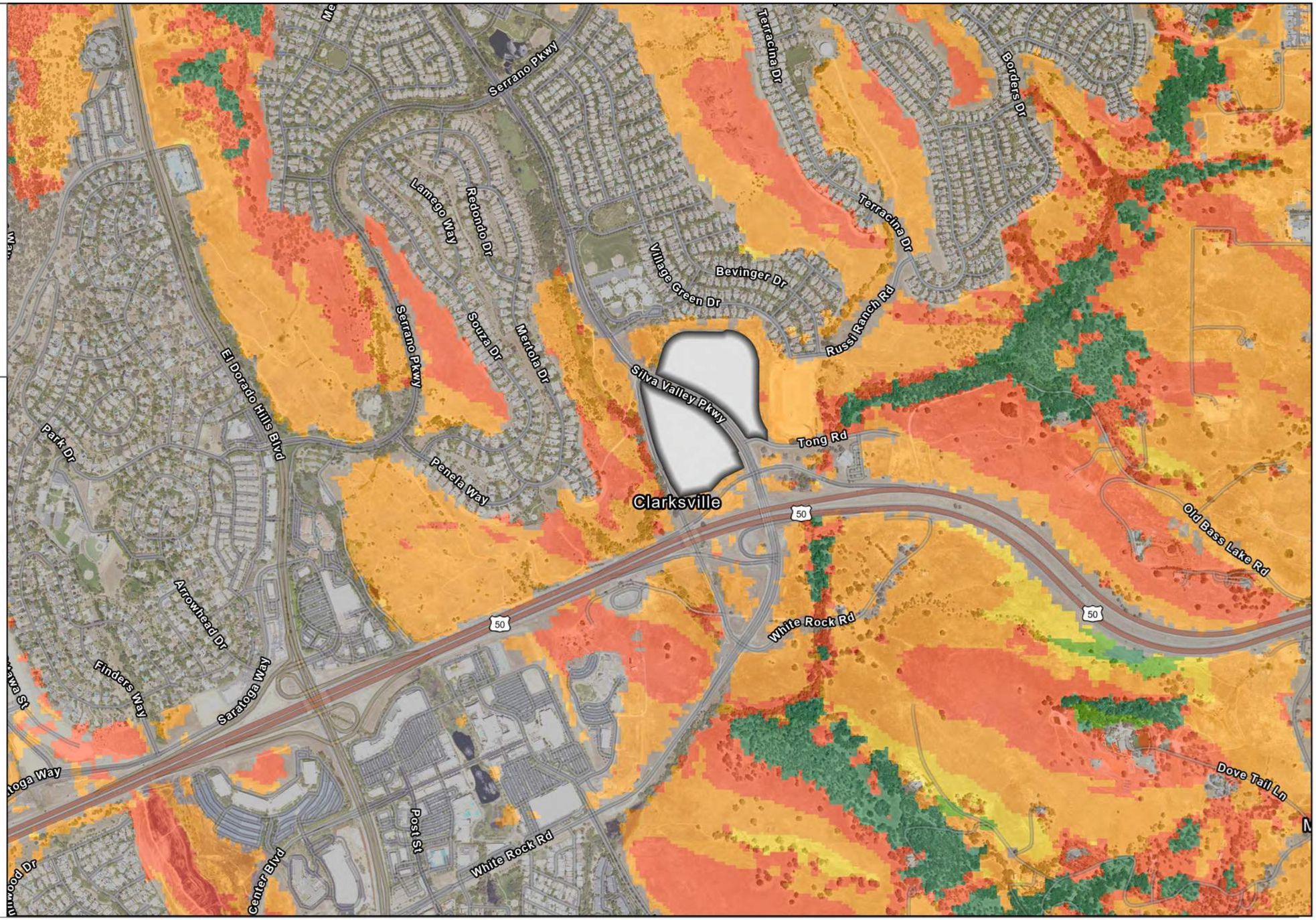
DUDEK

0 500 1,000 2,000 Feet

Development Area

Rate of Spread (mph)

- Developed
- <0.25
- >0.25-0.5
- >0.5-1
- >1-2
- >2



DUDEK

0 500 1,000 2,000 Feet

Appendix B-6

Rate of Spread - 97th Percentile Weather

El Dorado Hills 52 North and Costco South Wildfire Modeling

Evacuation Analysis

KITTELSON & ASSOCIATES
155 Grand Avenue, Suite 505
Oakland, CA 94612
P: 510.839.1742

TECHNICAL MEMORANDUM

August 20, 2025 Project# 26783

To: Ande Flower & Cameron Welch, County of El Dorado Planning

From: Grace Carsky, Sravya Kamalapuram, Amy Lopez

CC: Lt. Troy Morton, El Dorado County Office of Emergency Services; Chief Chrishana Fields, El Dorado Hills Fire; Chief Jeff Hoag, CAL FIRE

RE: El Dorado Hills Costco Warehouse - Evacuation Analysis

Introduction

Kittelson & Associates, Inc. (Kittelson) is providing an evacuation transportation analysis for the environmental impact report (EIR) of the proposed El Dorado Hills Costco warehouse development (Project) at the Silva Valley Parkway, El Dorado Hills site. This assessment provides estimates of roadway capacity constraints during wildfire evacuations, potential impacts to the roadway network under wildfire evacuation scenarios, and changes in travel times associated with the proposed Project. The assessment will cover two different wildfire event scenarios for both existing and near-term (2034) conditions. This memorandum presents the evacuation analysis methodology, results, and considerations for the County of El Dorado (County) and emergency responders including Cal FIRE, El Dorado Hills Fire Department, and El Dorado County Office of Emergency Services.

PROJECT DESCRIPTION

The proposed Project is a commercial development in El Dorado County north of US 50 along Silva Valley Parkway. It is bordered by existing residences and vacant land to the north, vacant land to the east, Clarksville Crossing to the west, and Tong Road and the US 50 westbound ramps to the south. The Project site currently is vacant. Figure 1 presents the Project location.

The Project consists of two sites on either side of Silva Valley Parkway: the North Site and South Site. The North Site will contain a fuel facility with 32 fueling positions. The South Site entails a Costco Warehouse retail center of approximately 165,000 cumulative square feet. Figure 1 presents the location of the proposed Project. Adjacent to the North Site fuel facility, future commercial development is anticipated for the surrounding vacant land (herein referred to as the "Remainder Area").

The Project is expected to generate 442 trips (221 vehicles) in the AM peak hour, 1,277 trips (638 to 639 vehicles) in the PM peak hour, and 1,697 trips (848 to 849 veicles) in the Saturday midday peak hour. During operating hours of the Costco warehouse and gas station, as many as 200 employees are expected to be on-site at any given time.

Figure 1

Costco Project Site
El Dorado Hills Costco
El Dorado County, California

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Wildfire Scenarios

To evaluate how the proposed development may affect congestion and travel times in the vicinity of the Project during wildfire evacuation scenarios, fire progression and fire behavior modeling was conducted by Dudek for the Project area. This modeling considered wildfire history, ignition sources, fuels/vegetation, and historical weather patterns for the Project site and the surrounding area. The detailed Wildfire Modeling methodology report prepared by Dudek is provided in Appendix A.

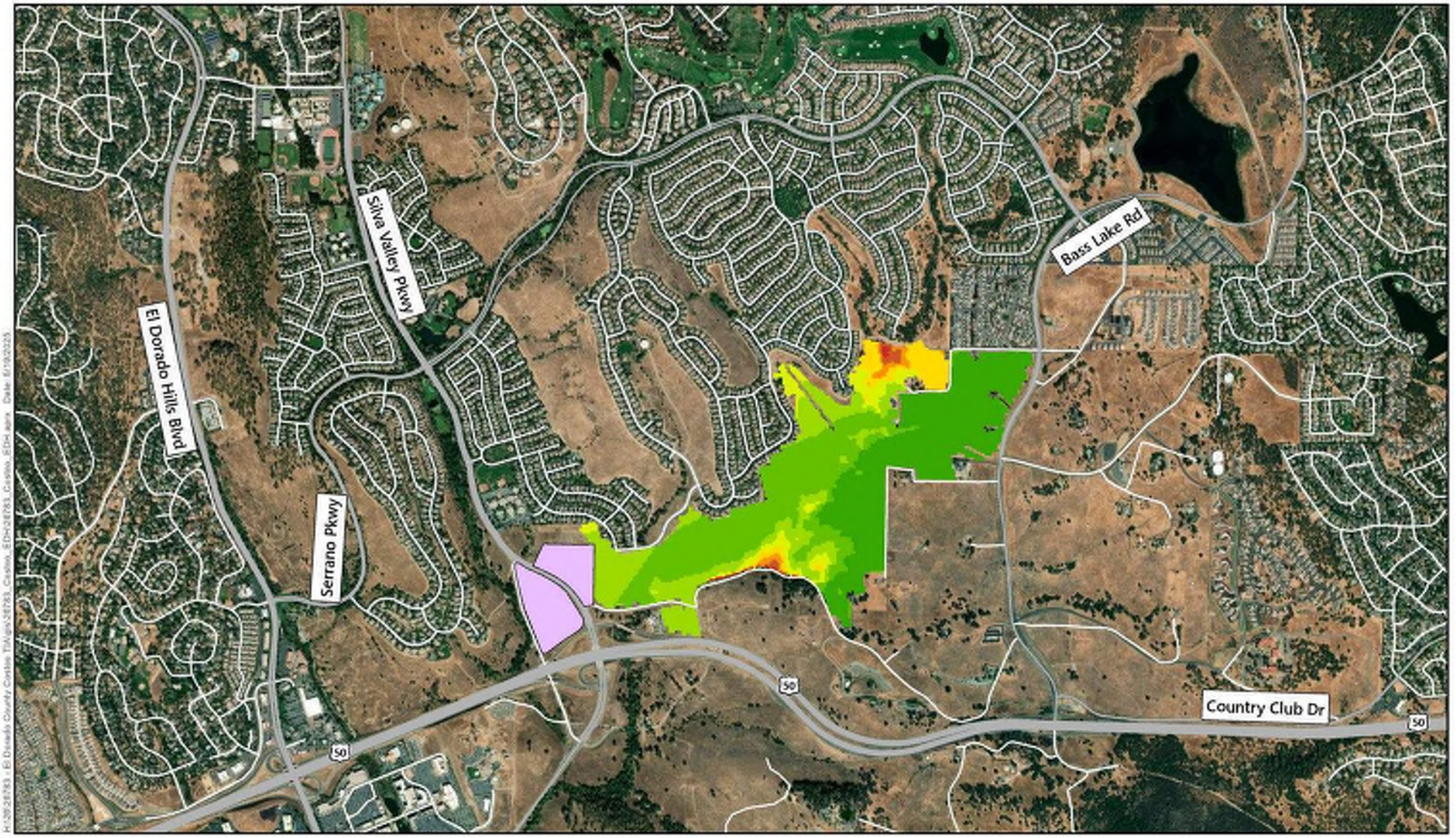
While the modeling identified three potential wildfire scenarios impacting the Project site, discussions with El Dorado County, El Dorado County Office of Emergency Services (OES), El Dorado Hills Fire Department, and the California Department of Forestry and Fire Protection (Cal FIRE) (hereby referred as the advisory group) led to the selection of two primary wildfire evacuation scenarios for further analysis. These scenarios assess wildfire behavior and evacuation strategies for area residents and Costco employees and members in the Project vicinity and nearby communities.

The details of the wildfire scenarios analyzed in this study are outlined in Table 1. Figure 2 and Figure 3 show the fire progression and fire spread for wildfire scenarios #1 and #2.

Table 1. Wildfire Scenarios

	Wildfire Scenario #1	Wildfire Scenario #2
Ignition Location	Northeast of the Project site	Southwest of the Project site
Wind Direction[1]	North/Northeast	Southwest
Fire Spread	Southwest towards the Project site	Northeast towards the Project site
Time to reach the Project Site	~143 minutes (2 hours 23 minutes)	Does not reach the Project site due to natural fire breaks including riparian vegetation and a paved roadway west of the Project site

Source: Wildfire Modeling Summary Report, Prepared by Dudek, 2025
Wind direction indicates the direction of where the wind is coming from



El Dorado Costco Project Site

Wildfire Scenario #1 (Hours Since Ignition)

- < 1 hr
- 1 - 2 hr
- 2 - 3 hr
- 3 - 4 hr
- 4 - 5 hr
- 5 - 6 hr
- 6 - 7 hr
- 7 - 8 hr

0 1 Miles

Figure 2

Wildfire Scenario #1
Fire Progression
El Dorado Costco

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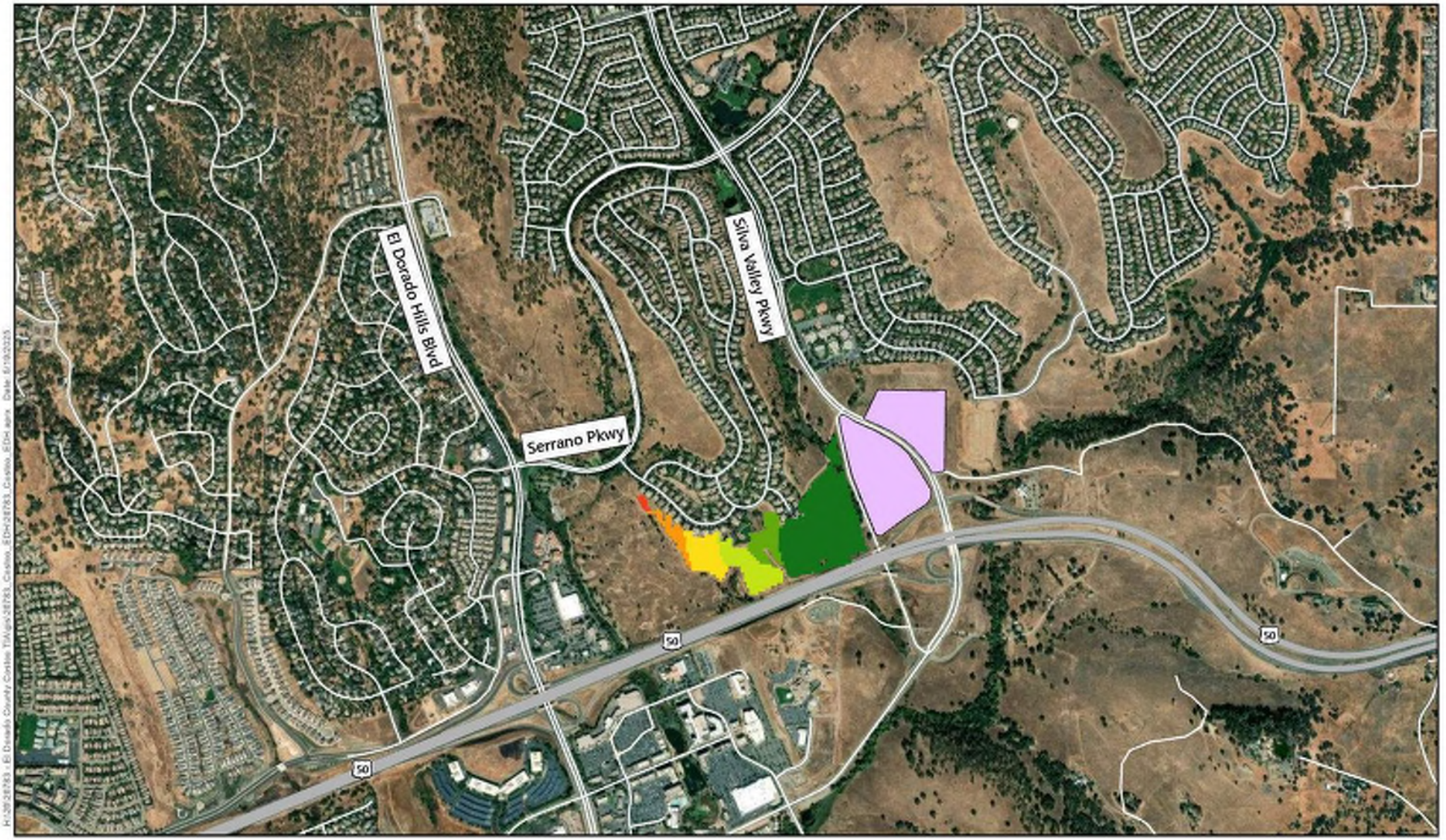

El Dorado Costco Project Site

Wildire Scenario #2 (Hours Since Ignition)

- <1 hr
- 1 - 2 hr
- 2 - 3 hr
- 3 - 4 hr
- 4 - 5 hr
- 5 - 6 hr

0 1 Miles

Figure 3

Wildfire Scenario #2
Fire Progression
El Dorado Costco

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Analysis Scenarios

This study evaluates the transportation related impacts of the Project during the two wildfire evacuation scenarios discussed in Table 1. To maintain consistency with the Traffic Impact Analysis (TIA) conducted by Kittleson & Associates, Inc. for the Project,[1] this study examines potential evacuation effects under the Existing and Near-Term (2034) conditions. To account for the worst-case scenario, all the scenarios are analyzed during the PM peak hour, which represents the peak traffic volume during a typical week: the sum of background traffic in the area plus traffic from the Project development, assuming Costco members and employees are in the warehouse and residents in the evacuation area are at home.

Accordingly, this study evaluates transportation related impacts during the PM peak hour for the two wildfire scenarios under the following conditions:

- Existing No Project
- Existing Plus Project
- Near-Term (2034) No Project
- Near-Term (2034) Plus Project

The Near-Term (2034) No Project and Plus Project conditions include the projected land use development and trip generation for the Remainder Area. The Remainder Area is approximately 13.79 acres and is not proposed for development as part of the current project. Thus, the Remainder Area is not considered in the Existing Plus Project conditions.

Travel Modeling Tools

The evacuation analysis uses the El Dorado County travel demand model to estimate roadway congestion and travel times in an evacuation under No Project and Plus Project conditions. The current travel model is calibrated and validated for a 2018 base year and includes a 2040 future scenario with 2040 land use forecasts and transportation improvement assumptions. Kittelson estimated land use conditions for Near-Term (2034) conditions by a linear interpolation of 2018 and 2040 land use assumptions and assuming the 2040 transportation improvements in the Project vicinity.

Evacuation Assumptions

This section outlines the assumptions made on when the residents, employees, and Costco members in the evacuation area would need to evacuate and the conditions under which they would evacuate.

[1] *EDH Costco TIA – DRAFT, February 2025*

TIME PERIOD

Kittelson modeled transportation activity for the worst-case scenario under which people in surrounding areas would evacuate. This period is assumed to be the PM peak hour when the sum of background traffic in the area plus traffic from the Project development is greatest during a typical week.

TRAVEL TYPE

Baseline travel represents normal travel patterns during the PM peak hour as included in the El Dorado County travel demand model. Evacuation travel represents estimated evacuation trips and travel time from each evacuating Traffic Analysis Zone (TAZ) to an evacuation destination. Kittelson reviewed the model's TAZs and assigned each TAZ a combination of Baseline travel and Evacuation travel (25% and 75%, respectively), based on its presence in the designated evacuation area.

EVACUATION AREA BOUNDARIES

For each of the two wildfire evacuation scenarios analyzed in this study, evacuation area boundaries were determined based on discussions with the advisory group. Accordingly, the following are the evacuation area boundaries assumed in this study.

- **Wildfire Scenario #1:** Evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/Old White Rock Road on the south, Silva Valley Parkway on the west, and Bass Lake Road on the east.
- **Wildfire Scenario #2:** Evacuation area is assumed to be bounded by Serrano Parkway on the north, US 50/White Rock Road on the south, El Dorado Hills Boulevard on the west, and areas surrounding Tong Road between Silva Valley Parkway and Bass Lane Road.

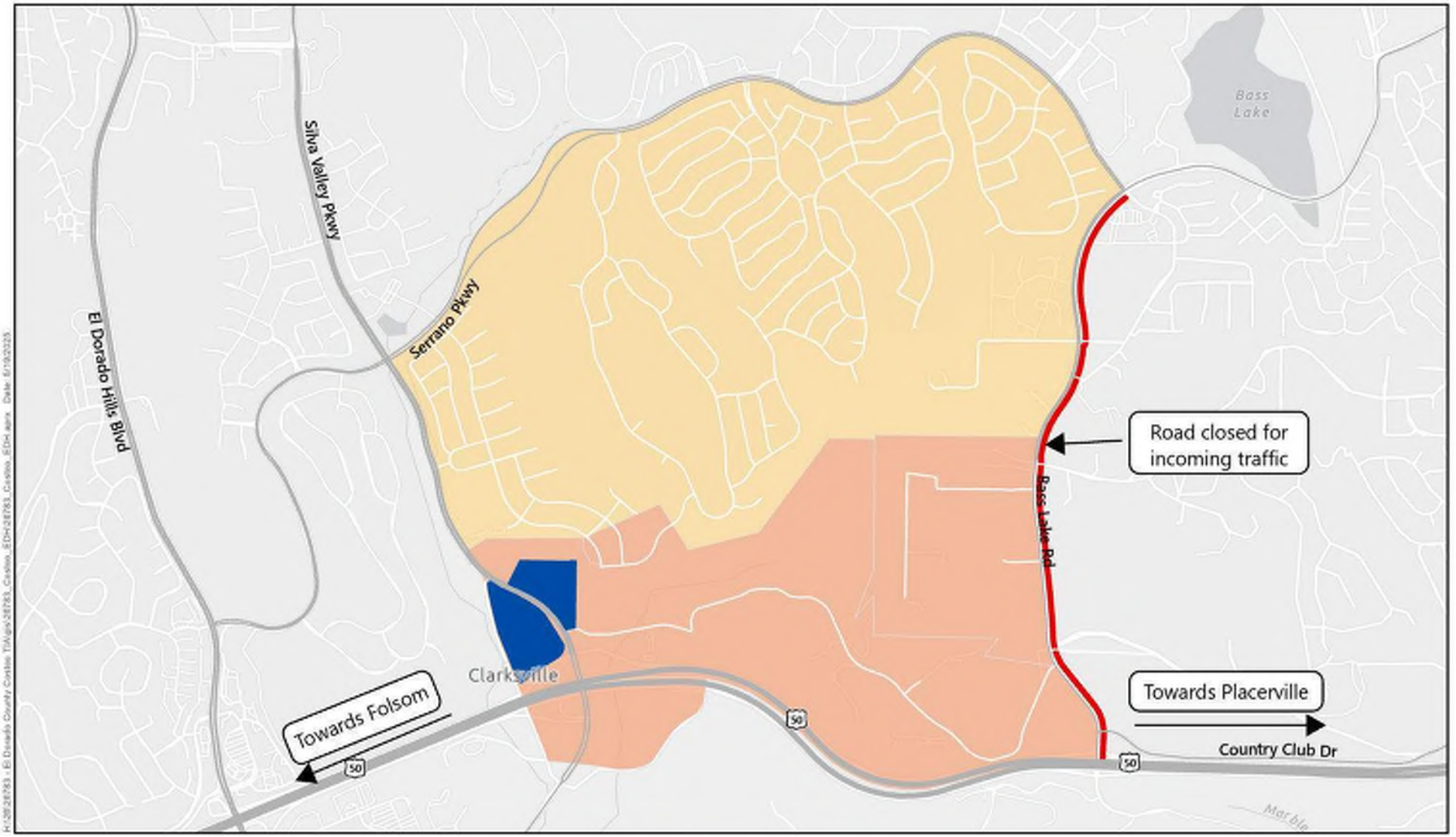
The evacuation areas are overlaid with the El Dorado County travel demand model's Traffic Analysis Zone (TAZ) map to identify the numbers of people that would need to be evacuated.

NUMBER OF EVACUATING TRIPS

Modeled trips are a function of the interactions between geographic patterns, including the land uses in an area, the socio-economic characteristics of the population in the area (e.g., auto ownership, income, and household size), and the type and extent of transportation facilities in an area. Kittelson obtained countywide land use information by TAZ (including households, population, and employment information) from the El Dorado County travel demand model for the Existing and Near-Term (2034) conditions. The land use information for Near-Term (2034) conditions also includes the projected land use for the Reminder Area, based on the County's General Plan.

The El Dorado County auto ownership information by Census Tract is obtained from the American Community Survey (ACS) 2023 five-year estimates. Based on this data, there are an average of 2.03 vehicles per household in El Dorado County. Therefore, the number of evacuating households is multiplied by two (rounded) to estimate the number of evacuating residential vehicles. Each evacuating employee is assumed to use one vehicle.

Kittelson estimated total evacuation trips by calculating the trips generated at household uses and trips generated by employees at non-residential land uses. If a fire occurs during the night, most residents would be home, but most employees would not be at their workplace. If a fire occurs during the workday, most employees would be at their workplace, but many residents would not be at their homes. The evacuation analysis conservatively assumes that 75 percent of residents and 75 percent of employees would need to evacuate during a wildfire event.



Percent Evacuating During Peak Hour*

- 25 percent
- 65 percent

- Road Closures
- El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.

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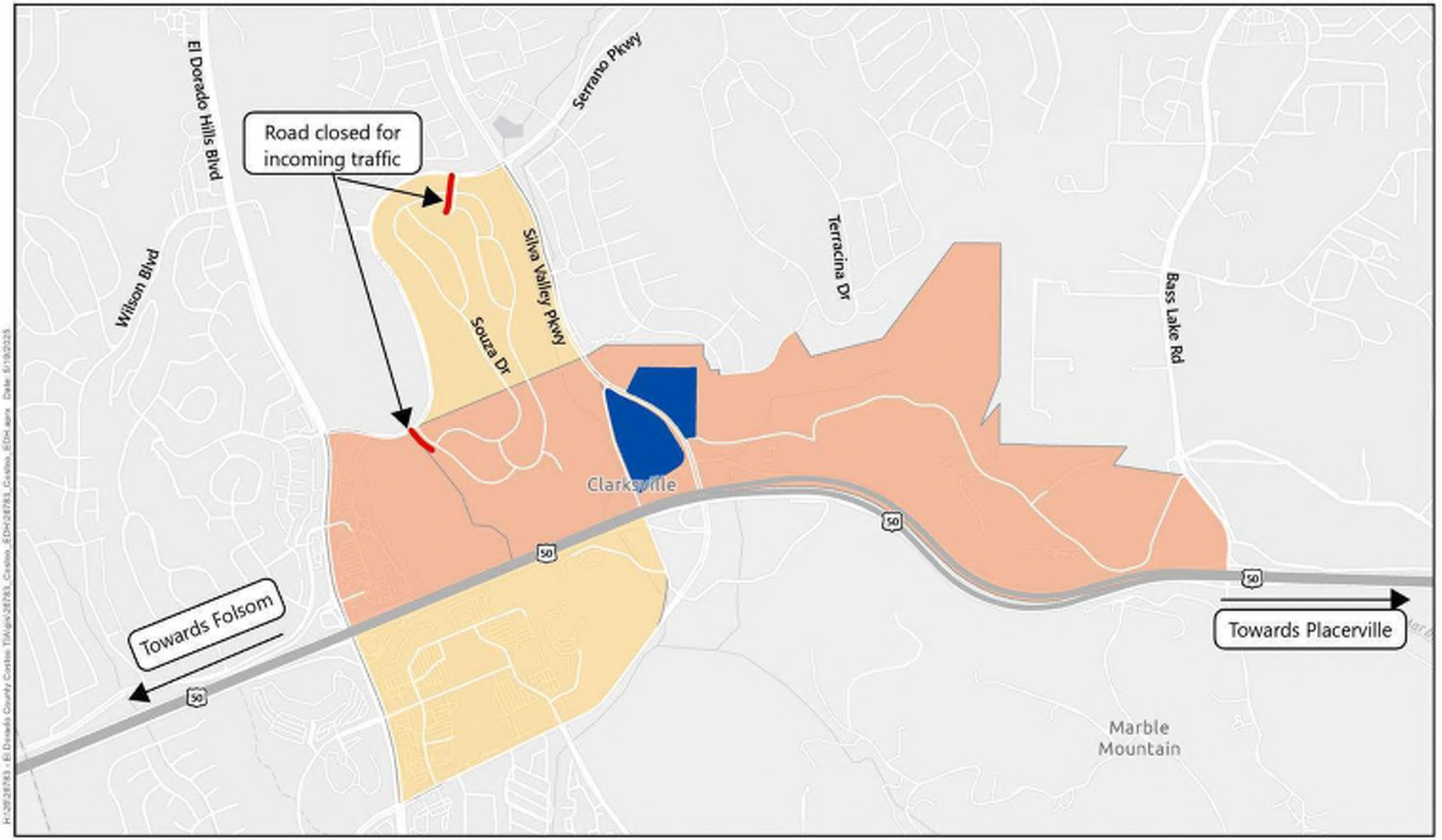
Figure 4

Percent Evacuating During Peak Hour*
Wildfire Scenario #1
El Dorado Costco



Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

- Road Closures
- El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders

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Figure 5

**Percent Evacuating During Peak Hour*
Wildfire Scenario #2
El Dorado Costco**

TRIP DISTRIBUTION

Kittelson considered separate trip distribution for the Costco members and employees and other residents and employees in the evacuation area outside of the Project site. The assumptions are as follows.

- **Costco Members and Employees**: Trip distribution assumptions were based on Costco member transaction data and a market area analysis conducted as part of the Project TIA. The analysis showed that most Costco members are expected to travel from areas east of the Project site, surrounding the City of Placerville and other parts of El Dorado County (Figure 6). Accordingly, the following evacuation trip distribution was assumed for Costco members and employees:
    - 65% evacuate eastward toward Placerville
    - 35% evacuate westward toward Folsom
- **Residents and Employees Outside the Project Site**: For residents and employees in the evacuation area outside of the Project site, trip distribution assumptions were based on existing land use, the location of evacuation destinations, and their relative proximity to the evacuation area. Accordingly, the following evacuation trip distribution was assumed for residents and employees in the evacuation area outside of the Project site:
    - 80% evacuate westward toward Folsom
    - 20% evacuate eastward toward Placerville

The trips were distributed from each of the evacuating TAZs to the evacuation destinations, as appropriate. The trip distribution is not intended to reflect a precise distribution of the routes that would be taken during an evacuation.

ROADWAY CAPACITY AND ROADWAY CLOSURES

Kittelson modeled trip patterns using the typical capacities for each roadway within and outside the evacuation area for roadways otherwise identified for road closures by the advisory group. The scenarios represent conditions without implementation of any evacuation strategies, such as manual traffic control or contraflow lanes, which could increase roadway capacity in one direction versus the other. The roadways identified for roadway closures for each of the scenarios include:

- **Wildfire Scenario #1:** Bass Lake Road is assumed to be restricted to outbound/evacuating traffic only, with no access allowed for inbound traffic.
- **Wildfire Scenario #2:** It is assumed that residential streets in the communities north of the Project site will be closed to incoming traffic and will only remain open for evacuating vehicles.

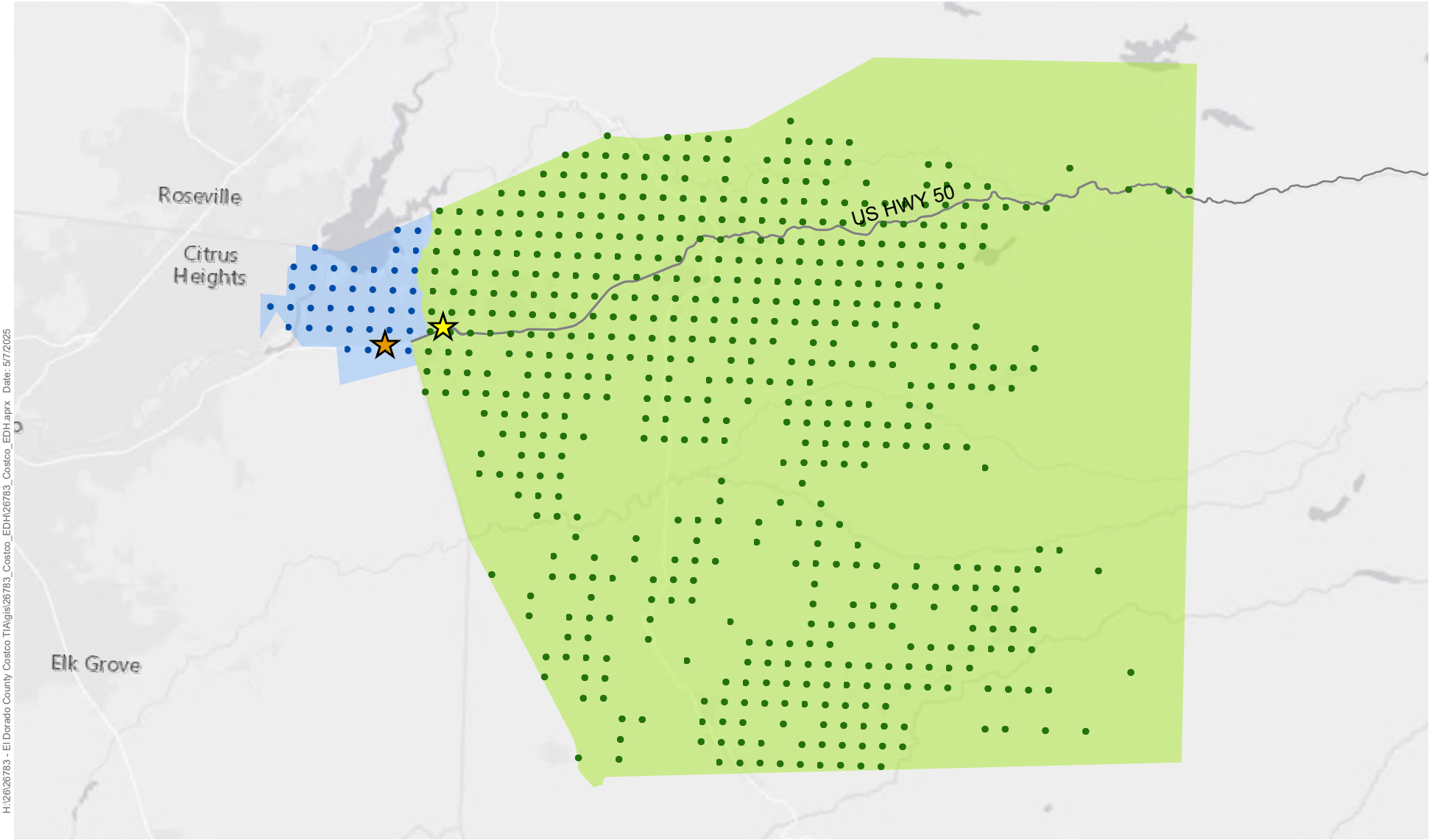


Figure 6

Future Market Areas
El Dorado Hills Costco

KITTELSON & ASSOCIATES

EVACUATION DESTINATION AND ROUTE CHOICE

Based on the conversations with the advisory group, Kittelson modeled evacuating vehicles to use US 50 to evacuate towards Folsom to the west or Placerville to the east.

The number of trips to each evacuation destination was assigned based on the location and direction of the evacuation based on the trip distribution described above. These destinations were selected for each of the evacuation scenarios with a goal of identifying evacuation travel patterns and congestion in the evacuation area and in the region.

EVACUATION ASSIGNMENT

During an evacuation event, residents and employees will receive one of three evacuation assignment orders:

- **No Action** – residents and employees do not need to evacuate or prepare for an evacuation.
- **Evacuation Warning** – residents and employees in a specific evacuation zone are ordered to prepare for an evacuation but do not need to evacuate immediately.
- **Evacuation Order** – residents and employees in a specific evacuation zone are ordered to evacuate immediately.

The peak hour for evacuation, when most vehicles evacuate, is defined differently depending on the wildfire scenario. For both wildfire scenarios, the peak hour is assumed to be the first hour of the evacuation.

The percentage of residents and employees evacuating is considered in two separate groups.

- **Costco Members and Employees:** To account for the worst-case scenario, it is assumed that all Costco members and employees will receive an evacuation order and evacuate during the peak hour in both wildfire scenarios.
- **Residents and Employees Outside the Project Site**: When an area is assigned an evacuation order or warning, it is assumed that 90 percent of residents and employees will evacuate over the duration of an evacuation and approximately 10 percent will remain behind. The estimated factors are based on survey results from people impacted by prior fires in California in UC Berkeley's Review of California Wildfire Evacuations from 2017 to 2019.[2] Based on Kittelson's conversations with the advisory group, it is assumed that evacuation will occur in phases, with different portions of the evacuation area receiving either an evacuation order or an evacuation warning.
    - Areas under an evacuation order are expected to have 65 percent of vehicles evacuating during the peak hour.
    - Areas under an evacuation warning are expected to have 25 percent of vehicles evacuating during the peak hour.

[2] *Wong, S., Broader, J. and Shaheen, P., 2022. Review of California Wildfire Evacuations from 2017 to 2019. [online] Escholarship.org. Available at:* <https://escholarship.org/uc/item/5w85z07g>

Evacuation Results

The El Dorado County travel demand model was used to estimate travel times and volume-to-capacity (V/C) ratios for each analysis scenario to understand how the Project would impact residents, employees, and Costco members in the evacuation area for each wildfire scenario. The following sections present the congestion locations and comparison of travel times for baseline conditions (no evacuation), existing conditions, and near-term (2034) conditions in No Project and Plus Project conditions for the two wildfire scenarios. The analysis is run assuming no manual traffic control is in place during the evacuation.

The congestion on a roadway segment is determined based on the V/C ratio of the segment derived from the El Dorado County travel demand model. Congestion locations are classified as shown in Table 2.

Table 2. Congestion Classification based on Volume-to-Capacity (V/C) ratio

Volume-to-Capacity (V/C) ratio	Congestion Classification
≤ 0.9	Under Capacity
0.9 to 1.0	Near Capacity
≥ 1.0	Over Capacity

Wildfire Scenario #1

This section presents the congestion location and travel times analysis under wildfire scenario #1 for all the analysis scenarios. The origin and destination location are identified based on the evacuation area boundaries identified for this wildfire scenario and likely evacuation destinations in the City of Folsom and City of Placerville. However, evacuation destinations are subject to change during an actual evacuation event based on direction from the Office of Emergency Services or evacuating persons' personal preferences.

EXISTING CONDITIONS

Figure 7 and Figure 8 show the congestion locations during wildfire scenario #1 for Existing Conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Existing Conditions No Project and Plus Project scenarios.

No Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

Plus Project

- Eastbound US 50 toward Placerville including sections adjacent to the evacuation area.
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

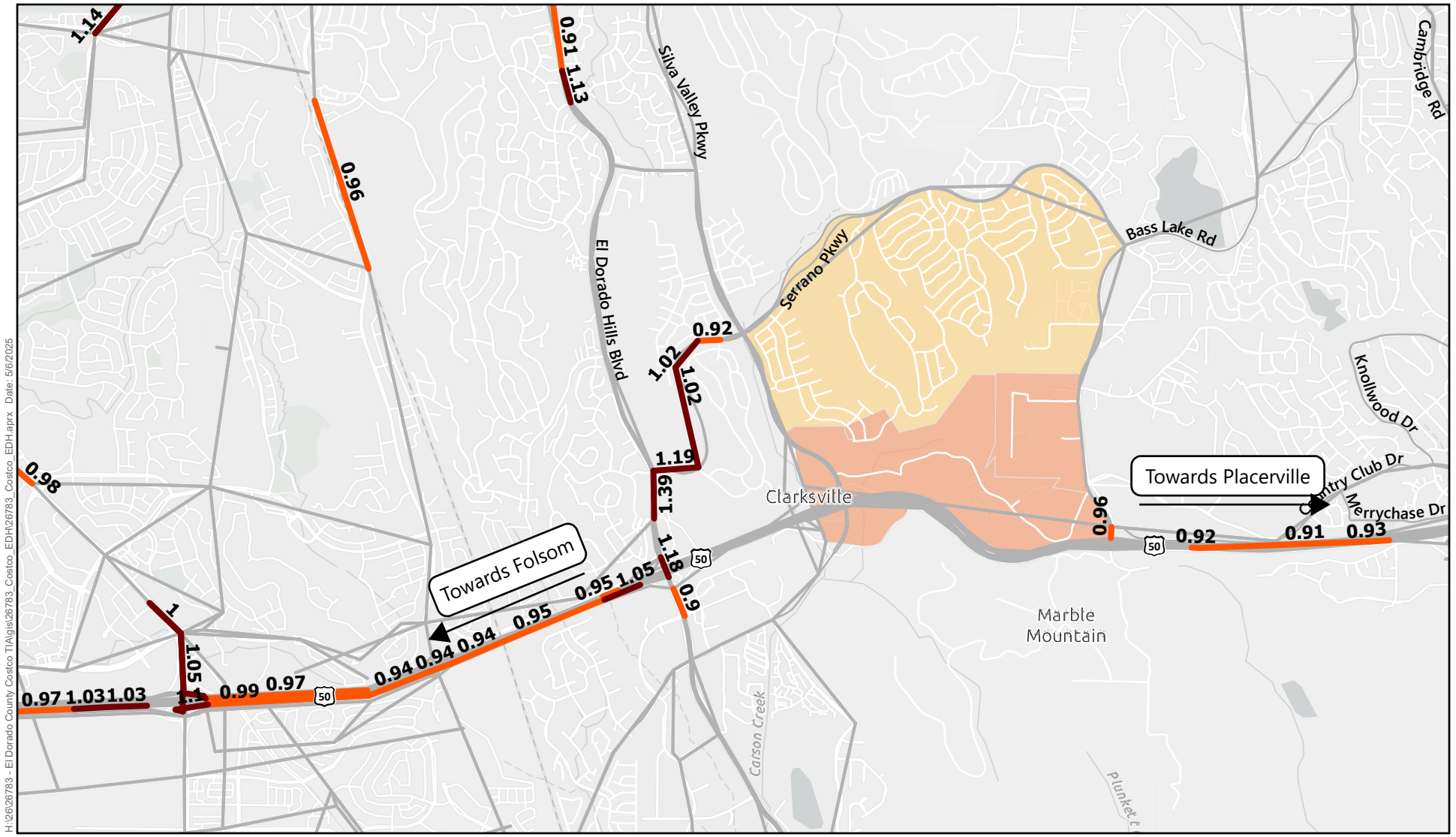
With the addition of Project traffic, volume-to-capacity ratio increases along US 50 towards Folsom and Placerville. Roadway capacity along Serrano Parkway between Silva Valley Parkway and El Dorado Hills operates over capacity under the No Project and Plus Project scenarios, though the volume-to-capacity ratio changes with the addition of Project traffic are minimal.

Table 3 shows the travel times (in minutes) during wildfire scenario #1 for existing conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the increase in travel time with Project traffic varies between 0.1 to 1.0 minutes (0-5% increase).

Table 3. Travel Time (minutes), Wildfire Scenario #1 - Existing Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
S. of Serrano Pkwy.	Folsom	9.5	10.1	10.2	0.1	1%
	Placerville	22.9	23.8	24.7	0.9	4%
W. of Bass Lake Rd.	Folsom	8.0	8.3	8.3	0.0	0%
	Placerville	19.0	19.8	20.6	0.8	4%
Old White Rock Rd.	Folsom	5.4	5.7	5.8	0.1	2%
	Placerville	19.6	20.3	21.1	0.8	4%
Village Green Dr.	Folsom	5.8	6.2	6.4	0.2	3%
	Placerville	20.6	21.3	22.3	1.0	5%
Costco	Folsom	4.6	5.0	5.2	0.2	4%
	Placerville	19.4	20.1	21.0	0.9	4%

Compiled by: Kittelson & Associates, Inc., 2025



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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

**Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.*

0 1 Miles

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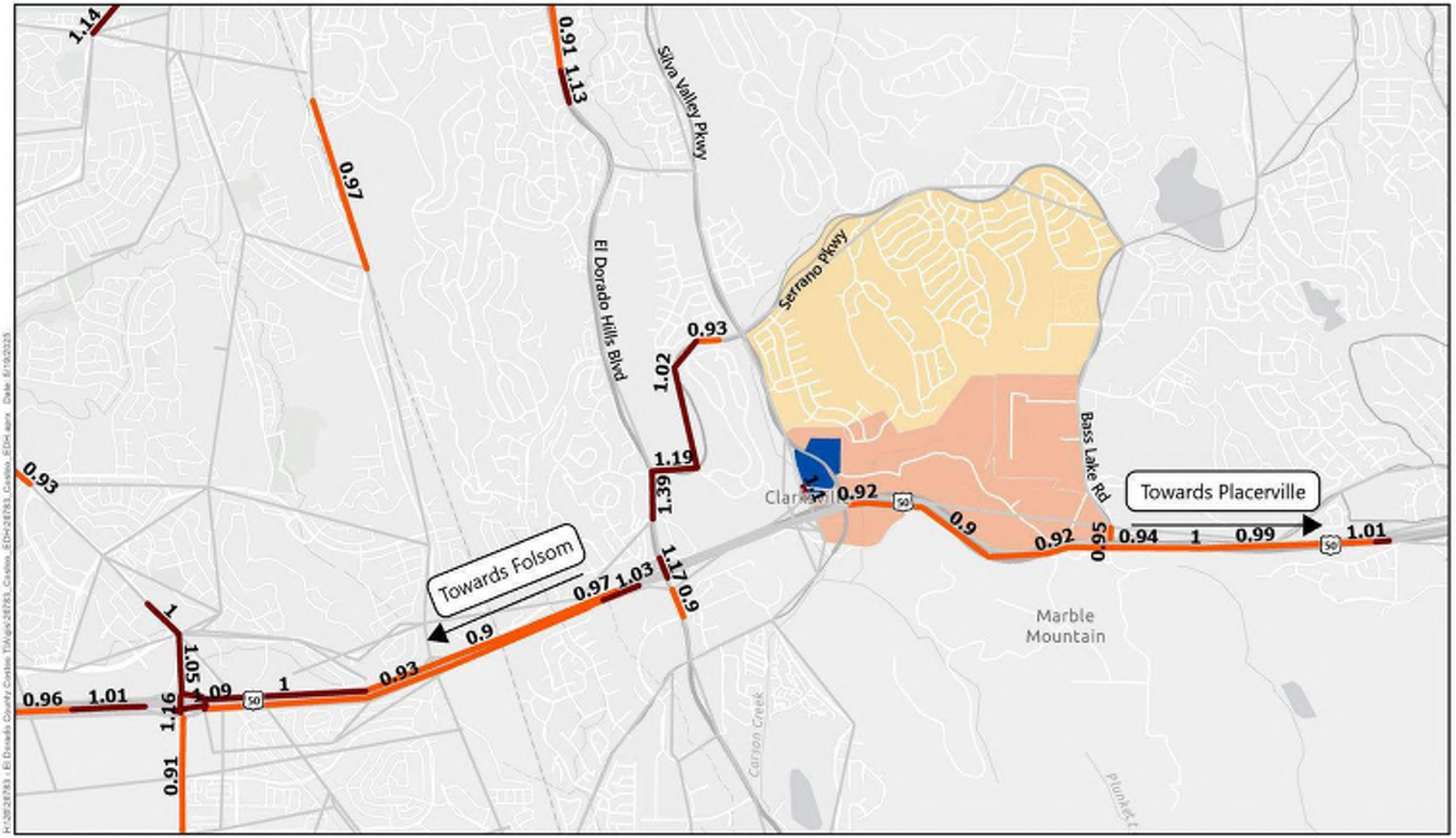
Figure 7

Congestion Locations
Wildfire Scenario #1
Existing Conditions - No Project
El Dorado Costco



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders

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Figure 8

Congestion Locations
Wildfire Scenario #1
Existing Conditions - Plus Project
El Dorado Costco

NEAR-TERM (2034) CONDITIONS

Figure 9 and Figure 10 show the congestion locations during wildfire scenario #1 for Near Term (2034) Conditions under Evacuation No Project and Evacuation Plus Project scenarios. In the No Project and Plus Project scenarios, roadways operating near or over capacity are as follows:

No Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway connecting evacuation area to Bass Lake Road
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

Plus Project

- Eastbound US 50 toward Placerville
- Eastbound and Westbound US 50 toward Folsom
- Serrano Parkway connecting evacuation area to Bass Lake Road
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50

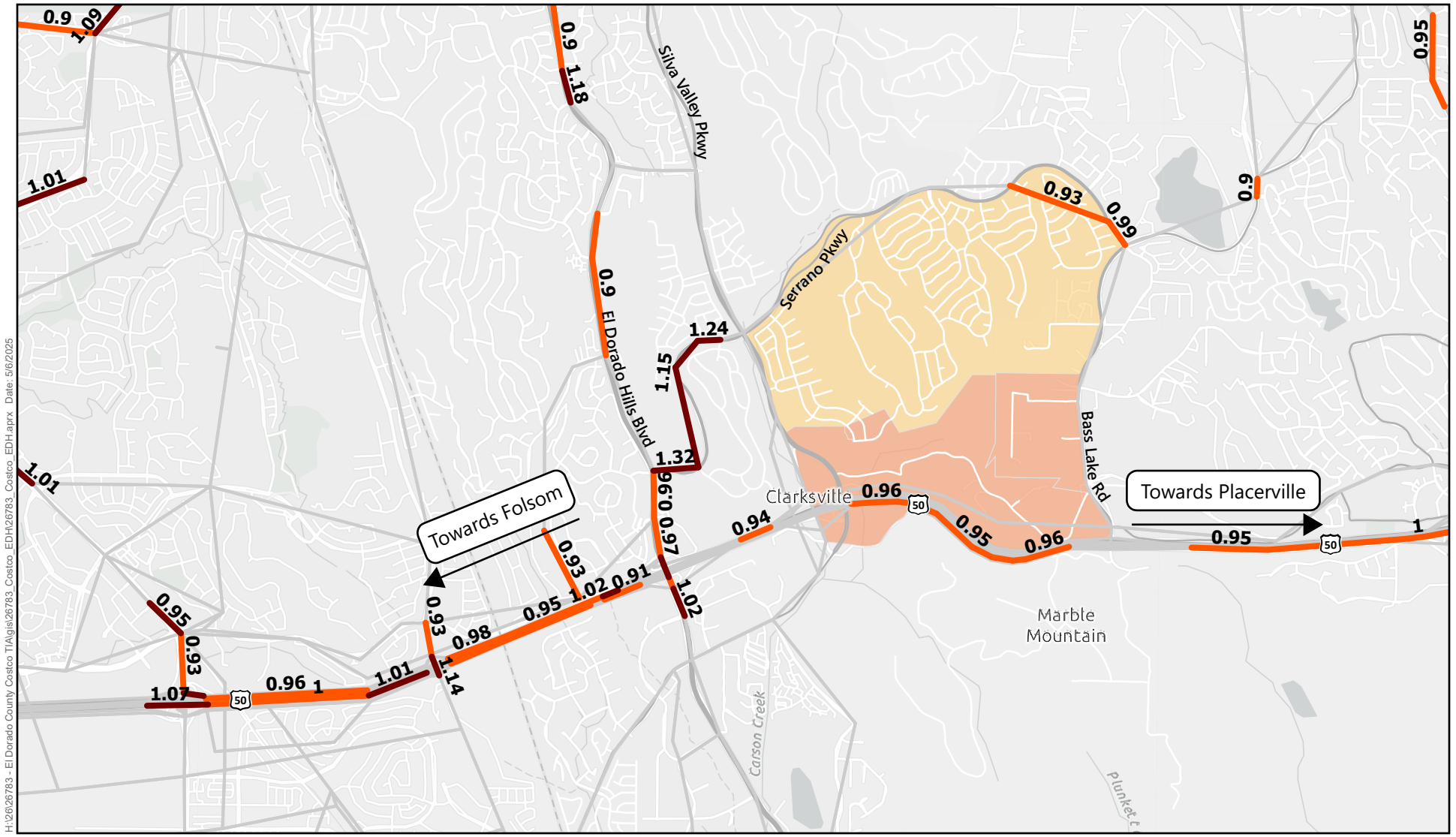
With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project Site, and along Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard.

Table 4 shows the travel times (in minutes) during wildfire scenario #1 for Existing Conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the increase in travel time with Project traffic varies between 0.1 to 0.8 minutes (1-4% increase) with the addition of the Project.

Table 4. Travel Times (minutes), Wildfire Scenario #1 - Near Term (2034) Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
S. of Serrano Pkwy.	Folsom	8.6	9.4	9.6	0.2	2%
	Placerville	22.2	22.9	23.4	0.5	2%
W. of Bass Lake Rd.	Folsom	8.3	9.0	9.1	0.1	1%
	Placerville	18.5	18.8	19.4	0.6	3%
Old White Rock Rd.	Folsom	5.3	5.9	6.0	0.1	2%
	Placerville	18.9	19.0	19.7	0.7	4%
Village Green Dr.	Folsom	4.9	5.5	5.7	0.2	4%
	Placerville	19.0	19.2	20.0	0.8	4%
Costco	Folsom	4.5	5.2	5.3	0.1	2%
	Placerville	18.7	18.9	19.6	0.7	4%

Compiled by: Kittelson & Associates, Inc., 2025



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Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

**Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.*

0 1 Miles

Figure 9

Congestion Locations
Wildfire Scenario #1
Near Term (2034) Conditions - No Project
El Dorado Costco

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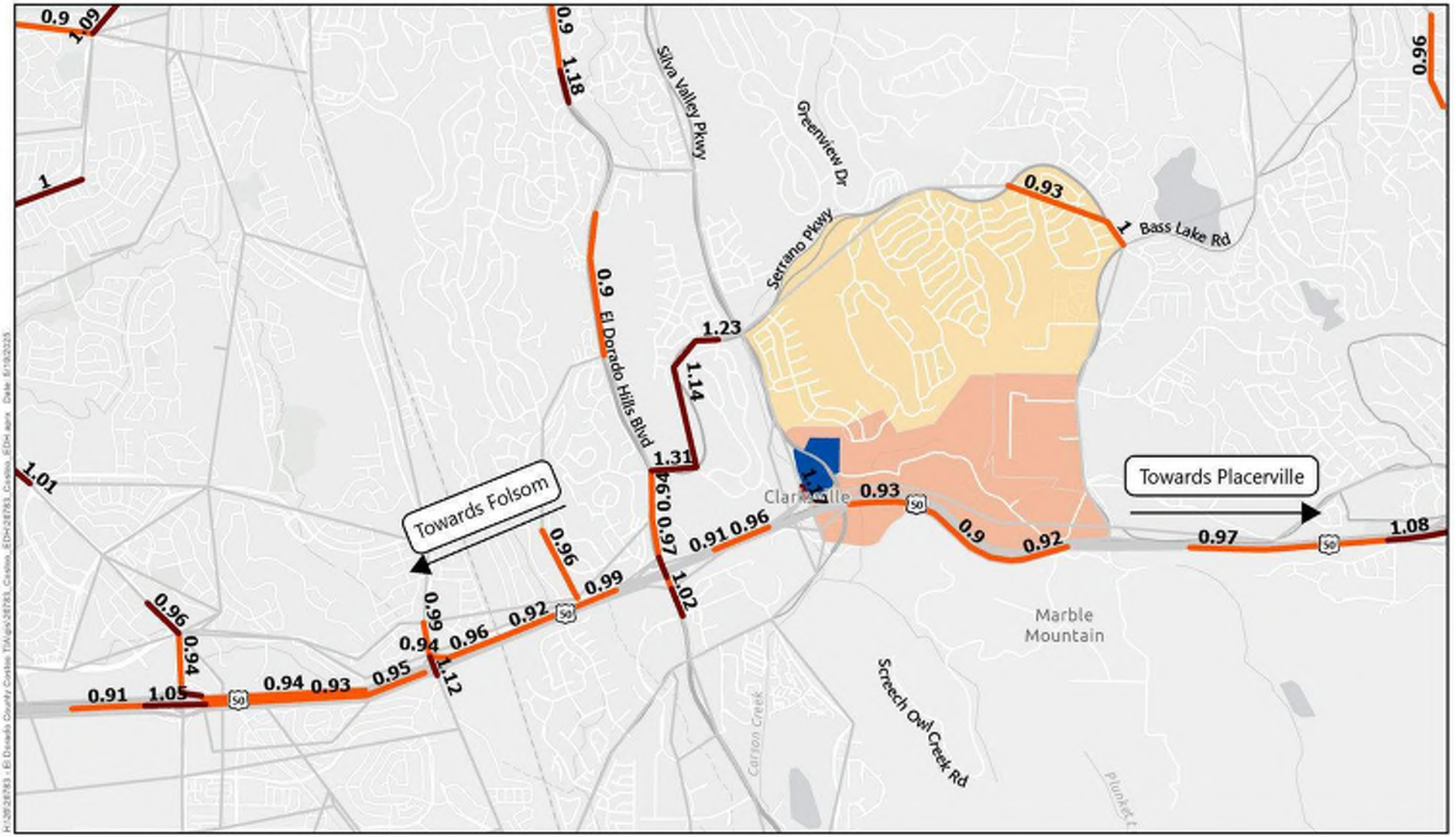

Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

25 percent 65 percent

El Dorado Costco Project Site

0 1 Miles

*Peak Hour is assumed to be the first hour of the evacuation, where residents, employees, customers and visitors are given evacuation orders.

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Figure 10

Congestion Locations
Wildfire Scenario #1
Near Term (2034) Conditions - Plus Project
El Dorado Costco

Wildfire Scenario #2

This section presents the travel times and congestion analysis under wildfire scenario #2 for all the analysis scenarios. The origin and destination locations are identified based on the evacuation area boundaries identified for this wildfire scenario and likely evacuation destinations in Folsom and Placerville. However, evacuation destinations are subject to change during an actual evacuation event based on direction from the Office of Emergency Services or evacuating persons' personal preferences.

EXISTING CONDITIONS

Figure 11 and Figure 12 show the congestion locations during the wildfire scenario #2 for Existing Conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Existing No Project and Plus Project scenarios.

No Project

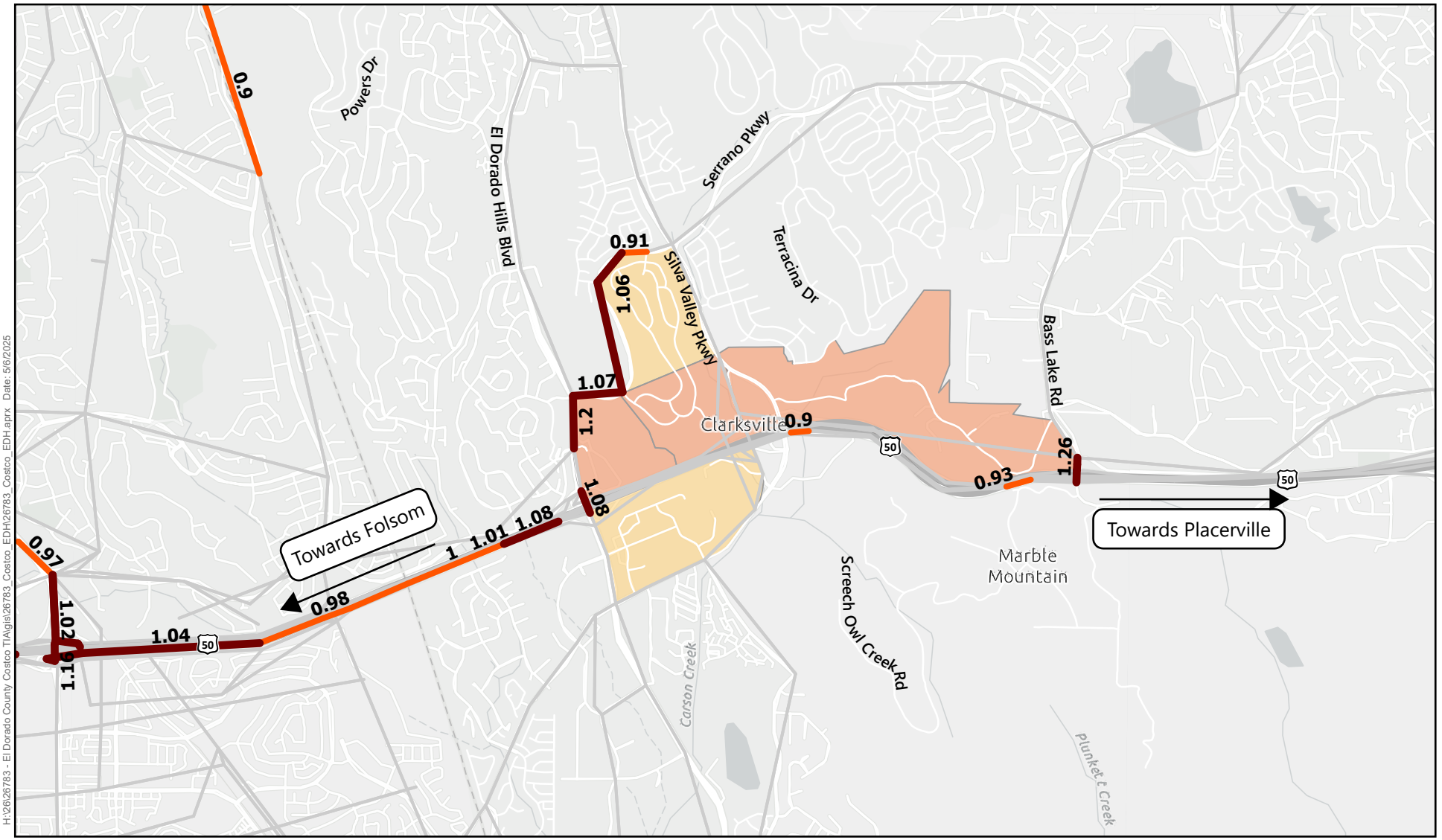
- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50
- Eastbound US 50 between Folsom and El Dorado Hills

Plus Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- El Dorado Hills Boulevard between Serrano Parkway and US 50
- A few sections of Eastbound US 50 between Folsom and Placerville including those adjacent to the Project site.

With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project site. Roadway capacity on Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard operates over capacity in the No Project and Plus Project scenarios, though the volume-to-capacity ratio changes with the addition of the Project are minimal.

Table 5 shows the travel times (in minutes) during wildfire scenario #2 for Existing Conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table, the increase in travel time with Project traffic varies between 0 to 1.2 minutes (0-6% increase).



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

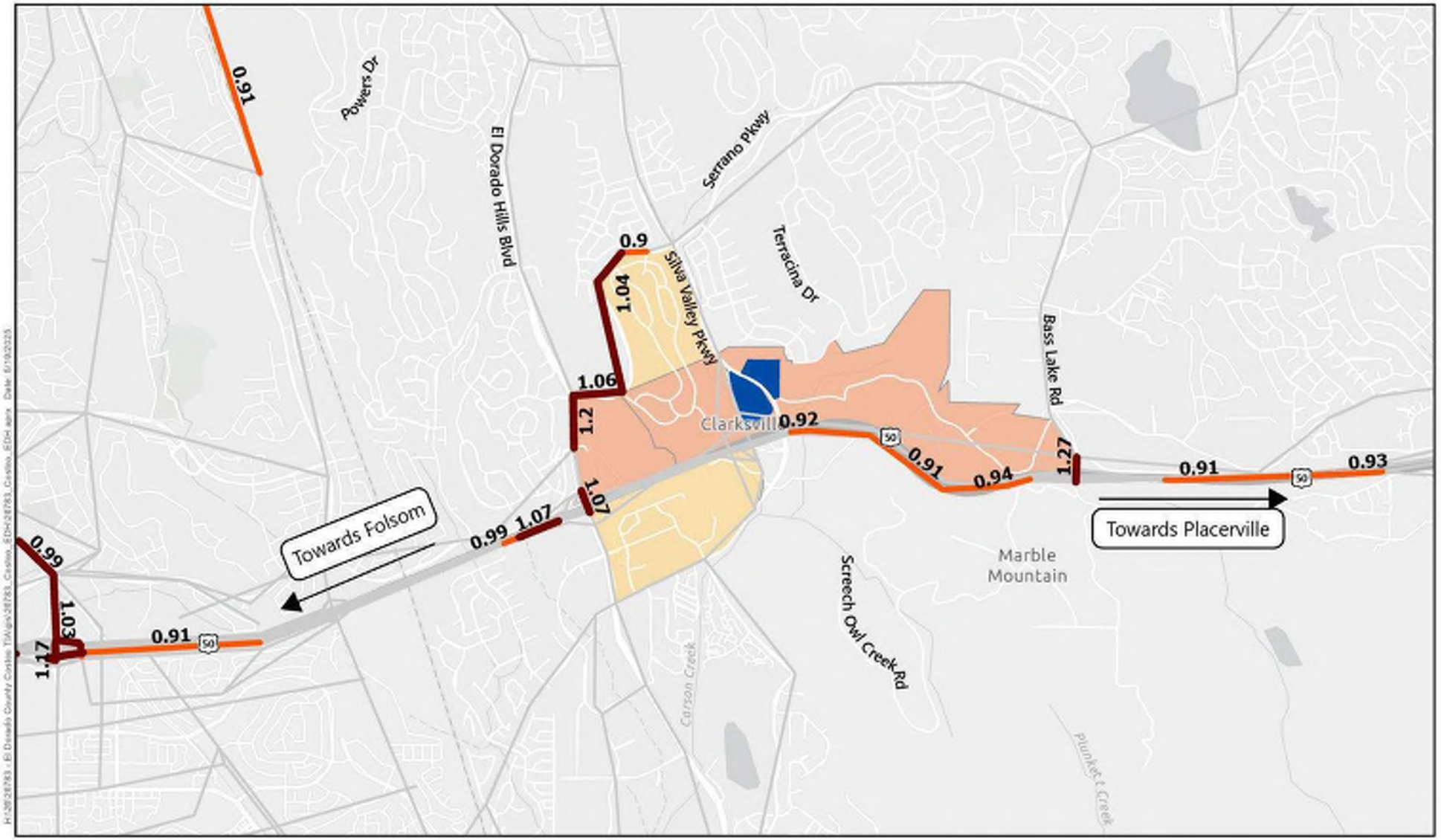
**Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders*

0 1 Miles

Figure 11

Congestion Locations
Wildfire Scenario #2
Existing Conditions - No Project
El Dorado Costco

KITTELSON & ASSOCIATES



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

*Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders

El Dorado Costco Project Site

0 1 Miles

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Figure 12

Congestion Locations
Wildfire Scenario #2
Existing Conditions - Plus Project
El Dorado Costco

Table 5. Travel Times (minutes), Wildfire Scenario #2, - Travel Times (minutes) - Existing Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
Souza Dr.	Folsom	5.6	5.7	5.8	0.1	2%
	Placerville	21.6	21.8	23.0	1.2	6%
Town Center	Folsom	4.4	4.5	4.6	0.1	2%
	Placerville	20.5	20.7	21.8	1.1	6%
Raley's	Folsom	3.8	3.9	3.9	0.0	0%
	Placerville	20.5	20.7	21.8	1.1	5%
Costco	Folsom	4.6	4.7	4.8	0.1	2%
	Placerville	19.4	19.6	20.8	1.2	6%

Compiled by: Kittelson & Associates, Inc, 2025

NEAR-TERM (2034) CONDITIONS

Figure 13 and Figure 14 show the congestion locations during the wildfire scenario #2 for Near Term conditions under Evacuation No Project and Evacuation Plus Project scenarios. The following are the locations operating near or over capacity in the Near-Term No Project and Plus Project scenarios.

No Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- Eastbound US 50 between El Dorado Hills and Placerville
- Eastbound and Westbound US 50 between El Dorado Hills and Folsom

Plus Project

- Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard
- Eastbound US 50 between El Dorado Hills and Placerville
- Eastbound US 50 and some sections of westbound US 50 between El Dorado Hills and Folsom

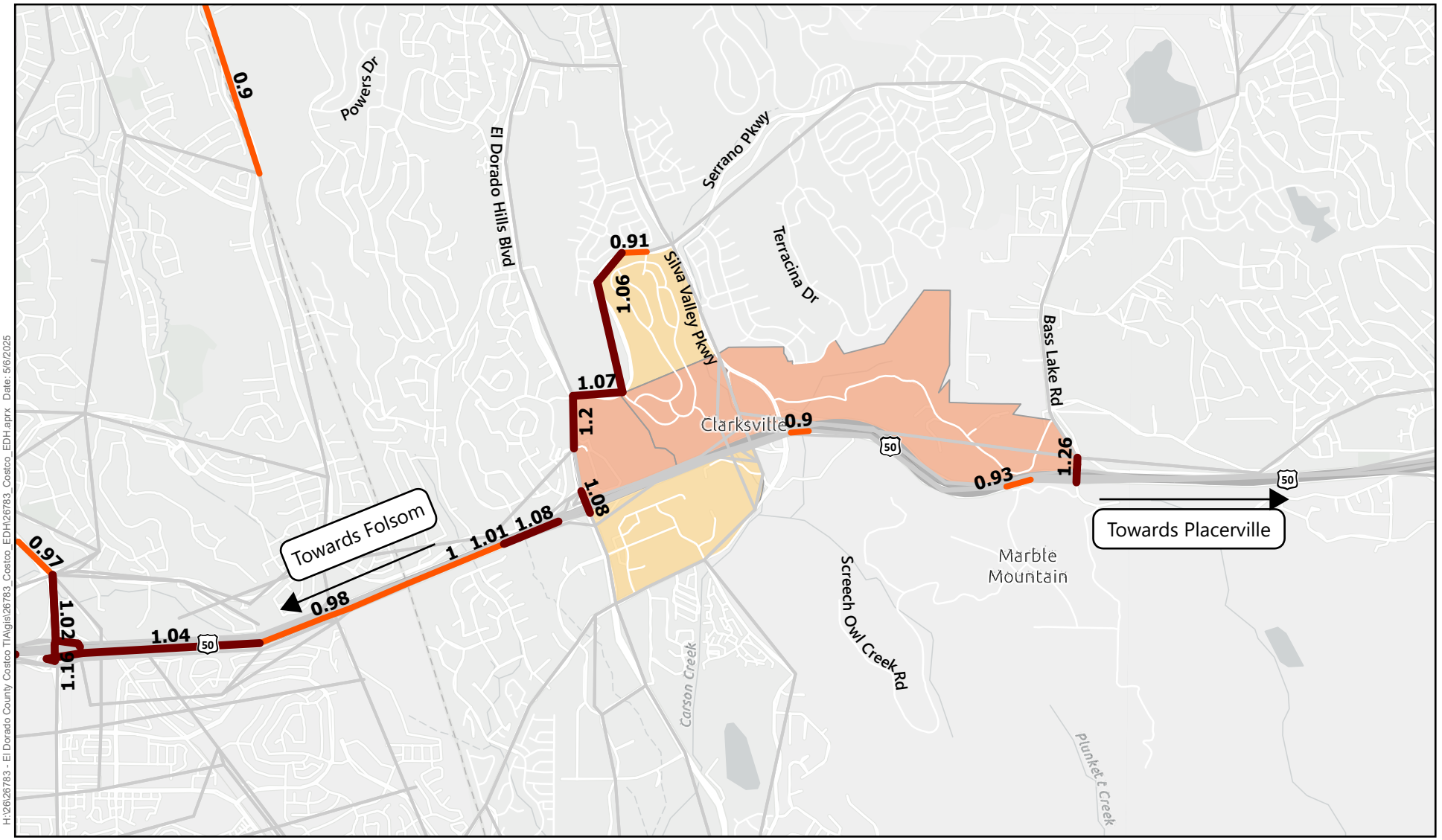
With the addition of Project traffic, volume-to-capacity ratio increases along US 50, towards Folsom and Placerville, including sections adjacent to the Project site and Serrano Parkway between Silva Valley Parkway and El Dorado Hills Boulevard.

Table 6 shows the travel times (in minutes) during wildfire scenario #2 for Near Term (2034) conditions under No Evacuation, Evacuation No Project, and Evacuation Plus Project scenarios. As seen in the table below, the change in travel time with Project traffic varies between 0 to 0.6 minutes (0-3% increase).

Table 6. Travel Times (minutes), Wildfire Scenario #2 – Near Term (2034) Conditions

Origin	Destination	No Evacuation Travel Time (mins)	Evacuation			
			No Project Travel Time (mins)	Plus Project Travel Time (mins)	Difference (mins)	Difference (percent)
Souza Dr.	Folsom	5.9	6.0	6.1	0.1	2%
	Placerville	20.1	20.1	20.7	0.6	3%
Town Center	Folsom	4.7	4.8	4.8	0.0	0%
	Placerville	19.9	19.9	20.3	0.4	2%
Raley's	Folsom	4.1	4.2	4.2	0.0	0%
	Placerville	19.9	20.0	20.3	0.3	2%
Costco	Folsom	4.5	4.6	4.7	0.1	2%
	Placerville	18.7	18.7	19.3	0.6	3%

Compiled by: Kittelson & Associates, Inc., 2025



H:\26\26783 - El Dorado County Costco TIA\gis\26783_Costco_EDH26783_Costco_EDH.aprx Date: 5/6/2025

Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

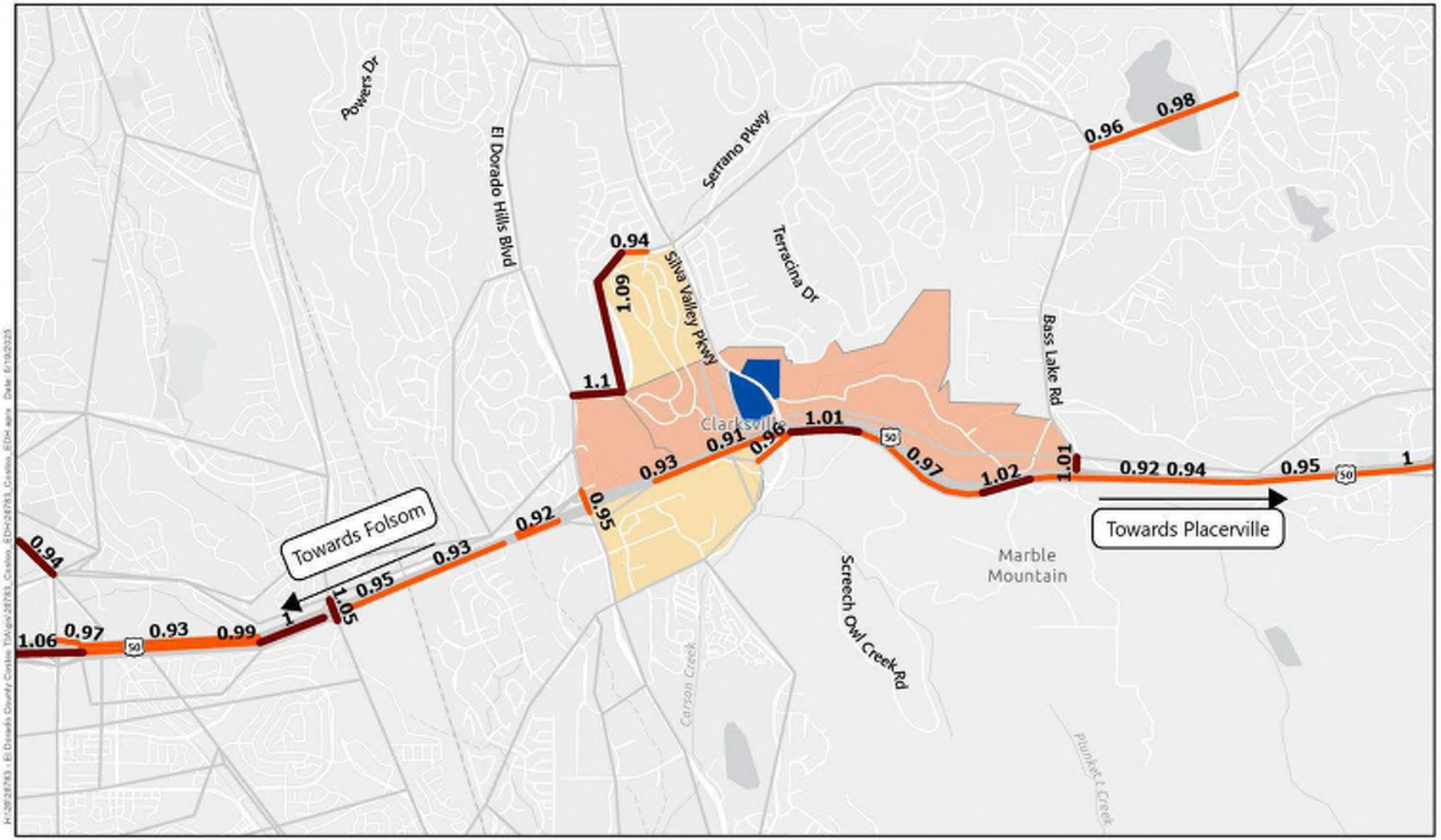
**Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders*

0 1 Miles

Figure 13

Congestion Locations
Wildfire Scenario #2
Near Term (2034) Conditions - No Project
El Dorado Costco

KITTELSON & ASSOCIATES



Congestion Locations

- Under Capacity
- Near Capacity
- Over Capacity

Percent Evacuating during Peak Hour*

- 25 percent
- 65 percent

El Dorado Costco Project Site

*Peak Hour is assumed to be the first hour, where residents, employees, customers and visitors are given evacuation orders

0 1 Miles

KITTELSON & ASSOCIATES

Figure 14

Congestion Locations
Wildfire Scenario #2
Near Term (2034) Conditions - Plus Project
El Dorado Costco

Evacuation Planning Considerations

This section describes evacuation projects and strategies that may be considered to improve the capacity and resilience of the evacuation area and surrounding region's roadway network to support future evacuation events. The projects and strategies were identified based on previous congestion and evacuation studies, review of recent evacuation efforts, and effective evacuation planning practices identified by US Department of Transportation (USDOT) and Federal Highway Administration (FHWA). The strategies are organized into five categories:

1. Roadway Management
2. Communications
3. Vulnerable Populations
4. Public Education
5. Resource Management

ROADWAY MANAGEMENT

This section includes infrastructure-related strategies that may aid in improving the capacity of the evacuation roadway network, which can present constraints or limitations to a successful evacuation. For each infrastructure-related treatment, it is necessary to consider downstream capacity limitations and identify if those limits nullify the potential benefits of the treatment as well as other competing roadway design needs to serve other functions and goals. Table 7 outlines each of these strategies and provides a brief description of the strategy and desired outcomes.

Of these strategies, the most effective for increasing evacuation capacity would be those that involve manual control of traffic combined with contra flow operations that allow evacuation on both inbound and outbound lanes of streets, combined with maintaining clear passages for emergency vehicles.

Table 7: Roadway and Intersection Capacity and Resilience Related Strategies

Strategy	Action Items
Limited contra flow on highways	Reverse one or more lanes of highway to accommodate an increased flow of traffic in one direction.
Unlimited contra flow on highways	Redirect all lanes of a designated evacuation route to accommodate rapid evacuation from a city or region.
Limited/unlimited contra flow on unlimited access arterials	Temporarily close inbound travel lanes on selected unlimited access arterials (such as parkways and boulevards) to allow outbound traffic to utilize these lanes during evacuation.
Closure of inbound lanes on selected roads and highways	Close inbound lanes on highways utilized for evacuation routes to prevent drivers on these routes from entering the evacuation area while evacuation is underway.
Restrict left-turn movements	Minimize left-turn movements along evacuation routes and on roads leading to evacuation routes.

Strategy	Action Items
Stage tow trucks	Consider how to stage tow trucks at bottleneck locations along evacuation routes to help detect and clear minor crashes and maintain traffic flows.
Adjust signal timing	Increase the green time and/or progression band for through movements leading out of an evacuation zone.
Signal operation during power outage	Install signal battery backups in case signal operations need to be maintained during a power outage. Consider using channeling devices, static signs, and coning strategies to manage intersection flow during power outage if signals lack power.
Additional access routes	Identify and communicate with communities that have at least two access points. Prioritize adding additional access to communities that are currently served by only one or two access points.
Public transit	Develop transportation solutions such as the use of a bus system for evacuating individuals with special needs (such as those with mobility limitations) and/or evacuating larger groups of people in fewer vehicles.
Traffic control points	Establish traffic control points (i.e., locations along designated evacuation routes with emergency management personnel) to maintain a greater degree of evacuation management. These locations could enhance the efficiency of an evacuation, reduce public confusion, and allow increased operational flexibility during an evacuation.
Vegetation clearing/management	Maintain evacuation roadways and shoulders, keeping them clear of trees, vegetation, and debris that would block travel lanes and shoulders for people evacuating and for emergency operation vehicles.

COMMUNICATIONS

This section describes communication strategies that address how information may be shared among agencies, organizations, and the general public for evacuations. During an emergency evacuation event, two types of communication take place: (1) communication among entities involved in the management of response, and (2) communication between the County and the general public. Table 8 outlines each of these strategies and provides a brief description of the strategy and desired outcomes.

Table 8. Communication Strategies for Evacuations

Strategy	Description and Outcome
Establish and maintain communications	Strengthen and maintain communication among coordinating emergency event agencies. This could be achieved through systems such as the Public Information Emergency System and Emergency Satellite Communications.

Strategy	Description and Outcome
Variable/Dynamic Message Signage	Use variable message board equipment and targeted installation of permanent dynamic message signs on evacuation routes to improve communication and reduce public confusion.
Traffic Control Center	Implement a traffic control center that would have up-to-the-minute reports on traffic patterns and could communicate directly with emergency officers via broadcast media, social media, and other emergency communications channels (e.g., County Telephone Emergency Notification System) to let drivers know about roadway congestion conditions and direct them to alternate routes.
Traffic counters/CCTV cameras	Install traffic counters and/or CCTV cameras on freeways, which can help assess traffic flow, volume of vehicles evacuating, and monitor incidents during emergency evacuation events.
Highway Advisory Radio	Implement highway advisory radio to provide information regarding primary and secondary evacuation routes and incidents to the public.
Pre-defined evacuation zones	The County could consider implementing a system of pre-defined evacuation zones. Pre-defined evacuation zones can provide a common reference system for first responders and the community.

VULNERABLE POPULATIONS

This section identifies strategies specifically for evacuation of vulnerable populations. The County can use demographic data and U.S. Census data to identify vulnerable population locations and communities. County staff and emergency response teams may work with specialized organizations such as hospitals, medical associations, public service organizations, public health staff, and other providers or community groups to identify and locate relevant population segments and the types of assistance needed. Table 9 outlines considerations by need.

Table 9: Additional Steps for Evacuation of Vulnerable Populations

Special Need	Action Items/Considerations
Visually impaired	May be reluctant to leave familiar surroundings when the request for evacuation comes from a stranger. People who are blind or partially sighted may have to depend on their guide dogs and/or others to lead them to safety.
Hearing impaired	May need to make special arrangements to receive evacuation warnings. Include visual aids such as pictures or maps to reinforce key messages.

Special Need	Action Items/Considerations
Mobility impaired	May need special assistance such as paratransit. Partner with neighboring jurisdictions and/or private/non-profit organizations to provide adequate paratransit services.
People without vehicles	Emphasize the importance of carpooling with neighbors or other community members. Provide information on transit routes and transit stops.
Non-English-speaking persons	Provide bilingual or multilingual materials to support communication with non-English speaking populations during evacuation.
People with medical conditions	Communicate in advance the location and availability of hospitals or facilities with emergency/life-sustaining medical equipment, such as dialysis machines.
Unhoused population	Arrange for food, shelter, and transportation for unhoused population. Offer age-appropriate emergency and evacuation information to unhoused children.

PUBLIC EDUCATION

Sharing information is a critical element to help educate the general public on how to prepare in advance for an evacuation. The public education strategies the County may consider include:

- Defining the meaning of different types of evacuation orders
- Sharing how evacuation orders are declared and communicated to the public
- Providing information on preparations to carry out in advance (such as emergency "go" kits or family evacuation plans)
- Conducting a public affair campaign(s) to distribute easy-to-read evacuation maps with alternate routes
- Providing information on available transportation options, including for vulnerable populations
- Providing information on evacuation shelters and support services offered during evacuation
- Providing regular emergency preparedness trainings in multiple languages at convenient, accessible locations
- Building capacity of resilience hubs, community-based organizations, and other community groups to support community-based disaster preparedness efforts through direct or passthrough funding, grant writing support, information sharing, etc.

RESOURCE MANAGEMENT

Evacuations are resource-intensive events that require significant personnel, facilities, and equipment to implement successfully. The County should determine what resources are available as well as what resources will be needed for staff to perform their responsibilities during an evacuation successfully, which may include the following:

- Clarity on staff roles and expertise available
- Facilities available (e.g., traffic operations center, shelters, etc.)

- Available information systems to support the evacuation (e.g., intelligent transportation systems, computer networks, road sensor loops, ancillary hardware such as cameras, etc.)
- Communication systems (e.g., landline, mobile phones, radio system, email, sirens)
- Vehicles/transports (e.g., staff transport, tow trucks, transit vehicles, heavy equipment)
- Miscellaneous materials to support implementation of evacuation strategies (e.g., traffic cones, channeling devices, static/dynamic message signs)

If critical resource gaps are identified, the County may look to work with other evacuation entities to determine additional resources and needs. The County may also work with private sector entities to expand the resource base. For example, utilities companies may keep cell and internet services running in vulnerable communities during public safety power shutoffs. Private service companies such as ambulance operators and towing companies can provide additional assets during evacuation. These companies can clarify what is expected of them during a potential evacuation event to ensure their services are available, when needed.

Conclusion

This memorandum documents the methodology and results of the evacuation analysis for two wildfire scenarios under Existing and Near-Term Conditions: No Project and Plus Project scenarios. The El Dorado County travel demand model was used to estimate roadway capacity and travel times during evacuations in No Project and Plus Project conditions.

EXISTING CONDITIONS

Under Existing conditions, roadway capacity is estimated to increase along US-50 in the westbound and eastbound directions. Though the roadway capacity is estimated to increase, overall roadway capacity is expected to remain under full capacity (v/c < 1.0).

Roadways near the project site, such as Silva Valley Parkway and Serrano Parkway, are estimated to see an increase in roadway capacity as residents, customers, and employees evacuate. The change in roadway capacity is estimated to be minimal.

NEAR-TERM (2034) CONDITIONS

Under Near-Term (2034) conditions, which include land uses and traffic for the Remainder Area, roadway capacity is estimated to increase along US-50 in the westbound and eastbound directions. Overall roadway capacity is expected to remain under full capacity (v/c < 1.0) for most of US-50 near the project site, but some segments are estimated to have a roadway capacity over capacity (v/c > 1.0).

Roadways adjacent to the project site, such as Silva Valley Parkway and Serrano Parkway, are estimated to see an increase in roadway capacity as residents, customers, and employees evacuate. The change in roadway capacity is estimated to be minimal.

The evacuation planning considerations and strategies identified in this memorandum can help enhance the capacity and resilience of the County's roadway network to support future evacuation events.

Appendix A

Wildfire Modeling Summary Report

Costco Wholesale Project

OCTOBER 2025

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Printed on 30% post-consumer recycled material.

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TABLES

FIGURES

APPENDIX

1 Introduction

This report summarizes fire behavior modeling efforts conducted for the Costco Wholesale Project (Project), a proposed commercial development located in El Dorado County, California. Fire progression and fire behavior modeling was conducted for the Project area to evaluate potential fire behavior characteristics and fire spread potential toward the Project site. The following tasks were performed:

- Evaluation of wildfire history, wildfire ignition, and fuels/vegetation mapping data for the Project site and surrounding area.
- A field evaluation of the Project site and surrounding area to better understand fuel (vegetation) conditions and confirm observations made during mapping data review and to refine the fuel model(s) to be used in the wildfire behavior and progression modeling efforts.
- Analysis and processing of local historical weather data to determine appropriate fuel moisture, wind speed, and wind direction inputs for the wildfire behavior and progression modeling runs.
- Creation of a base landscape data set (GIS-based terrain and fuels data) to be used for wildfire behavior and progression modeling efforts.
- Modeling of wildfire behavior (flame length, spread rate, and fireline intensity) and three (3) wildfire progression scenarios to understand the effect of a fire approaching the proposed Project site. Modeling was conducted using FlamMap. A GID-based fire behavior modeling application.
- Preparation of this Wildfire Modeling Summary Report that summarizes our methods, data sources, assumptions, and modeling results.
- Coordination and communication with the California Department of Forestry and Fire Protection (CAL FIRE) and the Project team.

1.1 Location

The Project site is located in El Dorado County, north of US 50 and Tong Road, east of Clarksville Crossing, and is bisected by Silva Valley Parkway. The northern portion of the Project site is approximately 24.83 acres (North Site) and includes APNs: 122-720-0019, 20, and 21. All the parcels are undeveloped, and 122-720-21 (6.57 of 7.75 acres) is primarily reserved for the future extension of County Club Drive to Silva Valley Parkway, which is not part of the Project. The southern portion of the Project site is approximately 18.42 acres (South Site) and includes APNs:122-720-018, 02, and 03. A portion of 122-720-003 and a portion of the unused former Tong Road right-of-way between Silva Valley Parkway and Clarksville Crossing are proposed to be utilized for site access. The 1.38-acre portion of 122-720-018 west of Clarksville Crossing on the South Site will not be developed as part of the Project, resulting in a net development site of 17.05 acres.

The modeling analysis area discussed in this report includes the Project site plus the area within 2 miles of the Project site. The Project site and modeling analysis area are presented in Figure 1.

Project and Modeling Area Location

1.2 Project Description

The Project proposes to develop the site as a Costco retail center with the Costco building at the center of the south portion of the site and a fuel facility on the north portion of the site. The maximum building area for the Costco South Site will be approximately 165,000 square feet. Development of this portion of the site includes the main Costco building, site access, and a parking area, including a subterranean parking structure. The fuel facility on the North Site will include a maximum 13,000 square foot open canopy and a 200 square foot controller enclosure. The remainder of the North Site will include Costco employee parking.

1.3 FlamMap Fire Behavior Modeling

The FlamMap software package was used to model potential fire behavior and fire spread in the modeling analysis area. FlamMap utilizes the same fire spread equations built into the BehavePlus software package but allows for a geographical presentation of fire behavior outputs as it applies the calculations to each pixel in an associated geographic information system (GIS) landscape (Finney 2002). The FlamMap software package is a publicly available resource available through the Fire, Fuel, and Smoke Science Program of the U.S. Forest Service. FlamMap is a GIS-based software package that models potential fire behavior and fire spread where weather conditions (wind and fuel moisture) are held constant. FlamMap generates map files of potential fire behavior characteristics (e.g., flame length, spread rate, fireline intensity) and fire progression data (fire growth perimeters, fire flow paths). Model outputs represent fire behavior calculated for each pixel within the analysis area independently and do not calculate fire spread across a landscape. The software requires a minimum of five input variables, including elevation, slope, aspect, fuel model, and canopy cover. Wind and weather data are also critical components to FlamMap modeling efforts. The following section presents a background on fire behavior modeling and this report presents the methods and data sources used in performing the FlamMap fire behavior modeling analysis.

1.4 Fire Behavior Modeling Background

Predicting wildland fire behavior is not an exact science due to the many variables that must be considered. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather, the limits of weather forecasting, and the weather that is often created by firestorms. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire information (Rothermel 1993). To be used effectively, the basic assumptions and limitations of fire behavior modeling applications 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 fuel less than 0.25 inches in diameter. These are the fine fuels that carry fire. Fuels greater than 1 inch in diameter have little effect, while fuels greater than 3 inches in diameter have no effect on fire behavior.

- Second, the model bases surface fire calculations and descriptions on a wildfire spreading through fuels that are within 6 feet of the ground and contiguous to the ground. Surface fuels are classified as grass, grass/shrub, shrub, timber litter, timber understory, or slash.

- Third, the software assumes that weather is uniform. However, because wildfires almost always burn under non-uniform conditions, creating their own weather, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, fire behavior computer modeling systems are not intended for determining sufficient fuel modification zone/defensible space widths. However, results can provide the average length of the flames, which is a key element for determining defensible space distances for minimizing structure ignition.
- Fifth, FlamMap is designed to simulate wildland fire behavior in vegetative fuels (such as grasses, shrubs, and trees), not structures.
- Sixth, FlamMap does not predict ember spotting from non-timber fuel types (e.g., shrubs, grasses).
- Seventh, fire spread modeling does not account for fire suppression efforts and therefore represents a worst-case scenario.

FlamMap can 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. Fuels are made up of the various components of vegetation, both live and dead, that occur in a particular landscape. The type and quantity will depend upon soil, climate, terrain, and management and disturbance (e.g., fire) history. The major fuel groups of grass, grass/shrub, shrub, trees, tree litter, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

2 Modeling Approach Summary

Three scenarios were evaluated for fire progression modeling, as defined below:

- **Scenario 1:** This scenario represented a fire burning under late summer/early fall north-northwest wind conditions (represented by 97th percentile fire weather conditions). The ignition point for this scenario was located to the northeast of the Project site.
- **Scenario 2:** This scenario represented a fire burning under summer southwest wind conditions (represented by 50th percentile fire weather conditions). The ignition point for this scenario was located to the southwest of the Project site.
- **Scenario 3:** Similar to Scenario 2, this scenario represented a fire burning under summer southwest wind conditions (represented by 50th percentile fire weather conditions). The ignition point for this scenario was located to the southwest of the Project site, though further east than that for Scenario 2.

Additionally, fire behavior modeling was used to evaluate potential fire behavior characteristics in the modeling analysis area. The results of this modeling effort are static outputs representing fire behavior characteristic at a site, given fuel, terrain, and weather inputs. The following fire behavior characteristics were modeled:

- Flame Length
- Spread Rate
- Fireline Intensity

3 Modeling Inputs

3.1 Model Inputs

3.1.1 Elevation

Elevation data were derived from a 1/3 arc-second (10m) resolution National Elevation Dataset (NED), acquired from the U.S. Geological Survey (USGS) National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and projected in the NAD 1983, California State Plane, Zone 2 coordinate system, with units in meters (USGS, 2024a). Elevation values in the modeling area range from 492 feet to 1,460 feet above mean sea level (AMSL). This data was utilized to create an elevation grid file, using units of feet AMSL. Elevation is a required input file for FlamMap runs and are necessary for adiabatic adjustment of temperature and humidity and for conversion of fire spread between horizontal and slope distances.

3.1.2 Slope

Using ArcGIS Spatial Analyst tools, a slope grid file was generated from the elevation grid file described above. Slope measurements utilized values in percent of inclination from horizontal. Slope values in the analysis area range from 0-37 degrees. The slope input file is necessary for computing slope effects on fire spread and solar radiance.

3.1.3 Aspect

Using ArcGIS Spatial Analyst tools, an aspect grid file was generated from the elevation grid file described above. The aspect values utilized were azimuth degrees. Aspect values are important in determining the solar exposure of grid cells.

3.1.4 Fuel Model

Fire Behavior Fuel Models (FBFMs) are standardized classifications used to describe the types of vegetation and other combustible materials that influence wildfire behavior. These models help predict fire spread, intensity, and flame length under various conditions. Fuel model data was created utilizing the 2023 National Land Cover Database (USGS 2024b). This database is a comprehensive dataset that provides detailed land cover and land use information for the United States. It is produced by the United States Geological Survey (USGS) and the Multi-Resolution Land Characteristics Consortium (MRLC) and is used for a wide range of applications in environmental monitoring, land planning, resource management, and research. Land cover data is provided at a 30-meter resolution and classifies landcover into the categories provided in **Exhibit 1**. Fuel model data was further refined to account for roadways and other non-burnable areas not accounted for within the NLCD Land Cover data.

Exhibit: 1: NLCD Land Cover Classifications (USGS 2024b)

This dataset was clipped to the modeling analysis area to derive fuel models in wildlands surrounding the Project site at a 10-meter resolution. A crosswalk was created to assign land cover classifications into unique FBFMs using the Scott and Burgan 2005 40 FBFMs (Scott and Burgan, 2005). Crosswalk values were determined through field observations and through comparison with regional FBFM classification standards as mapped by LANDFIRE. The land cover to FBFM crosswalk is provided in Table 1. As presented, fuels in the analysis area are comprised mainly of developed areas and annual grassland vegetation.

Table 1. Land Cover to Fire Behavior Fuel Model Crosswalk

NLCD Land Cover Classification	Fuel Model Classification	Acres
21-24 Developed 11 Open water	NB1 – Non-burnable/Developed	4,460

Table 1. Land Cover to Fire Behavior Fuel Model Crosswalk

NLCD Land Cover Classification	Fuel Model Classification	Acres
71 Grassland/Herbaceous	GR2 - Low Load, Dry Climate Grass	2,858
52 Shrub/Scrub	SH5 - High Load, Dry Climate Shrub	527
41 Deciduous Forest	TL2 - Low Load Broadleaf Litter	353
42 Evergreen Forest 43 Mixed Forest	TL6 – Moderate Load Broadleaf Litter	146
	Total:	**8,306**

Source: USGS 2024b, LANDFIRE 2023

3.1.5 Canopy Cover

Canopy cover is a required raster file for FlamMap operations. It is necessary for computing shading and wind reduction factors for all fuel models. Canopy cover is measured as the horizontal fraction of the ground that is covered directly overhead by tree canopy. Crown closure refers to the ecological condition of relative tree crown density. Stands can be said to be "closed" to recruitment of canopy trees but still only have 40% or 50% canopy cover. Coverage units are represented as percentage values (0–100).

Canopy cover for the analysis area was derived from NLCD 2023 Canopy Cover Database (MRLC 2023). The 2023 NLCD Canopy Cover dataset quantifies the percentage of forest canopy cover in 10% increments. It provides a spatial representation of canopy cover at a 30-meter resolution ranging from 0% (no canopy) to 100% (complete canopy coverage).

3.1.6 Weather

Historical weather data for the modeling area was utilized in determining appropriate fire behavior modeling inputs. For this analysis, 97th percentile fuel moisture, wind speed, and wind direction values were derived from Remote Automated Weather Station (RAWS) data and utilized in fire behavior and progression modeling efforts. Data from the Ben Bolt RAWS was utilized for modeling fire behavior and progression (approximately 250 feet north of the City-owned Grizzly Peak Open Space parcels). Table 2 summarizes location information and available data ranges for the Ben Bolt RAWS.

Table 2. Ben Bolt Remote Automated Weather Station Characteristics

Station Characteristics	Value
Station ID	42612
Latitude	38.59084
Longitude	-120.93362
Elevation	905 feet
Data Years	2005-2024

To determine weather-related modeling inputs, RAWS data were downloaded, processed, and analyzed using the FireFamily Plus software package (v. 5.0) to determine 97th percentile (Scenario 1) and 5th percentile (Scenarios 2 and 3) fire weather conditions. The RAWS data was evaluated from August 1 through October 15 for each year between 2005 and 2024 (extent of available data record) for the 97th percentile (Scenario 1) and from June 1

through August 31 for each year between 2005 and 2024 (extent of available data record) for the 50th percentile (Scenarios 2 and 3). Data derived from this analysis included values for 1-hour, 10-hour, and 100-hour fuel moistures, live herbaceous moisture, live woody moisture, 20-foot sustained wind speed, and wind direction. The weather data was also evaluated to determine the maximum sustained wind speed.

These weather values were incorporated into the Initial Fuel Moisture file used as an input in FlamMap. Wind direction and wind speed values for the FlamMap run were manually entered during the data input phase. Table 3 presents the wind and weather values used in the FlamMap fire behavior and progression modeling runs.

Table 3. Weather Variables used for Fire Behavior and Progression Modeling

Model Variable	Value Scenario 1 (97th Percentile Fire Weather)	Value Scenarios 2 and 3 (50th Percentile Fire Weather)
20-foot Wind Speed (mph)	10	8
Maximum Wind Speed (mph)	23	19
Wind Azimuth (degrees)	23	225
1-hour Fuel Moisture (%)	3	6
10-hour Fuel Moisture (%)	6	10
100-hour Fuel Moisture (%)	8	11
Live Herbaceous Fuel Moisture (%)	30	30
Live Woody Fuel Moisture (%)	59	59

Note: * Live herbaceous moisture values were lower than 30% so the herbaceous fuels are considered fully cured (Scott and Burgan 2005).

Wind direction (azimuth) for each Scenario was determined by evaluating wind rose outputs for sustained wind speeds, as presented in Exhibits 2 and 3.

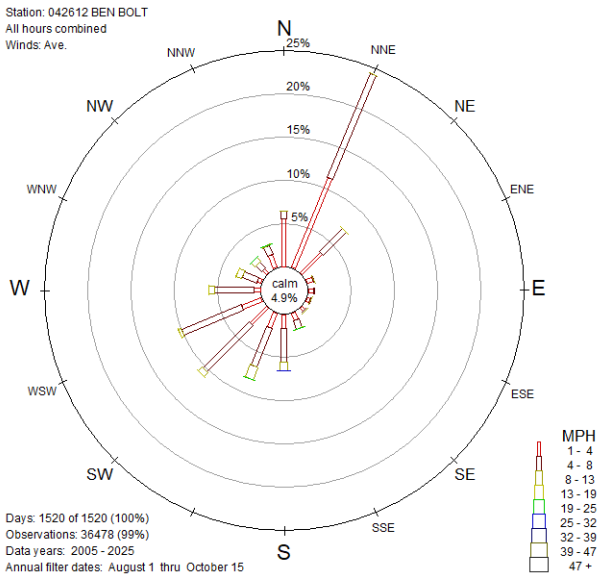

Exhibit 2. Wind rose for 97th percentile wind direction.

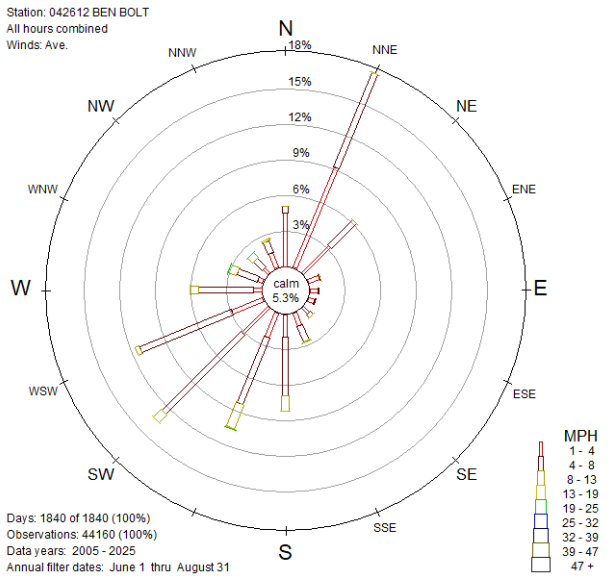

Exhibit 3. Wind rose for 50th percentile wind direction.

Finally, wind vectors were modeled within the FlamMap runs using the WindNinja tool embedded in the FlamMap software. WindNinja models the effect of topography on wind speed and direction and generates wind vector files for use in the modeling runs. The grid resolution for the WindNinja analysis was set at 30 meters.

3.1.7 Ignition Locations

We evaluated historic wildfire ignition point data in GIS format (NIFC 2025) to understand where historic ignitions have occurred and where it is likely that they could occur again. This data, coupled with an evaluation of wildfire history data (CAL FIRE 2024) and vegetation mapping data (USGS 2024b), informed the selection of ignition locations for the fire progression modeling effort. These locations were also evaluated in the field and ignition locations were reviewed with CAL FIRE prior to conducting the modeling runs. The following summarizes each of the ignition locations used for the fire progression modeling runs:

Exhibit 4. Photograph of field conditions located at the ignition point used for Scenario 1 (southwest corner of the intersection of Bass Lake Road and Hawk View Road).

Scenario 1: The ignition point for this scenario represents a roadside ignition occurring along the west side of Bass Lake Road near its intersection with Hawk View Road. This location contains ample roadside grasses that could potentially be ignited from human causes associated with roadways (e.g., cigarettes, dragging chains, molten catalyst material from vehicles, etc.) According to historic ignition data, multiple ignitions have occurred along Bass Lake Road.

Exhibit 5. Photograph of field conditions located near the ignition points used for Scenarios 2 and 3 (north of Highway 50 and east of El Dorado Hills Boulevard).

Scenario 2: The ignition point for this scenario represents a roadside ignition occurring along the north side of Highway-50 approximately 1,200 feet east of El Dorado Hills Boulevard. An ignition in this location is possible from a vehicle or other human causes. According to historic ignition data, multiple ignitions have occurred along Highway-50 in this region.

Scenario 3: The ignition point for this scenario represents a similar roadside ignition to Scenario 2 yet occurring approximately 2,000 feet further to the east and closer to the Project site. According to historic ignition data, multiple ignitions have occurred along Highway 50 in this region.

3.2 Model Outputs

Model outputs for this analysis include three fire progression maps (one for each of the three scenarios) and six landscape fire behavior characteristic maps, which include measurements of flame length, fireline intensity, and rate of spread for 50th and 97th percentile weather conditions. While wildfire progression maps present fire behavior and spread from a unique ignition point, landscape fire behavior models are static and represent wildfire behavior in all vegetated pixels present within the landscape.

Fire progression runs utilized the Minimum Travel Time (MTT) tool in FlamMap. The MTT tool is a two-dimensional fire growth model which calculates fire growth based on calculated fire spread rates from an ignition source (point, line, or polygon). The MTT tool uses fire spread rates to find minimum travel paths between data cells in the GIS landscape, with an output data file representing the number of minutes for a wildfire to reach a particular location from the ignition source. As FlamMap provides a static representation of fire behavior, modeling using the MTT tool holds wind and weather inputs constant over the modeling period. Each MTT simulation was assigned a burn period of 6 hours (360 minutes).

3.2.1 Fire Progression

The output files generated for the three progression runs included one arrival time grid and one line file representing major fire spread paths, considering modeling inputs and ignition location (output maps are presented in Appendix A). Major paths identify the most significant pathways for fire spread. The arrival time data presents time (in minutes) for a modeled fire to reach a specific location. This data was analyzed to determine the time necessary for a fire to burn from its ignition point to the Project site and surrounding communities. For some runs (Scenarios 2 and 3), the modeled fire did not reach the Project. This is due to the classification of non-burnable fuel models associated with roadways that function as barriers to grassland fire spread.

Scenario 1: A wildfire in this scenario spreads in a southwest direction driven by strong 23 mph winds from the north/northeast. Wildfire spreads quickly through herbaceous vegetation in a downslope direction through the Carson Creek drainage. Exiting roadways such as Silver Dove Way and Tong Road function as fuel breaks and prevent the fire from burning away from the drainage to the south. While the main fire front spreads in a southwest direction, the fire's flanks spread towards existing communities along Borders Drive and Archetto Drive. After about 1 hour, the modeled fire reaches riparian woodland vegetation which significantly slows fire spread. This alters the path of the fire front and results in fire spread across the north slope of Carson Creek. The fire front continues to spread southwest and eventually reaches the eastern edge of the Project site in 143 minutes (2 hours, 23 minutes).

Scenario 2: A wildfire in this scenario spreads in a northeast direction through grassland fuels. Fire spread is driven by 19 mph winds from the southwest and follows a slight uphill slope. The fire's northern perimeter is modeled to reach the edge of existing communities along Panela Way within 52 minutes. Spread along the fire's northeastern perimeter is halted by an existing dirt service road (roughly 16 feet wide) which travels across the open space and functions as a fuel break. This feature is modeled to prevent fire from continuing towards the Project site from this ignition location.

Exhibit 6: Aerial image of service road which functions as a fuel break and limits fire spread towards the Project site in Scenario 2.

Scenario 3: In this scenario, similar to Scenario 2, a wildfire spreads northeast across grasslands, driven by 19 mph winds from the southwest. The fire follows a slight uphill path and reaches the western edge of Old Silva Valley Parkway in 36 minutes. However, riparian vegetation and the paved roadway to the west of the Project site act as a natural fire break, preventing the fire from reaching the Project site.

3.2.2 Fire Behavior

Three output grid files for each weather scenario (50th and 97th percentile) were generated for the FlamMap run and represent flame length (feet), fireline intensity (BTU/ft/s), and rate of spread (mph). 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 et al. 2008). It is a somewhat subjective and non-scientific measure of fire behavior but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1993). Flame length values in the resulting grid file are in feet. Table 4 below presents an interpretation of flame length and its relationship to fireline intensity. Fireline intensity is a measure of heat output from the flaming front and affects the potential for a surface fire to transition to a crown fire. Rate of spread measures the horizontal movement of fire spread across the landscape and is useful to determine a fire's behavior and how many resources will be needed to contain the fire, as a faster-moving fire requires more immediate and significant resources. Maps depicting fire behavior in the modeling analysis area are presented in Appendix B (B1-B6).

As presented in B-1 under 50th percentile weather summer conditions, flame lengths within grass fuels (Fuel Model GS2) range from roughly 6-8 feet depending on slope and wind exposure. During peak 97th percentile weather conditions (B-2), flame lengths in grass fuels are modeled to reach upwards of 9-12 feet under sustained wind speeds of 23 miles per hour.

Under extreme weather and wind conditions (B-4), fireline intensity values may exceed 1,000 Btu/foot/second with spread rates greater than 2 miles per hour in grass fuels. While at high risk of ignition, grass fuels are generally less hazardous compared to other fuel types such as shrub and timber. This is largely to lower fuel loads and rapid burn-out times. Grass fuels are typically light, fine fuels, meaning they are composed of thin, dry material that ignites and burns quickly. While wildfires in grass fuels may produce large flame lengths and spread rapidly, these conditions are often sustained for short periods of time. Because of this, grass fires provide more opportunities for direct fire suppression from responding personnel.

Table 4. Fire Behavior Interpretation

Flame Length	Fireline Intensity	Interpretation
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 feet to 8 feet	100–500 BTU/ft/s	Fires are too intense for a 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 feet to 11 feet	500–1,000 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 1,000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at the head of fire are ineffective.

Source: Roussopoulos and Johnson 1975.
Note: BTU/ft/s = British thermal units per foot per second.

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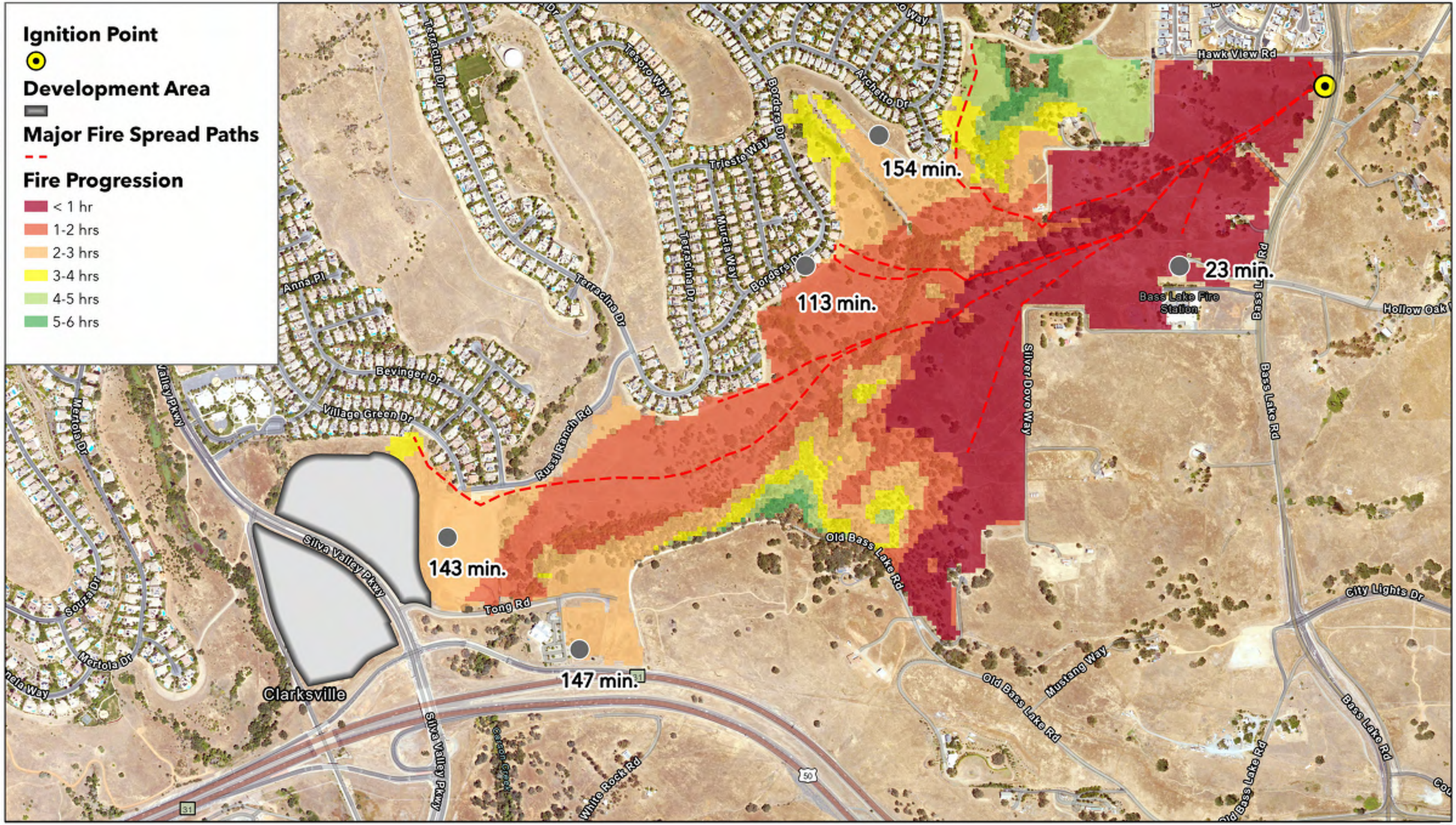
Appendix A
Fire Progression Model Outputs

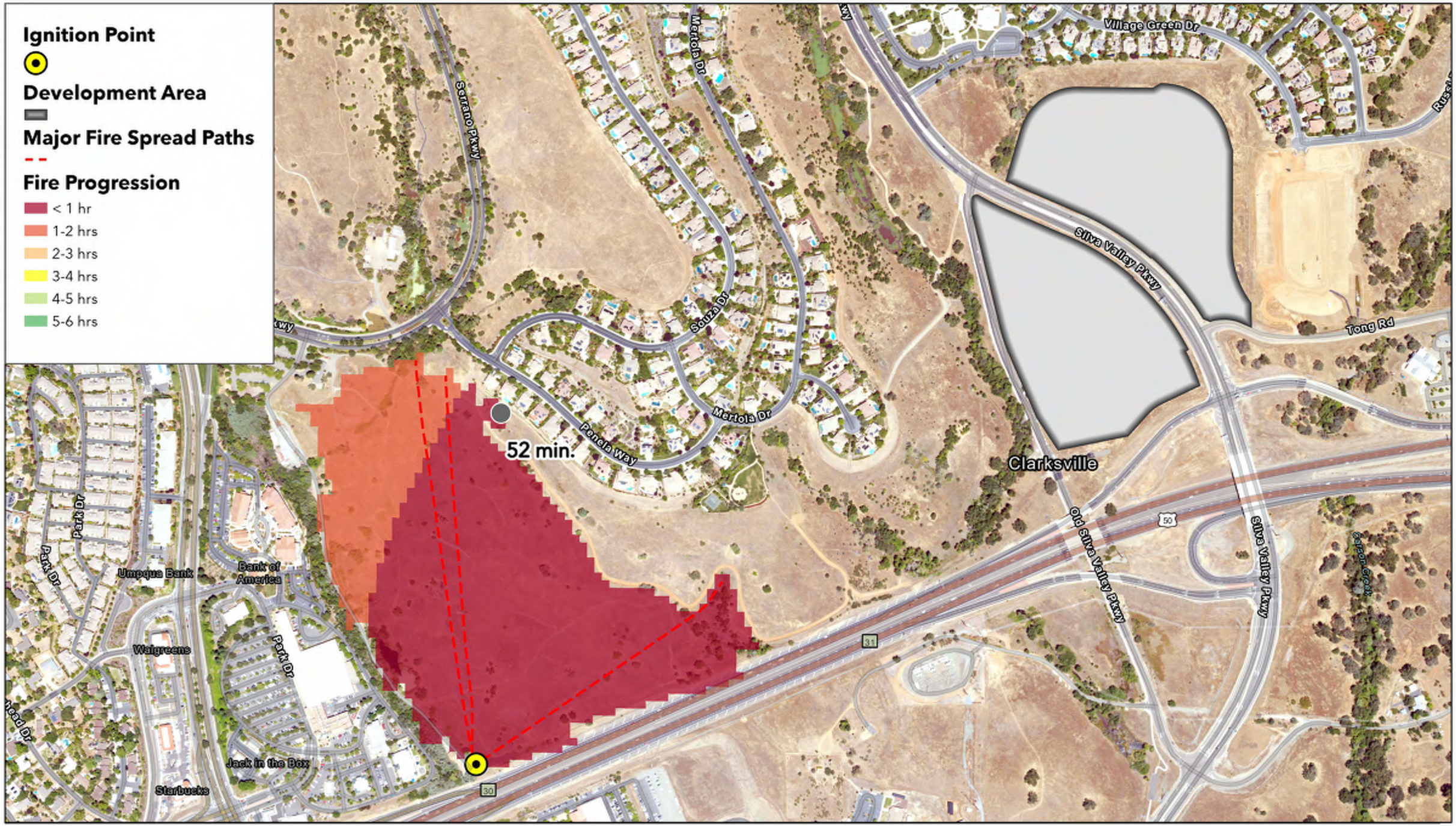


DUDEK

0 375 750 1,500 Feet

Appendix A-1

Scenario 1: 97th Percentile Weather / NE Ignition



DUDEK

0 245 490 980 Feet

Appendix A-2

Scenario 3: 50th Percentile Weather / SW Ignition

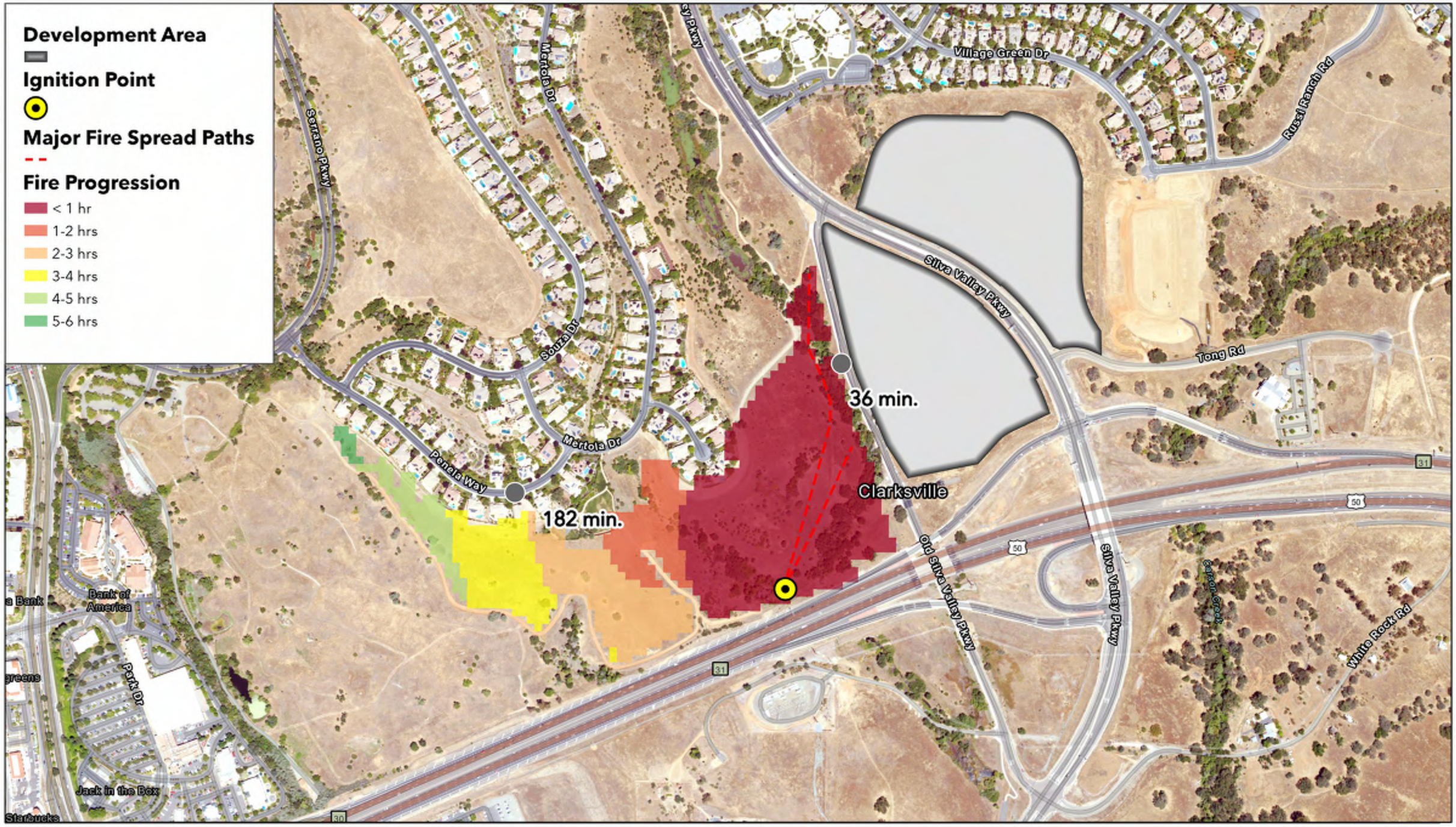
Development Area

Ignition Point

Major Fire Spread Paths

Fire Progression

- < 1 hr
- 1-2 hrs
- 2-3 hrs
- 3-4 hrs
- 4-5 hrs
- 5-6 hrs



DUDEK

0 245 490 980 Feet

Appendix A-3

Scenario 3: 50th Percentile Weather / SW Ignition

Appendix B

Landscape Fire Behavior Model Outputs

Development Area

Flame Length (ft)

- Developed
- <4
- >4-8
- >8-11
- >11-20
- >20

Appendix B-1

Flame Length - 50th Percentile Weather

Wildifre Modeling Summary Report: Costco Wholesale Project

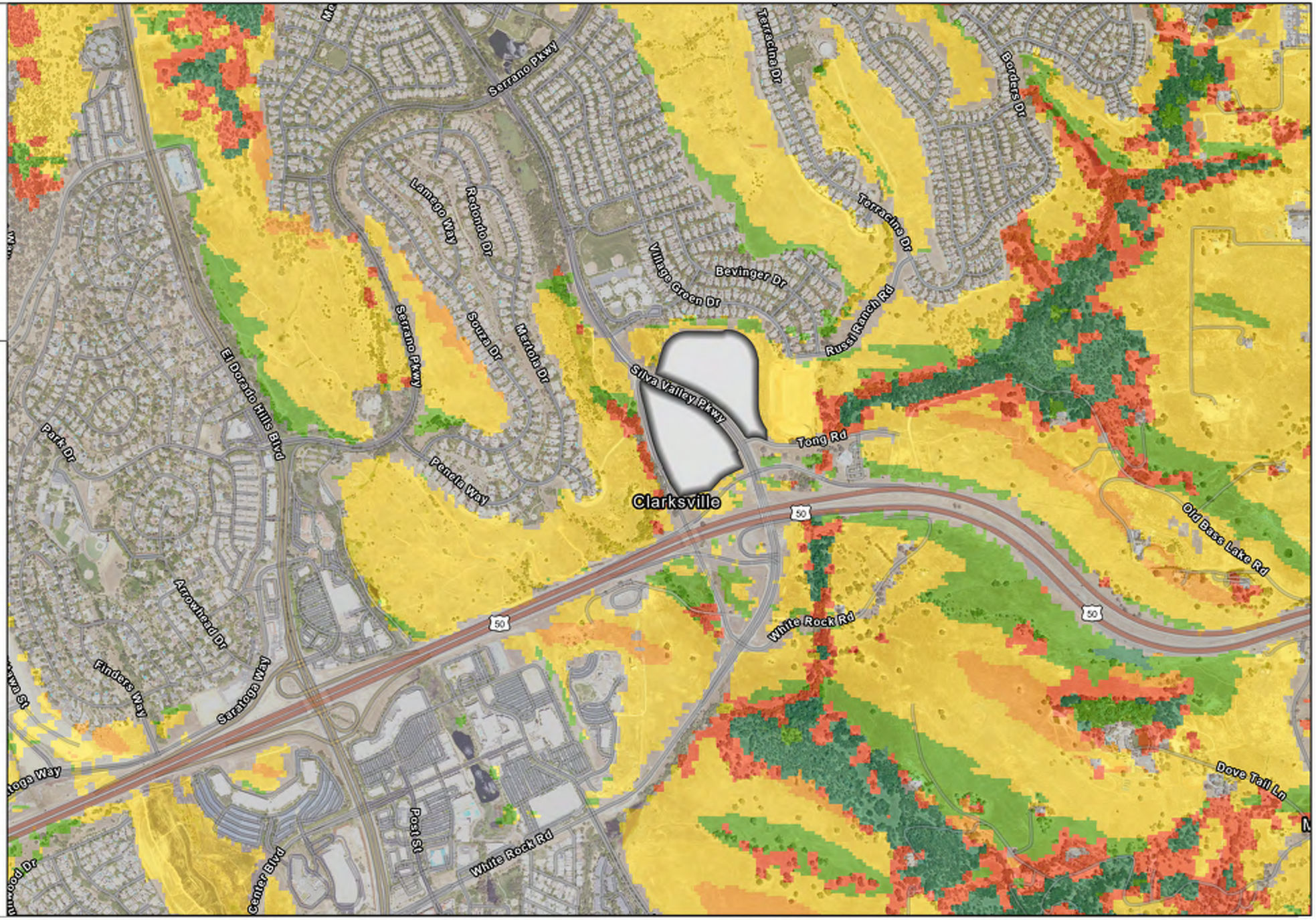
DUDEK

0 500 1,000 2,000 Feet

Development Area

Flame Length (ft)

- Developed
- <4
- >4-8
- >8-11
- >11-20
- >20



DUDEK

0 500 1,000 2,000 Feet

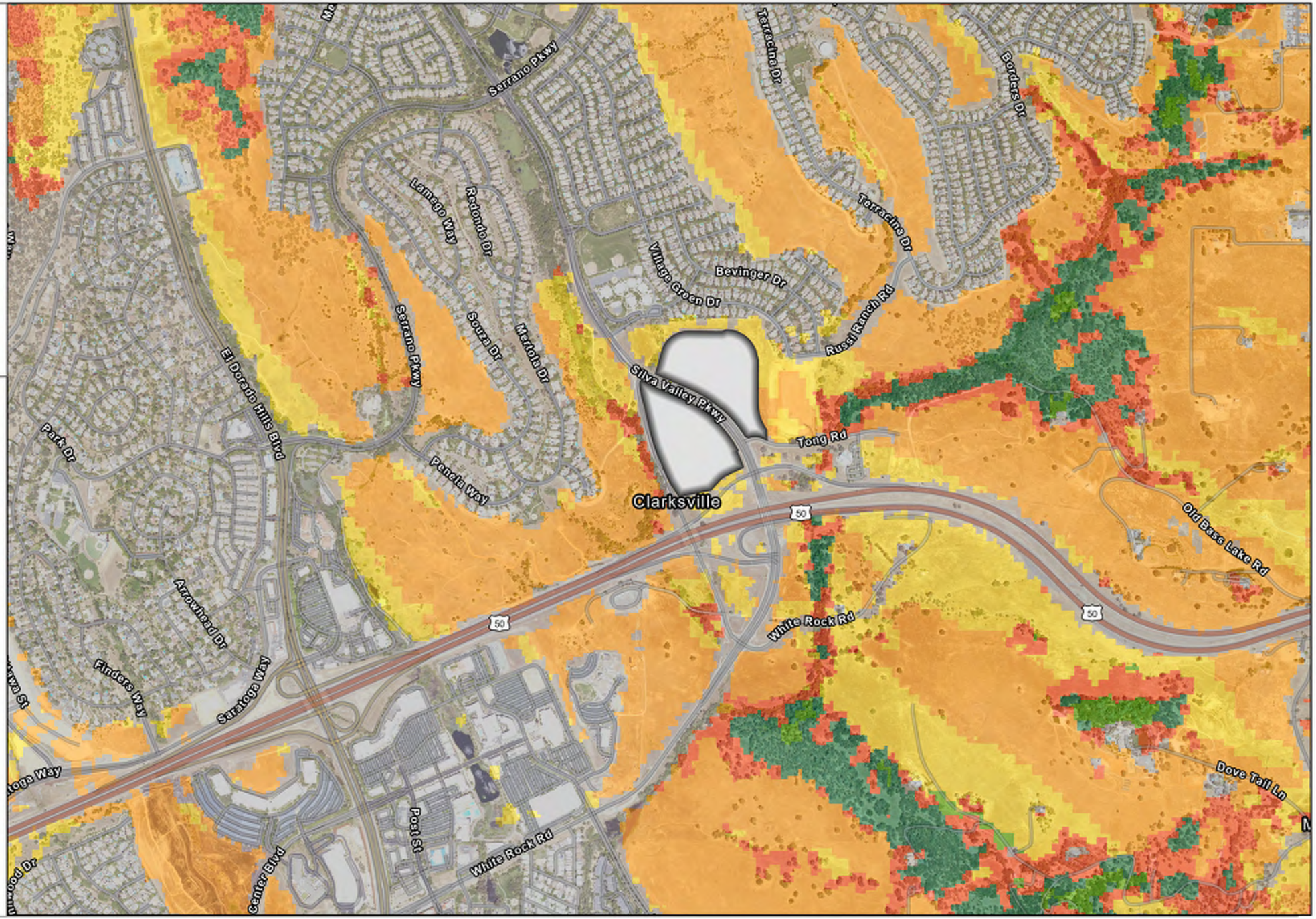
Appendix B-2

Flame Length - 97th Percentile Weather

Development Area

Fireline Intensity (BTU/ft/s)

- Developed
- <100
- >100-500
- >500-1,000
- >1,000-6,175
- >6,175



DUDEK

0 500 1,000 2,000 Feet

Appendix B-3

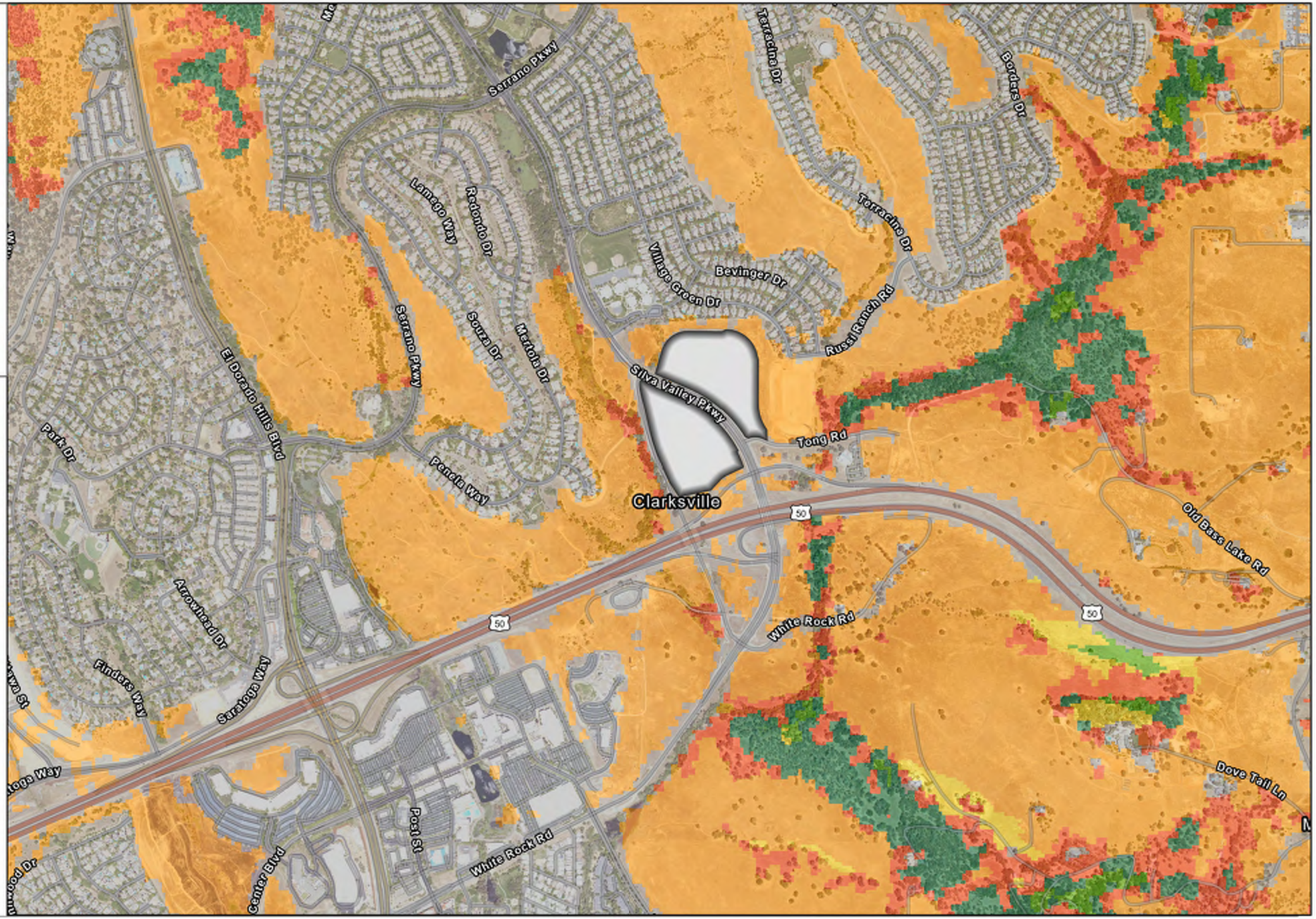
Fireline Intensity- 50th Percentile Weather

Wildifre Modeling Summary Report: Costco Wholesale Project

Development Area

Fireline Intensity (BTU/ft/s)

- Developed
- <100
- >100-500
- >500-1,000
- >1,000-6,175
- >6,175



DUDEK

0 500 1,000 2,000 Feet

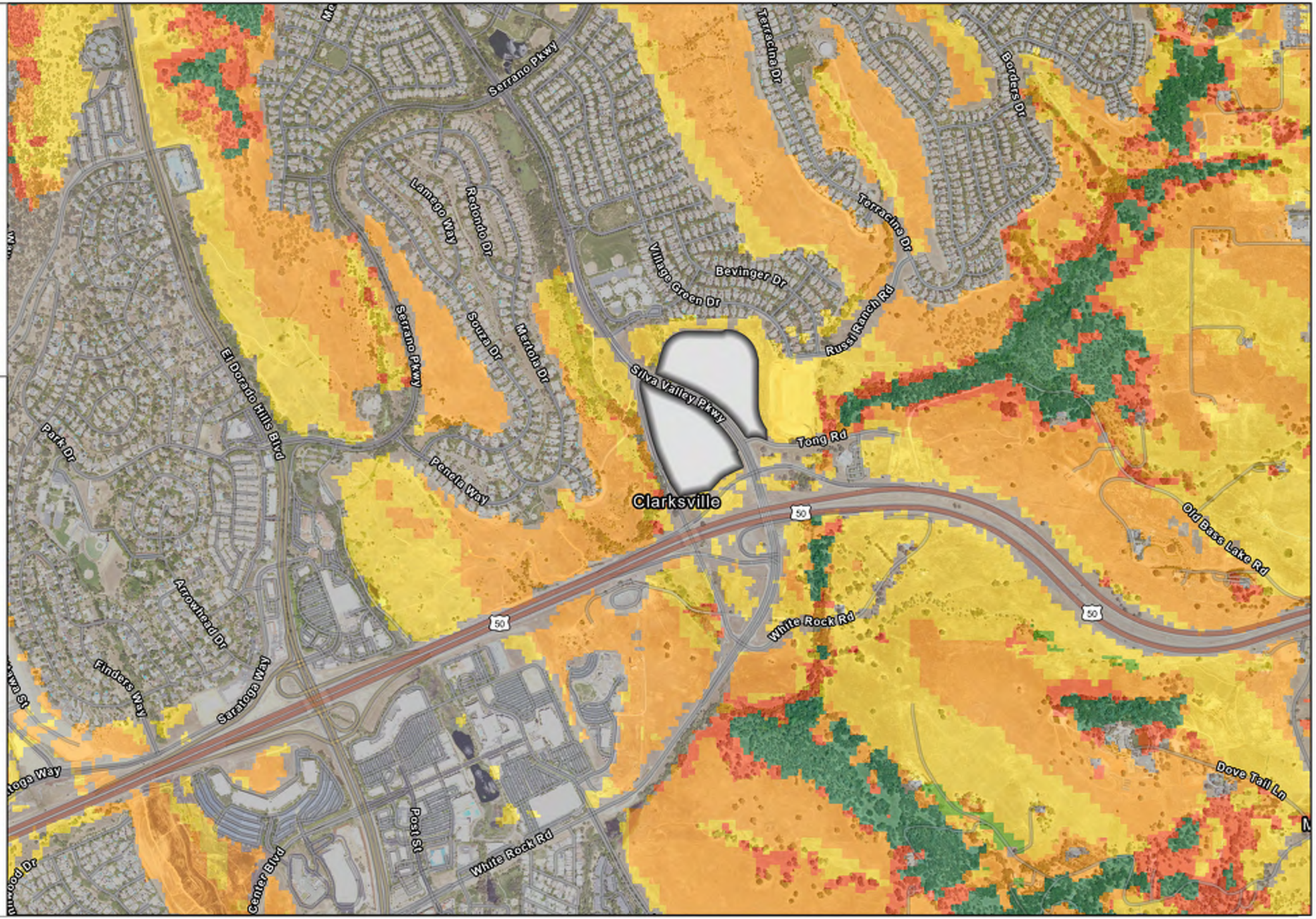
Appendix B-4

Fireline Intensity- 97th Percentile Weather

Development Area

Rate of Spread (mph)

- Developed
- <0.25
- >0.25-0.5
- >0.5-1
- >1-2
- >2



Appendix B-5

Rate of Spread - 50th Percentile Weather

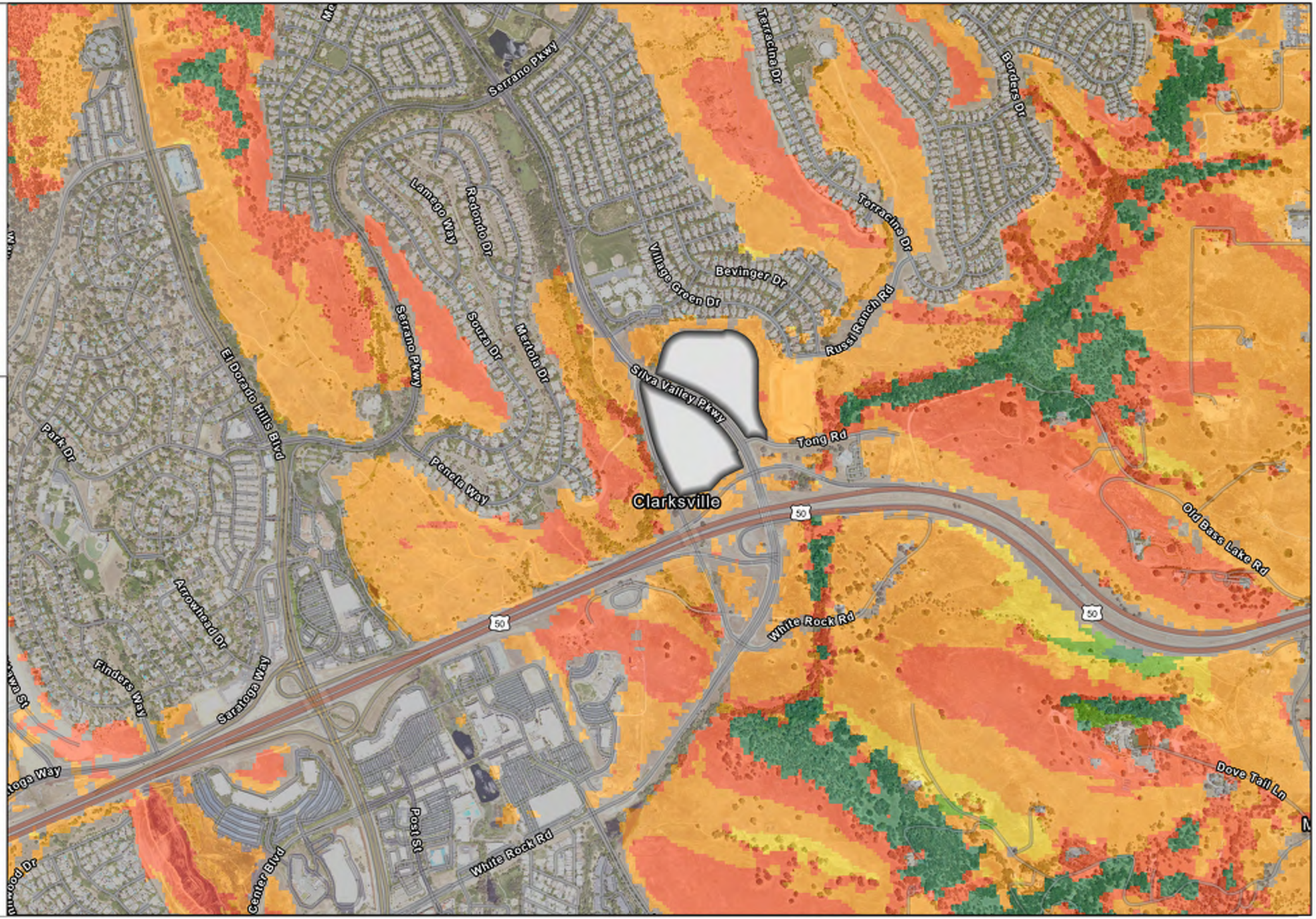
DUDEK

0 500 1,000 2,000 Feet

Development Area

Rate of Spread (mph)

- Developed
- <0.25
- >0.25-0.5
- >0.5-1
- >1-2
- >2



DUDEK

0 500 1,000 2,000 Feet

Appendix B-6

Rate of Spread - 97th Percentile Weather