APPENDIX J

WILDLAND FIRE BEHAVIOR ASSESSMENT

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for the Town of Portola Valley

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I. SUMMARY

This wildfire assessment provides an estimate of wildfire hazard and risk. The assessment combines factors involved in fire behavior, ignition potential and influence of wildfire response.

To predict fire behavior, we used new fine-scale maps (five-meter resolution) of vegetation and fuel type, and one-meter terrain information.

We performed a weather analysis for a five-day period to pick the fuel moistures that fire modeling would use. This is because fire behavior is more responsive to fuel moisture than the combination of temperatures and relative humidities. We selected the weather of October, 2019 as a condition representing extreme fire weather, and resulting dry fuel moistures.

We then ran a type of fire behavior prediction software, FlamMap, to provide spatial distribution of flame lengths, rates of fire spread, crown fire potential and fireline intensity. These served as the basis for an assessment of fire hazard under current conditions.

Currently, under hot dry August conditions, 59% percent of the area is expected to burn with flames greater than four feet length, which would challenge wildfire suppression with hand crews. Flames longer than 11 feet would be expected to burn 40% of the area. Under dry October conditions, 41% of the area is expected to burn with flames longer than four feet, and 54% with flames longer than 11 feet. Because the October weather conditions were slighter more extreme than the August conditions, the October weather conditions was selected for subsequent fire simulations evaluations.

The probability of ignitions was evaluated using distances from likely sources (housing, roads and powerlines). Currently, areas of likely ignitions occur off the project site.

The relative influence of fire response was also incorporated into the risk assessment.

The factors described above were weighted in the overall wildfire risk analysis:

- Fire behavior – 50%
- Ignition sources - 25%
- Wildfire response – 25%

The resulting wildfire risk rating shows there is high to very high risk in pockets throughout the property and particularly in the north-western area just below Pine Ridge Way. There are areas of low risk in the center of the property and near Alpine Road where pockets ofshort shrubs and grass exist. Within the project property itself, there is no area rated a 10 nor a 0. Just over 38% of the project property is rated a 7 or higher.

The same methods were used to evaluate risk in post-treatment conditions, with one exception. The fuel types were modified to reflect the effect the treatments prescribed in the project vegetation management plan and restricted by biological and regulatory concerns.

The post-treatment wildfire hazard of the site decreases because of the vegetation treatments, while the risk from ignition sources rises because of the additional human activity caused by the addition of residences. The addition of the new road in the project area resulted in a positive influence of wildfire response times.

Comparing the current condition with estimated post-treatment conditions, the overall fire risk (combining wildfire hazard, ignition occurrence and wildfire suppression influence), decreases after the project is installed. The following table compares the risk in the two conditions:

The potential impact of the project on evacuations was analysis ed evaluating traffic accumulations during four wildfire growth scenarios. The analysis showed that Alpine Road is an important evacuation route for the Central Portola Valley and Westridge neighborhoods in all scenarios. In all post-treatment scenarios, the addition of 60 cars to the current condition of an estimated 3884 cars in the area is likely to be inconsequential, because of the small incremental volume of cars as well as the inherent uncertainties in the traffic accumulation model.

Several additional mitigation measures are recommended as a way to further bolster wildfire safety. These include:

- Annual third-party inspection and certification of defensible space in HOA-property
- Fuel management easements on adjacent properties where defensible space is not 100-ft from structures so that the HOA can treat fuels appropriately.
- Consultation with the California Department of Fish and Wildlife regarding methods to remove over-abundant fuels in riparian forests and creekbeds, starting with invasive exotic species.
- Installation of non-combustible fences on sides as well as rear yards
- Installation and maintenance of ember-resistant zones 5-feet form side walls, per AB 3074
- Prohibition of smoking in common areas, outdoor fireplaces in yards and common areas, and use of mechanical equipment on hot, dry windy days. No mechanical equipment use on days of Red Flag Warning.
- Robust education of residents regarding ignition prevention

II. PURPOSE

Wildfires – unplanned wildland fires – can result in significant, long-lasting impacts to ecological, social, and economic systems; therefore, it is necessary to identify and quantify the risks posed by wildfire, and to subsequently develop cost-effective mitigation strategies. This assessment identifies the factors affecting wildland fire behavior and fire hazards that are included in the project description and vegetation management plan prepared for the project. This report presents a fire risk assessment and vegetation management plan for the proposed housing developed on the property referred to in this document as the 'Stanford Wedge'. This report also analyzes historic weather patterns, predicts worst-case scenario fire behavior, and compares that with post-mitigation predicted fire behavior. This plan identifies wildland fire hazards and provides spatial information to allow for an adequate assessment of impacts.

III. WILDFIRE HAZARD-RELATED EXISTING CONDITIONS

A. Introduction

There are several ways to assess risk of wildfire. Most employ the concept that risk is the likelihood of damage resulting from a wildfire event, and thus incorporates the hazard (the condition that promotes damage) with the probability of its occurrence. The description of hazards includes an assessment of vegetative fuels, weather, topography,along with ignition potential and values at risk.

The likelihood of occurrence can be assessed using at historic ignition occurrence, or linking typical causes and the presence of those causes, or even by the likelihood of a fire spreading into any area (thus incorporating the potential for fire spread, and not just ignition potential).

Fire history is described so that patterns of future fire can be compared with historic. Previous and possible ignition sources should be included in the analysis as increased density and changed land use would affect potential ignition risk. Ignition sources, such as those roadside fires along Alpine Road, will be addressed.

Wildfire spread is normally assessing an industry standard, FARSITE, which is based on Rothermel's fire spread model[1]. This model, in turn, is based on a set of wildland vegetative fuel model. Structures are not incorporated into this fire spread model. While there are fuel models that characterize grass, or chaparral, or different types of oak forests, there is no "Structure" fuel model. Some have tried to fit different types of structures into wildland fuel models, but the attempt is too coarse for application (Rice and Miller, 1997).

Several attempts have been made to model structure ignition and the role structures play in the spread during wildfires. Research targeted the ignitability of roofs, siding, decks, windows and other assemblies; in fact, these were the basis for the performance-based standards for these assemblies in the California Fire Code. None have reached conclusive methods that can be relied on to predict spread in the wildland urban interface.
To select or use a analysis method one needs to be clear not only about needs, goals, and objectives, but also about critical questions. By articulating critical questions one can then identify the issues that in turn determine the analysis method to use. Most methods are based on current fire science to provide answers to specific questions. An appropriate method must be matched to the specific issues in order to portray the fire situation accurately. This may require combining methods to address specific issues (Blonski, Miller and Rice (2010).

i. CAL FIRE Fire Hazard Assessments

Mapping of the Very High Fire Hazard Severity Zones (VHFHSZ), is based on data and models of, potential fuels over a 30-50 year time horizon and their associated expected fire behavior, and expected burn probabilities to quantify the likelihood and nature of vegetation fire exposure (including firebrands) to buildings. CAL FIRE created this state-wide data layer to show areas of

[1] https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr371.pdf

significant fire hazard based on vegetative fuels, structure density, terrain, weather, and other relevant factors. Details on the project and specific modeling methodology can be found at http://frap.cdf.ca.gov/projects/hazard/methods.html. CAL FIRE mapped hazard severity zones inside the Town of Portola Valley, however the Town Council decided not to adopt the mapping done by CALFIRE.

CAL FIRE also maps the results of different special analyses, and include:

- Communities at Risk: CAL FIRE Fire and Resource Assessment Program (FRAP) combined data from the Fire Hazard Severity Zones and CAL FIRE Wildland Urban Interface maps to visualize communities that are at high risk from wildfire damage. This data, combined with many other factors, is intended to help land managers understand what areas should be prioritized when developing hazard reduction projects. Areas are split into "priority" classifications, with class 1 areas being lower risk, and therefore lower priority for fuel treatments, than class 5 areas.
- Wildfire Threat to Communities**:** The data layer prioritizes lands where communities (people and associated infrastructure) are at risk from wildfire to direct efforts at reducing wildfire risk in these areas. This assessment combines fire hazard severity zones and assets (expressed as housing density).

ii. Fuel Hazard Assessment Study – Town of Portola Valley

The Town of Portola Valley commissioned a study by Moritz Arboriculture Consulting to provide information on relative wildfire hazards posed by different vegetation types. This study categorized the vegetation into eleven different vegetation fuel types and assigned a hazard rating to each, based on fuel models. The study assigned flame lengths to the fuel models but did not explain how they were determined. Mapping of areas, each larger than 5 acres, was done using aerial imagery, and ground reconnaissance.

The conclusions of this study formed the basis of the Town's Safety Element and a suite of programs and measures. It recommended general standards and specific recommendations for vegetive treatments along eight main roads (including Alpine Road) that would serve as evacuation routes.

B. Hazard Assessment Factors Used in this Report

The section regarding fuels presents a description of the surface and canopy fuels not only in the area of development, but also within the undeveloped parcel. This hazard assessment includes the type, density and distribution of these important factors.

The description of weather information is in terms of average worst conditions (typically the 90th percentile values observed over a decade or more) of relative humidity, temperatures, and especially wind speed and wind direction during times of high fire danger.

Information on terrain is included in enough detail so that wind patterns that may be affected by terrain can be described in the area of implementation in addition to prevailing winds.

Values at risk from wildfire is described so that the vulnerability from wildfire can be described.

These can then be compared to the impacts of treatments and the threshold of significance.

Values at risk would include a description of population, vulnerability of structures, ease of evacuation, infrastructure features and natural resources sensitive to fire. The location (uphill, or downwind, remote or adjacent) are = part of the description.

Existing conditions that support wildland fire response – The response times, and other aspects that influence the ability to contain/control fires are described.

C. LOCATION

The Stanford Wedge is a triangular parcel located on Alpine Road in-Portola Valley, on the eastern border of San Mateo County, California. The property in surrounded by residential lots to the north, west, and south. To the east is Stanford University property, some business, recreationalfields, and residential lots, as well as an extensive preserve.

Figure 1. Stanford Wedge location bounded by Alpine Road, Westridge Road, Cervantes Road, Minoca Road, and Golden Oak Drive.

D. VEGETATION TYPES OF STANFORD WEDGE

The property itself is best characterized by densely vegetated slopes, with several small drainages at the southern tip and a minor drainage to the north. This analysis used the most recent fine-scale vegetation map created for San Mateo County, produced in 2020. This product mapped enhanced vegetative life forms with a 5-meter resolution, and has been vetted by a consortium of public landowners and managers[2]

The vegetation was mapped using LiDAR data. The LiDAR data provides information about the density of vegetation (and other material) on a 3-D basis by measuring the distance of bounce-back of laser points. The process is to target an object with a laser and measure the time for the reflected light to return to the receiver. The data is analyzed for this purpose into attributes that include absolute canopy cover, canopy density, tree canopy height, vegetation height, as well as abundance of ladder fuels.

The vegetation mapping method combined on-the-ground vegetation sampling with a remote sensing technique that uses machine learning, LiDAR analysis, and photo-interpretation of high-resolution aerial imagery. The resulting maps represent the most comprehensive surveys to date of the counties' topography, built and natural features, and plant communities[3]

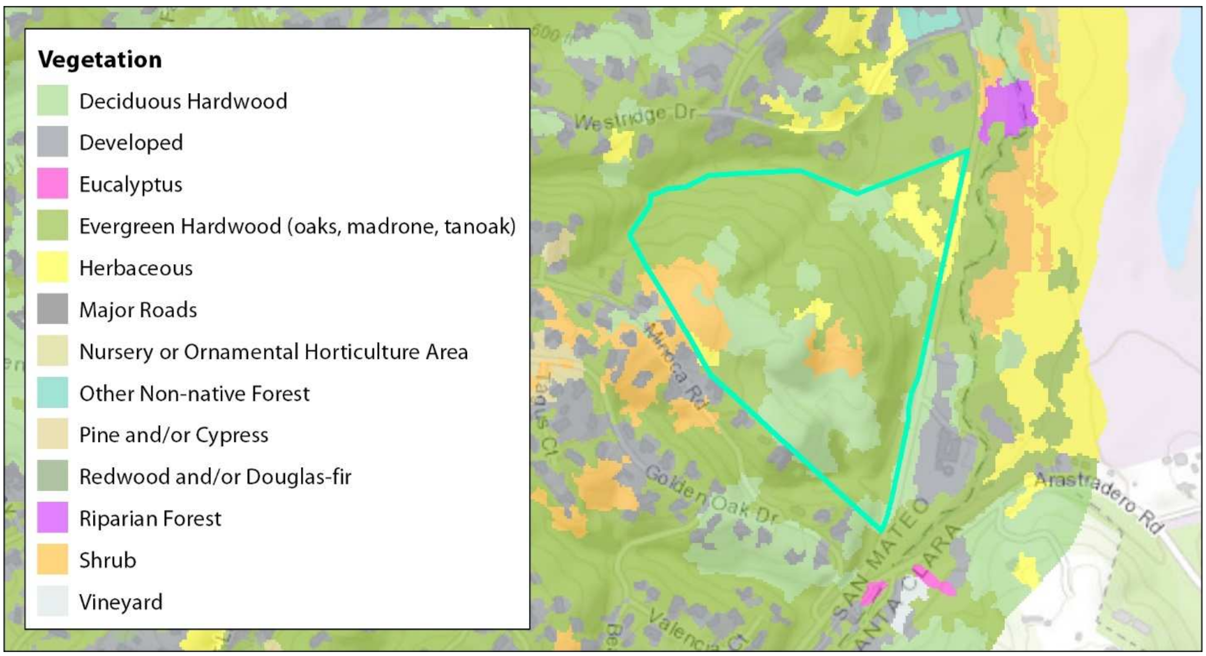

Figure 2. Vegetation major class derived from LiDAR data (Tukman, 2020)

The vegetation map shown above identifies major vegetation classes within and surrounding the target property. There is a small amount of herbaceous grasslands, primarily in the northeastern corner. Dominant the site is deciduous hardwood and evergreen hardwoods located throughout the property and extending into the surrounding area. Pockets of shrub (chamise and chaparral) exist along the western boundary and in the center of the property.

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[2] https://home.nps.gov/articles/000/new-draft-lifeform-map-available-for-san-mateo-county.htm and https://www.firesafesanmateo.org/news/entry/how-vegetation-mapping-will-help-prevent-fires-in-san-mateo-county?tmpl=component&print=1&format=print, and http://www.sanmateorcd.org/wp-content/uploads/2021/02/San-Mateo-Veg-Map-Project-Update-1-26-2021-002.pdf

[3] https://home.nps.gov/articles/vegetation-mapping-projects-underway.htm

E. WILDLAND VEGETATIVE FUEL TYPES OF STANFORD WEDGE

In order to predict fire behavior, vegetation is categorized into Fuel Models, each of which burns in a slightly different manner. Fuel models describe such vegetation as tall and short chaparral, tall and short grass, forest with and without an understory, and oak woodlands with and without understory vegetation. The structure (or arrangement) of the vegetation is just as important as the kinds of plants that grow in the vegetation[4].

Each fuel model is a code that represents fuel characters such of fuel loading at various size classes, bulk density, heat content, and moisture of extinction. The fuel model facilitates these fuel bed inputs into a fire behavior prediction system that, based on other inputs such as fuel moisture and weather conditions, calculates fire behavior characteristics such as flame length and rate of spread. In order to create a custom fuel model layer for Stanford Wedge, the merging of vegetation layers and the reconciliation of vegetation class nomenclature was needed.

In determining the appropriate fuel model to apply to an area, it is critical to consider the fuel that will actually carry the fire. For example, a sparse stand of eucalyptus, or an individual trees with a grass understory may be characterized as a grassland fuel model because the eucalyptus leaves and branches may not contribute much to the fire behavior because of the minor amount of leaf drop, or because the height at which the branches start so high it is unlikely to burn.

The six properties of fuel complexes that determine the potential fire behavior include quantity (loading), sizes (distribution of fuel particle sizes), chemistry (volatile content, silica-free ash content), moisture (percent water content, proportion of dead material in the vegetation, etc.), continuity (vertical and horizontal), and compactness (depth). These properties change over time with treatments, vegetative growth, or disturbance.

In addition, the canopy fuels are also described for fire behavior prediction. The fuels in the tree canopy are described in three ways: tree height, canopy cover, and height of live branches.

[4] Scott, Joe H and Robert E. Burgan, 20015. Standard Fire Behavior Fuel Models: A Comprehensive Set for use with Rothermel's Surface Fire Spread Model.

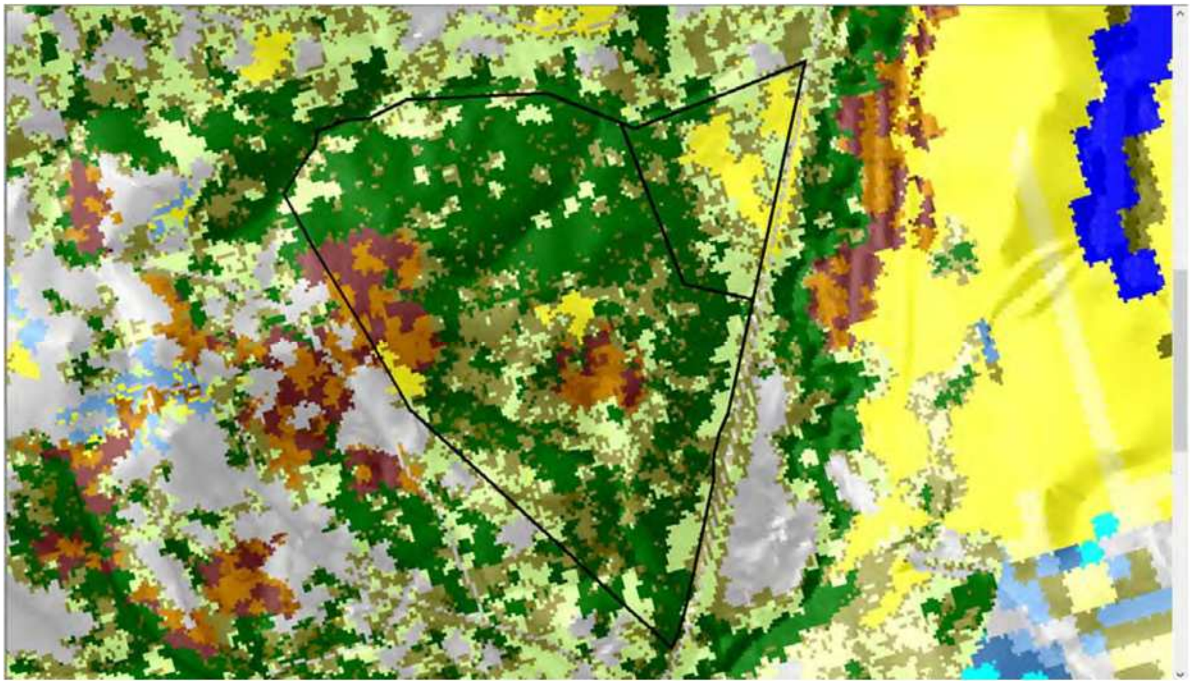


Figure 3. New fuel model map based on fine-scale vegetation mapping in San Mateo County, California Forest Observatory canopy data, and LANDFIRE data where other data products did not cover (Tukman, 2020, LANDFIRE, 2016, CFO, 2020) – zoomed into Stanford Wedge property.

Within the Stanford Wedge property, vegetation was mapped into 10 different fuel model classes using the dated set of fuel models now used nation-wide (Scott and Burgan 2005). Table 1 shows a description for each and the amount foundwithin the property.

Table 1. Fuel model acres.

Value	FBFM40	Title	Description	Acres	Percent
91	NB1	Urban	Urban/Developed	0.01	0.02%
102	GR2	Low Load, Dry Climate Grass	Low load, dry climate grass primarily grass with some small amounts of fine, dead fuel, any shrubs do not affect fire behavior	3.63	5%

Value	FBFM40	Title	Description	Acres	Percent
121	GS1	Low Load, Dry Climate Grass-Shrub	Low load, dry climate grass-shrub shrub about 1 foot high, grass load low, spread rate moderate and flame length low	14.45	19%
122	GS2	Moderate Load, Dry Climate Grass-Shrub	Moderate load, dry climate grass-shrub, shrubs are 1-3 feet high, grass load moderate, spread rate high, and flame length is moderate	3.81	5%
141	SH1	Low Load Dry Climate Shrub	Low load dry climate shrub, woody shrubs and shrub litter, fuelbed depth about 1 foot, may be some grass, spread rate and flame low	2.5	3%
142	SH2	Moderate Load Dry Climate Shrub	Moderate load dry climate shrub, woody shrubs and shrub litter, fuelbed depth about 1 foot, no grass, spread rate and flame low	0.8	1%
145	SH5	High Load, Dry Climate Shrub	High load, humid climate grass-shrub combined, heavy load with depth greater than 2 feet, spread rate and flame very high	0.07	0.1%
147	SH7	Very High Load, Dry Climate Shrub	Very high load, humid climate shrub, woody shrubs and shrub litter, dense finely branched shrubs with fine dead fuel, 4-6 feet tall, herbaceous may be present, spread rate and flame high	2.98	4%
161	TU1	Low Load Dry Climate Timber-	Low load dry climate timber grass shrub, low	11.48	15%

Value	FBFM40	Title	Description	Acres	Percent
		Grass-Shrub	load of grass and/or shrub with litter, spread rate and flame low		
165	TU5	Very High Load, Dry Climate Timber-Shrub	Very high load, dry climate shrub, heavy forest litter with shrub or small tree understory, spread rate and flame moderate	35.45	47%
				75.15	

F. WEATHER CONDITIONS

A thorough analysis of site-specific weather appears in Appendix A. A weather analysis offers insights into the frequency of fire weather and especially wind speed and direction.

The project site's location in proximity to the coast influences its weather conditions. It has the warm, dry summers and cool, moist winters characteristic of the fog belt area. Based on data from local weather stations, the area averages about 25 inches of precipitation a year, primarily in the fall and winter. Most of the measurable rainfall generally occurs during the winter months (mid-October to mid-April). Thus, the fire season (the time of highest fire danger) comprises the dry months of May to October.

Although summertime temperatures are usually quite warm (75 to 85°F), it is common for the fog to roll in during the early evenings and creep over the ridge tops to the site. Thus, proximity to the bay often creates a pattern of hot days and cool nights. Fog also sometimes keeps summertime temperatures cool in the project site.

The most important influence on fire behavior is wind. Wind can greatly affect the rate of spread and the increase in the heat output of a fire. Wind increases the flammability of fuels both by removing moisture through evaporation and by angling the flames so that they heat the fuels in the fire's path. The direction and velocity of surface winds can also control the direction and rate of the fire's spread. Aloft winds, defined as those that blow at least 20 feet above the ground, can carry embers and firebrands downwind. These burning fuels can ignite spot fires that precede the primary front. Gusty winds cause a fire to burn erratically and make it more difficult to contain.

The wind normally blows from the west but the most severe fire conditions occur in association with strong north or northeast winds. Under these conditions (common in the fall), humidities drop to 10%. These types of winds, which originate far to the east in the Great Basin, cause fire to spread downhill and to the south with speeds that equal uphill spread under normal windy conditions. However, it is questionable as to whether the Project Site would experience this type of wind because the air mass would necessarily flow over a body of water, and because of an absence of significant hills to the east or north of the Project Site, so wind could not subside over it.

In addition, because of the high ridges to the west of the project site, occasional episodes consisting of several still, stagnant days formed by stationary highs occur during summer months. During these periods—characterized by continuous high temperatures and low relative humidities—fuels dry to a National Fire Danger Rating System rating of over 81 for the Burning Index, indicating extreme resistance to fire-control. This overall weather pattern creates extremely low humidities and enhances the possibilities of ignition and extreme fire behavior.

Local topography influences microclimate conditions. Wind will tend to follow the pattern of least resistance and is therefore frequently deflected and divided by land forms. Summer winds are influenced by air movement into the predominant inland low from the higher-pressure area existing over the ocean. The slopes on the site produce pronounced diurnal up-canyon and down-slope winds caused by differential heating and cooling of air during the day.

G. TERRAIN OF STANFORD WEDGE

Topographic features, such as slope, aspect, and the overall form of the land, directly and indirectly affect the intensity, direction, and spread rate of wildfires. Fires burning in flat or gently sloping areas tend to burn more slowly and to spread more horizontally than fires on steep slopes.

The terrain on the site is comprised of steep, topographic bowl, generally descending from a high of roughly 680 feet in elevation in the western portion of the site down to approximately 320 feet in elevation in the northeastern portion of the site, near Alpine Rd.
Two small drainages flow from the west, one to the northeast, and another to the southeast.

Slope steepness varies across the site, with the flattest part being the area designated for residential development in the northeast. Another flatter knoll is located on the western border. Approximately 30% of the site has a slope steepness of greater than 30 percent.

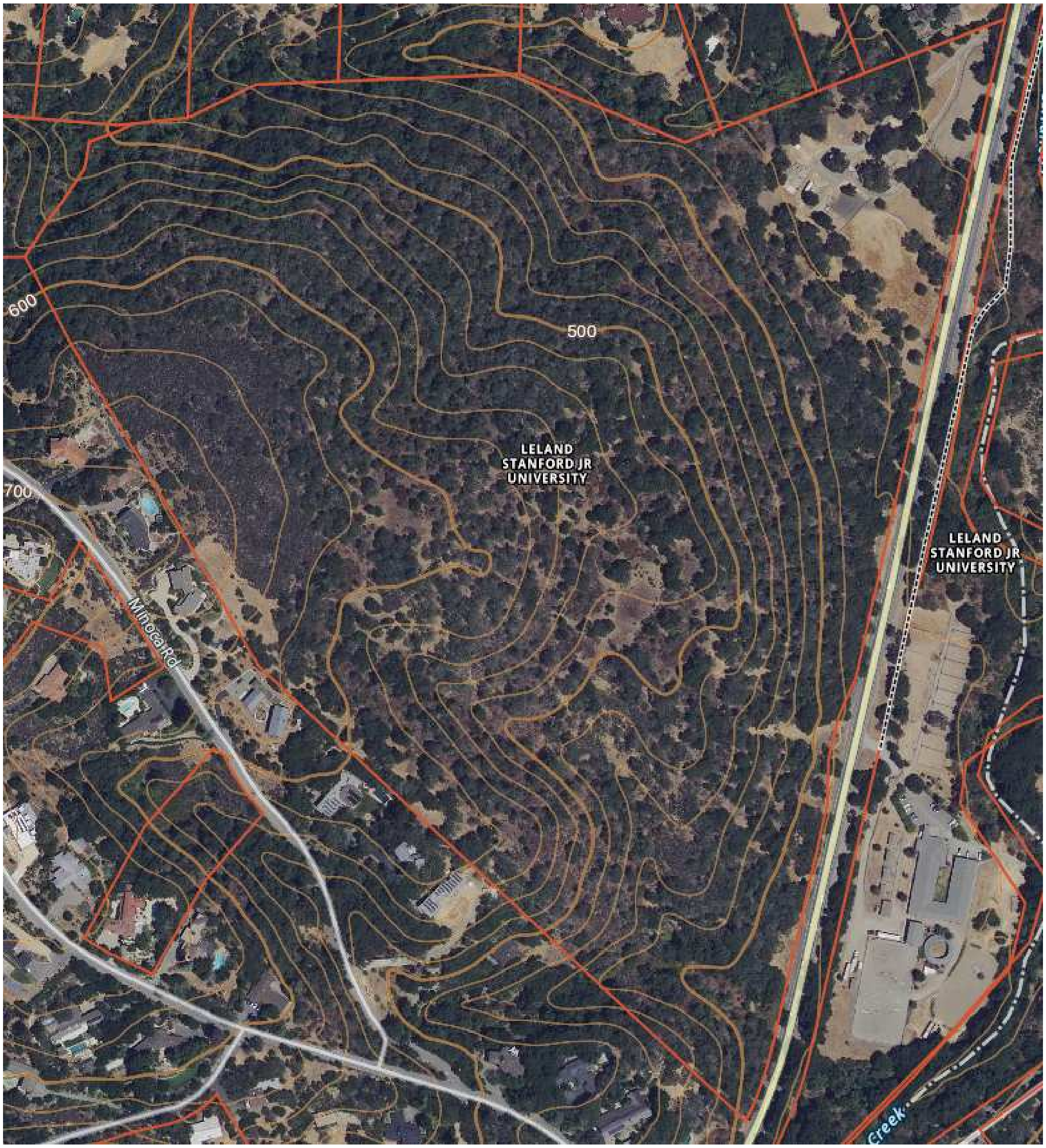


Figure 4. Topography as depicted in OnXmaps.com

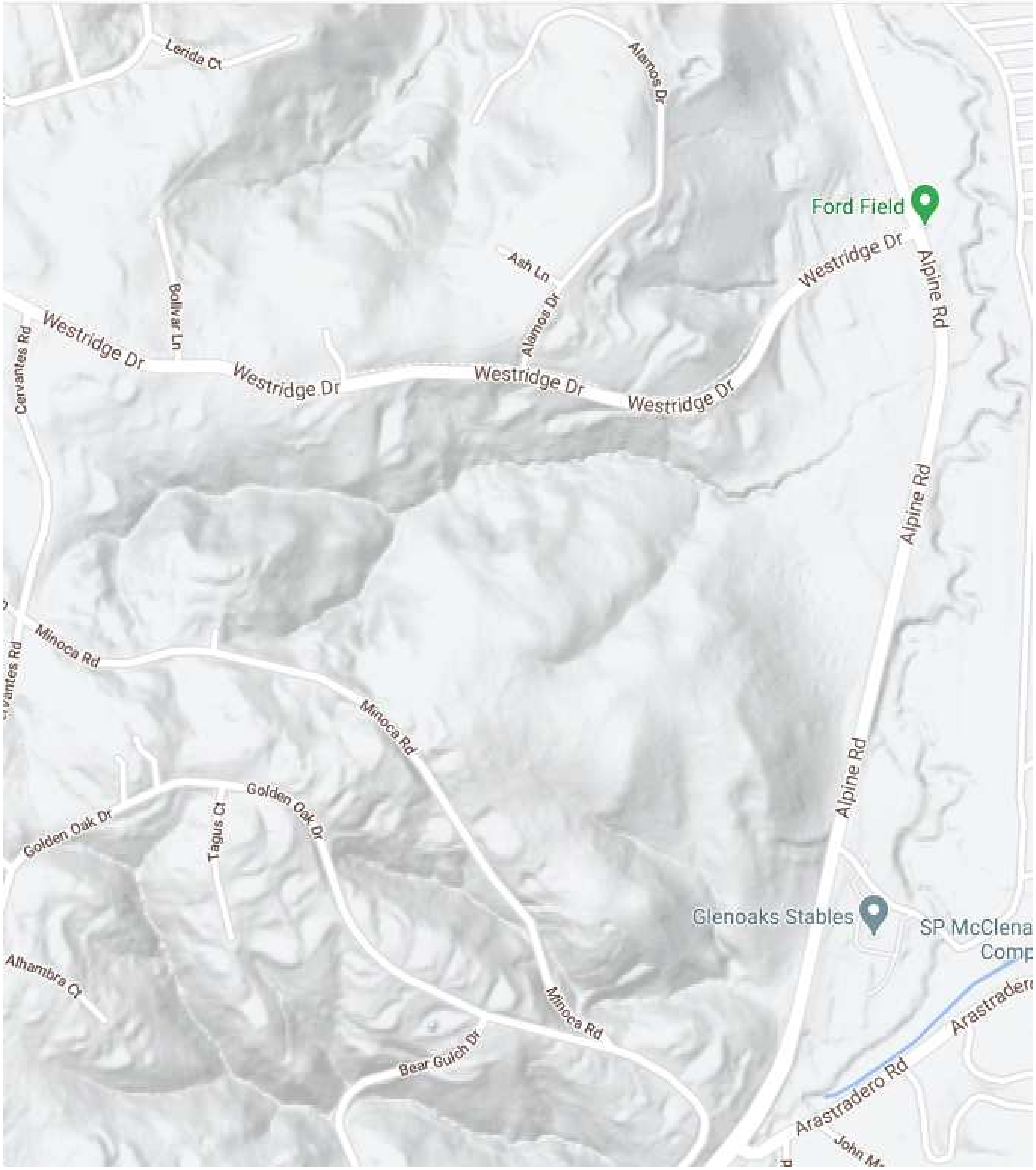


Figure 5. Terrain as shown by Googlemaps.com

H. DESCRIPTION OF NEIGHBORING PARCELS

Residential parcels surround the Project Site on three sides and are generally uphill from the project site. Lots vary in size from approximately one to four acres. Most homes are located further away than 100-feet from the boundary with the project site, however, some existing properties, especially those west of the site, have buildings within 100-feet of the project boundary, which makes creation and maintenance of defensible space on those properties problematic because they do not own all the land necessary to ensure the creation and maintenance of 100-feet of defensible space . Some of the adjacent parcels have moderate volumes of vegetation that are well-spaced and relatively fire-safe, while others have abundant vegetativefuels. Similarly, while many residences, especially those dating after 1996, are built with ignition-resistant construction features, others, particularly the older ones, have wooden exteriors that can be readily ignited from a wildfire.

The following photographs of adjacent parcels illustrate the diversity of vegetation characteristics and structural elements, with both fire-safe and hazardous conditions.

I. FIRE HISTORY OF THE AREA

California has long been recognized as one of the most fire-prone natural landscapes in the world. The State of California Hazard Mitigation Plan states that wildfire represents the third greatest source of hazard to California, behind flood and earthquake hazards, both in terms of recent state history as well as the probability of future destruction of greater magnitudes than previously recorded (September 2018). Wildfires between 2017 and 2020 were by far the most destructive and deadly in recent history, so this raking is likely to change.

The Bay Area's combination of hot dry summers and strong winds, conducive topography, flammable vegetation, dense urban development, and limited fire-fighting access present significant risks to the public and to structures and property located along the wildland-urban interface.

Luckily, wildfire is a rare occurrence in the area, and locally, the area has been spared of large, damaging wildfires. The CZU Complex (caused by a rare lightning storm) reached the southern edges of San Mateo County, but did not extend into the immediate area. The Skeggs Fire in 2017 (also caused by lightning), burned 50 acres near Skyline Rd and Skeggs Point, 3 miles west of Woodside. In addition, smallfires have occurred recently in the Palo Alto Arastradero Preserve.

J. FIRE SUPPRESSION RESPONSE

The area is served by the Woodside Fire Protection District, with a fire station just three minutes away. All fire suppression personnel are certified to the California State Firefighter II level and are participate in the California Incident Command Certification Program. They have responded to several large wildland fires outside their district, supporting the incident. Stations are equipped with fire response apparatus suitable for wildfire response.

Table 2. Travel times to the corner of Alpine Road and Westridge Drive from the five nearest fire stations, per Google Maps average travel time.

Station	Address	Approx. Mileage	Approx. Travel time
WOODSIDE FIRE PROTECTION DISTRICT STATION 8	135 Portola Rd. Portola Valley, CA	2.0	3 minutes
WOODSIDE FIRE PROTECTION DISTRICT HEADQUARTERS STATION 7	3111 Woodside Rd. Woodside, CA	5.3	7 minutes
PALO ALTO FIRE STATION MAYFIELD 2	2675 Hanover Palo Alto, CA	5.6	8 minutes
PALO ALTO FIRE STATION FOOTHILLS PARK 8	3300 Page Mill Rd. Palo Alto, CA	5.0	10 minutes
PALO ALTO FIRE STATION STANFORD UNIVERSITY 6	711 Serra St Palo Alto, CA	4.7	11 minutes

IV. PREDICTED FIRE BEHAVIOR WITH CURRENT CONDITIONS

Wildfire hazard is a physical situation with potential for wildfire to cause harm to persons or damage to resources or assets. There are several ways to assess fire hazard, but most use fuel characteristics as a primary factor. Others also include topography and weather in the hazard assessment, and many include structural fuels in the factors considered.

For example, CAL FIRE uses both the mapped Very High Fire Hazard Severity Zones and the Population density to identify Wildfire Threats to Communities, as below. This shows the Project Site as designated to be lowest and low threat, in part because the area is not locally designated as a very high fire hazard severity zone:

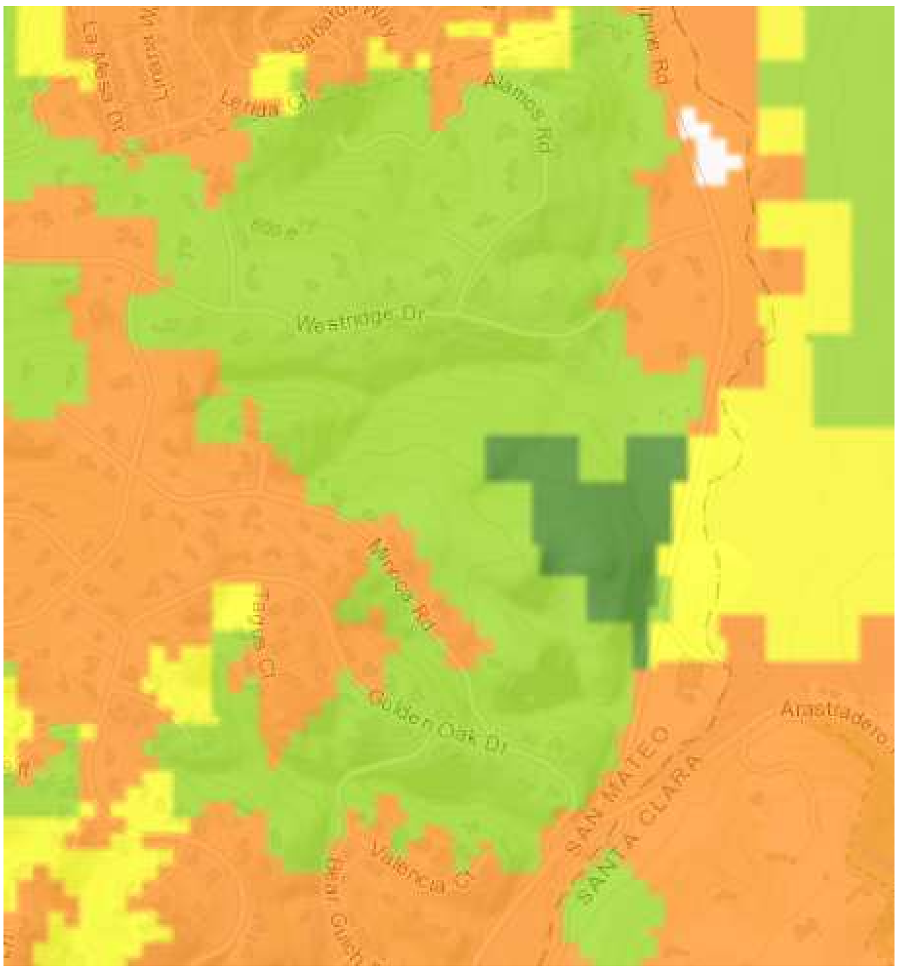


Figure 6. Wildfire Threat to Community, with Project Site encircled. Dark green is lowest Threat, Light green low threat, Yellow = Moderate Threat, and Orange is High Threat. From https://calfire-forestry.maps.arcgis.com/apps/MapSeries/index.html?appid=f767d3f842fd47f4b35d8557f10387a7

The effort in this report relies on site-specific fire behavior as an indicator of fire hazard, because fire behavior integrates the three main factors of fuels, weather and topography. In addition, fire behavior itself (principally flame length and heat released per unit area) is closely related to the ability to suppress a fire, potential structural damage from fire and ecological fire effects. In addition, using site-specific fire behavior is more closely linked to factors that can be changed to lessen the hazard; the benefits of managing wildland fuels are easily demonstrated in changed fire behavior.

For the purposes of this assessment, three broad classes of input data are required when modeling fire behavior 1) terrain, which is expressed as slope steepness, aspect and elevation, and 2) fuels, as defined as surface fuel model, canopy bulk density, crown base height, and tree height and canopy cover, and 3) weather data, which includes information about temperatures, relative humidifies, as well as wind speed and direction. This characterizes the fuels in a three-D fashion, to include both the fuels closer to the forest floor (surface fuels) and the trees in the canopy, and its connectedness. The total volume, size class distribution, proportion of live-to dead material, and density of fuel are estimated.

While most readily available data for this area have a 30-meter (roughly 100 feet by 100 feet) resolution, we were able to use recently acquired liDAR data to develop a dataset with higher resolution of 10 meter (roughly 30 feet by 30 ft). We were also able to use higher-resolution surface fuels data recently developed for the entire San Mateo County (Tukman, 2020). This higher resolution (nine times higher) allows for a finer-grain analysis with more specifics and captures smaller detailed in the project area.

Wildfire simulations produce several measures of wildfire hazard at the near-maximum potential for wildfire behavior that hypothetically could occur. These measures include flame length, fireline intensity, and crown fire potential. Together, these determine potential wildfire intensity.

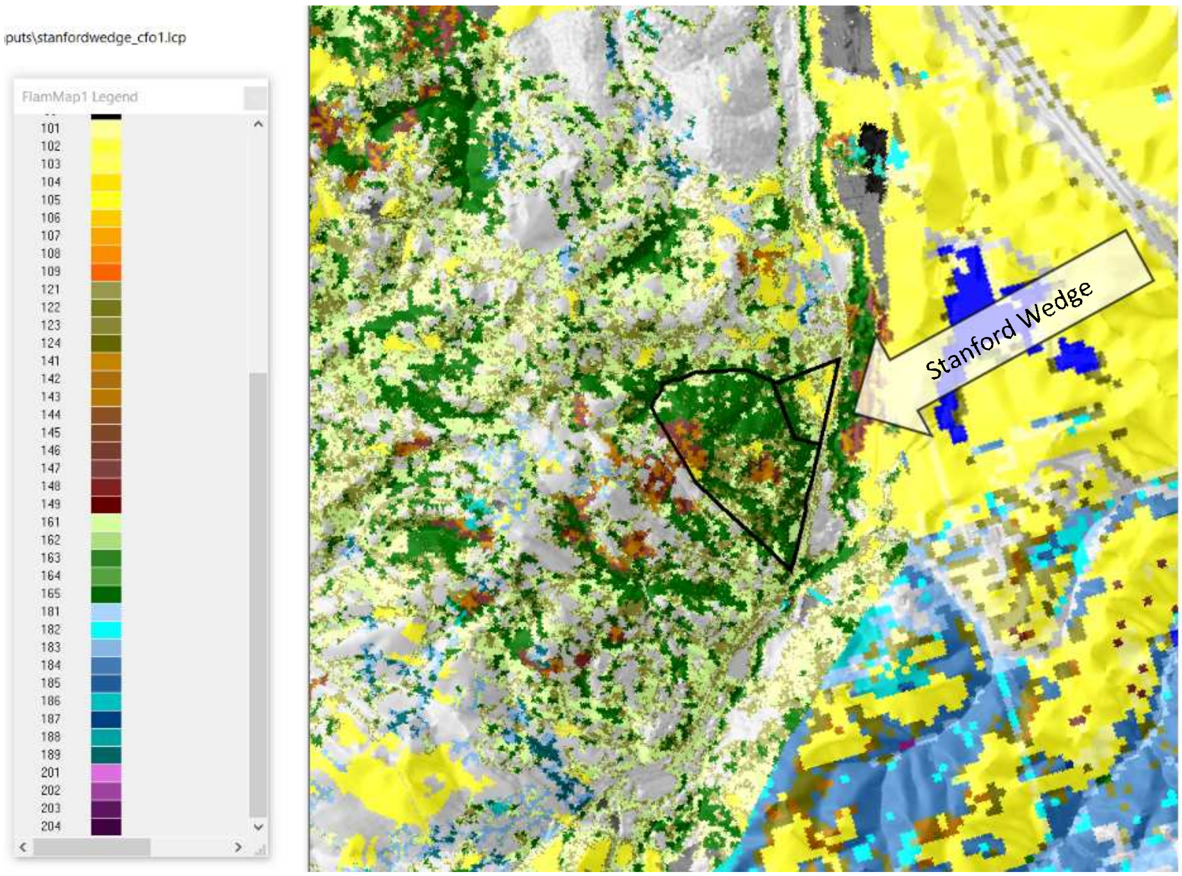


Figure 7. New fuel model map based on fine-scale vegetation mapping and CFO data in San Mateo County and LANDFIRE data outside of San Mateo County (Tukman, 2020, CFO 2020, LANDFIRE, 2016).

The area modeled encompasses the Stanford Wedge along with a buffer of 1 mile surrounding the parcel. The fire behavior prediction software used in this analysis does **not** model fire behavior through urban or developed areas. Fuel models in this wider area include the full range of fuel types covering grass (100s or GR#), grass-shrub (120s or GS#), shrub (140s or SH#), and forested with understory (160s or TU#).

A. PREDICTED WILDFIRE BEHAVIOR WITH CURRENT CONDITIONS

For this assessment, it is desirable to assess wildfire behavior *potential* to provide a benchmark for changes in fuel model (post-development mitigation vegetation removal), and to compare two weather scenarios (October 2019 or August 2020) to determining the near-maximum conditions. See Appendix A for more details about the weather during those times.

We also want to assess fire *growth* at the near-maximum. The near-maximum wildfire behavior is an assessment of headfire behavior for a severe weather condition (though usually not the most severe possible).

We used FlamMap to predict fire behavior at near-maximum potential to determine wildfire intensity. Wildfire intensity is the primary wildfire characteristic related to the potential for harm or damage – typically, the greater the intensity, the greater the potential for harm or damage. This will be reported as wildfire hazard and overall risk (when taking into account other things like ignition sources and suppression capabilities).

> ***characteristics (spread rate, flame length, fireline intensity, etc.), fire growth and spread and conditional burn probabilities under constant environmental conditions (weather and fuel moisture). With the inclusion of FARSITE it can now compute wildfire growth and behavior for longer time periods under heterogeneous conditions of terrain, fuels, fuel moistures and weather. (https://www.firelab.org/project/flammap)***

We used three applications in our analysis. FlamMap predicts fire behavior across an entire landscape all at once with static weather parameters as input. Thus FlamMap can compare fire outputs uniformly across a landscape.Farsite indicates fire growth patterns based on a specified ignition location, and BEHAVE provides tabular outputs not linked to a particular location.

The difference between fire potential and fire growth is:

- Fire potential refers to predicting fire behavior across a landscape as if each pixel is burning independent of everything else. This type of fire behavior prediction allows a comparison between different fuel treatments while holding everything else constant.
- Fire growth refers to predicting fire behavior across a landscape from a fixed ignition point and allowing the fire to progress through time.

Five separate predictive scenarios were developed. See Appendix B for more details about the scenario matrix with the FlamMap/FARSITE inputs for each scenario. The first two were run as fire potential models and the last three were run as fire growth models.

There are several fire behavior outputs that the fire behavior software can generate. However, in this report, we focus on the most common measures. For Fire Potential (FlamMap) Scenarios, the measures of fire behavior presented are ***type of fire*** (crown fire potential), ***fireline intensity***, and ***flame length***. Fire Growth (FARSITE) Scenarios focused on ***fire perimeters by time.***

Of these, two are especially pertinent for identifying areas of high fire hazard: flame length and crown fire potential.

Flame Length

Flame length is often correlated to the ability to control a fire. A flame length of eight feet is usually looked at as a cut-off point for strategic firefighting decisions on whether to attack the fire directly, or instead attempt control through indirect methods. Attacking the fire directly involves efforts to slow the flaming front at its head – where it is advancing fastest. Indirect attack involves fire control methods on the fire's flank or well ahead of the fire (using backfires or retardants).

High flame lengths are well correlated to structural damage. Flame lengths are often used as a proxy for fire intensity because they are highly correlated to fire intensity. Flame length closely corresponds to fire intensity, which can predict fire severity and potential damage to the environment.

Crown Fire Potential

Crowning activity indicates locations where fire is expected to travel into and possibly consume the crowns of trees. A fire can burn exclusively along the forest floor (called a surface fire), or it can climb and consume the tree crown of an individual tree (torching), or it can reach into and spread through tree canopy to tree canopy (crown fire).

When a fire burns through tree crowns, countless embers are produced and are distributed, sometimes at long distances. These embers can start new fires, which can each grow and confound the finest fire suppression forces. For watershed purposes, prediction of torching or crown fire is highly correlated with fire severity

Hot fires create embers that loft ahead of the flaming front that ignite new fires called "spot fires". "Spotting potential" or "crowning potential" describes the propensity of vegetation to create and disburse embers that have the potential to start countless new fires well in advance of the main fire.

i. FIRE POTENTIAL SIMULATIONS (FIRE POTENTIAL OCTOBER SCENARIO AND FIRE POTENTIAL AUGUST SCENARIO)

Two fire potential scenarios were calculated for predicted fire behavior. The only difference between the two fire potential scenarios (FIRE POTENTIAL OCTOBER SCENARIO and FIRE POTENTIAL AUGUST SCENARIO) are the weather parameters used to condition the initial fuel moistures. A weather analysis defined extreme weather conditions (the 90th percentile), based on historical data from a representative weather station. At roughly 3.7 miles to the southeast, the Los Altos weather station sits at a similar elevation (539 feet) as the Stanford Wedge and is similarly surrounded by residential lots. Forthese reasons, the Los Altos RAWS station was considered for the primary weather data (See Appendix A for more details about the weather analysis).

For FIRE POTENTIAL OCTOBER SCENARIO, the weather from October 22nd to October 26th, 2019 was used. During this five-day time period, the Los Altos weather station experienced relatively warm temperatures, peaking at 93 degrees Fahrenheit with a low relatively humidity of 10%. Wind speeds were relatively mild, peaking at 10mph from the ENE. This will be called the 'Fire Potential October Scenario'.

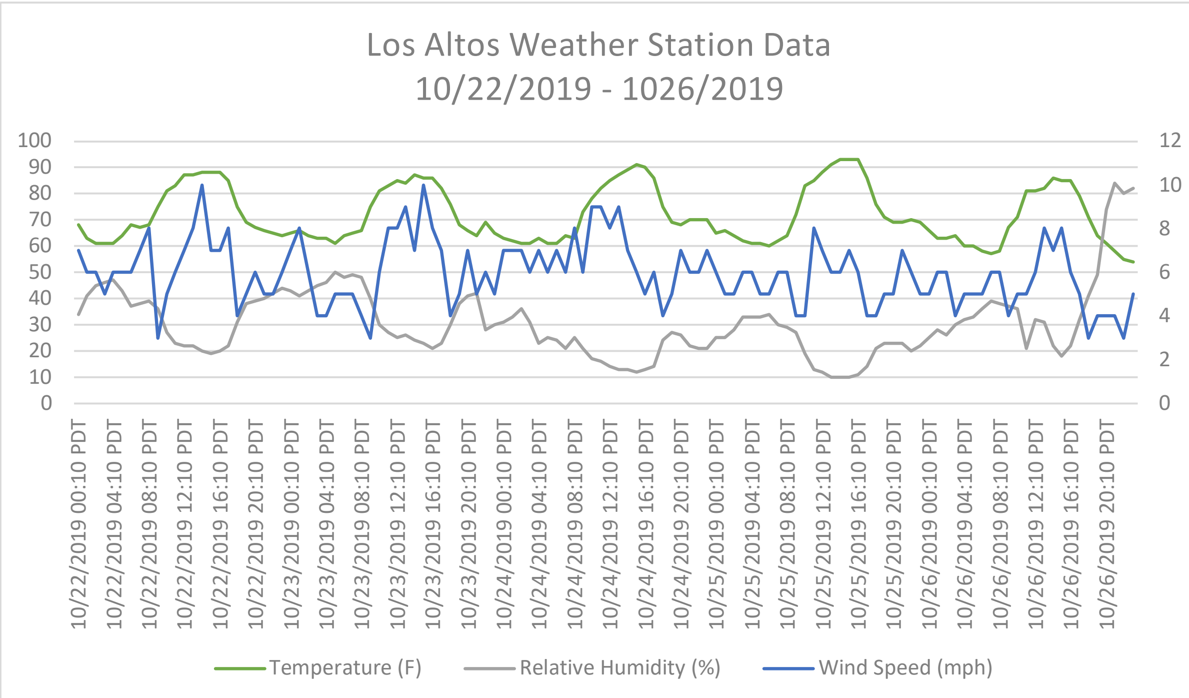


Figure 8. Hourly weather for Los Altos from 10/22/2019 to 10/26/2019

For FIRE POTENTIAL AUGUST SCENARIO, the weather from August 13th to August 19th, 2020 was used. In this time period, the Los Altos weather station experienced higher temperatures, reaching 105 degrees Fahrenheit twice during this week. Relative humidity also reached below 10% on the last day. Inaddition, wind speeds reached up to 37mph, mostly from the NNE. However, these winds occurred during the very early morning hours immediately preceding precipitation on the 16th of August. This scenario will be called the 'Fire Potential August Scenario'.

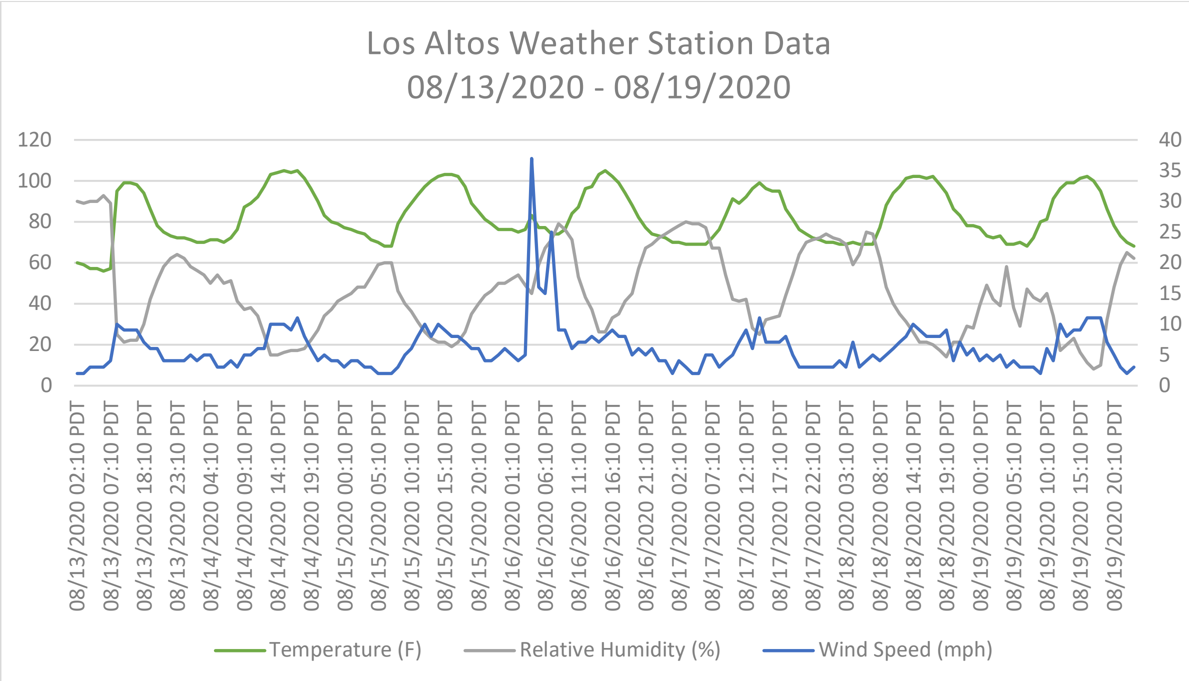


Figure 9. Hourly weather for Los Altos from 08/13/2020 to 08/19/2020

The input parameters for both the Fire Potential October Scenario and   the Fire Potential August Scenario were entered according to the Scenario Matrix. These included using the 90th percentile fuel moistures conditioned by temperature and wind, with a starting wind direction and speed set to: **NE at 10mph**. In addition, the foliar moisture was set to 60% and we used the Scott/Reinhardt (2001) methodology for calculatingcrown fire activity (fire type).

Flame Length
Under the **FIRE POTENTIAL OCTOBER SCENARIO**, predicted flame lengths range from 0 to over 25 feet. The pocketsof higher flame lengths are found throughout the parcel but mainly away from the proposed development site. There are pockets of relatively lower flame lengths predicted west-central portion of the main property where the canopy is more open.

Under this scenario, over 59% of the property experiences flame lengths over 4 feet in height.Flame lengths of 4 feet is considered the limit for the use of hand labor for fire suppression.

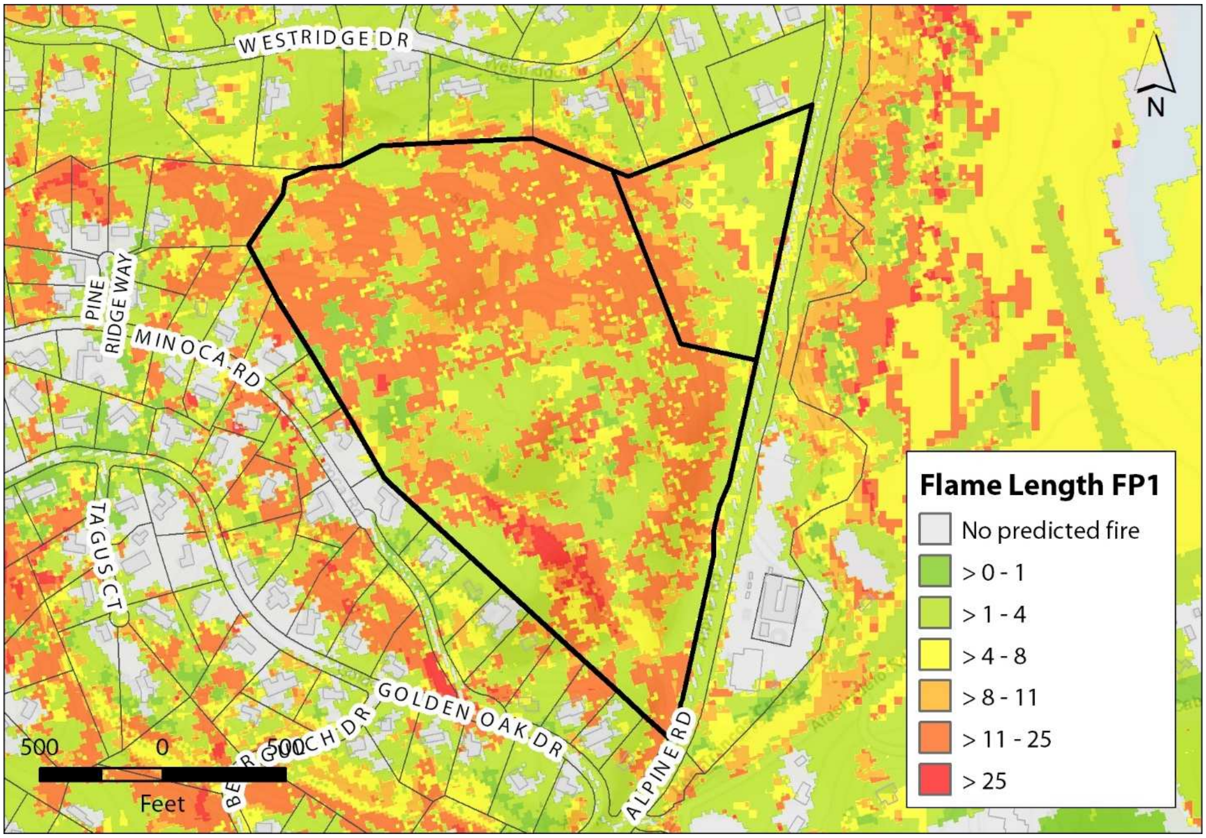


Figure 10. Flame length output results for FIRE POTENTIAL OCTOBER SCENARIO (FP1).

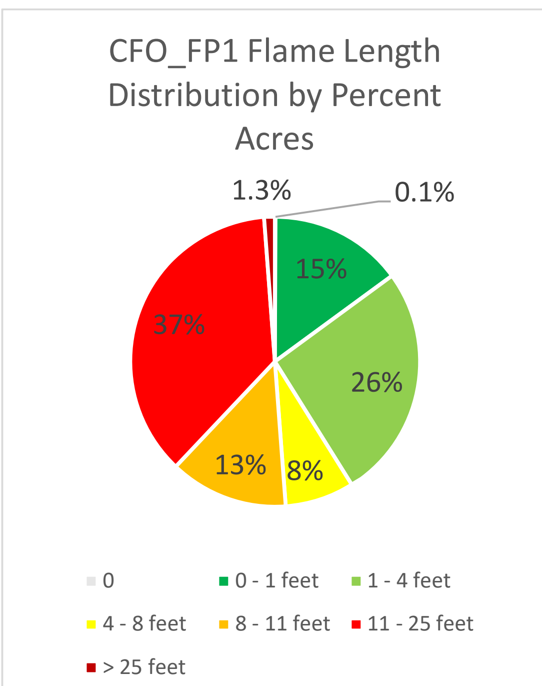


Figure 11. Pie chart of FIRE POTENTIAL OCTOBER SCENARIO flame length distribution by percent acres.

The graph above indicates close to 40% of the property would burn with flame lengths over 11 feet in length. The areas which exhibit this extreme fire behavior occurs throughout the project but is concentrated in the oak woodlands to the southwest of the property surrounded by shrub. Wherever shrub fuel model intersection with forested areas with low canopy base height, fire behavior can be expected to be extreme.

Under the **FIRE POTENTIAL AUGUST SCENARIO**, overall fire behavior is more benign. This scenario uses the August2020 weather. While there were excess days of heat, the thunderstorm activity brought some precipitation and/or cloud cover to the area, increasing overall relative humidity.

Even so, predicted flame lengths also range from 0 to over 25 feet. The pockets of higher flame lengths found throughout the parcel in the previous scenario remains the same, but overall flame lengths are lower. Under this scenario, 41% of the property experiences flame lengths over 4 feet in height.

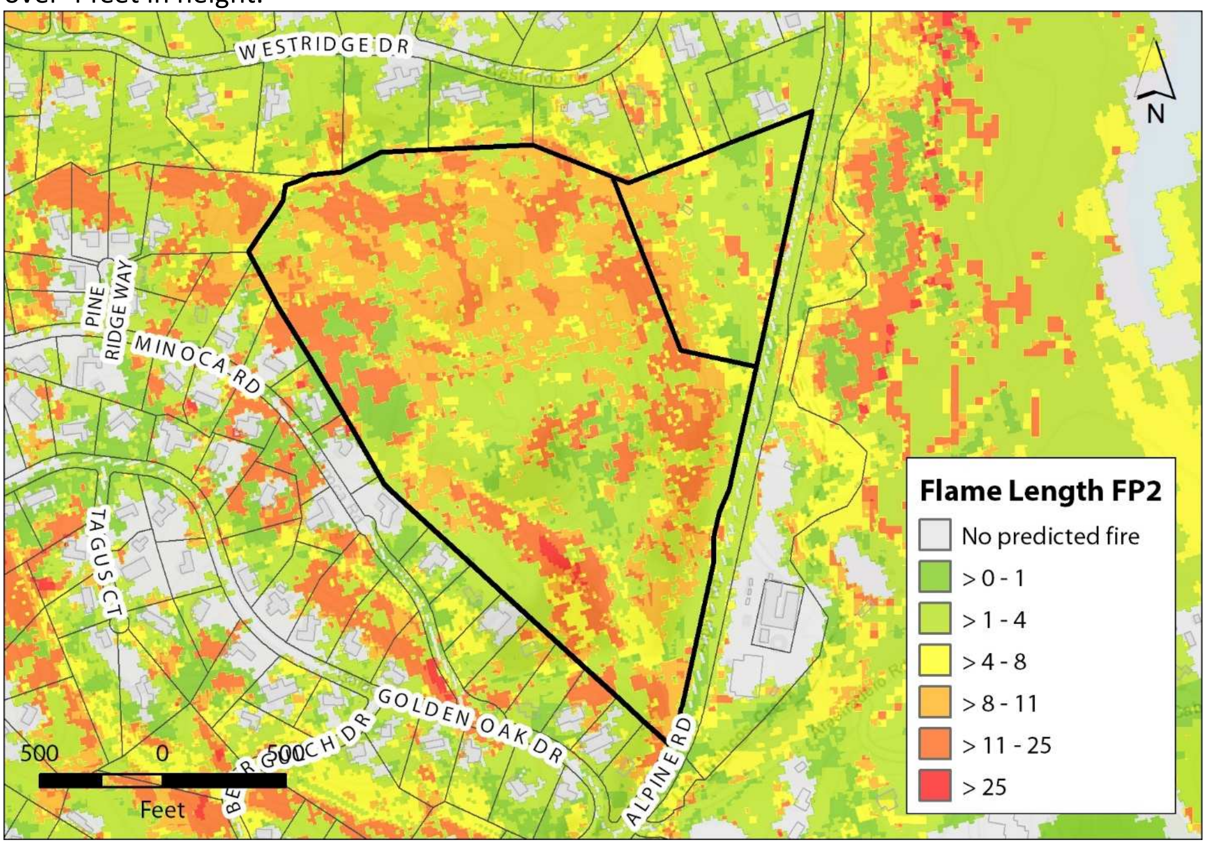


Figure 12. Flame length output results for FIRE POTENTIAL AUGUST SCENARIO

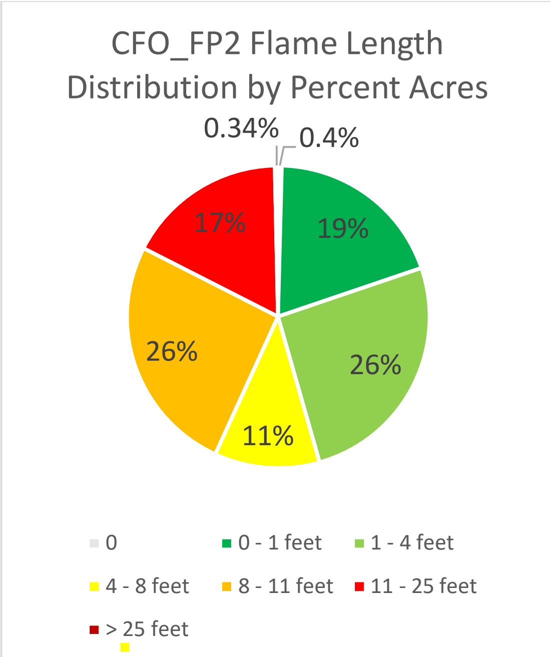


Figure 13. Pie Chart of FIRE POTENTIAL AUGUST SCENARIO flame length distribution by percent acres.

Under this scenario, the pie chart indicates that an almost even distribution of areas burn under each flame length classification.

Fireline Intensity (Current Conditions)

Fireline intensity (FLI) is the rate of heat release per unit length of flaming fire front (reported in kW/m), regardless of flame front depth (Byram 1959). This metric is, in other words, the amount of energy released at the leading edge of the fire. It is best used to differentiate fire behavior in flashy fuels from more dense, small fuels, and is a robust measure of overall fire intensity.

Under the **FIRE POTENTIAL OCTOBER SCENARIO**, predicted fireline intensity ranges from 0 to over 10,000 kW/m. The pockets of higher intensity are found throughout the parcel but mainly away from the proposed development site. There are pockets of relatively lower fireline intensity predicted in the west-central portion of the main property where the canopy is more open.

Under this scenario, 60% of the property experiences fireline intensities over 350 kW/m. 350 kW/m is considered the limit for the use of hand labor for fire suppression.

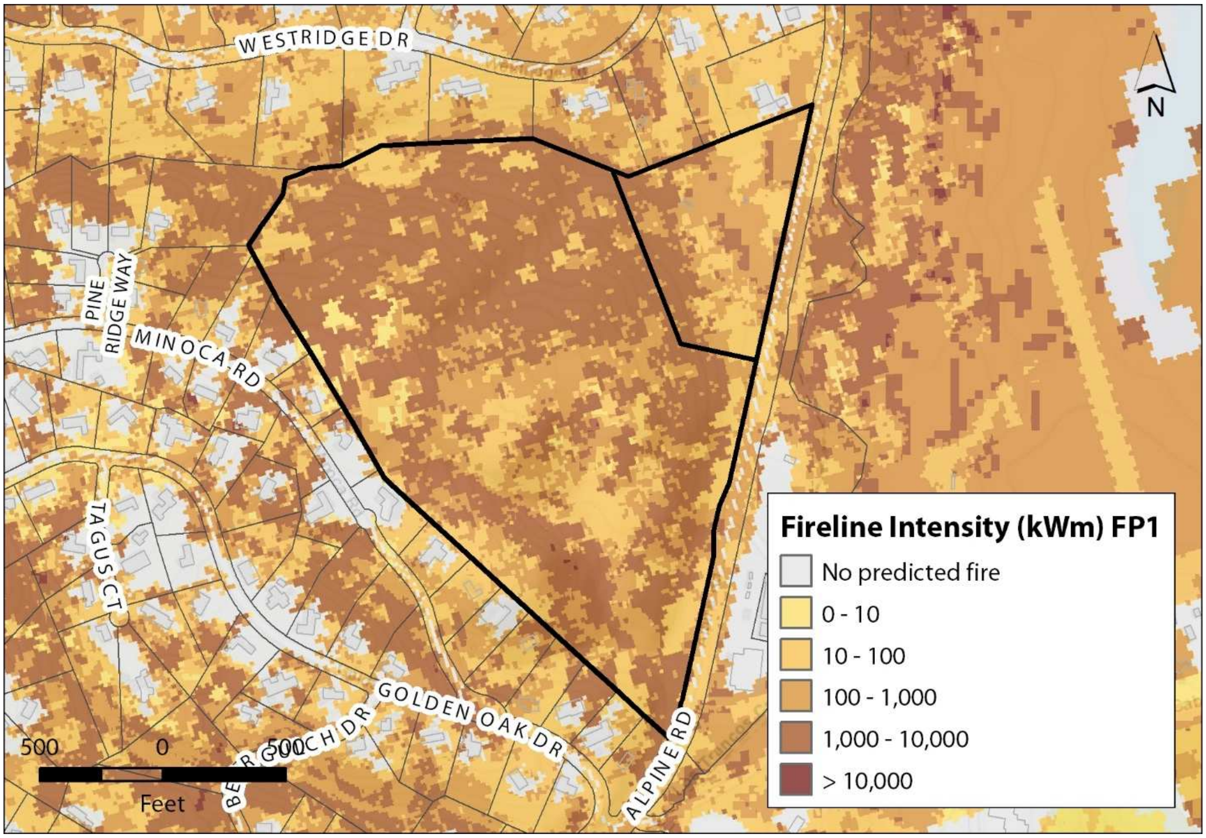


Figure 14. Fireline Intensity output results for FIRE POTENTIAL OCTOBER SCENARIO.

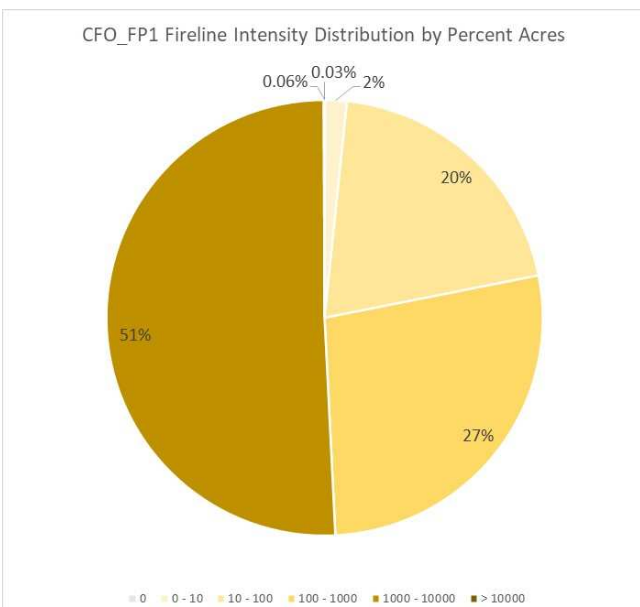


Figure 15. Pie chart of FIRE POTENTIAL OCTOBER SCENARIO Fireline Intensity distribution by percent acres.

The chart shows that just over 51% of the predicted fireline intensity for this scenario is over 1,000 kW/m – well over the capabilities of a hand crew. The areas that experience these intense fires are throughout the property. Only the pockets of grass and grass/shrub fuel models do not produce fireline intensities over 1,000 kW/m.

Under the FIRE POTENTIAL AUGUST SCENARIO, predicted fireline intensity ranges from 0 to over 10,000 kW/m aswell. The pockets of higher intensity are found throughout the parcel but mainly away from theproposed development site. Similar to the FIRE POTENTIAL OCTOBER SCENARIO, there are pockets of relatively lower fireline intensity predicted in the west-central portion of the main property where the canopy is more open. Overall, the relative patter is the same, but less in intensity.

Under this scenario, 56% of the property experiences fireline intensities over 350 kW/m.

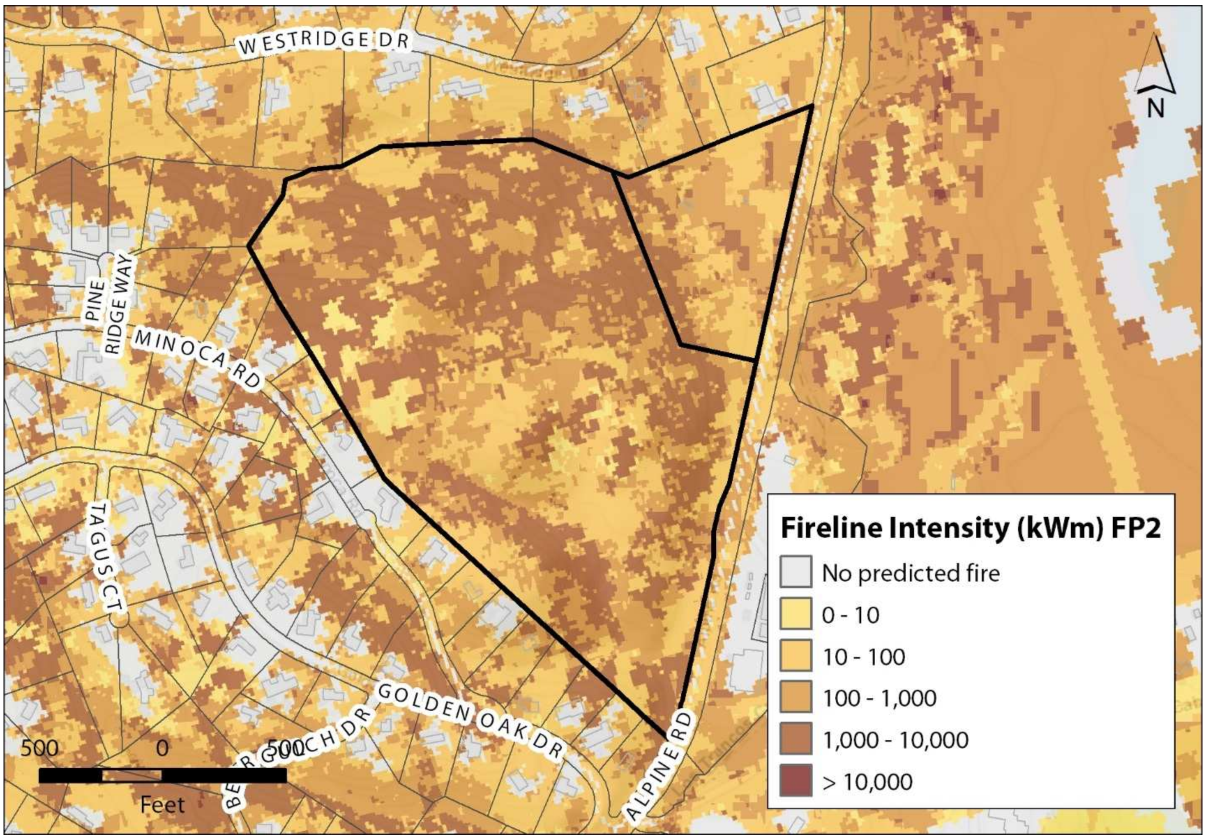


Figure 16. Fireline Intensity output results for FIRE POTENTIAL AUGUST SCENARIO.

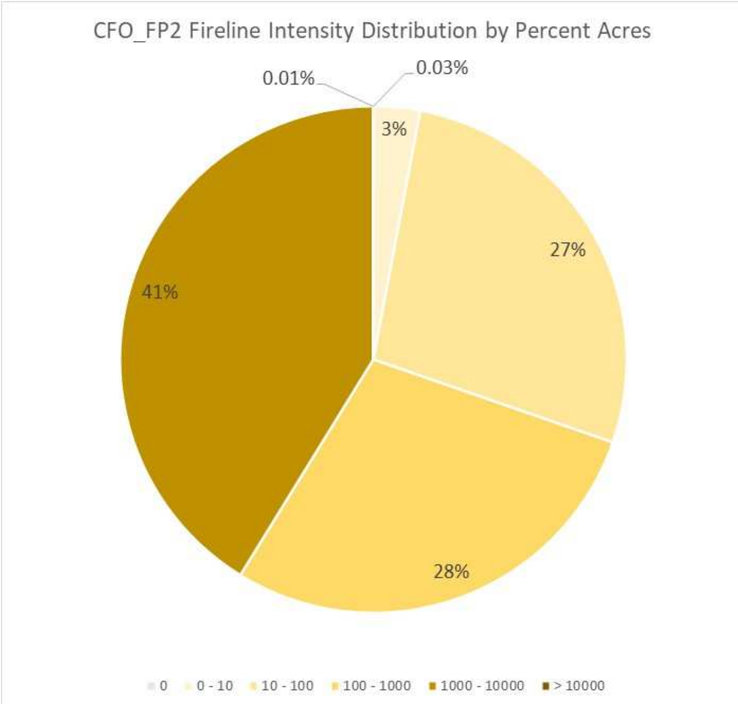


Figure 17. Pie chart of FIRE POTENTIAL AUGUST SCENARIO Fireline Intensity distribution by percent acres.

Similar to the first scenario, this graph shows that most of the area will burn with a fireline intensity that will exceed direct attack with a hand crew.

Crown Fire Potential

The type of fire expected for the weather scenario is the most basic characterization of potential wildfire behavior. Geospatial fire modeling systems inherently classify type of fire into four classes: non – burnable, surface fire, passive crown fire, and active crown fire.

A surface fire indicates that a fire will remain on the ground and not reach into the crowns of trees. This type of fire is inherent for fuel models that represent grass and shrubs. But can also apply to forested fuel models where the flame length does not get high enough to reach the crown base height (CBH). For areas where the flame lengths do exceed the CBH, a torching or passive crown fire will be predicted. Active crown fire is rare, and occurs with a strong wind, and is independent of the combustion of surface fuels.

Under the conditions modeled in the FIRE POTENTIAL OCTOBER SCENARIO, the type of fire predicted across theStanford Wedge is predominantly a passive crown fire (71%) while the remainder is a surfacefire (29%).

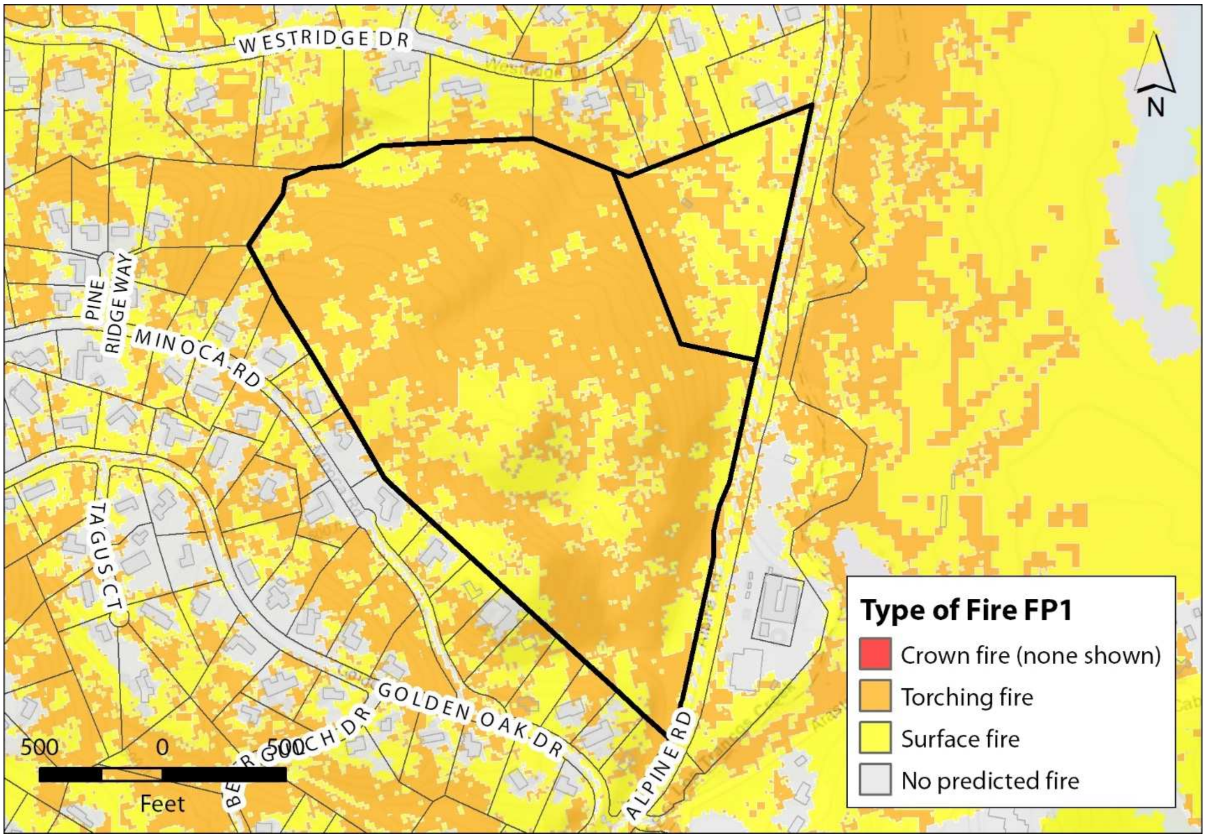


Figure 18. Type of fire (or Crown fire activity) output results for FIRE POTENTIAL OCTOBER SCENARIO.

Because of the relatively low crown base height throughout the property, wherever there is a forested fuel type, torching is predicted.

Under the conditions modeled in the FIRE POTENTIAL AUGUST SCENARIO, there is slightly more surface fire predicted than a torching fire than in the previous scenario. However, the majority of theproperty (65%) still experiences a torching fire rather than a surface fire.

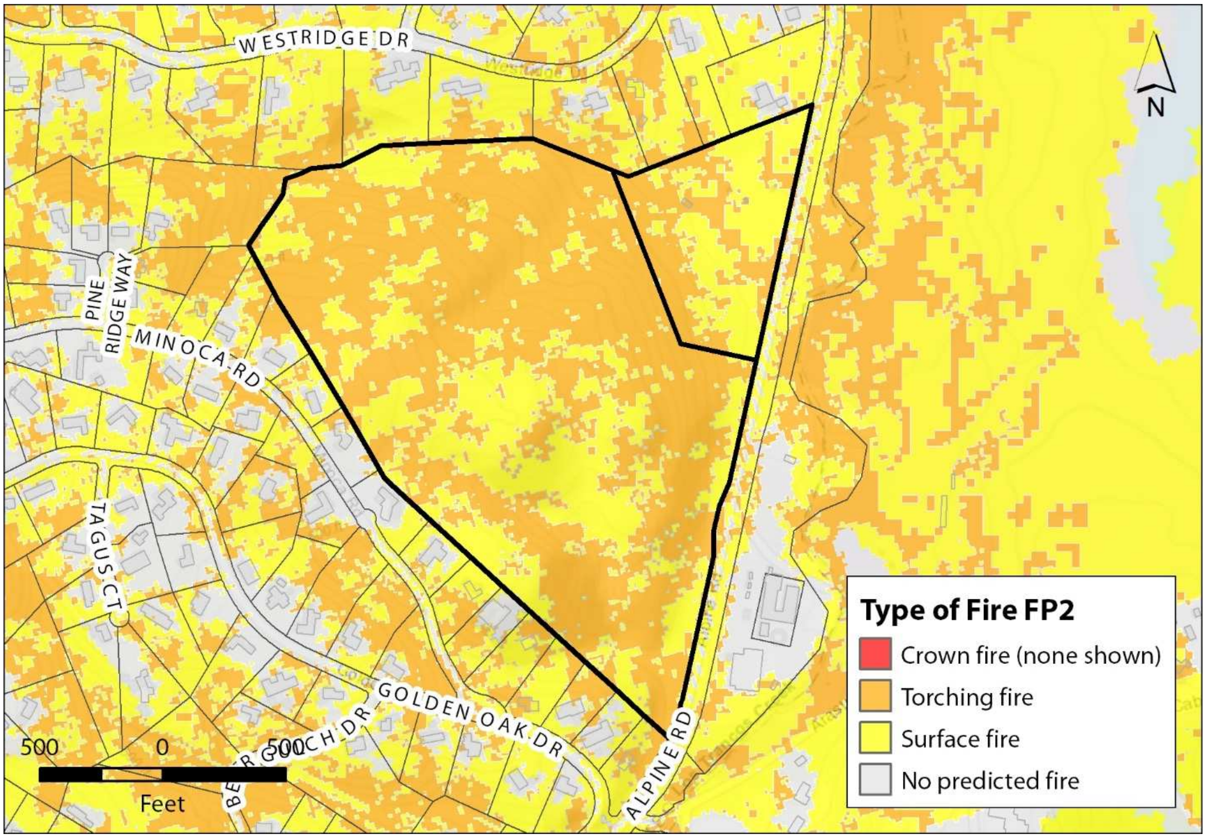


Figure 19. Type of fire (or Crown fire activity) output results for FIRE POTENTIAL AUGUST SCENARIO.

ii. FIRE GROWTH MODELS

In order to capture the near-maximum predicted fire behavior and since the overall predicted flame lengths, fireline intensity, and type of fire for FIRE POTENTIAL AUGUST SCENARIO is lower than FIRE POTENTIAL OCTOBER SCENARIO, we madethe decision to use the October 2019 weather parameters for all subsequent fire growth models.

Three fire growth models were calculated for predicted fire behavior using three different ignition and weather pattern scenarios. For each scenario, the daily weather data is from October 2019. However, the wind directions shift depending on the chosen ignition location. For FG1, the winds are as they were experienced in October 2019 (primarily from the ENE). For FG2, winds were shifted to the SW. And for FG3, winds were shifted to theSE. Thus, the scenarios are called in this report the ENE Wind Scenario, the SW Wind Scenario and the SE Wind Scenario, for the FG1, FG2, and FG3 scenarios, respectively.

The ignition locations for each scenario varied to capture four likely scenarios of potential ignition. These were determined based on proximity to property and expected human activity. No scenario considers random ignitions (i.e. as in a lightning storm) because despite the recent fires caused by lighting, the proportion of ignitions from lightning is very low, compared to ignitions caused by human activity. Additionally, lightning strikes are usually located on ridgelines, and elevations higher than the project site.

For the ENE Wind Scenario, we imagined a fire starting on a property off Westridge Drive, near the northern boundary of the Stanford Wedge. In this scenario, the supposed threat is from a fire starting off the property that poses an immediate threat to the future development as well as the undeveloped portion the property.

For SW Wind Scenario, the ignition point is imagined as a roadside ignition along Minoca Road where there are well-developed brush fields on residential lots and on the Stanford Wedge propertyas well. The supposed threat in this scenario comes from a fire starting off the property that poses an immediate threat to the undeveloped portion of the property.

In the third scenario (SE Wind Scenario), we wanted to highlight that though the proposed new fire road within the center of the property would aid in access for fuel mitigation work, it would also attract people into the property where an accidental fire may occur. In this case, the supposed fire threat comes from within the undeveloped portion of the property The ignition location is not likely to occur under current conditions because access is limited. However, this scenario is illustrative of the growth potential from an ignition in the general vicinity, and compares how fast fire and where will spread in both pre- and post-project conditions.

In the fourth scenario (ENE Wind Scenario @ Project) reflects the possibility of a fire starting just outside the developed area of the project, possibly associated with the increased human activity at the site. The location is slightly outside the area that would be managed as defensible space in the post-treatment scenario because if it were to be located in the defensible space zone, fire spread would be very slow and fire perimeter would be very small.

Fire Perimeters

All simulations were allowed to run from 1300 (1pm) to 1700 (5pm) for a total of a four-hour simulation time. In all simulations, fire growth is unimpeded by fire suppression efforts. The fire suppression capabilities of the Woodside Fire Protection District cannot be overestimated. In order to compare scenarios, the effect of suppression was not included, only for comparison purposes. The response for pre- and post-project scenarios would be quite different, in terms of the location of activities, and the type of actions that would be appropriate. Thus, comparing the possible fire spread, incorporating the wildfire response would confound the results. In this regard, fire growth is unrealistically large, but does indicate patterns in direction and potential for growth. In addition, structures are assumed to be non-burnable, which is also an unrealistic assumption. (Due to an internal model setting, reported perimeters stop at the time step immediately preceding the last, so only perimeters up to 1645 are reported below.)

Fire perimeters labeled by each time step reflects the fire growth from the immediate time period before it. For example, the 1hour simulation time step polygon represents fire growthfrom the fifteen minutes before that hour.

The maps below show predicted fire perimeter after 1 hour of simulation time highlighted in black. The darker red areas show areas that will experience fire soonest, given the parameters of each scenario. In all three scenarios, wind speed remains at or below 10mph. However, the wind direction shifts depending on the ignition location (arrow on map indicates wind direction).

ENE Wind Scenario Fire Growth

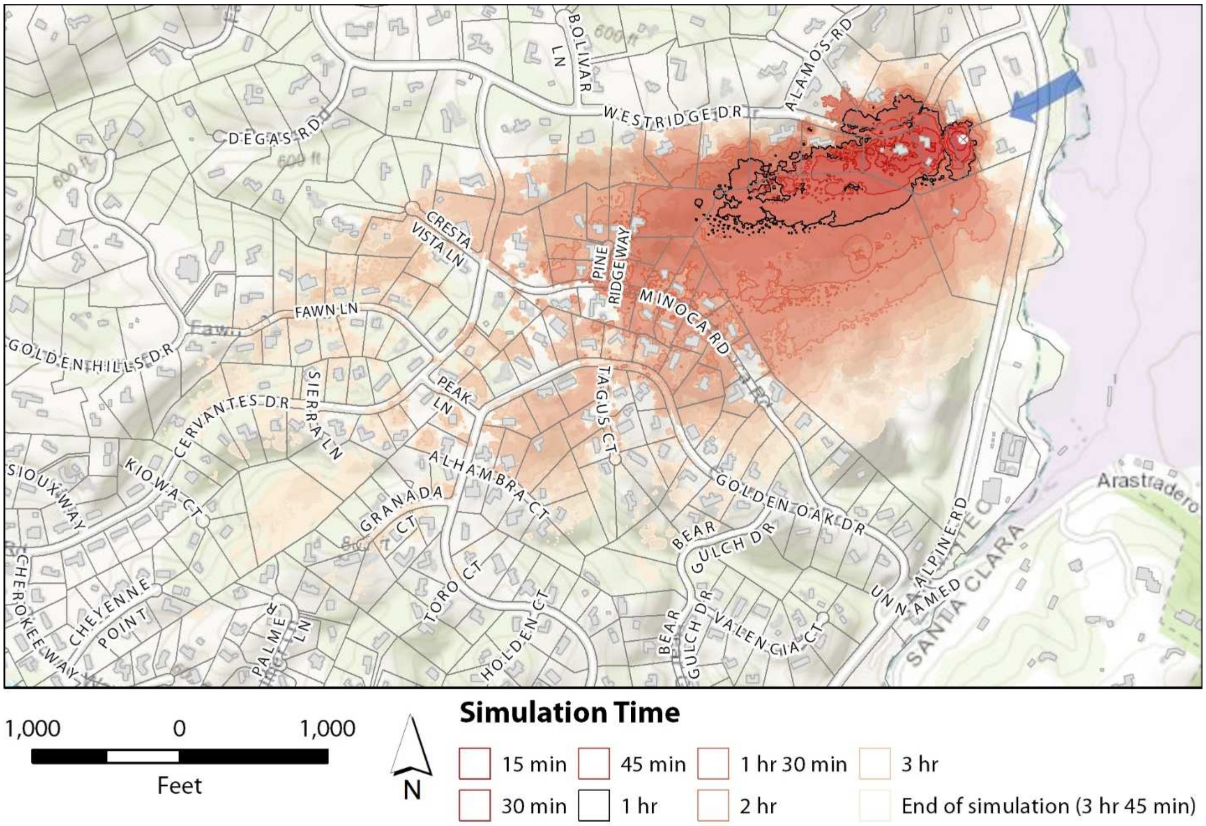


Figure 20. Perimeters for predicted fire growth for ENE Wind. Wind direction from NE (shownwith blue arrow).

For *ENE Wind* Scenario, where we imagined a fire starting on a property off Westridge Drive, near the northern boundary of the Stanford Wedge, the fire grew to less than half an acre in the first 15 minutes and then a little over 18 acres in 1 hour. Several homes are immediately threatened, and numerous spot fires are generated that grow outside of the main fire perimeter. The simulated fire quickly crosses over Westridge Drive. Further into the simulation, the fire has burned through most of the Project Site and continues into the neighborhood west of the property, impacting homes along Westridge Road, Pine Ridgeway, Minoca Road, Golden Oak Drive, and many others. In addition, Alpine Road is also burned over. The fire grows to over 200acres within the four-hour simulation.

SW Wind Scenario FIRE GROWTH

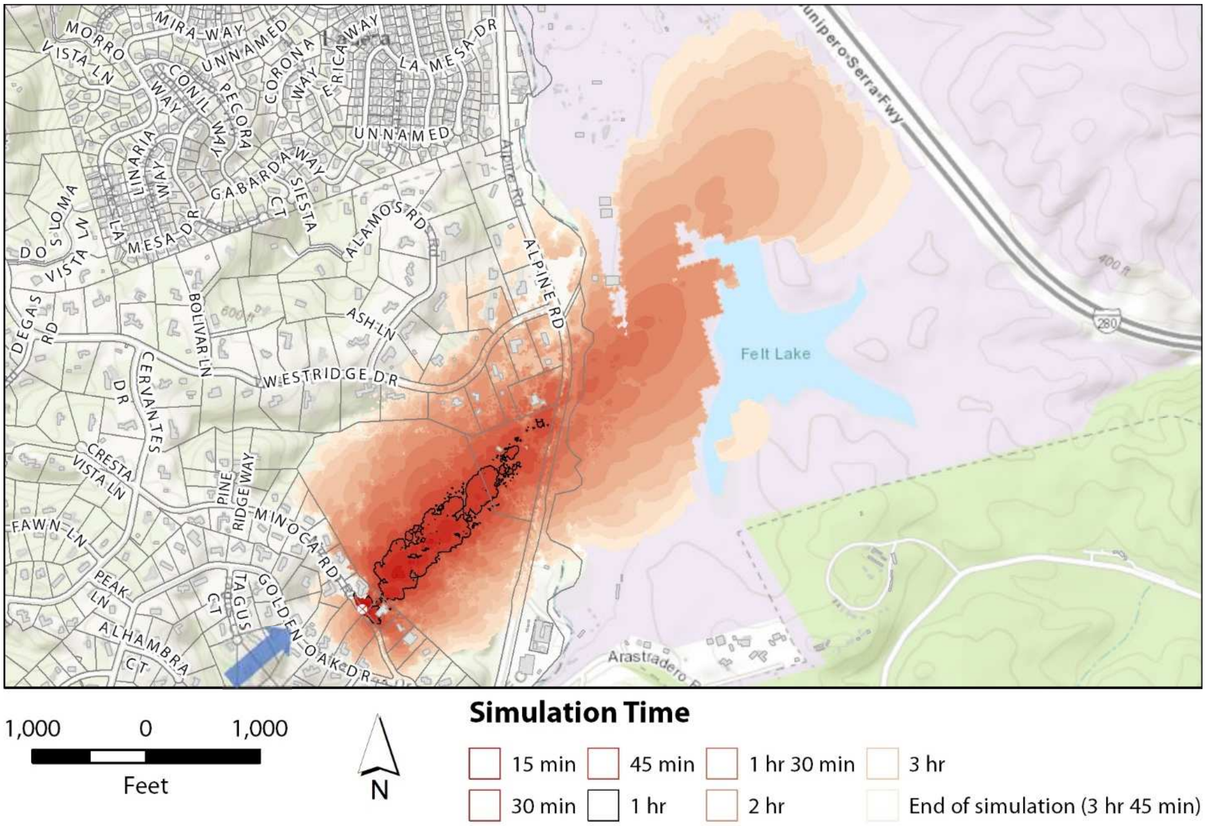


Figure 21. Perimeters for predicted fire growth for the ENE Wind Scenario. Wind direction from SW (shownwith blue arrow).

For the **SW Wind Scenario**, the ignition point is imagined as a roadside ignition along Minoca Road where there are brush fields on residential lots and on the Stanford Wedge property as well. This fire grew to less than a tenth of an acre in the first 15 minutes and then close to 11 acres in 1 hour.Several homes are immediately threatened along Minoca Road. However, the fire moves quickly to the northeast and most homes on the western side of the property are spared.

Numerous spot fires are generated that grow outside of the main fire perimeter. The simulated fire does not reach the homes on the other side of the property along Westridge Road until after an hour of burning. However, soon after, the fire overruns Alpine Road and moves quickly through the grass fields to the northeast, reaching Highway 280 within the four-hour simulation. The fire grows to over 280 acres.

SE Wind Scenario Fire Growth

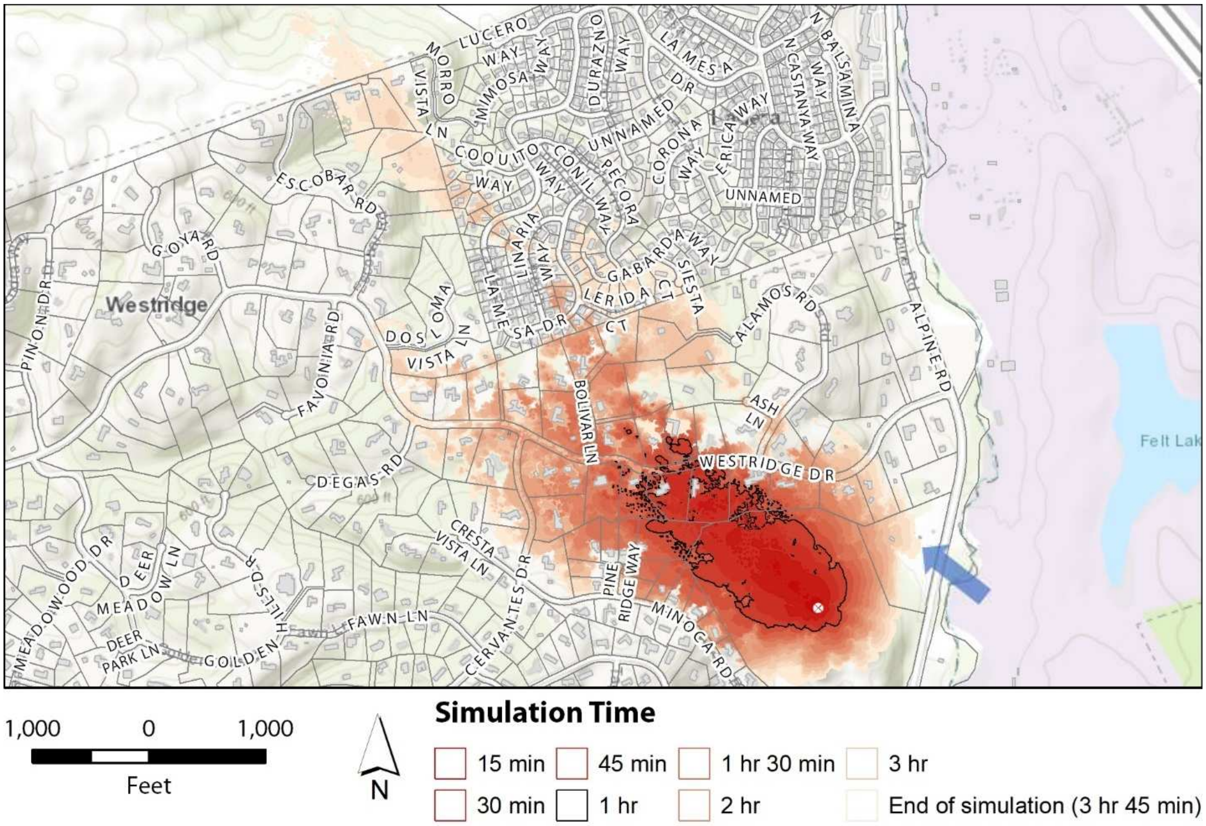


Figure 22. Perimeters for predicted fire growth for SE Wind Scenario. Wind direction from the SE (shownwith blue arrow).

In the third scenario (SW Wind), we wanted to show that, though the proposed new fire road within the center of the property would aid in access for fuel mitigation work, it would also attract people into the property where an accidental fire may occur. Similar to the other scenarios, this fire grew to half an acre in the first 15 minutes and then quickly burned close to 31 acres in 1 hour. No homes are immediately impacted, however, given enough time, the fire threatens homes along Westridge Drive and Minoca Road. Numerous spot fires are generated that grow outside of the main fire perimeter. Within an hour, homes in the neighborhood northwest and north of the property are compromised, as are the main routes down to Alpine Road. Within the four-hour simulation, the fire grows to just under 200 acres.

For the fourth scenario, (NE Wind@Project), where we imagined a fire starting within the study property, just west of the proposed housing development, the fire grew to less than half an acre in the first 15 minutes and then a little less than 25 acres in 1 hour. Homes are not threatened until the 45-minute timestep, however over 146 spot fires are generated, some of which grow outside of the main fire perimeter. The simulated fire eventually crosses over Minoca Road. Further into the simulation, the fire has burned through most of the property and continues into the neighborhood southwest of the property, impacting homes along Minoca Road, Golden Oak Drive, Bear Gulch Drive, Alpine Road, and others. The fire grows to over 258 acres within the four-hour simulation.

One fire growth scenario was calculated using the NE Wind, but placed at the border of the developed area of the project suite. In this scenario, the ignition location and wind direction simulate what would happen in the event of a fire starting just west of the new development and what would be threatened downwind of its location.

Fire Perimeters

The simulation was allowed to run from 1300 (1pm) to 1700 (5pm) for a total of a four-hour simulation time. (Due to a model setting, reported perimeters stop at the time step immediately preceding the last, so only perimeters up to 1645 are reported below.)

Fire perimeters labeled by each time step reflects the fire growth from the immediate time before it. For example, the 1 hr simulation time step polygon represents fire growth from the fifteen minutes before that hour.

The maps below show predicted fire perimeter after 1 hour of simulation time highlighted in black. The darker red areas show areas that will experience fire soonest. Wind speed remains at or below 10mph. However, the wind direction is from the NE.

Fire Growth of the NE Wind@Project

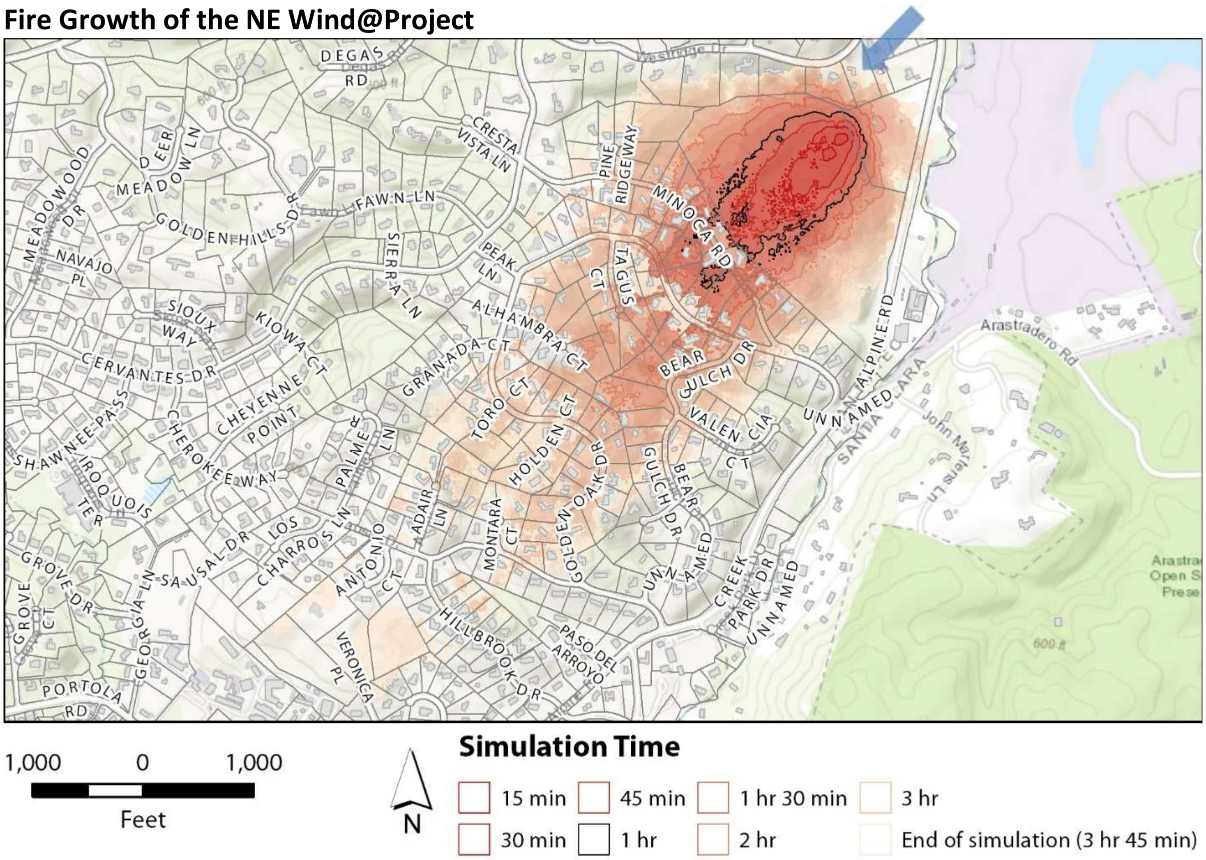


Figure 23. Perimeters for predicted fire growth for NE Wind @ Project scenario. Wind direction from the SE (shownwith blue arrow).

For NE Wind @ Project scenario, where we imagined a fire starting within the study property, just west of the proposed housing development, the fire grew to less than half an acre in the first 15 minutes and then a little less than 25 acres in 1 hour. Homes are not threatened until the 45-minute timestep, however over 146 spot fires are generated, some of which grow outside of the main fire perimeter. The simulated fire eventually crosses over Minoca Road. Further into the simulation, the fire has burned through most of the property and continues into the neighborhood southwest of the property, impacting homes along Minoca Road, Golden Oak Drive, Bear Gulch Drive, Alpine Road, and others. The fire grows to over 258 acres within the four-hour simulation.

TABLE 1. FIRE GROWTH ACREAGE TABLE FOR NE WIND @ PROJECT

Elapsed	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	11	0	0.49	0.49
00 00:30	10/23 13:30	112	3	5.22	4.73
00 00:45	10/23 13:45	146	41	14.55	9.33
00 01:00	10/23 14:00	119	38	24.84	10.29
00 01:15	10/23 14:15	162	52	36.06	11.22
00 01:30	10/23 14:30	138	59	47.21	11.16
00 01:45	10/23 14:45	176	54	59.10	11.89
00 02:00	10/23 15:00	211	66	74.43	15.33
00 02:15	10/23 15:15	245	65	97.49	23.06
00 02:30	10/23 15:30	320	121	119.10	21.61
00 02:45	10/23 15:45	340	152	145.28	26.18
00 03:00	10/23 16:00	434	142	164.18	18.89
00 03:15	10/23 16:15	425	140	185.36	21.18
00 03:30	10/23 16:30	480	196	228.75	43.39
00 03:45	10/23 16:45	472	242	258.15	29.40

V. WILDFIRE HAZARD AND RISK OF CURRENT CONDITIONS

After running the models, we determined overall wildfire hazard of current conditions, from the outputs from the FlamMap (**fire potential**) scenario. We chose to use **FIRE POTENTIAL OCTOBER SCENARIO** fire prediction outputs that were combined and reclassified into a low, moderate, high, and very high scale for ease of interpretation. This was also done to highlight those areas that experience the highest fireline intensity, flame lengths, and fire type.

In order to do this, both the flame length output and the fireline intensity output were reclassified to a common scale (Table 12 and 13 below). The fire type layer is already in a value range that is comparable with the reclassification tables below.

Table 3 – Flame length rage associated with seven fire length levels

FLAME LENGTH LEVEL	FLAME LENGTH RANGE
FIL 1	0 – 2 feet
FIL 2	2 – 4
FIL 3	4 – 6
FIL 4	6 – 8
FIL 5	8 – 12
FIL 6	12 – 15
FIL 7	Greater than 15 feet

Table 4 – Classification of fireline intensity into fireline intensity classes

FIRELINE INTENSITY RANGE (KW/M)	FIRELINE INTENSITY CLASS
1 – 10 KW/M	I
10 – 100	II
100 – 1,000	III
1,000 – 10,000	IV
> 10,000	V

These three layers were then added and again the output was reclassified into a low, moderate, high, and very high scale for ease of interpretation. The results are shown in Figure 23 (next page).

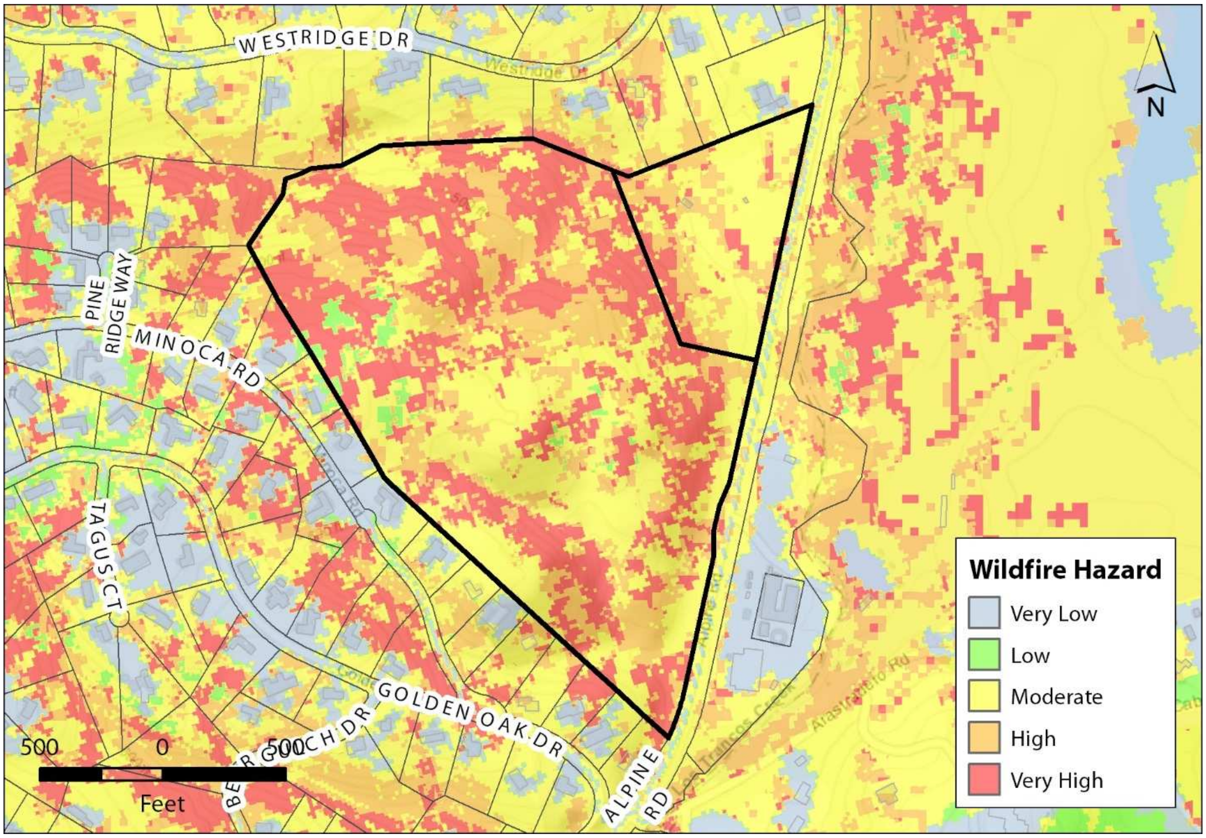


Figure 24. Wildfire hazard based on current predicted flame length, fireline intensity, and type of fire (using outputs from FIRE POTENTIAL OCTOBER SCENARIO scenario).

Figure 24 above shows that based on fire behavior only, the current wildfire hazard is very high in many areas throughout the property, both adjacent to the proposed development project as well as along the property boundary where residential homes exist. Inside the property, these very high areas account for a third of the property. Areas of high wildfire hazard exist throughout the property as well and covers a similar sized area (28%). Moderately rated areas dominate the south-center portion of the property and accounts for 37% of the property. There is very little low wildfire hazard within the property (1%).

Table 5. Wildfire hazard using FIRE POTENTIAL OCTOBER SCENARIO fire behavior outputs.

FIRELINE INTENSITY RANGE (KW/M)	ACRES	PERCENT
VERY LOW	0.01	0.02%
LOW	1.0	1%
MODERATE	27.8	37%
HIGH	21.2	28%
VERY HIGH	25.0	33%

A. WILDFIRE LIKELIHOOD

i. POTENTIAL IGNITION SOURCES

For this analysis, we did not base burn probability on fire behavior predictions and past fire occurrence. Instead, we looked at the physical proximity to potential ignition sources such as proximity to housing/structures, roads, and distribution powerlines.

While lightning does play a role in starting fires in California and despite the recent lightning-strike fires of 2017 and 2020, in the San Francisco Bay Area, these types of fires are very rare, and generally strike at locations on ridgetops at elevations higher than the project site and vicinity. For this reason, we did not consider lightning strike data as a source of fire ignitions.

Each potential ignition source was buffered by a set distances and assigned a relative value to indicate very high, high, moderate, or low probability of ignition. The reasoning is: the closer to a road or powerline or building, the more likely an ignition will occur. Table 6 shows the buffers used and the relative values assigned for each layer of data.

Table 6. Buffer distances and relative risk for each ignition source considered.

VARIABLE	BUFFER	VALUE
PROXIMITY TO HOUSING/STRUCTURES	Less than 100 feet	Very High (4)
	100 – 500 feet	High (3)
	500 – 1,000 feet	Moderate (2)
	1,000 ft – 0.5 miles	Low (1)
	greater than 0.5 miles	None (0)
PROXIMITY TO ROADS (HIGHWAYS)	Less than 100 feet	Very High (4)
	Greater than 100 feet	None (0)
PROXIMITY TO POWERLINES/TRANSMISSION LINES	Greater than 100 kV & Less than 100 feet	Low (1)
	Greater than 100 kV& Greater than >100 feet	None (0)
	Less than 100 kV & Less than 100 feet	Very High (4)
	Less than 100 kV & Greater than 100 feet	None (0)

By combining these layers and reclassifying the values to very high, high, moderate, and low, we get a map that gives us the current relative risk based on the location of potential ignition sources (Figure 24).

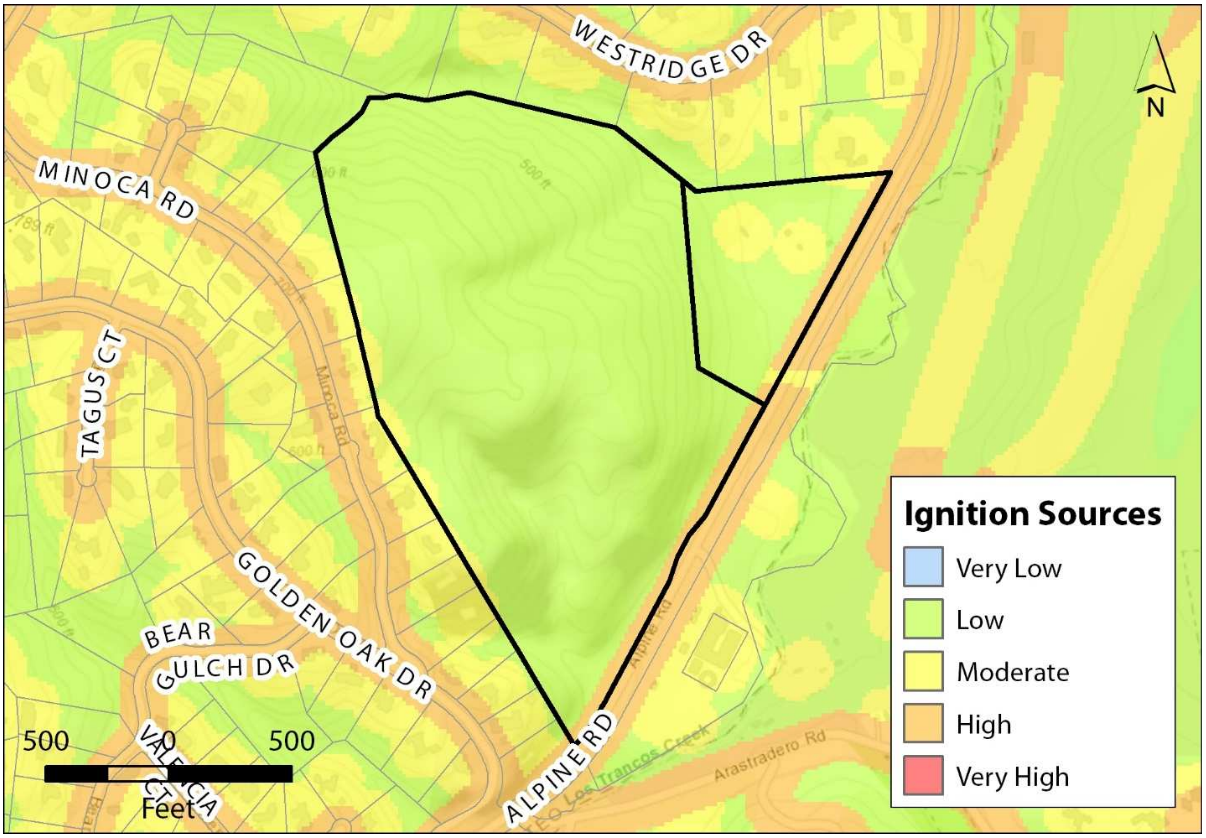


Figure 25. Combined potential ignition sources near the Stanford Wedge.

The figure above show that based on the potential ignition sources reviewed for this assessment, potential ignition sources within the property is low. Ignition sources currently emanatefrom outside the property.

ii. WILDFIRE SUPPRESSION RESPONSE'S INFLUENCE ON RISK

While the predicted Wildfire Behavior and Potential Ignition Sources increase overall risk to wildfire, the expected Wildland Fire Suppressions response can lessen that risk. This is especially the case with the Stanford Wedge as it is near several city-operated fire stations.

To gauge response times, we assigned a cost of how many minutes it would take to travel through any given pixel. The minutes for each pixel were determined by the posted speed limit on each road segment. For areas immediately near a road, the time to travel to those pixels were similar to the travel times on the roads themselves. The further away we get from the roads, the longer it takes to travel through those areas.

Once we had our time-cost surface, we determined the total time it would take to travel from any of the nearby fire stations to any given location in the area. The result is a surface that shows the total time it would take (based on the cost surface) to visit any location from the nearest fire station.

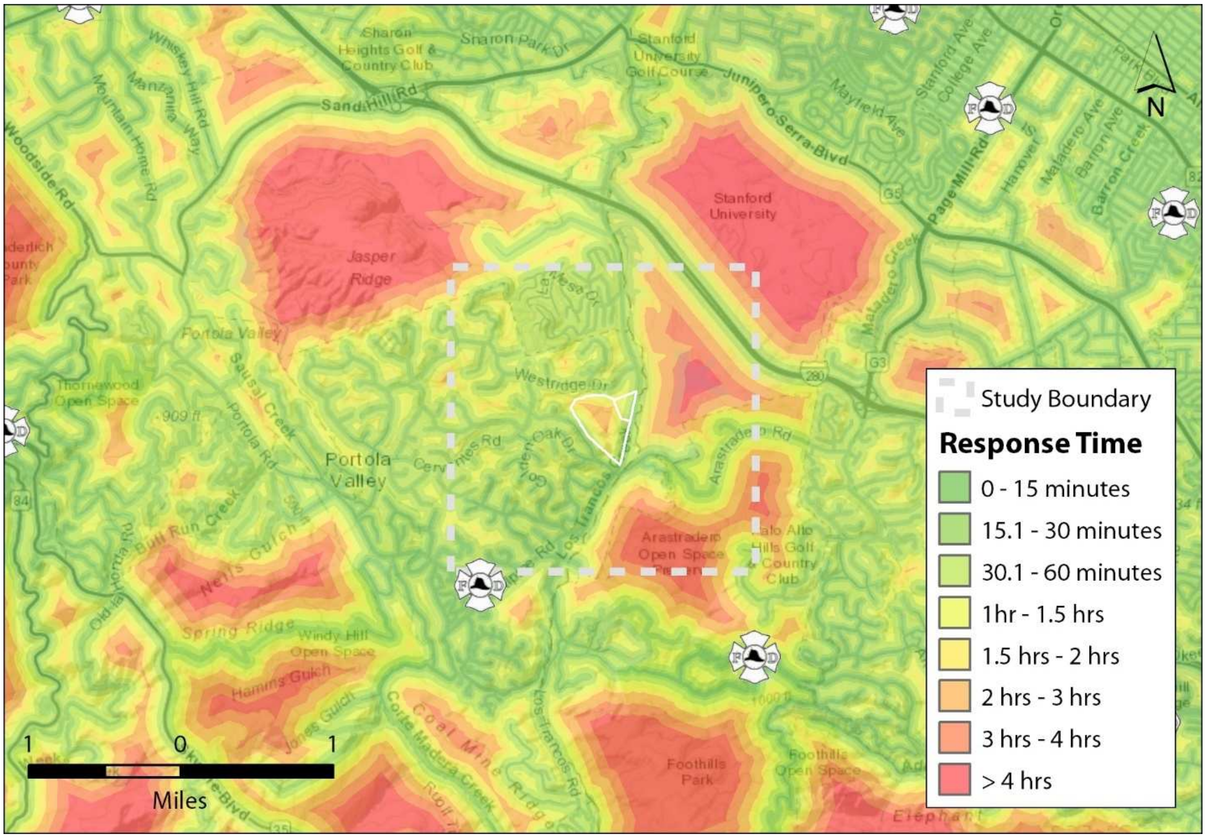


Figure 65. Response time from nearest fire station to any given location in the study area (based on posted speed limit).

We then re-classified this surface into a rating per the guidelines shown in Table 7. This was so that the values were at a scale similar to the scale for all the other input layers. Numbers have a negative value, thus reducing the overall fire risk based on the calculated response times.

Table 7. Proximity to fire suppression resources with associated factors to lower risk.

TRAVEL TIME FROM FIRE STATION	VALUE
LESS THAN 15 MINUTES	Very High (-4)
15 – 30 MINUTES	High (-3)
30 – 60 MINUTES	Moderate (-2)
60 – 90 MINUTES	Low (-1)
GREATER THAN 90 MINUTES	Very Low (0)

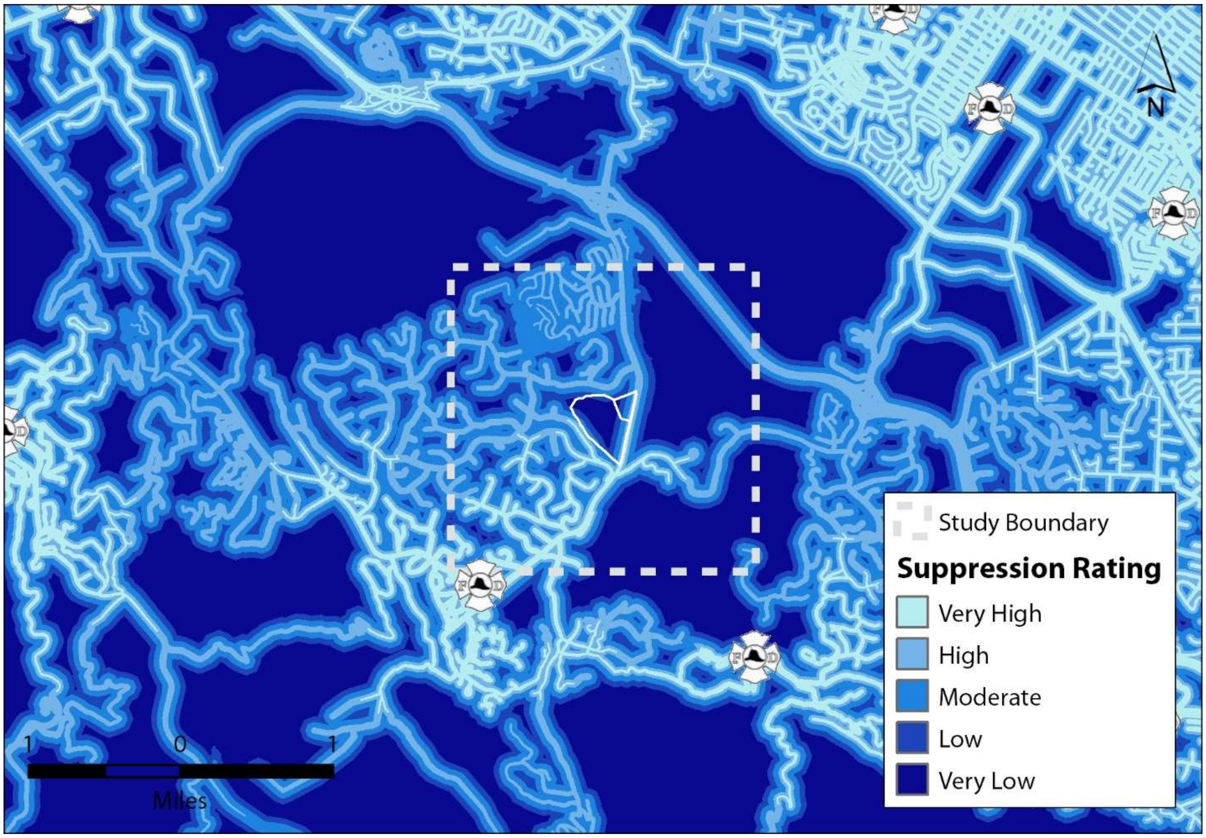


Figure 27. Relative wildfire suppression response (ground only) based on street speed and proximity to roads.

While fire stations are relatively close to the property (see table below), in relation to other locations, the study area is considered a very low suppression response site due to the fact that no roads currently travel through the property. Therefore, those areas take more time to access.

B. WILDFIRE RISK OF CURRENT CONDITIONS

To determine overall wildfire risk for the Stanford Wedge, we combined our results from the wildfire hazard analysis (50%), the potential ignition sources analysis (25%), and the wildfire suppression response (25%) to create a layer that would represent the **wildfire risk** on and surrounding the property. The resulting data layer was reclassified to a scale of 1 to 10; 1 equal to a low risk of wildfire and 10 being the highest risk of wildfire.

The three components were each given a weight so that only a portion of their rating would be accounted for in the equation. In other words, the wildfire hazard rating was multiplied by 0.50, the potential ignition rating was multiplied by 0.25, and the suppression response was multiplied by 0.25. In this way, we “weight” the resulting risk model toward the wildfire hazard rating. Alternatively, no weighting could be done.

We chose to weight this model heavily on the inherent wildfire hazard layer because potential ignition sources and the suppression response can change dramatically based on available resources and human activity.

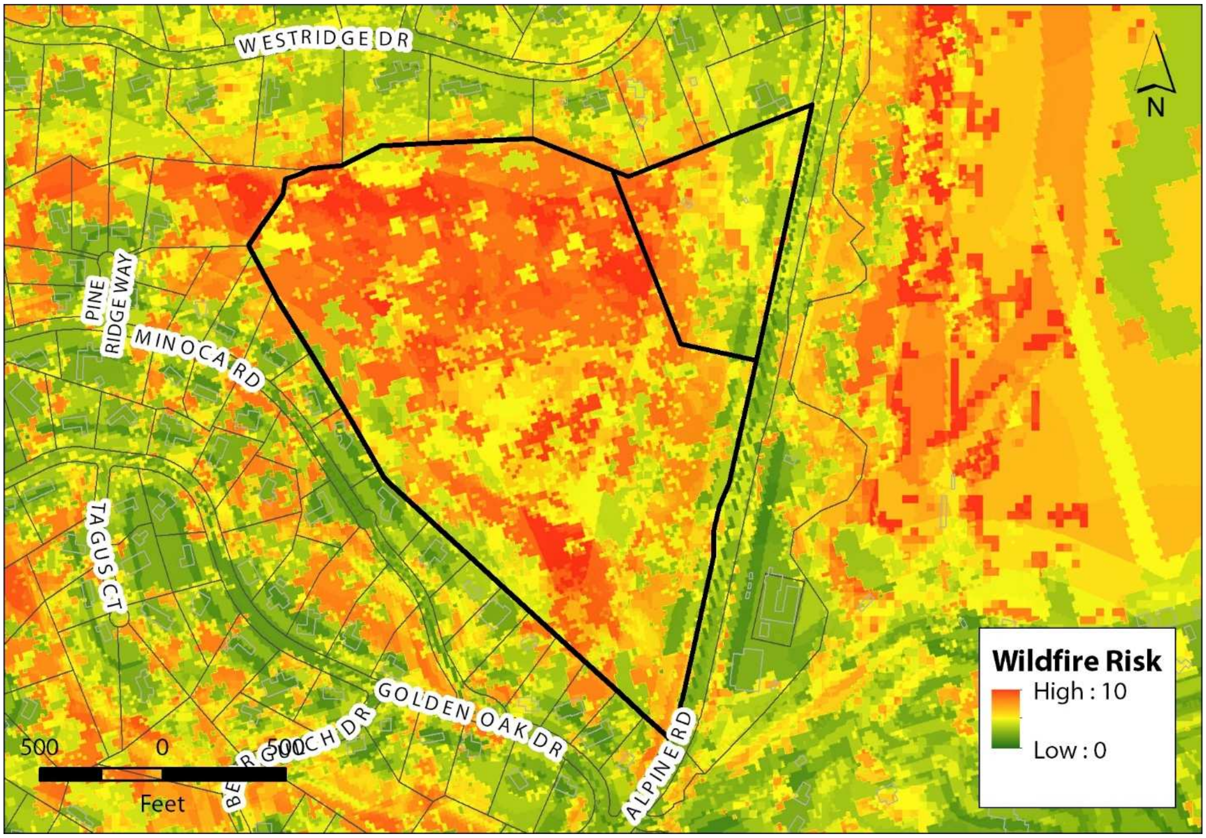


Figure 28. Wildfire risk for the Stanford Wedge, taking into consideration potential fire behavior, potential ignition sources, and fire suppression response.

The resulting wildfire risk rating layer (Figure 28) shows there is high to very high risk in pockets throughout the property and particularly in the north-western area just below Pine Ridge Way. There are areas of low risk in the center of the property and near Alpine Road where pockets of short shrubs and grass exist. Within the property itself, there is no area rated a 10 nor a 0. Just over 38% of the property is rated a 7 or higher.

Table 8. Wildfire risk acres within the Stanford Wedge

RISK CATEGORY (1-10)	ACRES	PERCENT
0 – VERY LOW TO NONE	0.0	0%
1 – LOW	1.1	1%
2	5.1	7%
3	7.3	10%
4	12.6	17%
5 – MODERATE	12.1	16%
6	8.8	12%
7	20.7	28%
8 – HIGH	7.6	10%
9 – VERY HIGH	0.03	0.04%
10 – EXTREME	0.0	0%

VI. EVACUATION/TRAFFIC ACCUMULATIONS CURRENT CONDITIONS

In this section, we wanted to look more closely at the fire growth scenarios to determine how each might affect expected evacuation routes. All the fire growth scenarios were chosen because in all three Alpine Road is compromised and/or roads serving the surrounding neighborhoods were impacted.

For this exercise, we used Network Analyst in ArcMap to determine traffic accumulations along expected routes residents would likely use to exit the area. Evacuation destinations include three intersections along Highway 280: Sand Hill Road, Alpine Road, and Arastradero road on-ramps. A total of 3,884 vehicles were modeled from structures located within the area bounded by Arastradero Road, Portola Road, and Sand Hill Road. We assumed two vehicles per structure and 50 vehicles at the inn/stables located on Alpine Road. The number of cars assumed is an over-estimate for current conditions. Research shows that the number of cars used per household to evacuate from wildfires ranges from .89 cars to 1.5 cars, whereas the analyses used 2 cars per household. However, it is appropriate for this analysis so that the total number of cars includes the possibility that additional dwelling units not currently accounted for, and includes the current boarders at the stables.

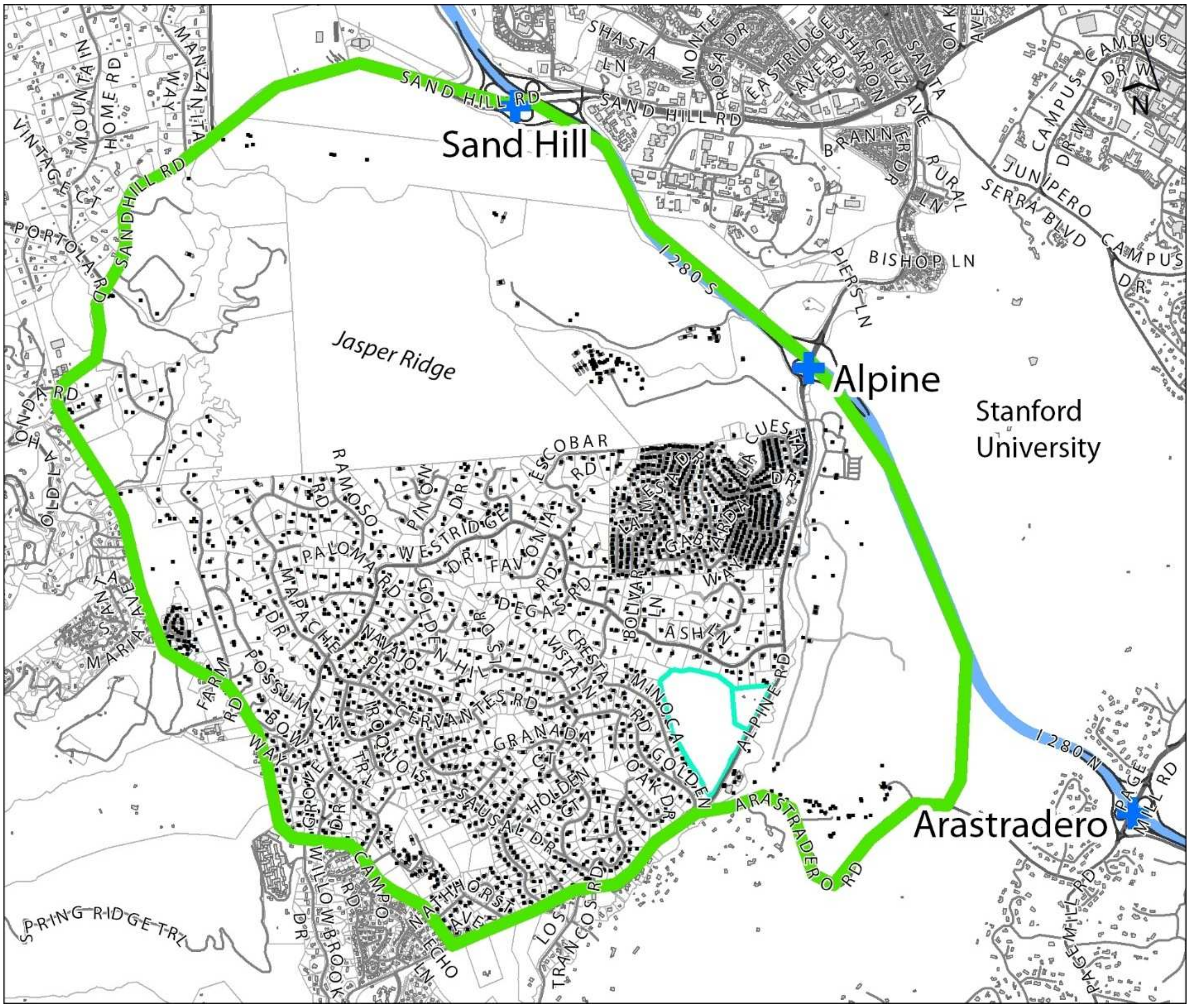


Figure 29. Area included in traffic accumulations (shown in bright green) for the expected evacuated area due to modeled fires.

The Network Analyst geoprocessing tool solves for the closest route from the source (the structures) to the facility (in this case, the destination, or the highway on-ramps). It uses the amount of time it takes to travel along any segment of road based on the posted speed limit. The results show that of the three possible routes, the route that terminates at the Alpine Road on-ramp intersection accounts for the shortest route for more than 90% of the structures in the modeled area.

Table 9. Number of routes to each destination (based on closest route). Note: each structure was counted twice (two vehicles)

DESTINATION	NUMBER OF ROUTES	PERCENT
ARASTRADERO	66	2%
ALPINE	3544	91%
SAND HILL	274	7%

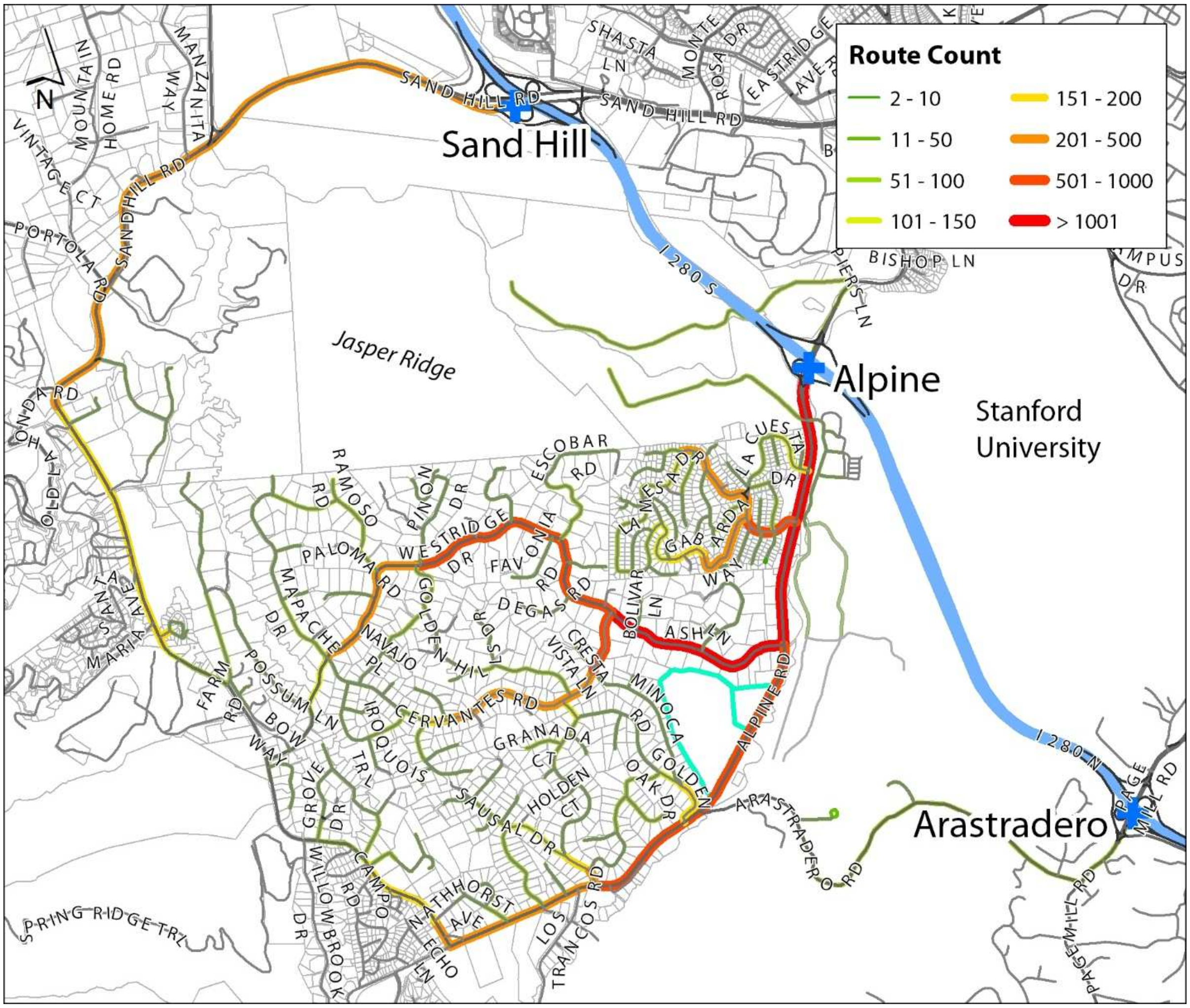


Figure 30. Route counts (accumulations) for the Stanford Wedge area.

The analysis shows that much of the Central Portola Valley and Westridge neighborhoods heavily rely on exiting the area via Alpine Road. The intersection of Alpine Road and Westridge Road could experience up to 2,260 vehicles trying to pass through in a relatively short amount of time during an evacuation. Structures may not be residences and not all are located within the study property.

Each of the fire growth scenarios illustrate which houses will be impacted first and what roads will be compromised or blocked.

A. FIRE GROWTH SCENARIO ENE WIND

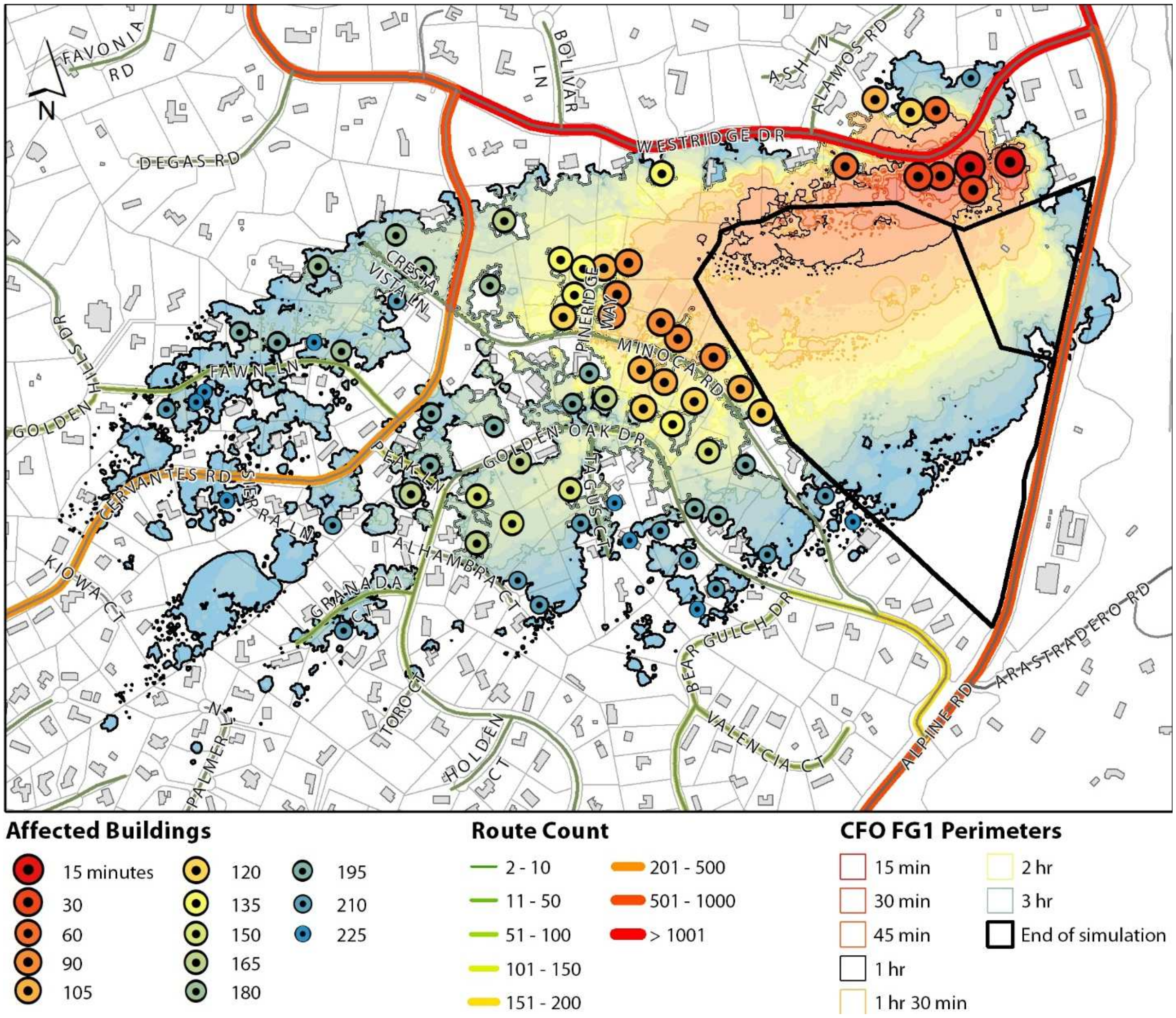


Figure 31. CFO_FG1 fire growth perimeters with route counts and affected buildings.

In the ENE Wind fire growth scenario, 72 structures are directly affected by the fire. Due to the initial ignition point being right behind a house, two houses immediately next to the ignition point are impacted by the fire within the first 15 minutes. In addition, 6 separate fires are burning due to spot fires.

Westridge Drive is not impacted until 45 minutes into the fire, at which time, five homes have been directly affected by the fire and there are over 100 small spot fires, some of which have spotted over 1,000 feet from the initial ignition point. At this point, all routes leading down Westridge Dr toward Alpine Rd are compromised (over 1,400 routes impacted). In an evacuation, these would have to be re-routed to Minoca Rd.

Between 45 minutes and 90 minutes into the fire, the fire is moving through the northern portion of the property. During this time, no homes are immediately threatened and there is time to evacuate those homes northwest of the fire out towards Minoca Rd.

After 90 minutes, 13 homes are directly affected by the fire and spots fires have reached across the property onto Micona Rd – which is now impacted by the fire. An additional 152 routes are now impacted.

Alpine Rd is not impacted by the fire until 3 hours into the simulation. However, once it does, it will potentially affect an additional 788 routes going north to Highway 280. Overall, over 2,200 routes may need to be re-routed to avoid this fire perimeter.

If allowed to burn for four hours, the fire grows to just over 200 acres with over 600 separate, small spot fires (in total, most of which have been incorporated into the main fire). Spot fires have reached close to Cherokee Way (off Cervantes Rd), which is almost one mile from the initial ignition point. Affected roads include (in alphabetical order): Alhambra Ct, Alpine Rd, Cervantes Rd, Cresta Vista Ln, Fawn Ln, Golden Oak Dr, Granada Ct, Minoca Rd, Peak Ln, Pineridge Way, Sierra Ln, Tagus Ct, and Westridge Dr.

B. FIRE GROWTH SCENARIO SW WIND

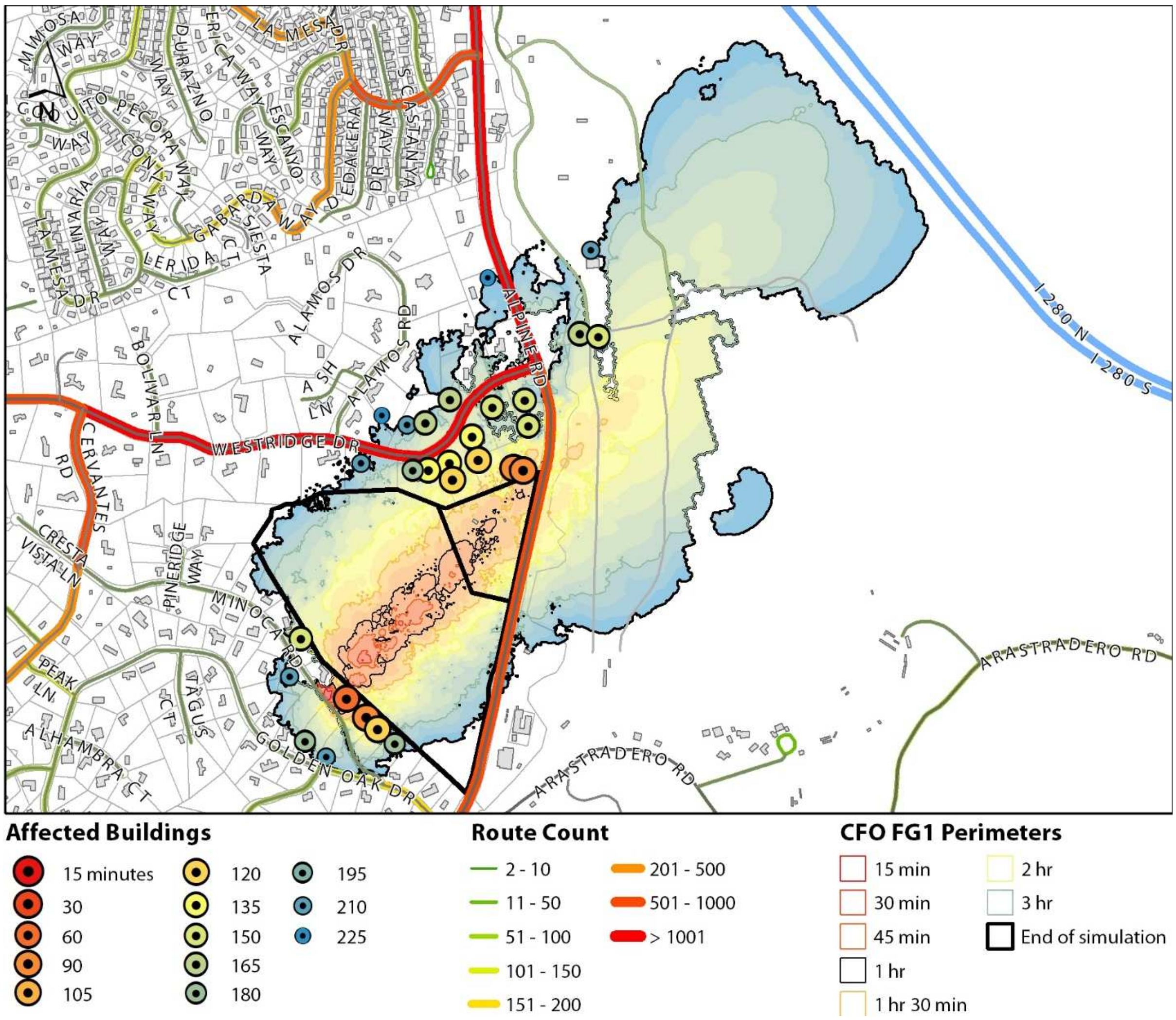


Figure 32. SW Wind fire growth perimeters with route counts and affected buildings.

In the SW Wind fire growth scenario, 24 structures are directly affected by the fire. Even though the initial ignition point is immediately next to a home, because of the wind direction, no houses are immediately affected by the fire. In addition, due to low volume of fuels present at the ignition point, the fire remains very small (less than an acre) during those first 15 minutes. However, by 30 minutes, though no houses are directly impacted, the fire has burned into the interior of the property, with a spot fire as far away as 880 feet from the initial ignition point. After 45 minutes of burning, spot fires continue to expand the perimeter to the northeast, almost into the proposed development area at 1,500 feet away.

At 60 minutes, one house near the ignition point is finally impacted by the fire. Spot fires have reached all the way across the property at 2,300 feet away, with close to 100 spot fires burning along the perimeter and front of the fire. At 75 minutes, fire has completely made it across the property is now impacting Alpine Rd and potentially 788 routes to Highway 280 will need to be re-routed to the south.

At 90 minutes, 2 additional structures are impacted, and spot fires have reached 3,100 feet from the initial ignition point. After 120 minutes, 3 additional structures are impacted, and the fire continues to grow and spot ahead towards the northeast. At 135 minutes, the fire begins to grow perpendicular to the wind and begins to impact Westridge Dr and Minoca Rd.

At 150 minutes, 5 additional homes are impacted by the fire, it has now burned over Westridge Dr and threatening homes to the north. After 180 minutes, 6 additional structures are impacted by the fire. At 195 minutes, no additional structures are directly affected by the fire, but the fire's leading front has come within 200 feet of Highway 280. At 210 minutes, 5 additional structures are directly affected by the fire and then at 225 minutes, 2 additional structures are affected, and the fire essentially reaches highway 280, but does not spot over it.

If allowed to burn for four hours, the fire grows to just over 280 acres with 195 separate, small spot fires (in total, most of which have been incorporated into the main fire). The front of the fire has reached Highway 280, which is almost one mile from the initial ignition point. Affected roads include (in alphabetical order): Alpine Rd, Golden Oak Dr, Minoca Rd, Westridge Dr, and several unpaved roads.

C. FIRE GROWTH SCENARIO SE WIND

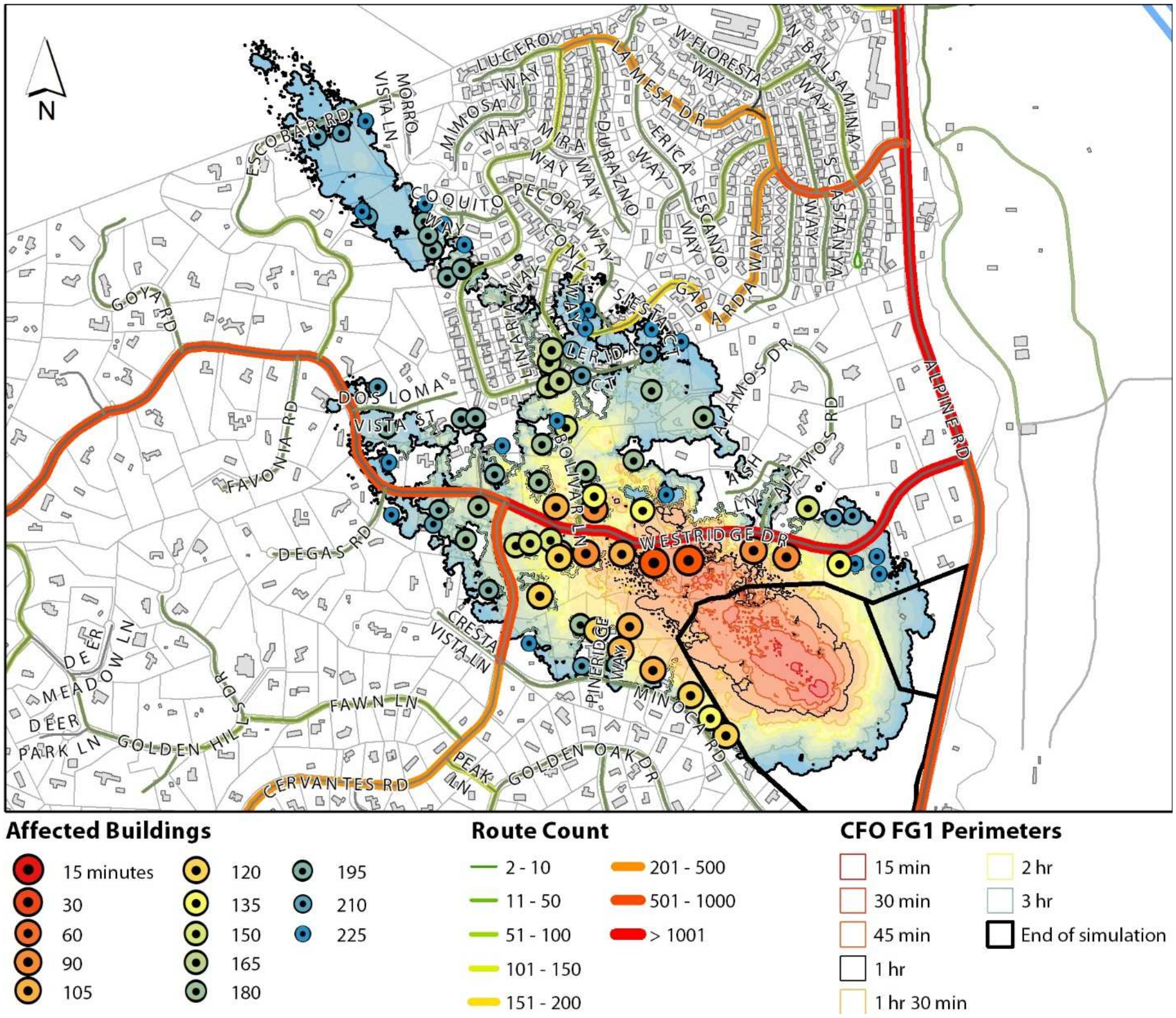


Figure 33. SE Wind fire growth perimeters with route counts and affected buildings.

In the SE Wind fire growth scenario, 87 structures are directly affected by the fire. Since the initial ignition point was in the middle of the undeveloped portion of the property, no structures are immediately affected by the fire. However, in the first 15 minutes, over 20 spot fires are independently burning.

- At 30 minutes, no homes are affected, but the fire has grown to 6 acres with 124 spot fires.
- At 45 minutes, 2 homes are affected, Westridge Dr has been reached, potentially impacting over 1,400 exit routes to Alpine Rd.
- At 60 minutes, the fire has grown to 52 acres with 157 number of spot fires.
- At 90 minutes, 4 additional homes are impacted.
- At 105 minutes, 5 additional homes are impacted.
- At 120 minutes, 6 additional homes are impacted.
- At 135 minutes, the fire has spotted into the Ladera neighborhood which has smaller

lots, and 4 additional homes have been impacted.

- At 150 minutes, Cervantes Rd has been reached by the fire and 5 additional homes have been impacted.
- At 165 minutes, 4 additional homes have been affected.
- At 180 minutes, Minoca Rd has been reached on the southwestern flank of the fire, 9 additional structures have been impacted and spot fires have reached across the southwestern corner of the Ladera neighborhood.
- At 195 minutes, 12 additional homes impacted, fire has almost reached Escobar Rd and has grown to close to 150 acres.
- At 210 minutes, 12 additional homes impacted, fire has reached beyond Escobar Rd.
- At 225 minutes, the fire has spotted over 1 mile to the northwest and 20 additional homes are directly affected by the fire.

If allowed to burn for four hours, the fire grows to just under 200 acres with 445 separate, small spot fires (in total, most of which have been incorporated into the main fire). The front of the fire has reached over a mile to the northwest, past Escobar Rd. Affected roads include (in alphabetical order): Alamos Rd, Ash Ln, Bolivar Ln, Cervantes Rd, Conil Way, Degas Rd, Escobar Rd, Gabarda Way, La Mesa Dr, Lerida Ct, Linaria Way, Minoca Rd, Pecora Way, Pineridge Way, Siesta Ct, and Westridge Dr.

D. FIRE GROWTH SCENARIO NE WIND @ PROJECT

TABLE 2. NUMBER OF ROUTES TO EACH DESTINATION (BASED ONCLOSEST ROUTE). NOTE: EACH STRUCTURE WAS COUNTED TWICE ASSUMING TWO VEHICLES PER HOUSEHOLD).

DESTINATION	NUMBER OF ROUTES	PERCENT
ARASTRADERO	66	2%
ALPINE	3544	91%
SAND HILL	274	7%

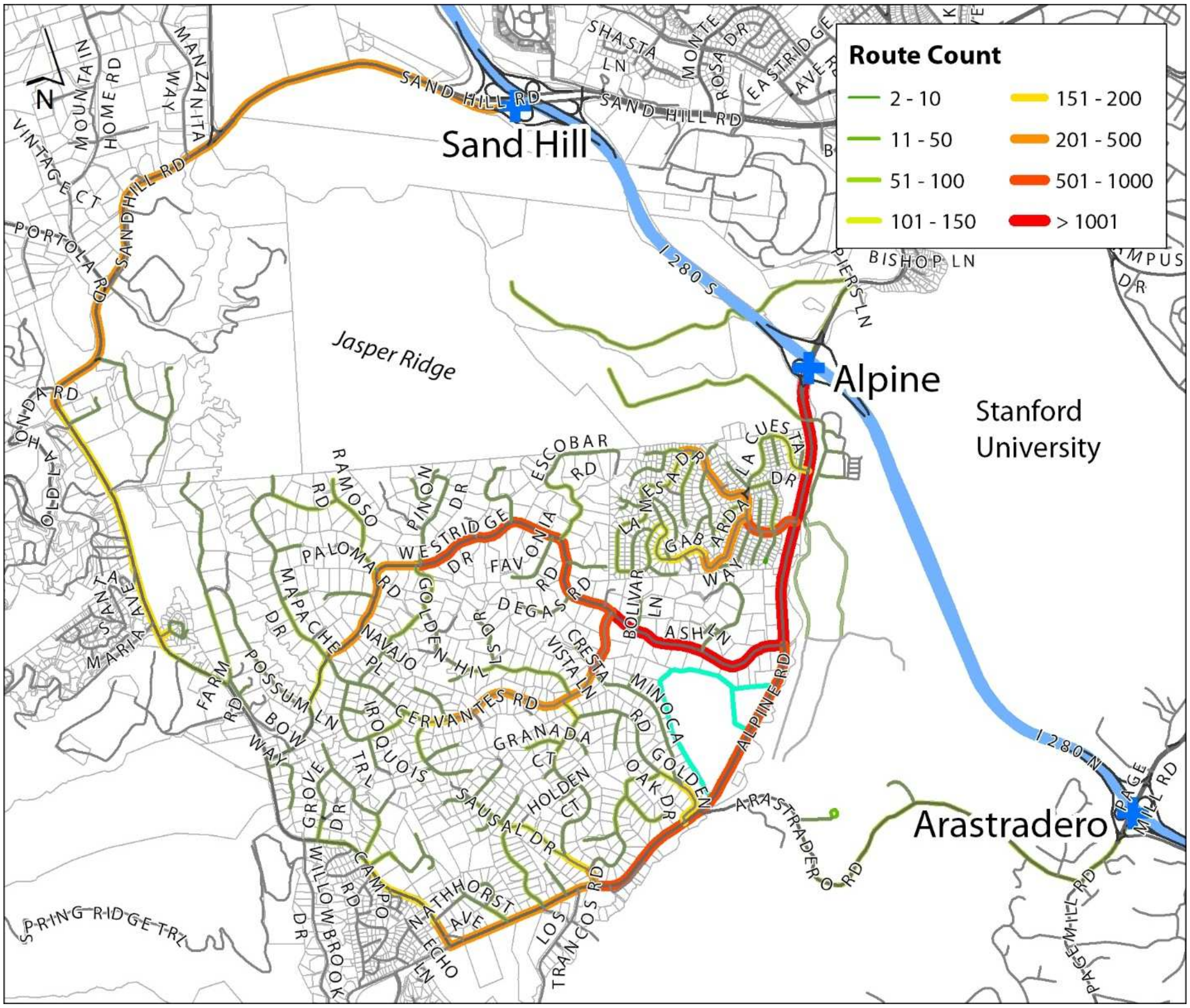


Figure 34. Route Counts (accumulations)under the NE Wind @ Project Scenario

The analysis shows that much of the Central Portola Valley and Westridge neighborhoods heavily rely on exiting the area via Alpine Road. The intersection of Alpine Road and Westridge Road could experience up to 2,260 vehicles trying to pass through in a relatively short amount of time during an evacuation. Please note, structures may not be residences and not all are located within the study property.

In the next section, we will go through the fire growth scenario and determine which houses will be impacted first and what roads will be compromised or blocked.

FIRE GROWTH SCENARIO NE WIND @ PROJECT

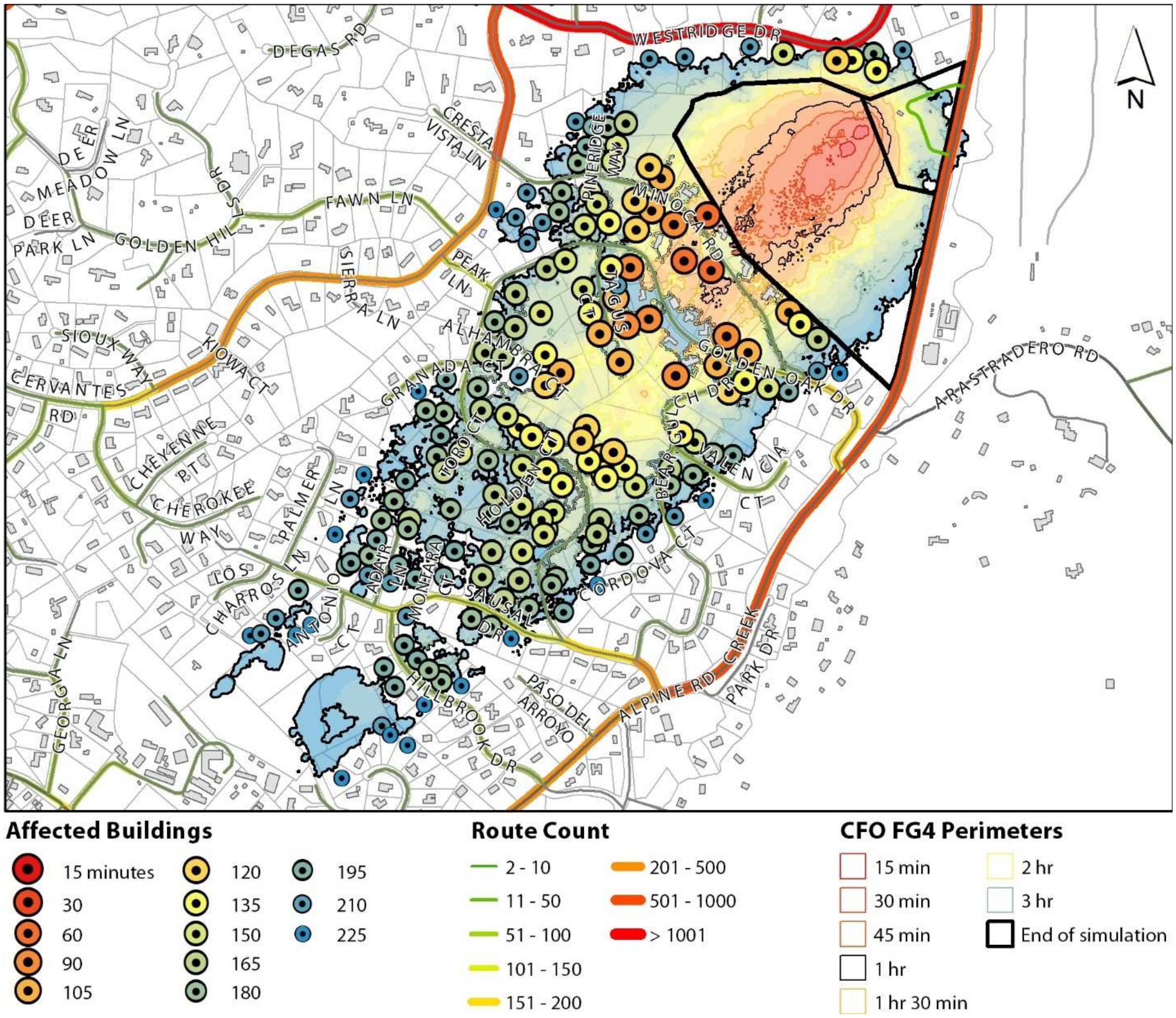


Figure 35 NE Wind @ Project fire growth perimeters with route counts and affected buildings.

In the CFO_FG4 fire growth scenario, 188 structures are affected by the fire (completely engulfed or within 100 feet of fire perimeter). Due to the wind direction, the fire doesn't immediately threaten the homes closest to the ignition point (to the north), but rather two homes to the southwest (across the entire property) are impacted by the fire at the 45-minute mark. At this point, there are 146 spot fires (some of which have been engulfed in the main fire) and the total size of the fire is 15 acres.

The fire never gets beyond Westridge Drive to the north due to the wind keeping the fire heading to the southwest. This means that most of the routes in and out of the neighborhood to the north are free and clear with no burn impacts.

Beyond 45 minutes, however, the fire moves fairly quickly through the neighborhood to the southwest, impacting more and more homes as the wind pushes it to the southwest, parallel to Alpine Road. After 60 minutes, 5 homes are directly affected by the fire and the fire is well past Micona Rd – which is now impacted by the fire. This will impact 152 routes out to Alpine Road.

While Alpine Rd is never impacted by the fire, other smaller roads between Alpine Road and Westridge Drive are directly impacts, potentially affecting up to 422 routes.
If allowed to burn for four hours, the fire grows to just over 258 acres with over 472 separate, small spot fires (in total, most of which have been incorporated into the main fire). Spot fires have reached within 1000 feet of Portola Road, which is almost 1.5 miles from the initial ignition point. Affected roads include (in alphabetical order): Adair Ln, Alhambra Ct, Alpine Rd, Bear Gulch Dr, Golden Oak Dr, Hillbrook Dr, Holden Ct, Minoca Rd, Pineridge Way, Sausal Dr, Tagus Ct, Toro Ct, Valencia Ct, and Westridge Dr.

VII. WILDFIRE SIMULATION WITH POST-TREATMENT CONDITIONS

We modeled the effects of the proposed plan and vegetative fuel treatments to determine the post-treatment fire behavior, for both the developed and undeveloped portion of the property. We will describe known effects of treatment or actions in terms of physical changes: the change in vegetation structure, volume, density, moisture, and distribution. These changes will determine the change in potential fire behavior, which in turn, determines the effects of fire, and threats posed by the project to adjacent, nearby landowners, as well as potential additional demands on the public services and Town residents.

Vegetation management reduces the total fuel load (amount of fuels to burn), by removing cut material, alters the fuel distribution by arranging the horizontal and vertical spacing of vegetation so that the fire spreads more slowly, such as in locations with chips on the forest floor, and reduces the flammability of fuels by increasing moisture in the current vegetation by removing dead material, or by changing to a more fire-resistant vegetation type. The effect of fuel modification is to reduce ignitability, rate of spread, and fire intensity (or heat output). The ways the fuels are expected to change due to the treatments is an important assumption.

The locations of treatments were determined, and the changes to the fuels as a result of those treatments were described and quantified.

The aim of this analysis is to ascertain if the recommended vegetation treatments would significantly change the overall **wildfire risk** rating for the property and its surroundings with the proposed development in place.

In order to do this, we altered the fuel characteristics, (surface fuel model, the canopy base height, and the canopy cover) based on our understanding of how the proposed vegetation management strategies will change the arrangement and continuity of fuels on the property. We also considered the various constraints on the vegetation management activity, such as creek protection and city-required defensible space mandates for the property, as explained in the Biological Resources Report (H.T. Harvey & Associates, 2020). Table 20 showsthe various vegetation management recommendations, their resulting changes on the landscape, and their constraints. Changes in the fuel model are based on descriptions of changes to the vegetation structure (arrangement), volume and size class distribution. For example, masticating the understory shrubs of an oak woodland would change the fuel model from a Timber-Understory fuel model, where the foliage and dead material in the shrubs would carry the fire to a Timber Litter fuel model, where the newly masticated (chips and small diameter dead material) will now carry the fire.

Table 10.

TREATMENT DESCRIPTION	FUEL MODEL PRIOR TO TREATMENT	FUEL MODEL AFTER TREATMENT	MANAGEMENT CONSTRAINT
DEFENSIBLE SPACE – 55FT ALONG PROPERTY PERIMETER	GR2, SH5, SH7, TU1, TU5	GR1, GS1, TL2	NO WORK IN RIPARIAN FOREST AND 30FT FROM STREAM CENTERLINE[5]
SHRUB REDUCTION AND SPACING	SH7, SH5	SH5, GR1	4M (~12FT) SPACING BETWEEN SHRUB CLUMPS
FOREST THINNING/ MASTICATION	TU1, TU5	TL6, TL9 40% CANOPY COVER 8-FT CANOPY BASE HEIGHT	NO WORK IN RIPARIAN FOREST AND 30FT FROM STREAM CENTERLINE NO HEAVY EQUIPMENT ON 30%+ SLOPES
WOOD RAT NESTS	VARIED	SB1	CANNOT BE REMOVED

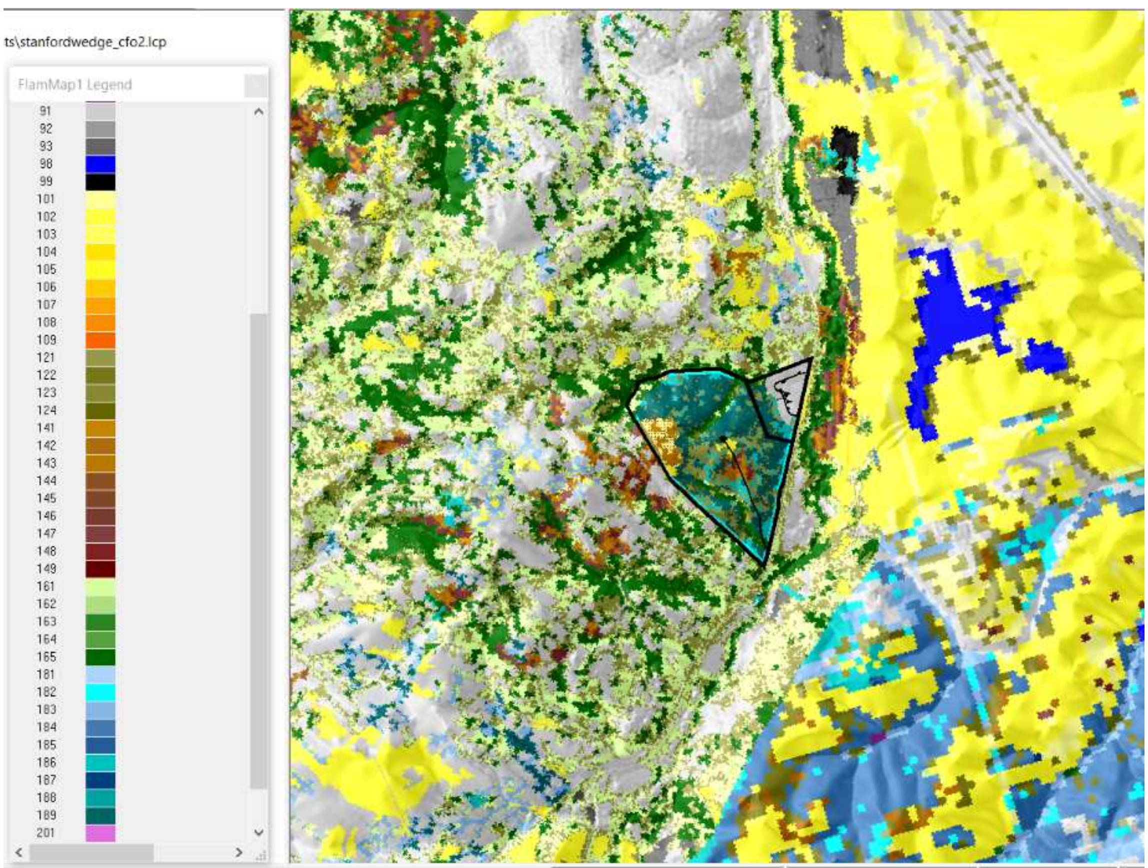


Figure 36. Fuel model map based on interpreted proposed vegetation management treatments post development.

[5] H.T. Harvey & Associates, 2020.

The landscape file encompasses the same as are in the analysis for current conditions: Stanford Wedge along with a buffer of 1 mile surrounding the parcel. Only fuels within the Stanford Wedge were altered based on the proposed post development vegetation management treatments. Also, the northeastern portion of the property was changed to Urban, an "unburnable" model in our fire behavior modeling software. The fire behavior prediction software used in this analysis does **not** model fire behavior through urban or developed areas.

Fuel models include the full range of fuel types covering grass (100s or GR#), grass-shrub (120s or GS#), shrub (140s or SH#), forested with understory (160s or TU#), forested with litter understory (180s or TL#) along with a slash model (SB2) to represent the presence of woodrat nests.

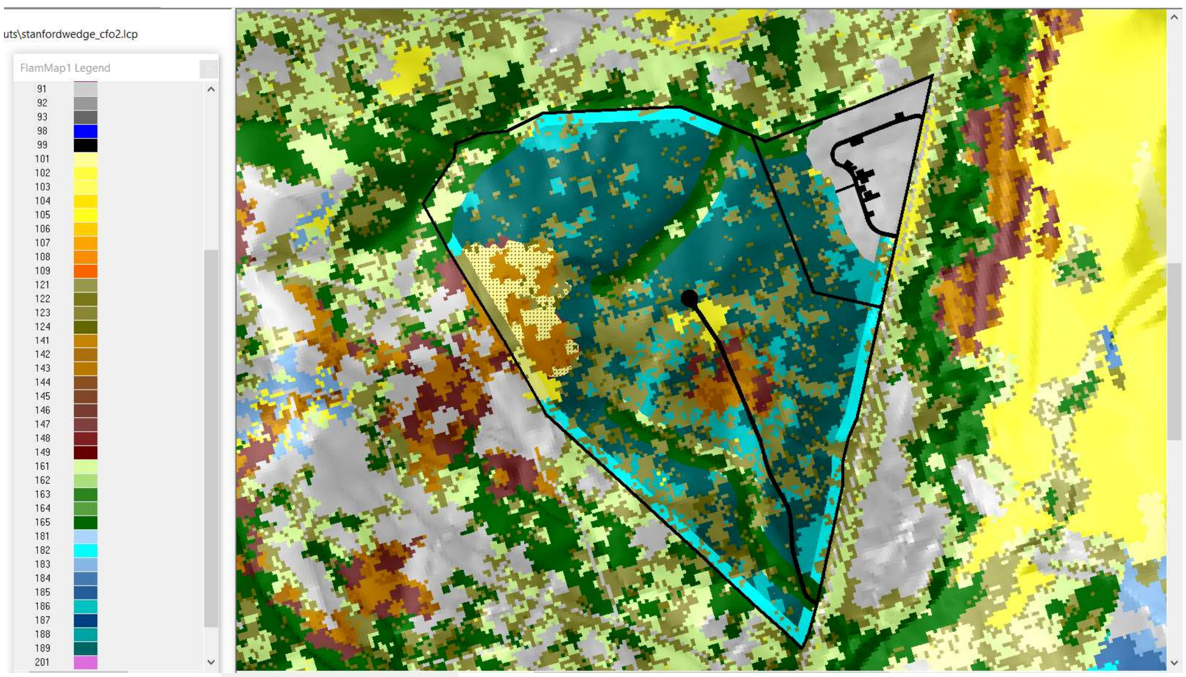


Figure 37. fuel model map based on interpreted proposed vegetation management treatments post development. – zoomed into Stanford Wedge property.

Table 11 shows a description for each fuel model and the amount found within the property. There is a significant increase in the Urban classification (NB1) as well as a shift of forested models from the forested with understory (TU5) to forested with litter (no understory, TL9). There is also a reduction of tall, high fuel load shrub model (SH7). In addition, the canopy cover was reduced to 40% for much of the forested area (excluding riparian areas) due to the extensive thinning of the oak forests.

Table 11. Fuel model acres post treatment.

VALUE	FBFM40	TITLE	DESCRIPTION	ACRES	PERCENT
91	NB1	Urban	Urban/Developed	5.10	7%
99	NB9	Bare ground	Bare ground/Road	1.53	2%
101	GR1	Short, Sparse Dry Climate Grass	Short, sparse dry climate grass is short, naturally or heavy grazing, predicted rate of fire spread and flame length low	2.09	3%
102	GR2	Low Load, Dry Climate Grass	Low load, dry climate grass primarily grass with some small amounts of fine, dead fuel, any shrubs do not affect fire behavior	0.76	1%
121	GS1	Low Load, Dry Climate Grass-Shrub	Low load, dry climate grass-shrub shrub about 1 foot high, grass load low, spread rate moderate and flame length low	13.73	18%
122	GS2	Moderate Load, Dry Climate Grass-Shrub	Moderate load, dry climate grass-shrub, shrubs are 1-3 feet high, grass load moderate, spread rate high, and flame length is moderate	3.57	5%
141	SH1	Low Load Dry Climate Shrub	Low load dry climate shrub, woody shrubs and shrub litter, fuelbed depth about 1 foot, may be some grass, spread rate and flame low	2.24	3%
142	SH2	Moderate Load Dry Climate Shrub	Moderate load dry climate shrub, woody shrubs and shrub litter, fuelbed depth about 1 foot, no grass, spread rate and flame low	0.70	1%
145	SH5	High Load, Dry Climate Shrub	High load, humid climate grass-shrub combined, heavy load with depth greater than 2 feet, spread rate and flame very high	0.30	0.4%
147	SH7	Very High Load, Dry Climate Shrub	Very high load, humid climate shrub, woody shrubs and shrub litter, dense finely branched shrubs with fine dead fuel, 4-6 feet tall, herbaceous may be present, spread rate and flame high	0.76	1%

161	TU1	Low Load Dry Climate Timber-Grass-Shrub	Low load dry climate timber grass shrub, low load of grass and/or shrub with litter, spread rate and flame low	1.19	2%
165	TU5	Very High Load, Dry Climate Timber-Shrub	Very high load, dry climate shrub, heavy forest litter with shrub or small tree understory, spread rate and	5.73	8%
182	**TL2**	**LOW LOAD BROADLEAF LITTER**	**LOW LOAD BROADLEAF LITTER, BROADLEAF, HARDWOOD LITTER, SPREAD RATE AND FLAME LOW**	**3.95**	**5%**
186	TL6	Moderate Load Broadleaf Litter	Moderate load broadleaf litter, spread rate and flame moderate	6.36	8%
189	TL9	Very High Load Broadleaf Litter	Very high load broadleaf litter, may be heavy needle drape, spread rate and flame moderate	27.10	36%
201	SB1	Low Load Activity Fuel	Low load activity fuel, light dead and down activity fuel, fine fuel is 10-20 t/ac, 1-3 inches in diameter, depth < 1 foot, spread rate moderate and flame low	0.01	0.02%
				75.15	

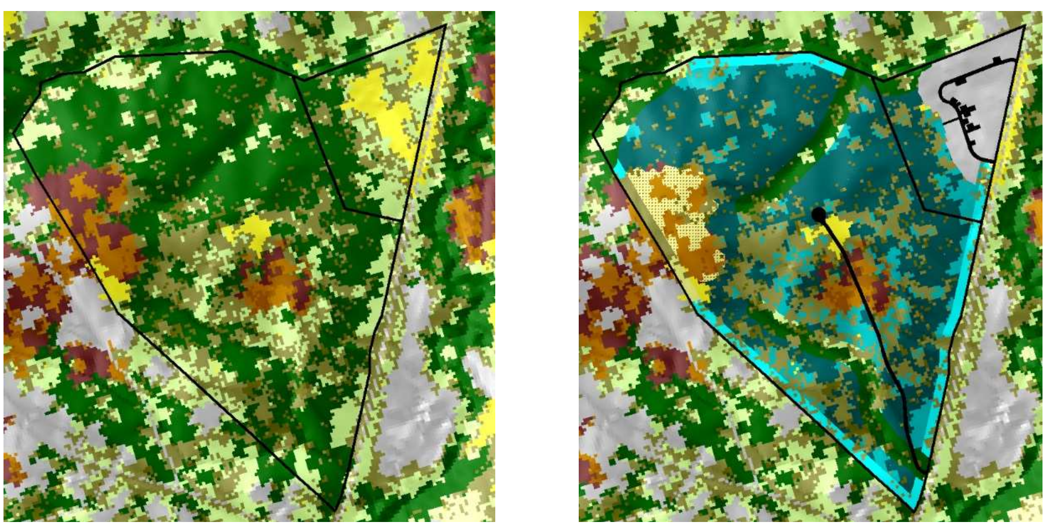


Figure 38. Side by side comparison of pre and post treatment fuel model distribution.

A. PREDICTED WILDFIRE BEHAVIOR WITH POST-TREATMENT CONDITIONS

After fuel characteristics and treatment locations were assigned, FlamMap was run again using the same weather and terrain information to identify the change in fire behavior due to treatments.

All were done with the same weather parameters for a direct comparison of results with the pre-treatment (or pre-development) fire predictions.

Four separate predictive scenarios were developed. Table X in Appendix B Wildfire Simulation Details shows a scenario matrix with the FlamMap/FARSITE inputs for each scenario. The first two were run as fire potential models and the last two were run as fire growth models. As with the analysis of current conditions, the same measures were used, being flame length, crown fire potential, and fireline intensity.

To differentiate between the pre and post treatment scenarios, a 'p' (indicating post-treatment scenarios) has been added to thescenario's unique identifiers.

i. FIRE POTENTIAL MODELS (POST-TREATMENT)

Two fire potential models were calculated for predicted fire behavior. The only difference between the two fire potential models (FIRE POTENTIAL OCTOBER SCENARIOp and FIRE POTENTIAL AUGUST SCENARIOp) are the weather parametersused to condition the initial fuel moistures. For FIRE POTENTIAL OCTOBER SCENARIOp, the weather from October 22nd to October 26th, 2019 was used. At this time period, the Los Altos weather station experienced relatively warm temperatures, peaking at 93 degrees Fahrenheit with a low relatively humidityof 10%. Wind speeds were relatively mild, peaking at 10mph from the ENE.
For FIRE POTENTIAL AUGUST SCENARIOp, the weather from August 13th to August 19th, 2020 was used. At this time period, the Los Altos weather station experienced higher temperatures, reaching 105 degrees Fahrenheit twice during this week. Relative humidity also reached below 10% on the last day. Inaddition, wind speeds reached up to 37mph, mostly from the NNE. However, these winds occurred during the very early morning hours immediately preceding precipitation on the 16th of August.

The input parameters for both FIRE POTENTIAL OCTOBER SCENARIOp and FIRE POTENTIAL AUGUST SCENARIOp were entered according to theScenario Matrix. These included using the 90th percentile fuel moistures conditioned bytemperature and wind, with a starting wind direction and speed set to: NE at 10mph. Inaddition, the foliar moisture was set to 60% and we used the Scott/Reinhardt (2001) methodology for calculating crown fire activity (fire type).

Flame Length (Post-Treatment)
Under the FIRE POTENTIAL OCTOBER SCENARIOp, predicted flame lengths range from 0 to over 25 feet. Overall, much lower flame lengths are predicted throughout the property. However, along the streamsand the riparian areas, where no vegetation treatment was applied, flame lengths remain high.

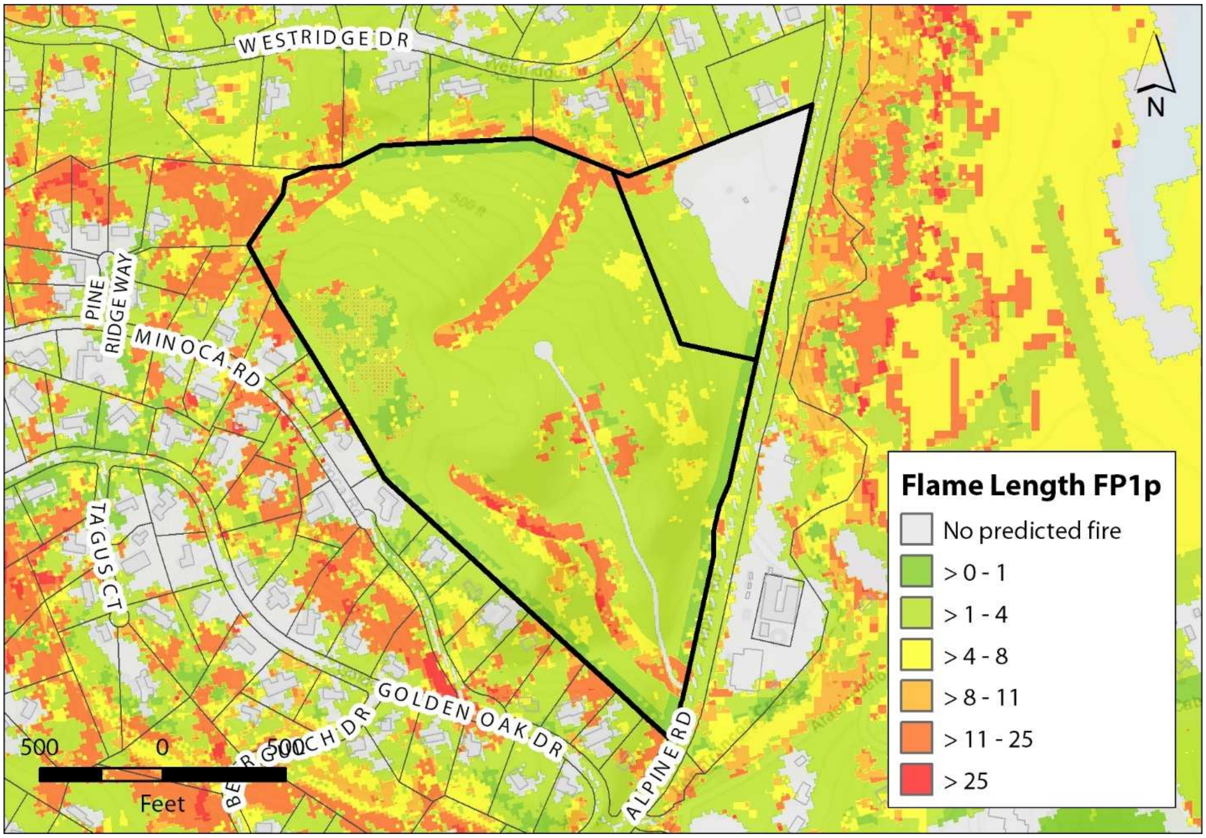
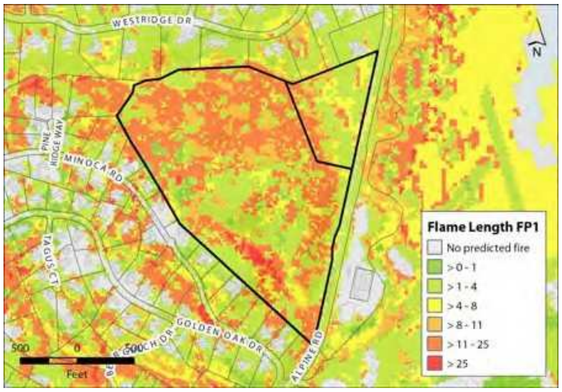


Figure 39. Flame Length Output Results for FIRE POTENTIAL OCTOBER SCENARIO – post treatment.

Under this scenario with the treatments applied as proposed, 88% of the property experiences flame lengths under 4 feet in height.

Table 12. Flame length acres by flame length range for FIRE POTENTIAL OCTOBER SCENARIOp.

FLAME LENGTH RANGE	ACRES	PERCENT
NO PREDICTED FIRE	8.0	11%
0 – 1 FEET	8.7	12%
1 – 4	48.8	65%
4 – 8	2.6	3%
8 – 11	1.8	2%
11 – 25	4.8	6%
GREATER THAN 25 FEET	0.3	0.3%



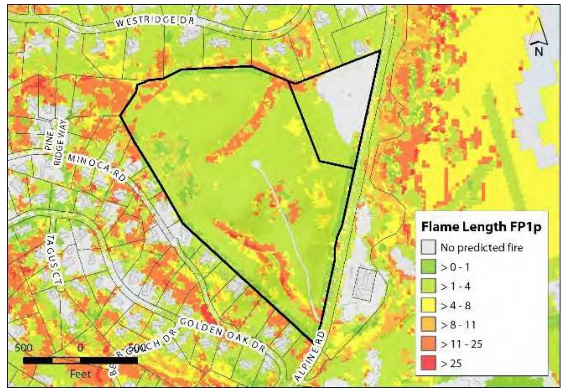


Figure 40. Side by side comparison of pre and post treatment Flame Lengths for the 1st Fire Potential scenario.

The two marked differences between the pre-treatment and post-treatment scenarios is the “unburned” developed area, which now covers much of the northeast corner of the property. Remember, FlamMap does not predict fire outcomes for urban areas. The next largest difference occurs throughout the undeveloped portion of the property where extensive changes will be made in the canopy cover (down to 40% throughout). In addition, the fuel models in these areas were changed from a timber with understory model to a timber with only litter in the understory. These changes keep the flame lengths relatively low throughout.

Under the FIRE POTENTIAL AUGUST SCENARIOp, where temperatures were higher, predicted flame lengths also range from 0 to over 25 feet. But again, much lower flame lengths are predicted throughout theproperty than in the pre-treatment scenario. However, once again, along the streams and the riparian areas, where no vegetation treatment was applied, flame lengths remain high.

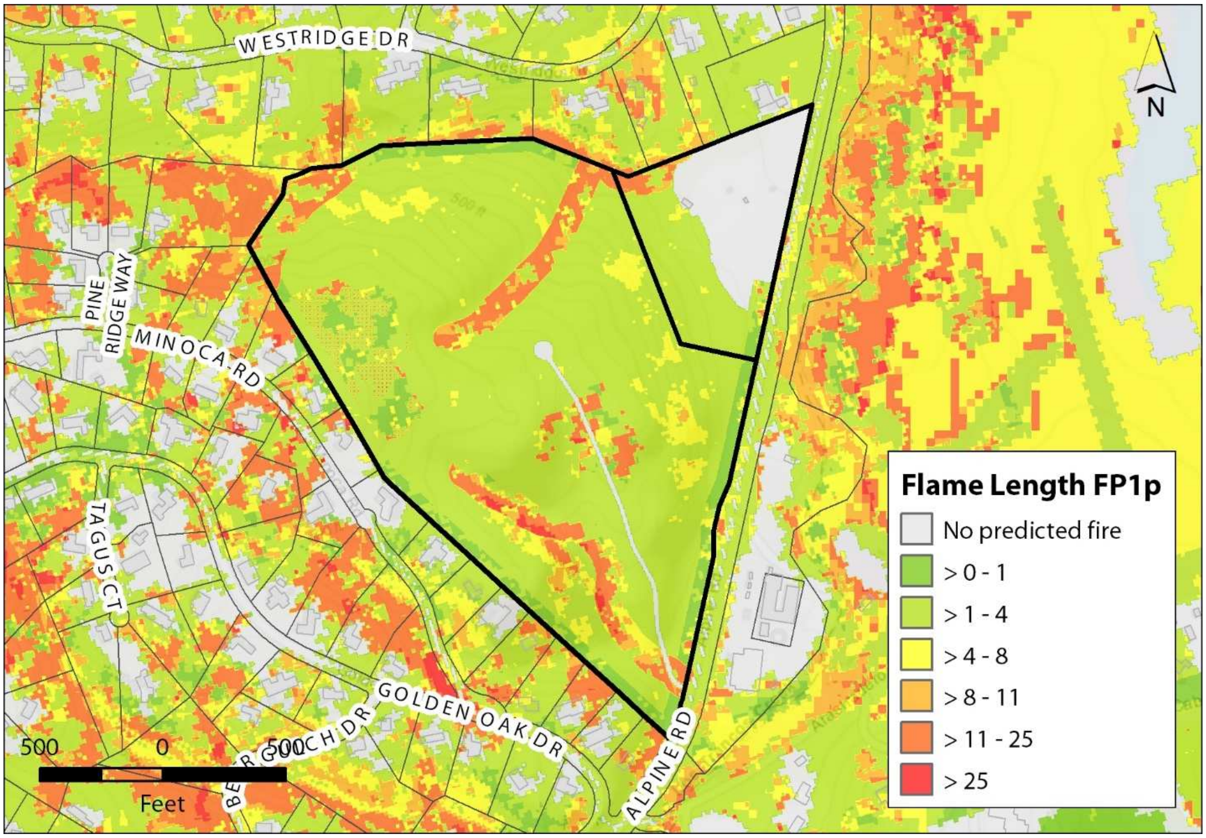


Figure 41. Flame length output results for FIRE POTENTIAL AUGUST SCENARIO – post treatment.

In this scenario, the perimeter treatment seems the most effective, presumably due to overall lower fire activity. Under this scenario with the treatments applied as proposed, 90% of the property experiences flame lengths under 4 feet in height.

Table 14. Flame length acres by flame length range for FIRE POTENTIAL AUGUST SCENARIOp.

FLAME LENGTH RANGE	ACRES	PERCENT
NO PREDICTED FIRE	9.9	13%
0 – 1 FEET	12.0	16%
1 – 4	46.0	61%
4 – 8	1.6	2%
8 – 11	3.1	4%
11 – 25	2.6	3%
GREATER THAN 25 FEET	0.03	0.04%

Fireline Intensity (Post-Treatment)

Similar reductions were found in fireline intensity for both the FIRE POTENTIAL OCTOBER SCENARIO and FIRE POTENTIAL AUGUST SCENARIO. Both areshown side-by-side comparisons for ease of viewing.

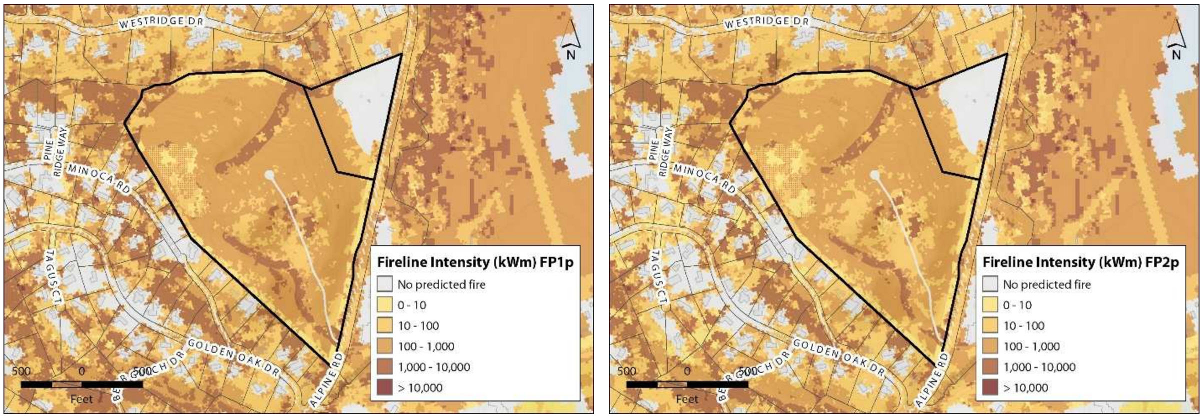


Figure 42. Fireline intensity RESULTS FOR FIRE POTENTIAL OCTOBER SCENARIO and 2 – post treatment.

Both show a marked decrease in fireline activity throughout the property, especially in the areas with non-fuels (northeast developed corner and the new interior fire road) and along the property's perimeter where defensible space treatments were applied. Small pockets of higher fireline intensity remains along the riparian and/or stream corridors as well as where pockets of shrubs remain.

Crown Fire Potential (Post-Treatment)

For the type of fire predicted, for both the FIRE POTENTIAL OCTOBER SCENARIO and FIRE POTENTIAL AUGUST SCENARIO, the majority of the fire remains a surface fire rather than transitioning to a torching fire. Both are shown side-by-side comparisons for ease of viewing.

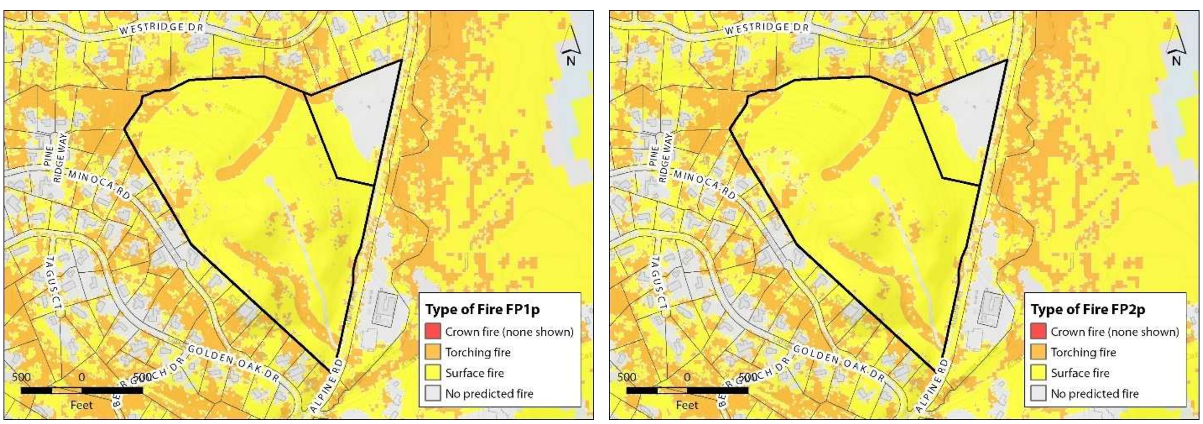


Figure 43. Type of fire results for FIRE POTENTIAL OCTOBER SCENARIO and 2 – post treatment.

Both show a marked decrease in torching activity throughout the property, especially in the areas with non-fuels (northeast developed corner and the new interior fire road) and along the property's perimeter where defensible space treatments were applied. Small pockets of torching activity remain along the riparian and/or stream corridors as well as where pockets of shrubs remain.

ii. FIRE GROWTH MODELS (POST-TREATMENT)

The fire growth models conducted for the pre-treatment landscape was done again for the post-treatment landscape. Again, we chose to use the October 2019 weather parameters for direct comparison with the pre-treatment fire growth scenarios.

The description of each scenario is repeated here.

The ignition locations for each scenario varied to capture three likely scenarios of potential ignition. These were determined based on proximity to property and expected human activity. No scenario considers random ignitions (i.e. as in a lightning storm) for the reasons discussed above.

For ENE Wind scenario, we imagined a fire starting on a property off Westridge Drive, near the northern boundary of the Stanford Wedge. In this scenario, the threat is from a fire starting off the property that poses an immediate threat to the future development as well as the undeveloped portion the property.

For SW Wind scenario, the ignition point is imagined as a roadside ignition along Minoca Road where there are well-developed brush fields on residential lots and on the Stanford Wedge propertyas well. The threat in this scenario comes from a fire starting off the property that poses an immediate threat to the un-developed portion of the property.

In the third scenario (SE Wind scenario), we wanted to highlight that though the proposed new fire road within the center of the property would aid in access for fuel mitigation work, it would also attract people into the property where an accidental fire may occur. In this case, the firethreat comes from within the un-developed portion of the property. This scenario is not likely in the current condition because access is poor. However, it does allow for a comparison of fire growth potential under current conditions and post-treatment conditions.

In NE Wind @ Project scenario, this ignition location and wind direction simulates what would happen in the event of a fire starting just west of the new development and what would be threatened downwind of its location. Like the SE Wind Scenario, this is not a likely ignition location under current conditions.

Fire Perimeters (Post-Treatment)
All simulations were allowed to run from 1300 (1pm) to 1700 (5pm) for a total of a four-hour simulation time. Due to a model setting, reported perimeters stop at the time step immediately preceding the last, so only perimeters up to 1645 are reported below.

Fire perimeters labeled by each time step reflects the fire growth from the immediate time period before it. For example, the 1 hr simulation time step polygon represents fire growth from the fifteen minutes before that hour.

The map on the following page show predicted fire perimeter after 1 hour of simulation time highlighted in black. The darker red areas show areas that will experience fire soonest, given the parameters of each scenario. In all three scenarios, wind speed remains at or below 10mph. However, the wind direction shifts depending on the ignition location (arrow on map indicates wind direction).ENE WIND TIME OF ARRIVAL (POST-TREATMENT)

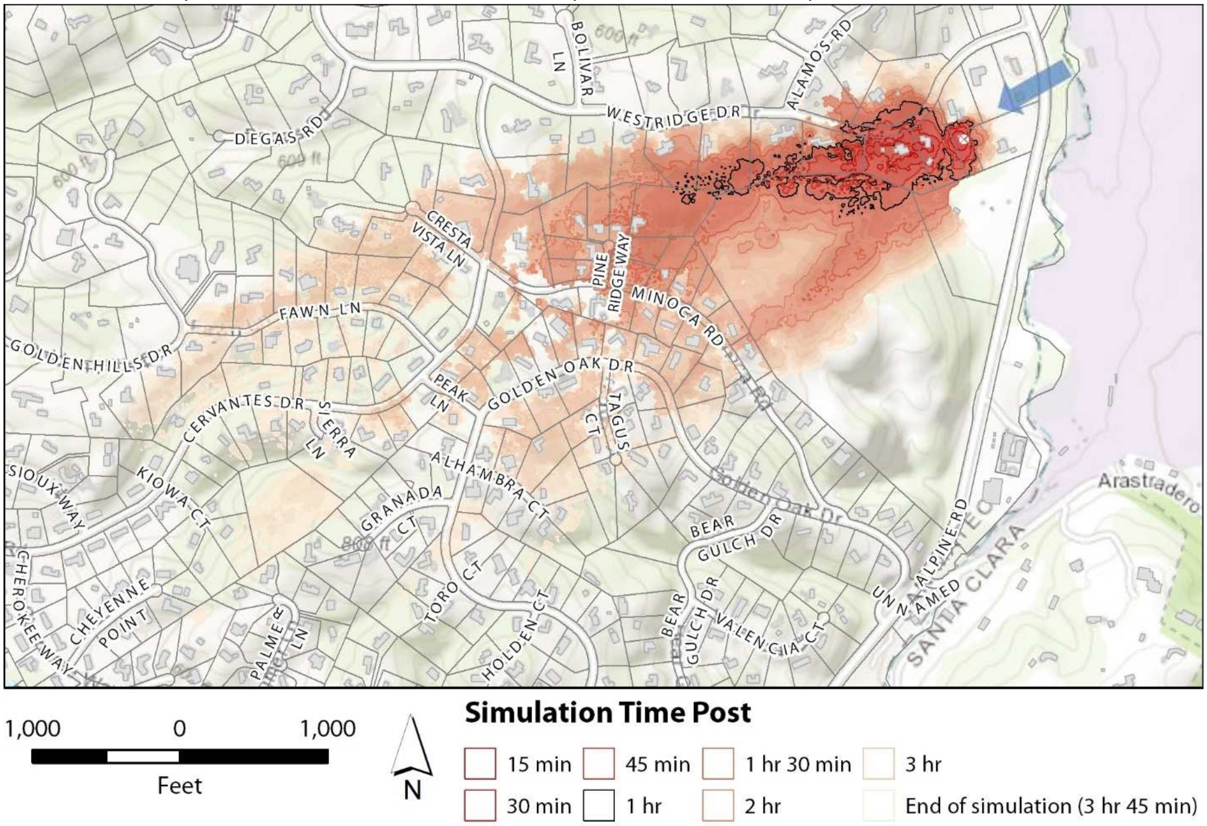


FIGURE 44. Perimeters for predicted fire growth for ENE -post treatment. Wind direction shown with blue arrow.

For the ENE Wind scenario where we imagined a fire starting on a property off of Westridge Road, near thenorthern boundary of the Stanford Wedge, the fire grew to less than half an acre in the first 15minutes and then a little over 12 acres in 1 hour. Several homes are immediately threatened, and numerous spot fires are generated that grow outside of the main fire perimeter. The simulated fire quickly crosses over Westridge Road. Further into the simulation, the fire has burned through most of the property and continues into the neighborhood, impacting homes along Westridge Road, Pine Ridgeway, Minoca Road, Golden Oak Drive, and many others.

However, in contrast to the pre-treatment scenario, the fire does not burn down to Alpine Road due to the developed northeast corner of the property. Though the fire perimeter is similar to the pre-treatment scenario, the fire only grows to around 170 acres (rather than 200 acres) within the four-hour simulation. Additionally, there are areas within the property where the fire slows down and does not move as rapidly as in the pre-treatment scenario.

SW WIND SCENARIO TIME OF ARRIVAL (POST-TREATMENT)

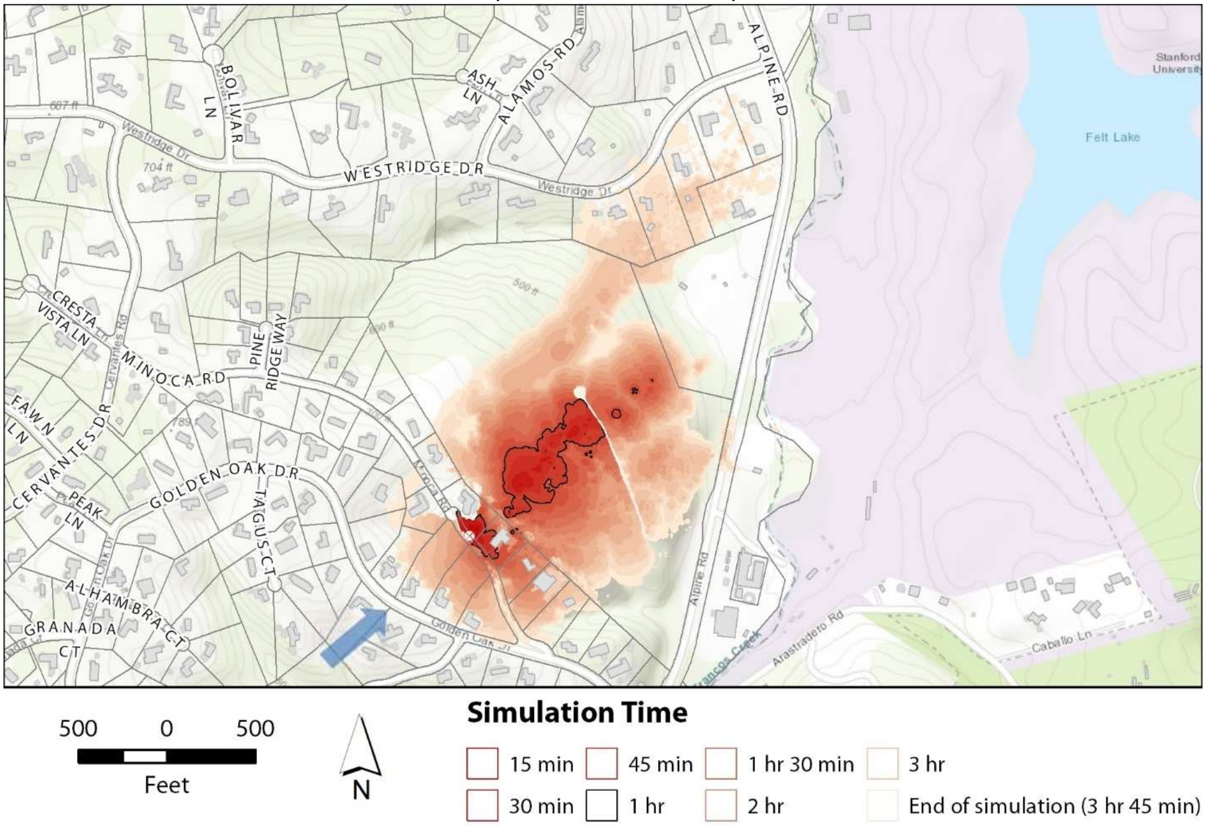


Figure 45. Perimeters for predicted fire growth for SW Wind scenario – post treatment. Wind directionshown with blue arrow.

For SW Wind scenario, the ignition point is imagined as a roadside ignition along Minoca Road where there are well-developed brush fields on residential lots and on the Stanford Wedge property as well. Similar to the pre-treatment scenario, the post-treatment fire grew to less than a tenth of an acre in the first 15 minutes and then just over 4 acres in 1 hour. The initial similarity is primarily due to the fact that the fire started outside the property where no treatment is proposed. Several homes are immediately threatened along Minoca Road. However, the fire moves to the northeast and most homes on the western side of the property are spared. Some spot fires are generated that grow outside of the main fire perimeter. Similarly, the simulated fire does not reach the homes on the other side of the property along Westridge Road until wellafter an hour of burning. Unlike the pre-treatment scenario, because this fire grows much slower, within the time frame allowed, the fire does not reach Alpine Road, nor does it make the run toward Highway 280. The fire grows to just over 60 acres, in contrast to the 280 acres inthe pre-treatment scenario.

SW WIND SCENARIO TIME OF ARRIVAL (POST-TREATMENT)

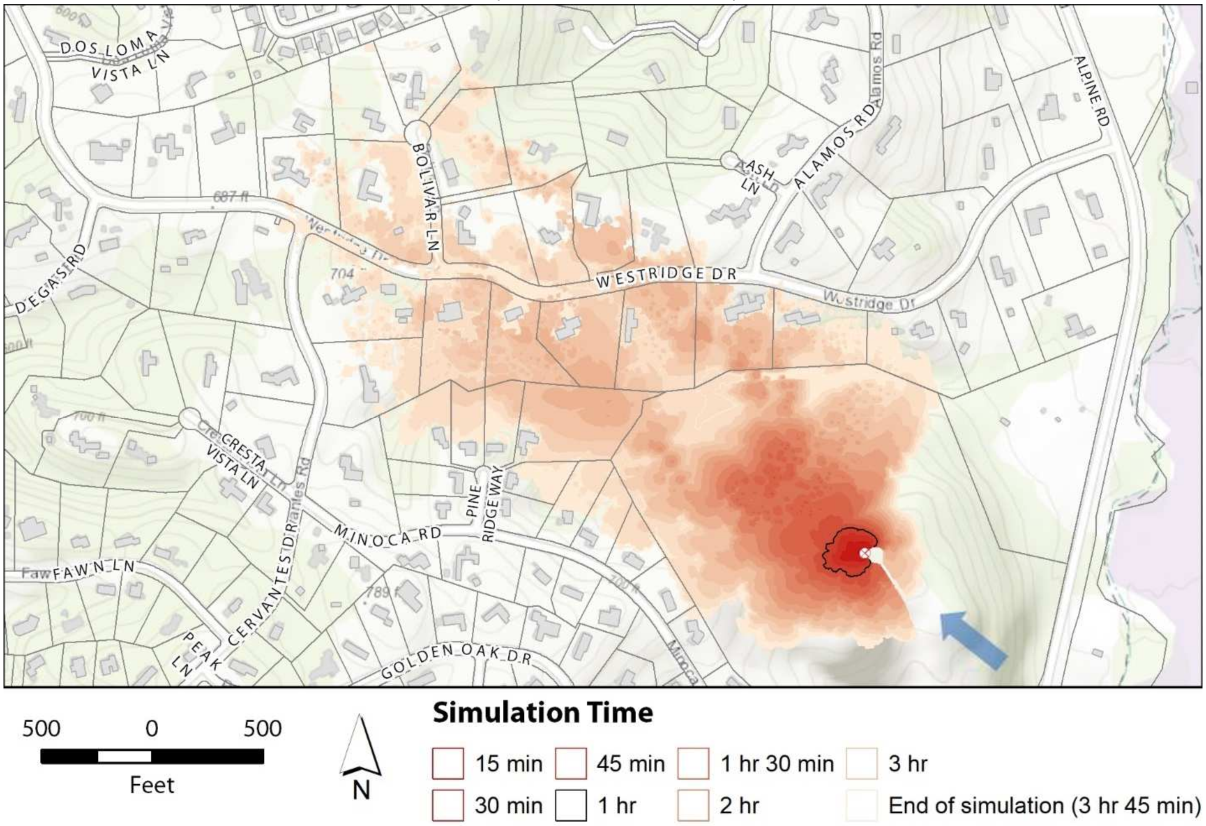


Figure 46. Perimeters for predicted fire growth for SE Wind – post treatment. Wind direction shown with blue arrow.

In the third scenario (with a SE Wind), we wanted to show that, though the proposed new fire road within the center of the property would aid in access for fuel mitigation work, it would also attract people into the property where an accidental fire may occur. Even with all the post-treatments applied, a fire still grows fairly quickly and runs northwest into the adjacent neighborhoods – though much slower and within the scenario time frame, does not reach as far. In this post-treatment scenario, the fire grew to less than a tenth of an acre in the first 15 minutes, which is very manageable with local, firefighting crews. In an hour, it is still less than 1 acre. No homes are immediately impacted, however, given enough time, even this slow-moving fire will threaten homes along Westridge Drive and Pine Ridge Way. Numerous spot fires are generated that grow outside of the main fire perimeter. Within the four-hour simulation, the fire grows to just over 77 acres (much less than the pre-treatment predicted 200 acres).

VIII. WILDFIRE HAZARD (POST-TREATMENT)

As with the pre-treatment section, to determine overall wildfire hazard, we took the outputs from the FIRE POTENTIAL OCTOBER SCENARIOp scenario and combined/reclassified them into a low, moderate, high, and very high rating. This is done to highlight those areas that experience the highest fireline intensity, flame lengths, and fire type. We used the same methodology as described previously.

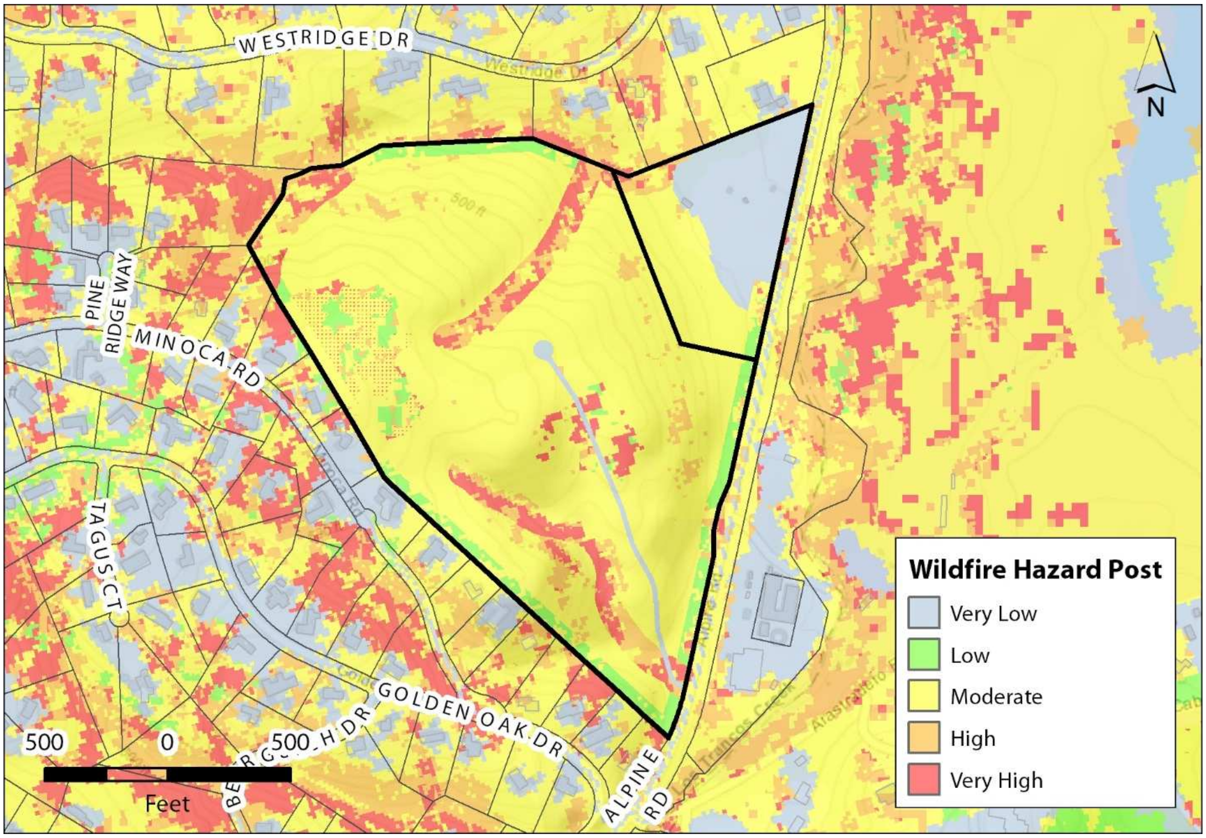


Figure 47. Wildfire hazard based on predicted flame length, fireline intensity, and type of fire (using outputs from FIRE POTENTIAL OCTOBER SCENARIOp- post treatment scenario).

The figure above show fire hazard based on fire behavior only, the wildfire hazard is moderate in many areas throughout the property and is very low in some portions and particularly along the property's inner perimeter where defensible space treatments were applied. There are no areas with a rating of very high – a dramatic reduction from 33%. Moderate to low rated areas is common throughout the property except along the riparian forest and stream corridors, which often have a higher fuel moisture.

Table 14. Wildfire hazard using FIRE POTENTIAL OCTOBER SCENARIO fire behavior outputs.

FIRELINE INTENSITY RANGE (KW/M)	ACRES	PERCENT
VERY LOW	0.01	<1%
LOW	23.3	31%
MODERATE	44.8	60%
HIGH	7.1	9%
VERY HIGH	0.0	0%

Below is a side-by-side comparison of the pre-treatment and post-treatment fire hazard rating.

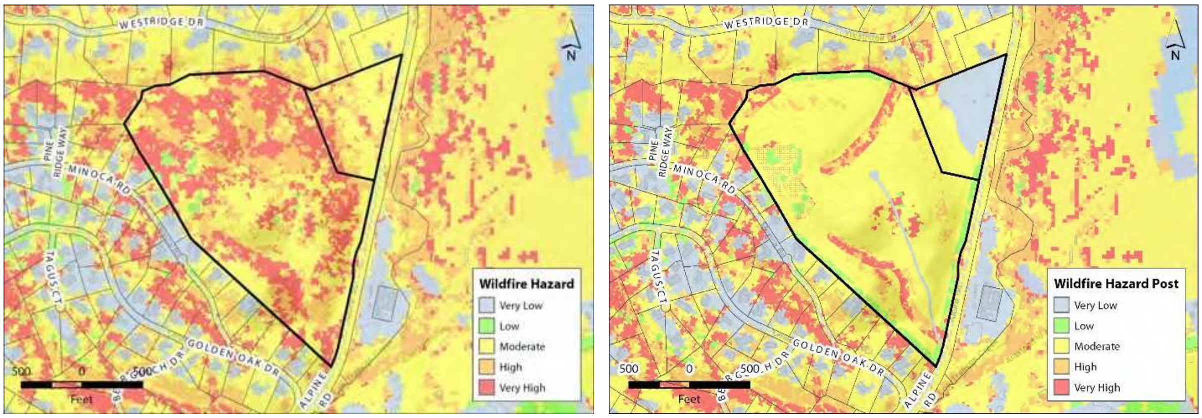


Figure 48. Side by side comparison of pre and post wildfire hazard rating.

With the proposed vegetation treatments as we applied them to our landscape file, the overall fire hazard is reduced to mostly moderate throughout the property. This means that the predicted flame lengths, fireline intensity and type of fire are relatively low and can be expected to be managed easily with local resources.

A. WILDFIRE LIKELIHOOD (POST-TREATMENT)

For the post-treatment analysis, in terms of wildfire likelihood, much remains the same as in the pre-treatment analysis. However, the presence of the developed northeast corner and the dirt road leading into the interior of the property made subtle changes to the results. Below is a duplication of the previous analysis with those two changes.

i. POTENTIAL IGNITION SOURCES (POST-TREATMENT)

Potential ignition sources were buffered by a set distanced and assigned a relative value to indicate very high, high, moderate, or low probability of ignition. The reasoning is: the closer to a road or powerline or building, the more likely an ignition will occur. Table 6(in previous section) shows the buffers used and the relative values assigned for each layer of data.
By combining these layers and reclassifying the values to very high, high, moderate, and low, we get a map that gives us relative risk based on the location of potential ignition sources (Figure 49).

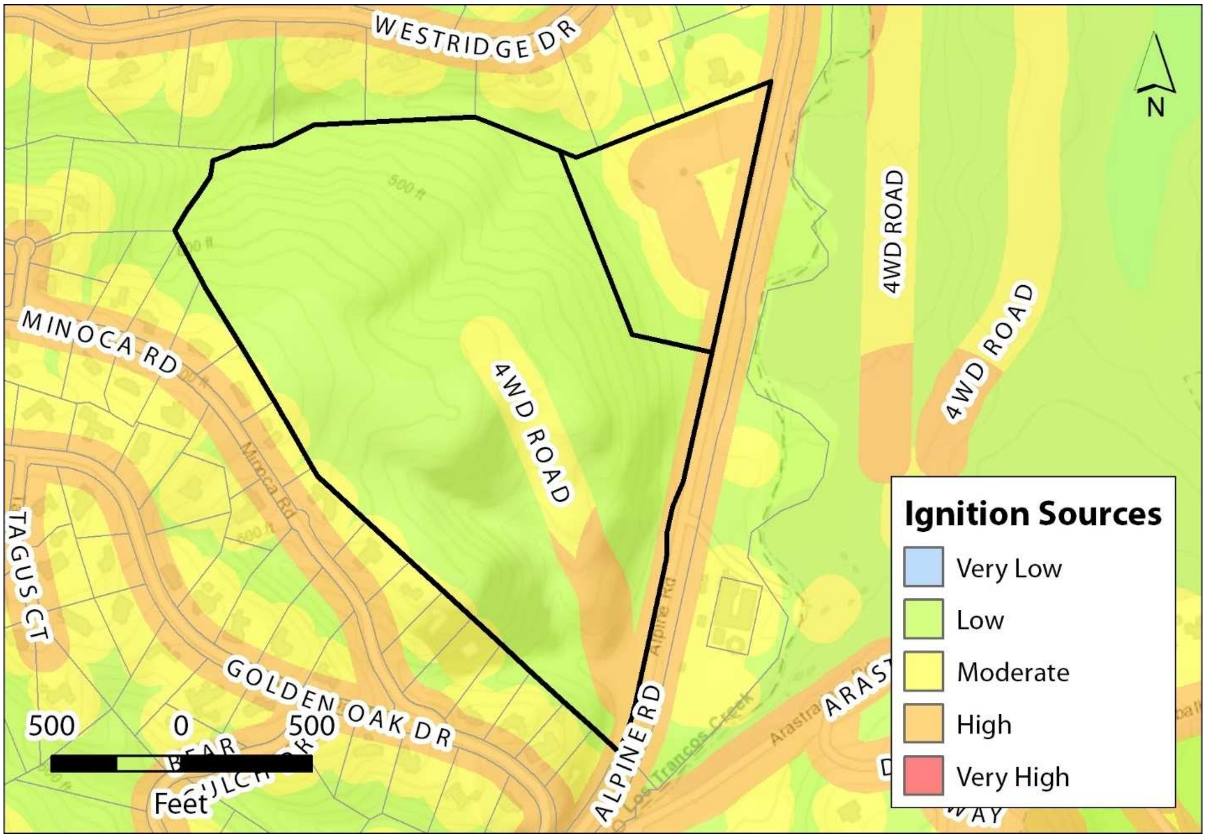


Figure 49. Combined potential ignition sources – Post Treatment.

The figure above shows that based on the potential ignition sources reviewed for this assessment, potential ignition sources within the property after the proposed development has increased. There are now ignition sources more likely coming from within the property along the proposed development and along the unpaved access road than before the proposed development.

ii. WILDFIRE SUPPRESSION RESPONSE (POST-TREATMENT)

As we did for the pre-treated landscape, we assigned a cost of how many minutes it would take to travel through any given pixel based on the road network. The minutes for each pixel were determined by the posted speed limit on each road segment. An average of 25mph was assumed for the new road through the development portion of the property and 15mph was assumed for the unpaved access road into the interior of the undeveloped portion of the property. For areas immediately near a road, the time to travel to those pixels were similar to the travel times on the roads themselves. The further away we get from the roads, the longer it takes to travel through those areas.

With this new time-cost surface, we determined the total time it would take to travel from any of the nearby fire stations to any given location in the area. The result is a surface that shows the total time it would take (based on the cost surface) to visit any location from the nearest fire station.

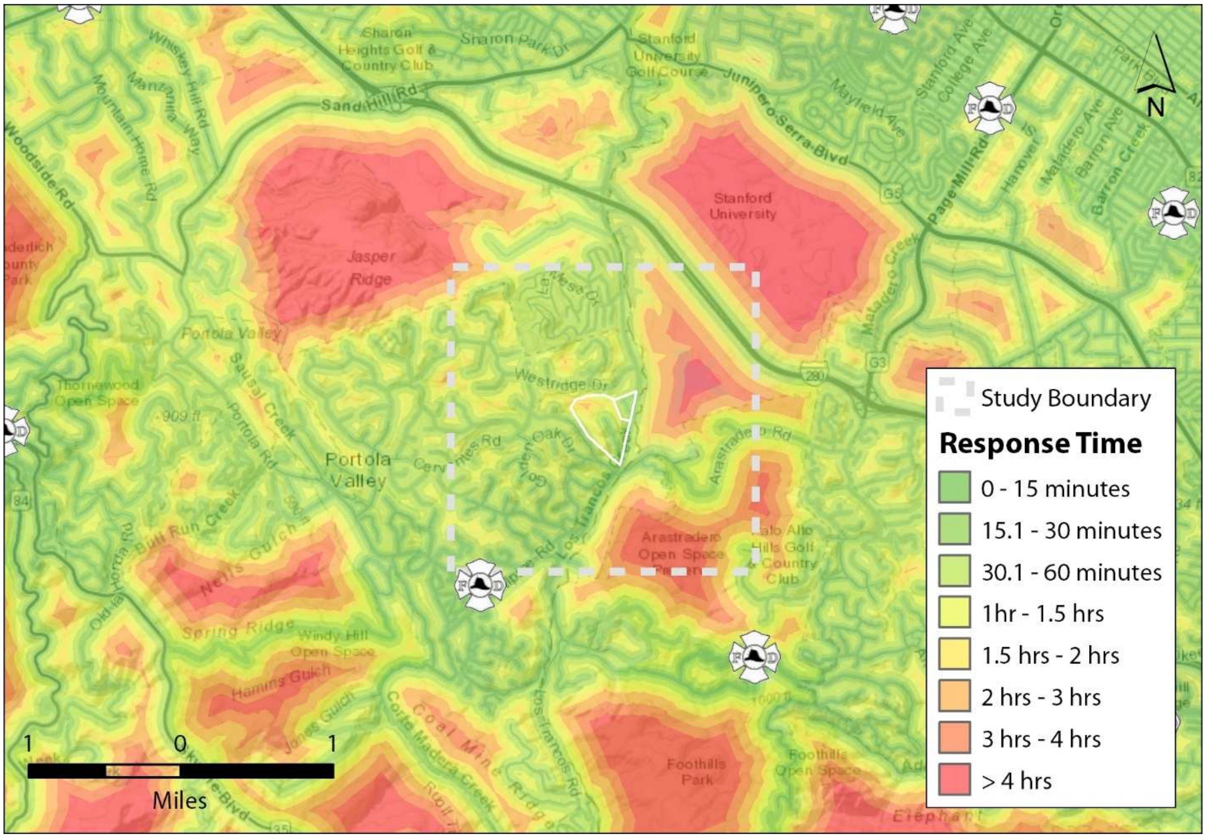


Figure 50. Response time from nearest fire station to any given location in the study area (based on posted speed limit). New roads included in post-development/post-treatment scenario.

We then re-classified this surface into a rating per the table below. This was to so that the values were at a scale that is similar to the scale for all the other input layers. Note that the numbers have a negative value, thus lessening the overall fire risk based on the calculated response times.

Table 15. Proximity to fire suppression resources with associated factors to lower risk.

TRAVEL TIME FROM FIRE STATION	VALUE
LESS THAN 15 MINUTES	Very High (-4)
15 – 30 MINUTES	High (-3)
30 – 60 MINUTES	Moderate (-2)
60 – 90 MINUTES	Low (-1)
GREATER THAN 90 MINUTES	Very Low (0)

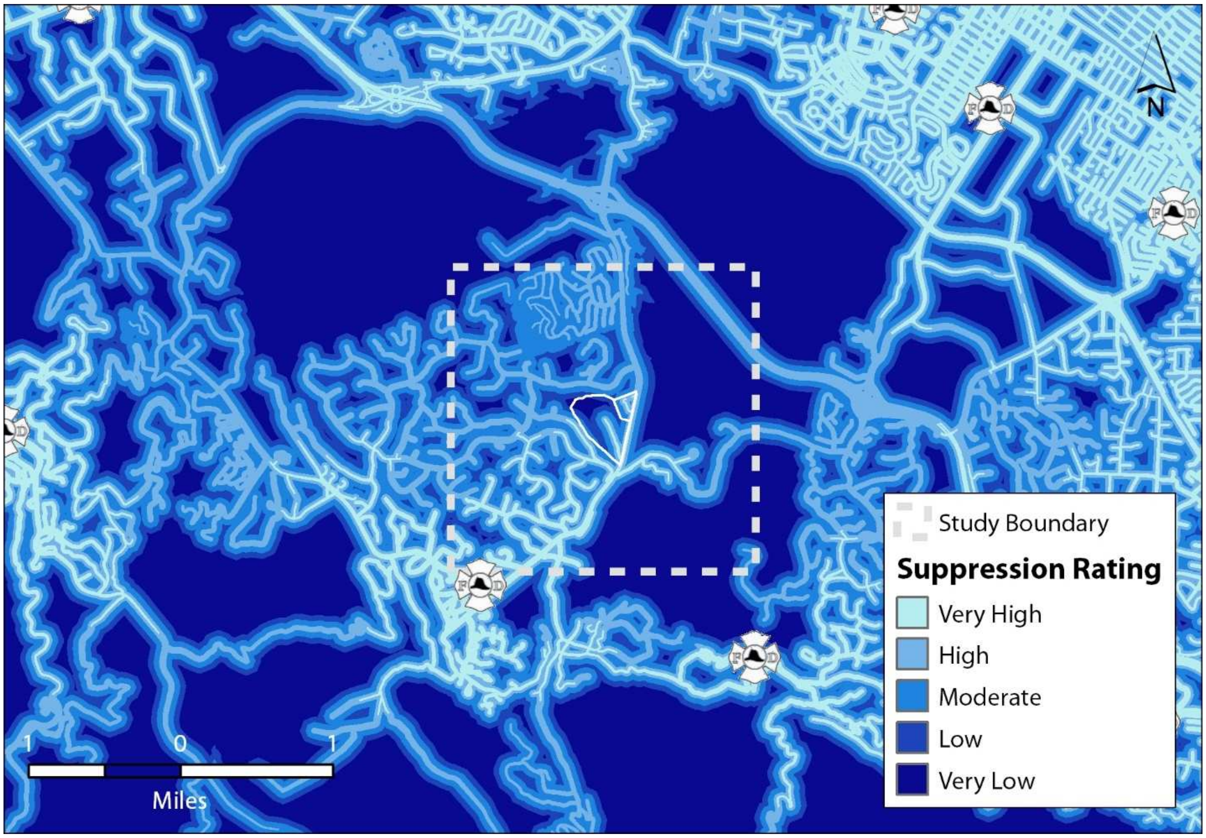


Figure 51. Relative wildfire suppression response (ground only) based on street speed and proximity to roads.

The new roads, including the paved road within the to-be-developed portion of the parcel and the unpaved road in the undeveloped portion of the parcel, significantly increase the suppression rate (due to increased access) for areas within the Stanford Wedge.

IX. WILDFIRE RISK (POST-TREATMENT)

Again, mimicking the process completed for the pre-treatment landscape, to determine overall wildfire risk, we combined our results from the wildfire hazard analysis (50%), the potential ignition sources analysis (25%), and the wildfire suppression response (25%) to create a layer that would represent the wildfire hazard on and surrounding the property. The resulting data layer was reclassified to a scale of 1 to 10; 1 equaling a low risk of wildfire and 10 being the highest risk of wildfire.

The three components were each given a weight so that only a portion of their rating would be accounted for in the equation. In other words, the wildfire hazard rating was multiplied by 0.50, the potential ignition rating was multiplied by 0.25, and the suppression response was multiplied by 0.25. In this way, we "weight" the resulting risk model toward the wildfire hazard rating. Alternatively, no weighting could be done.

We chose to weight this model heavily on the inherent wildfire hazard layer because potential ignition sources and the suppression response can change dramatically based on available resources and human activity.

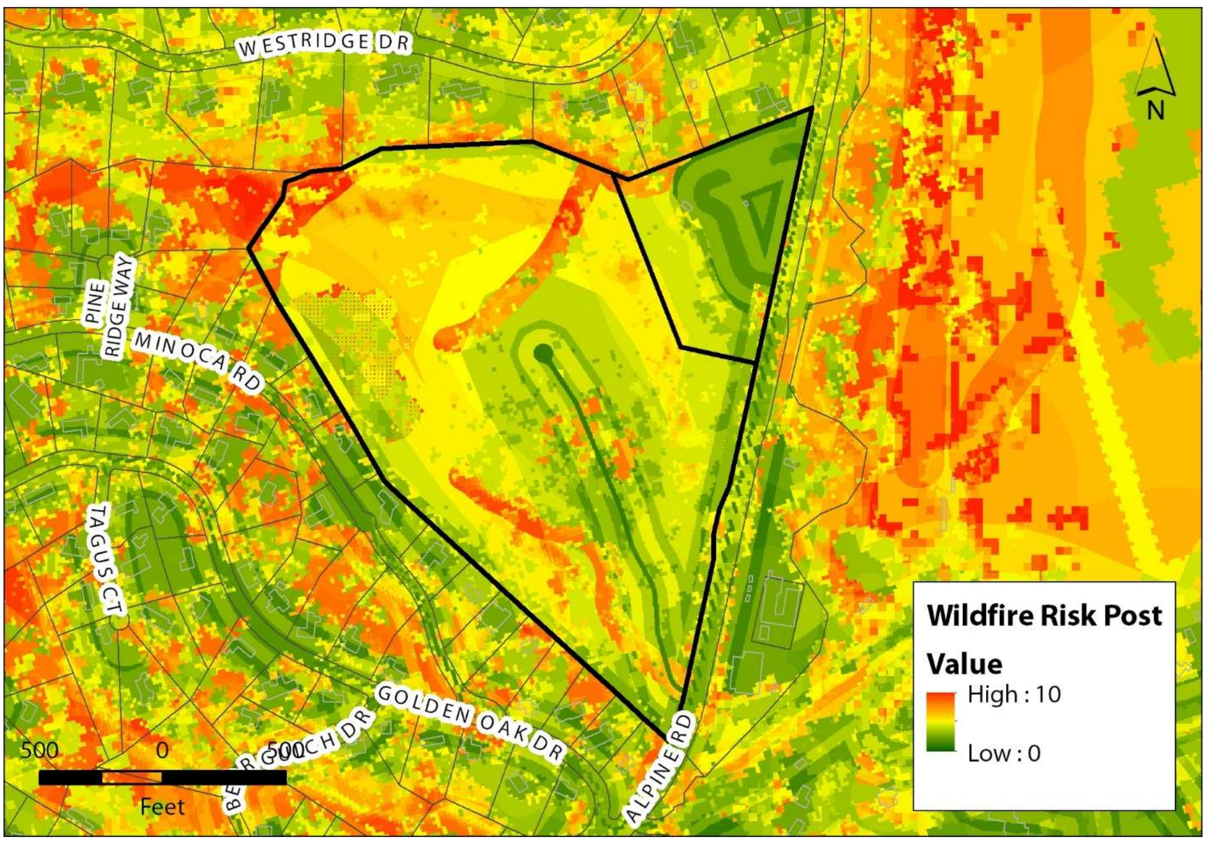


Figure 52. Wildfire risk for the Stanford Wedge, Taking into consideration potential fire behavior, potential ignition sources, and fire suppression response post treatment/development.

Table 16. Wildfire risk acres within the Stanford Wedge – Post Treatment

RISK CATEGORY (1-10)	ACRES	PERCENT
0 – VERY LOW TO NONE	0	0%
1 – LOW	3.2	4
2	10.0	13
3	13.6	18
4	29.8	40
5 – MODERATE	10.3	14
6	3.8	5
7	2.6	4
8 – HIGH	1.5	2
9 – VERY HIGH	0.25	0.3
10 – EXTREME	0	0

Comparing the current condition with estimated post-treatment conditions, the overall fire risk (combining wildfire hazard, ignition occurrence and wildfire suppression influence), decreases after the project is installed. The following table compares the risk in the two conditions:

Table 17. Comparison of wildfire risk between current and post-treatment conditions.

	CURRENT CONDITION		POST TREATMENT		
RISK CATEGORY (1-10)	ACRES	PERCENT	ACRES	PERCENT	DIF %
0 – VERY LOW TO NONE	0	0	0.0	0	0
1 – LOW	1.1	1	3.2	4	3
2	5.1	7	10.0	13	6
3	7.3	10	13.6	18	8
4	**12.6**	**17**	**29.8**	**40**	**23**
5 – MODERATE	12.1	16	10.3	14	-2
6	8.8	12	3.8	5	-7
7	**20.7**	**28**	**2.6**	**4**	**-24**
8 – HIGH	7.6	10	1.5	2	-8
9 – VERY HIGH	0.03	0.04	0.3	0.3	0
10 – EXTREME	0	0	0.0	0	0

Below is a side-by-side comparison of the pre-treatment and post-treatment (post-development) wildfire risk rating.

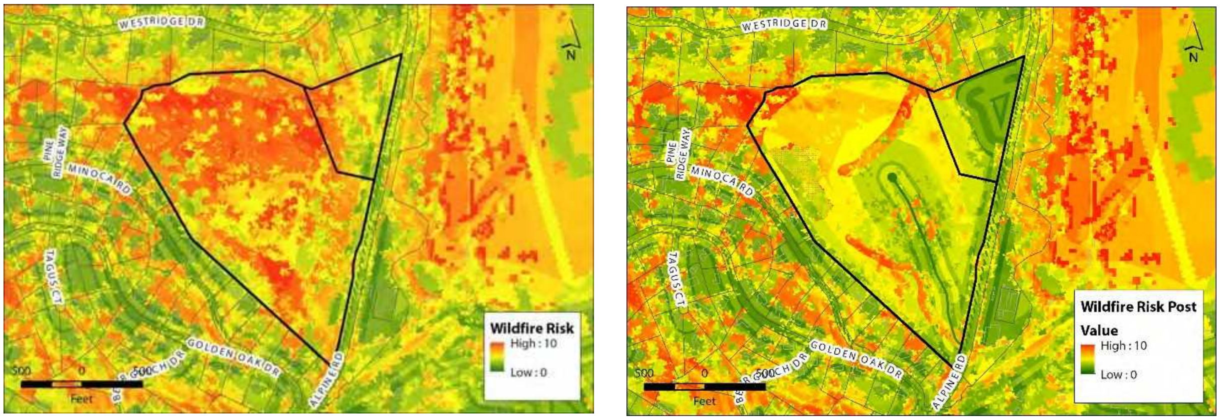


Figure 53. Side-by-side comparison of overall wildfire risk. Pre-treatment is on the left, post-treatment is on the right.

The overall result of the treatments is a reduction of areas with a rating of 7 or more. Pre-treatment, over a third of the property experiences a rating above 7. After treatment, less than 10% of the property experiences a rating above 7. In addition, the areas with a rating of 3 or lower has increased to 35% of the property (previously at 18%).

X. EVACUATION/TRAFFIC ACCUMULATIONS (POST-TREATMENT)

As we did for the pre-treatment landscape, we wanted to look more closely at the post-treatment fire growth scenarios and determine how each might affect expected evacuation routes and resulting change in traffic accumulations at different locations. For comparison purposes, we will re-do the pre-treatment analysis for all three fire growth scenarios.

It is important to note that there is an element of randomness associated with the propagation of spot fires. The parameters given specify the percentage of fires allowed to propagate (in this case, 5 percent), however, *which* of those spot fires are allowed to burn is chosen randomly. Therefore, there is a slight variation in direction and size of a fire growth progression from one scenario run to the next, even if all parameters remain the same.

As before, we used Network Analyst in ArcMap to determine traffic accumulations along expected routes residents would likely use to exit the area. Evacuation destinations include three intersection along Highway 280: Sand Hill Road, Alpine Road, and Arastradero road on-ramps. A total of 3962vehicles (78 more than in current conditions) were modeled from structures located within the area boundedby Arastradero Road, Portola Road, and Sand Hill Road. We assumed two vehicles per structure (including the 38 new structures resulting from this project) and 50 vehicles at the inn/stables located on Alpine Road. The 78 vehicles amount to a two percent increase.

A. FIRE GROWTH SCENARIO ENE WIND (POST-TREATMENT)

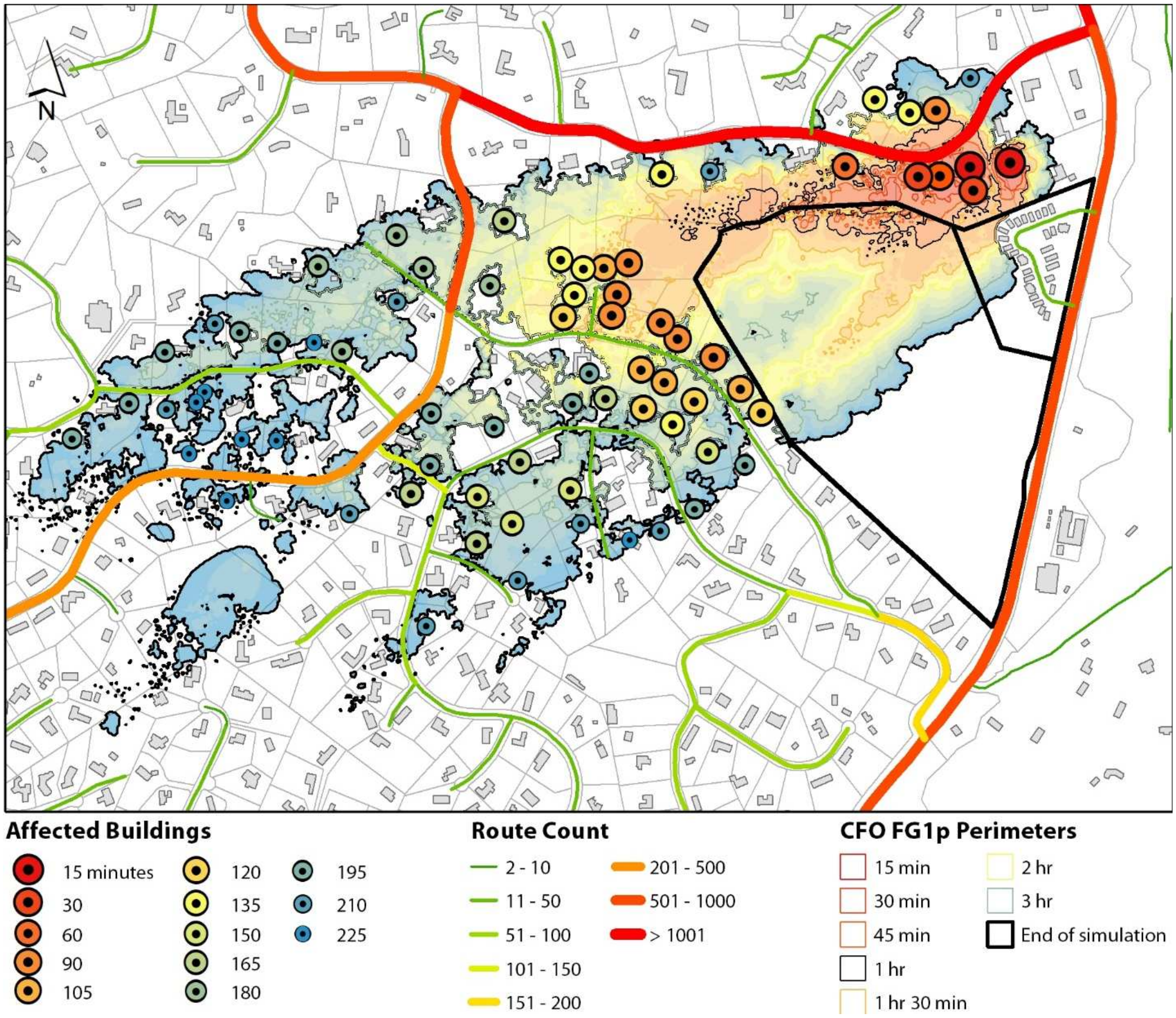


Figure 54. ENE Windp *post treatment fire growth perimeters with route counts and affectedbuildings.*

In the post-treatment ENE Windp fire growth scenario, the same number (72) structures are directly affected by the fire. Due to the initial ignition point being right behind a house, two houses immediately next to the ignition point are impacted by the fire within the first 15 minutes. In this scenario, due to less volatile fuels along the perimeter of the property, only three (instead of 6) separate fires are burning due to spot fires within the first 15 minutes of the fire.

Westridge Drive is impacted 30 minutes into the fire, at which time, five homes have been directly affected by the fire and there are 25 (less than 100 in the previous scenario) small spot fires. Though there are fewer spot fires, they are still spotting quite a distance to the southwest. At this point, all routes leading down Westridge Dr toward Alpine Rd are compromised (over 1,400 routes impacted). In an evacuation, these would have to be re-routed to Minoca Rd. The additional 78 cars would not affect traffic on Westridge Dr., but would add 78 more routes to the accumulation at the intersection of Westridge and Alpine Road. This intersection would experience 2238 cars, potentially in a relatively short time. This is a 3.45 percent increase in accumulation of routes at this location.

After 1 hour into the simulation, the fire reaches the heavy fuels northwest of the property. The fire slows within the property where fuel treatments have been applied, but it moves quickly through the heavy fuels at the top of the slope (just behind the houses on Pine Ridge.
Similar to the pre-development scenario, 13 homes are directly affected by the fire and spots fires have reached across the property onto Minoca Rd – which is now impacted by the fire. An additional 152 routes are now impacted.

In this scenario, due to the treatments applied within the Stanford Wedge property, Alpine Rd is not impacted within the simulation time and remains open for evacuation. The fire reaches 168 acres (less than 30 acres from previous scenario). Though smaller is size, the fire still impacts many roads including (in alphabetical order): Alhambra Ct, Cervantes Rd, Cresta Vista Ln, Fawn Ln, Golden Oak Dr, Granada Ct, Minoca Rd, Peak Ln, Pineridge Way, Sierra Ln, Tagus Ct, and Westridge Dr.

B. FIRE GROWTH SCENARIO SW Wind (POST-TREATMENT)

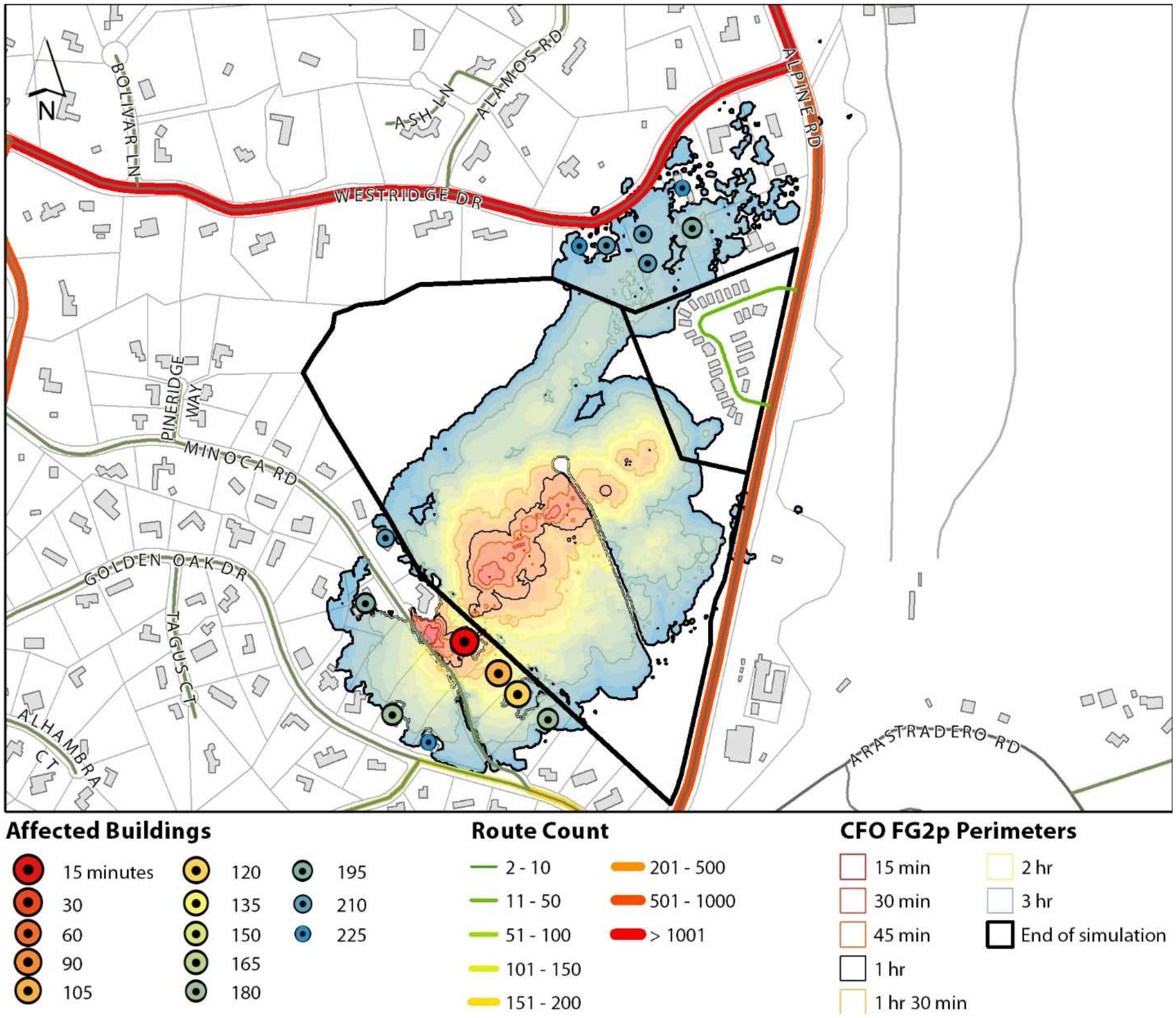


Figure 55. SW Wind Post Treatment fire growth perimeters with route counts and affected buildings.

In the post-treatment SW Wind fire growth scenario, 14 structures (versus 24 structures in the pre-treatment scenario) are directly affected by the fire. Even though the initial ignition point is immediately next to a home, because of the wind direction, no houses are immediately affected by the fire. Similar to the pre-treatment scenario, due to low to little fuels present at the ignition point, the fire remains very small (less than an acre) during those first 15 minutes. Again, like the pre-treatment scenario, by 30 minutes, though no houses are directly impacted, the fire has burned into the interior of the property, with a spot fire as far away as 880 feet from the initial ignition point. However, the spotting and fire growth is smaller than in the previous scenario due to lower availability of fuels and lower torching activity within the Stanford Wedge property. After 45 minutes of burning, spot fires continue to expand the perimeter to the northeast, almost into the proposed development area at 1,500 feet away. Unlike the pre-treatment scenario, however, the fire slows down significantly and never reaches the developed area due to expected low availability of fuels immediately next to new homes. One home on Minoca Rd has been affected by the fire at this point.

With this relatively slow-moving fire, the next house to be impacted is at 105 minutes, again near the ignition point. Spot fires are moving rapidly to the northeast; however, the number and scale have been reduced due to less available fuels within the property.

It is not until three hours into the fire that homes along the northern boundary become impacted and Westridge Dr becomes compromised. If allowed to burn for four hours, the fire grows to 63 acres (as opposed to 280 acres in the pre-treatment scenario) with 114 separate, small spot fires (in total, most of which have been incorporated into the main fire). The front of the spotting fire has just reached Alpine Road with some small spots crossing over, however, Alpine Road itself has not been compromised and could remain open to evacuation during most of this fire. Affected roads include (in alphabetical order): Alpine Rd, Golden Oak Dr, Minoca Rd, and Westridge Dr. As in previous fire growth scenario, the additional 78 routes due to the project will not affect routes on the affected roads. The project will contribute 78 additional routes along Alpine Rd, passing by the intersection of Westridge Dr. and Alpine Rd.

C. FIRE GROWTH SCENARIO SE Wind(POST-TREATMENT)

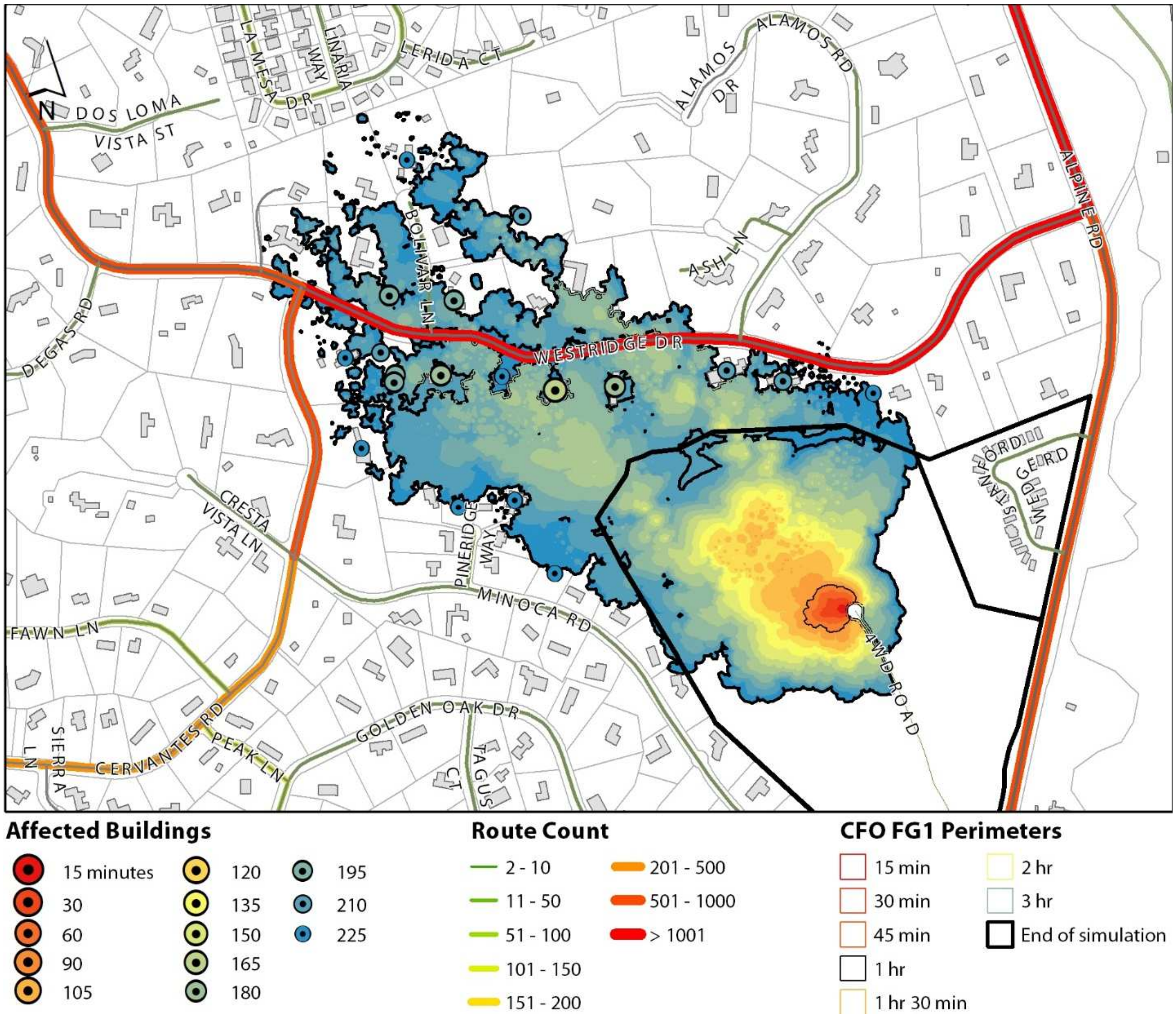


Figure 56. SE Wind Post treatment fire growth perimeters with route counts and affected buildings.

In the post treatment SE Wind fire growth scenario, only 19 structures are directly affected by the fire (as opposed to 87 structures in the pre-treatment scenario). As previously, since the initial ignition point is in the middle of the undeveloped portion of the property, no structures are immediately affected by the fire. Because of the treated areas (raised canopy base height and lower canopy cover), the fire remains a surface fire and does not produce any spot fires until over an hour into the simulation, where it encountered the edge of the riparian area (which remained untreated).

After an hour, numerous spot fires are generated and propagate the fire to the northeast. Once the fire leaves the treated areas, it moves a bit quicker. The first home to be affected directly by the fire is at 165 minutes into the simulation.

If allowed to burn for four hours, the fire grows to just over 75 acres (under 200 acres in the pre-treatment scenario). The front of the fire does reach beyond West Ridge Drive and the very edge of the Ladera neighborhood. However, with the initial fire moving so slowly and is accessible because of the proposed unpaved fire road, a fire starting in within the Stanford Wedge, with the treatments applied as described, would be relatively easy to put out with local suppression forces.

Affected roads include (in alphabetical order): Bolivar Ln, Cervantes Rd, and Westridge Dr. The effect of the additional 78 routes is similar to the two previous scenarios.

D. FIRE GROWTH SCENARIO NE WIND @ PROJECT (POST-TREATMENT)

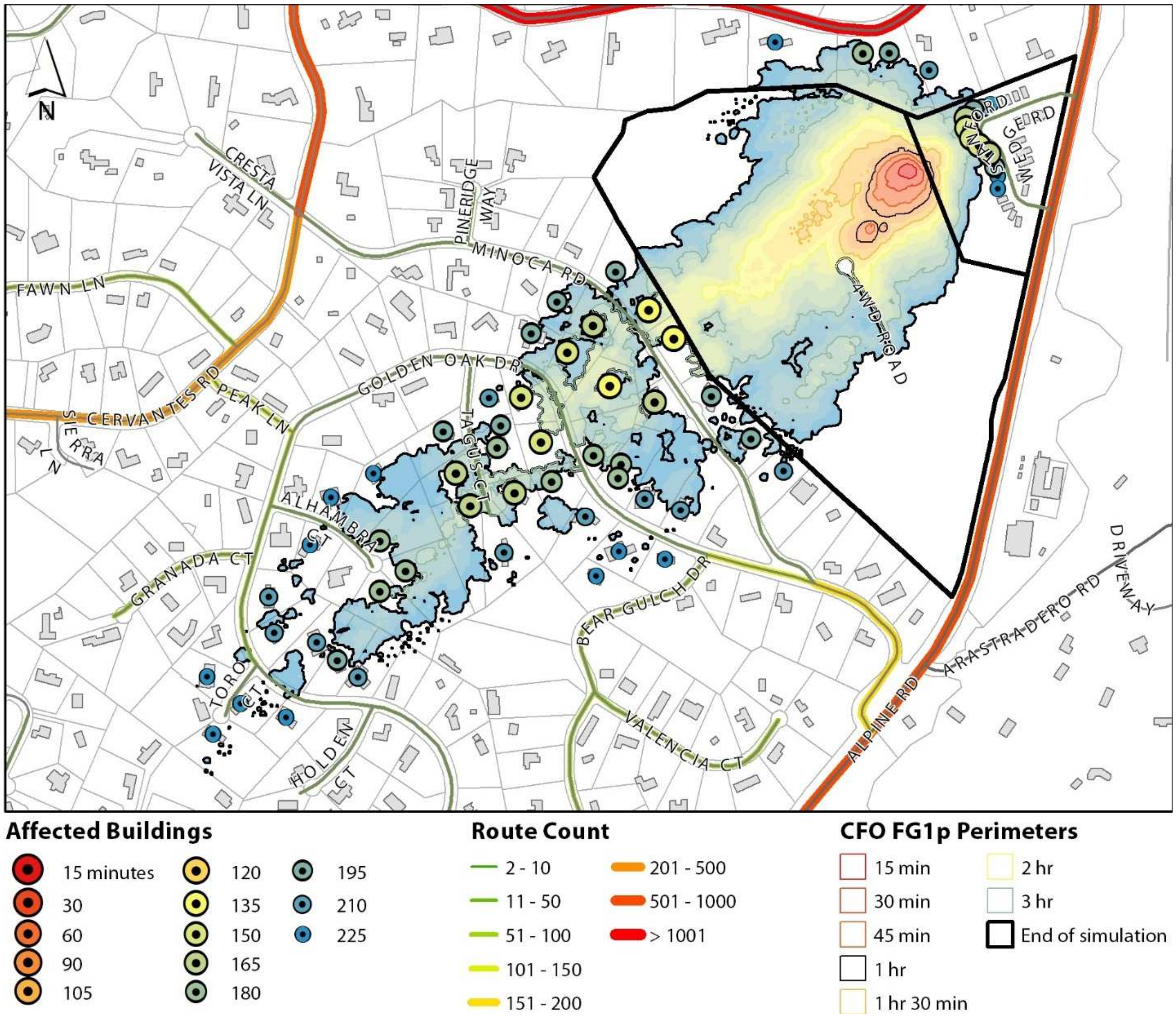


FIGURE 1 NE Wind @ Project Post treatment fire growth perimeters with route counts and affected buildings.

In the post-treatment ***NE WIND @ PROJECT*** fire growth scenario, significantly less structures (56) are directly affected (engulfed or within 100 feet of fire perimeter) by the fire. Due to less volatile fuels within the property, the fire remains small and contained within the study property for much longer, allowing suppression forces ample time to respond.

Similar to the pre-treatment scenario, the fire never gets beyond Westridge Dr to the north due to the wind keeping the fire heading to the southwest. This means that most of the routes in and out of the neighborhood to the north are free and clear with no burn impacts.

The fire does not threaten any homes until over two hours of fire simulation time has passed. In addition, the fire does not breach the study properties boundary until two hours have elapsed.

Once the fire is past the treatment areas, it behaves similarly as in the pre-treatment scenario. However, because not as many spot fires have been generated nor is the fire has hot, it does not impact as many homes or roads. However, Minoca Rd is still impacted.

If allowed to burn for four hours, the fire grows to just over 66 acres with over 180 separate, small spot fires (in total, most of which have been incorporated into the main fire). Spot fires have reached about 0.8 miles into the southwestern neighborhood, but still has about another 0.7 miles to reach Portola Rd.

Affected roads include (in alphabetical order): Alhambra Ct, Golden Oak Dr, Minoca Rd, Tagus Ct, Toro Ct, and Westridge Dr. Also, any proposed roads within the study property (4WD road and Stanford Wedge Rd. (temporary name)).

Despite the fire growth into the project area, the additional 78 routes do not contribute to additional traffic on any of the affected roads; routes from the project will exit to Alpine Rd and are assumed to travel north to Highway 280. In this scenario, there would be a maximum of 78 cars traveling on Alpine Rd through the intersection of Westridge Dr. and Alpine Rd. Should the routes travel south to Arastradro Rd or to Sandhill Rd. via Portola Valley Rd., a maximum of 78 cars would travel on Alpine Rd. crossing the intersection of Minoca Rd. Because the fires growth blocks Minoca Rd, few routes from Minoca Rd are likely to travel to Alpine Rd.

XI. DISCUSSION AND CONCLUSIONS

- Overall, the development does not increase fire hazard or risk. On the contrary, if the treatments and defensible space as required by the WFPD and the Vegetation Management Plan are rigorously applied, it will substantially lower bothfire hazard and risk. In addition, the proposed structures are built to be ignition-resistant. Combined with stringent vegetation treatments, this area can serve as a fuelbreak, buffering the area from fire spread.

- The reduction in overall risk resulted in the improved fire behavior associated with the required vegetation management and improved fire department response due to the new road. The additional human activity creates a greater likelihood of ignition. Mitigation measures, aimed at ignition prevention should be compiled (see recommendations below). Should an ignition occur, the quick response to the site of three minutes or less minimizes the detrimental effect – in terms of ignition sources – of the 30 new residences.

- From a fire potential standpoint, the overall fire risk is substantially reduced when the project is implemented. However, there are still untreated areas within the property (mainly due to regulatory restrictions) that could pose a risk to structures within and outside the property, because residential values at risk are located uphill from the property in three of the four directions from the site. The terrain poses a challenge for both implementation of the vegetation management plan and fire suppression, and because it promotes fire spread in almost every direction, regardless of whether the fuels have been treated.

- From a fire growth standpoint, if a fire were to start within the treated areas, fire spread is much slower and the spot fire generation potential has been reduced due to treatments linked to the project. However, untreated fuels outside of the property remain a threat to surrounding structures.

- Shrubby areas inside the property pose fire hazards in both pre- and post-treatment conditions

- The worst-case scenario is a fire that starts in the middle of the property with untreated fuels, since access is limited, terrain is challenging, and fire spread would be fast, regardless of wind direction, since the terrain will aid fire spread.

- Due to treatments associated with project implementation, fewer roads and fewer intersections are blocked during an evacuation due to a wildfire. However, many roads are still impacted by a wildfire, regardless of the project, because Alpine Road is vital access route out of harm's way.

- Mitigation work that focuses along the perimeter of the property has been shown to be effective and is a recommended strategy.

- We do not believe that the oak woodland needs to be thinned to a 40% canopy cover. This level of canopy openings actually promotes growth of understory shrubs and small trees. These type of fuels comprises ladder fuels, the biggest factor in tree torching, ember production, which in turn is the biggest threat to adjacent residences.

- Additional mitigation measures are recommended:
  - Annual third-party inspection and certification of defensible space in HOA-property; the letter of compliance should be sent to the Woodside Fire Protection District.
  - Stanford should obtain fuel management easements on adjacent properties where defensible space is not 100-ft from structures so that the HOA can treat fuels appropriately.
  - Consultation with the California Department of Fish and Wildlife regarding methods to remove over-abundant fuels in riparian forests and creekbeds, starting with invasive exotic species.
  - Installation of non-combustible fences on sides as well as rear yards. If solid, non-combustible fences are uses, they could form a radiant heat barrier rather than a source of heat.
  - Installation and maintenance of ember-resistant zones 5-feet from side walls, per AB 3074
  - Prohibition of smoking in common areas, outdoor fireplaces or pizza ovens in yards and common areas, and use of mechanical equipment on hot, dry windy days. No mechanical equipment use on days of Red Flag Warning.
  - Robust education of residents regarding ignition prevention

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APPENDIX A: WEATHER ANALYSIS

The acquisition and analysis of historical weather data representative of the fire modeling landscape is the next step in a geospatial assessment of wildfire hazard. Datasets from Remote Automated Weather Stations (RAWS) are the principal source of historical weather data for a wildfire hazard assessment. The selected RAWS should be representative of the larger landscape, not just the local area around the RAWS. A reasonable amount of years to use in a weather analysis is 10 years because it captures the variability of factors.

Figure 1. RAWS weather stations near the Stanford Wedge Property.

There are three RAWS station within the vicinity of the Stanford Wedge: Los Altos (LOCA1 – 43912), La Honda (LAHC1 – 43304), and Pulgas (PUGC1 – 43309). The nearest weather station is an intermittent RAWS station (IRAWS 18). However, this station is operational during select months only and does not include data for all months for the past 10 years. For this reason, it was not considered in this analysis. The La Honda RAWS station is just over 6.6 miles away and is at a higher elevation than the Stanford Wedge (approximately 200 feet higher). For this reason, La Honda was not considered. This leaves us with the Los Altos or Pulgas weather stations to choose from.

The Pulgas weather station is immediately adjacent to Highway 280. The flow of traffic on Highway 280 and the highway itself heavily influences the wind direction at that weather station. At roughly 3.7 miles to the southeast, the Los Altos weather station sits at a similar elevation (539 feet) as the Stanford Wedge and is similarly surrounded by residential lots. For these reasons, the Los Altos RAWS station was considered for the primary weather data.

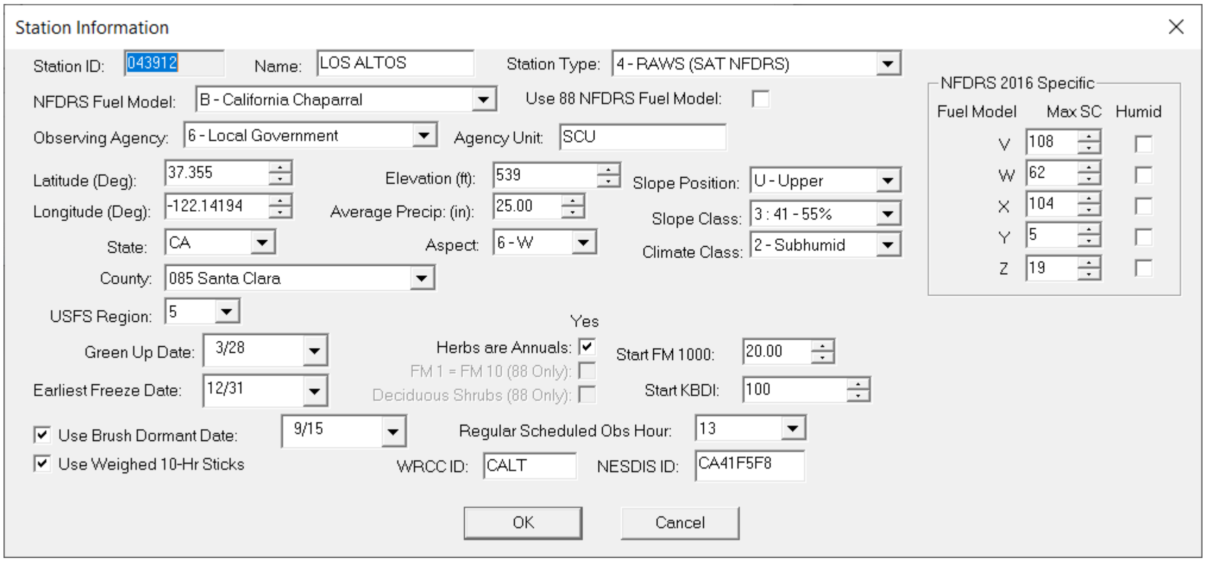


Figure 2. Station information for Los Altos RAWS weather station

The Los Altos RAWS station is located at latitude 37.355, longitude -122.14194 at an elevation of 539 feet (Figure 6). The station receives an average of 25 inches of rain (historically). It is located west of Highway 280 along Moody Road. For this effort, 10 years of data, from January 1, 2010 to December 31, 2019, were analyzed to determine the parameters under which the fire simulations will run. The main software tool for analyzing the weather data will be FireFamily Plus (www.firemodels.org). FireFamilyPlus is an industry standard used by all Federal firefighting agencies and is taught in fire behavior analyst courses certified by the National Wildfire Coordinating Group.

In order to simulate fire potential and growth weather data is needed that summarizes the daily highs and lows for an extended period of time, wind speed and direction to match that time period, and initial fuel moisture conditions for each fuel size class.

Daily and hourly weather summary was acquired through the National Fire and Aviation Management (FAMWEB) website system (Fire/Weather Data Extract→Weather→Historical) and imported into FireFamily Plus which included readings in the FWX format.

Before homing in on a specific month or week, our initial analysis focused on all months of the year to determine the 90th percentile range of data values that would represent the worst fires that often exceed fire suppression resources. Below is presented a series of tables and graphs that summarize the 90th percentile data for the Atlas Peak RAWS station.
While fuel moisture is not a direct weather measurement, it is the driving force behind all fire behavior and is directly influenced by the weather. Because of this, this initial survey of the weather data focused on determining percentile weather that predicted a high Ignition Component (IC) and a high Energy Release Component (ERC).

The IC is a rating of the probability that a firebrand will cause a fire requiring suppression action. Since it is expressed as a probability, it ranges on a scale of 0 to 100. An IC of 100 means that every firebrand will cause a fire requiring action if it contacts a receptive fuel. An IC of 0 would mean that no firebrand would cause a fire requiring suppression action under those conditions.

The ERC is an index related to how hot a fire could burn. It is directly related to the 24-hour, potential worst case, total available energy (BTUs) per unit area (in square feet) with the flaming front at the head of a fire. It includes larger-diameter fuels in its calculation, so it is therefore good at indicating long-term drying and its effect on fire behavior. The higher the number, the higher the potential for energy to be released.

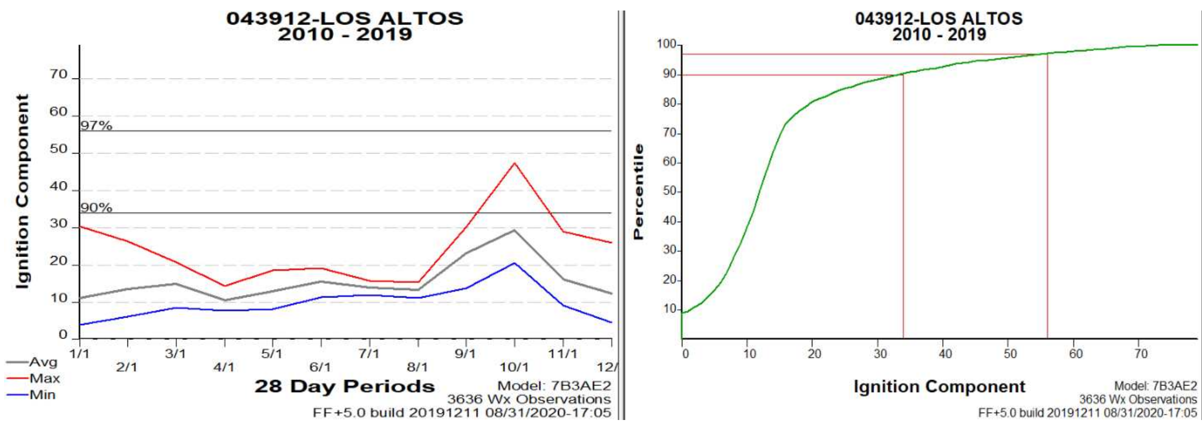


Figure 3. Ignition Component for the Los Altos RAWS station, monthly average using data from 2010 through 2019.

Figure 3 above shows an initial review of the calculated IC for all months. If we take into consideration the maximum calculated IC (shown in red on the left graph) we note that the IC peaks in October at 47 (47% chance of a fire needing suppression occurring) and immediately drops off in November (down to 29). This indicates that for much of the year, the IC is relatively low (below 50%) and it is only in October when conditions might warrant a fire that may exceed local suppression forces.

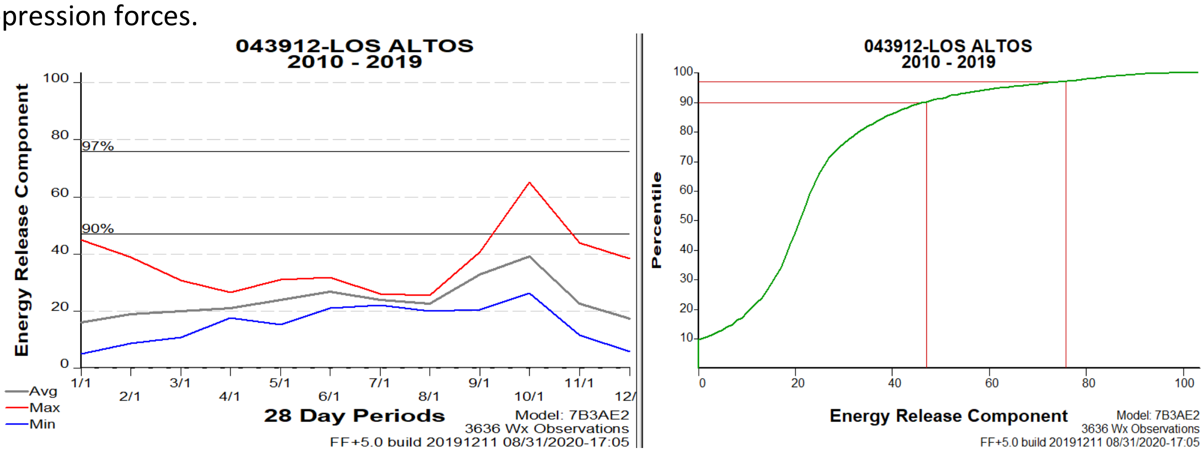


Figure 4. Energy Release Component for the Los Altos RAWS station, monthly average using data from 2010 through 2019.

Figure 4 above shows the ERC for all months. ERC is greatest in the month of October, after a summer of drying which is typical in San Mateo County.

These charts indicate that our weather analysis should focus on the month of October for developing our weather and wind files to use in our fire prediction scenarios. While this summary preview of the weather data does not mean a fire, or worst-case fire, will occur outside of October, based on these data, it is more likely to occur in October. Therefore, our weather files will draw from October values to determine the fuel moisture parameters to run our fire behavior simulations.

Our next step is to review the wind and wind direction data for October to determine an initial wind speed and direction. Note: Wind speed measurements at RAWS stations correspond to a height of 20 ft above the ground (or vegetation, if present).

Total of all hourly periods

MPH Range	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
1-4	1.2	1.4	2.6	2.6	1.5	0.8	0.7	0.6	0.6	0.9	2.9	13.0	4.9	2.0	1.9	1.2	38.7
4-8	0.9	1.5	3.2	3.5	1.0	0.5	0.5	0.4	0.7	1.0	2.5	21.3	4.5	2.8	1.5	1.0	46.8
8-13	0.5	0.5	1.1	1.0	0.4	0.2	0.1	0.1	0.1	0.3	0.4	0.5	0.6	1.1	0.8	0.4	8.3
13-19	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.3	0.1	0.0	1.6
19-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.5
25-32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
32-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (%)	2.6	3.5	7.1	7.2	2.9	1.6	1.3	1.1	1.5	2.5	6.1	35.1	10.2	6.3	4.4	2.6	96.1
Calm (<1)																	3.9
Ave Speed (MPH)	4.6	4.5	4.9	4.8	4.0	4.1	4.4	3.5	5.2	5.8	4.4	4.0	4.1	5.6	5.3	4.3	4.4

Wind type: Both

7131 total observations used out of a possible 14880 (47%)
310 days (310 w/ complete wind dirs - 100%)

Figure 5. Frequency table showing wind speed and direction for the Los Altos RAWS station for the month of October from 2010 to 2019 (all hours combined).

The output from the frequency analysis shows that the predominant wind direction during our analysis month is from the west-southwest (WSW or 247.5 degrees azimuth) with an average speed of only 4 mph. It also shows that 20% of the time, the wind speed ranges between 4 to 8 miles per hour (mph). Figure 9 also shows that over 80% of the time, winds remain below 8 mph. Winds speeds over 13mph are rare but do happen (2.2% of the period summarized).

```
043912 - Wind Speed vs. Direction Report

   printed on: 09/01/2020    at  08:33:07 AM  (from run # 1)
   using database: G:\fire_behavior_analysis\Stanford\StanfordWedge

------------------------------------------------------
Active Working Set:
   Station: 043912  - LOS ALTOS
   Data years:  2010 - 2019
   Analysis Period Length: 28 (Monthly) days
   Annual filter dates:  October 1  thru  October 31
------------------------------------------------------
Station Details:
   043912 LOS ALTOS              Fuel model: B   (Use 88?: N)

   Slope class: 3   Climate class: 2   Greenup: 03/28   Freeze: 12/31
   Start KBDI: 100  Start FM1000:20   Avg. Precip: 25.00
   FM1 = FM10?  N   Herb Annual?   Y   Deciduous?  N
   Aspect:      6   Slope posit.:  U   Elevation:  539
   Latitude:   37.36   Longitude: -122.14
   Weighed Stick Moistures Used:   Yes
   Dormancy Date Used: 09/15
   SOW:        Use SR_SOW if SOW is Missing
   WetFlag:    Use SR_WetFlag if WetFlag is Missing
------------------------------------------------------

28-Day Period Beginning 10/1
```

	Wind Speed(Both), MPH														
	0 - 3		4 - 7		8 - 12		13 - 18		19 - 24		>24		TOTAL		AVG
Dir	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	SPEED
NE	277	4.4	1177	18.6	66	1.0	13	0.2	3	0.0	2	0.0	1538	24.4	4.9
E	225	3.6	425	6.7	107	1.7	18	0.3	7	0.1	2	0.0	784	12.4	5.3
SE	93	1.5	264	4.2	136	2.2	28	0.4	1	0.0	2	0.0	524	8.3	6.7
S	72	1.1	118	1.9	78	1.2	11	0.2	6	0.1			285	4.5	6.4
SW	558	8.8	345	5.5	48	0.8	2	0.0	1	0.0			954	15.1	3.5
W	705	11.2	280	4.4	19	0.3	1	0.0	1	0.0	1	0.0	1007	16.0	3.1
NW	188	3.0	94	1.5	8	0.1							290	4.6	3.3
N	134	2.1	77	1.2	6	0.1	3	0.0	4	0.1			224	3.5	3.9
CLM	257	4.1	39	0.6	12	0.2	11	0.2	8	0.1	1	0.0	328	5.2	2.0
TOT	2509	39.8	3105	49.2	541	8.6	111	1.8	35	0.6	10	0.2	6311	100.0	4.5

```
6821 observations used out of a possible 14880 (45%)
310 days (310 w/ complete wind dirs - 100%)
```

Figure 6. Wind speed versus Wind Direction report for the month of October, summarized across 2010 to 2019 for the Los Altos RAWS station

Next, we compared the wind speed versus wind direction report (Figure 6). This report shows the number of times the recorded wind came from a certain direction at a given speed. This report shows that much of those winds reported in the frequency table came from the northeast (NE) (18.6%) and also the west (W) and southwest (SW) (20% combined). There appears to be periods of steady winds from the NE and WSW.

This finding prompted us to review the daily activity of the winds using wind roses. A wind rose is a graphic tool used to give a succinct view of how wind speed and direction are distributed for a location.

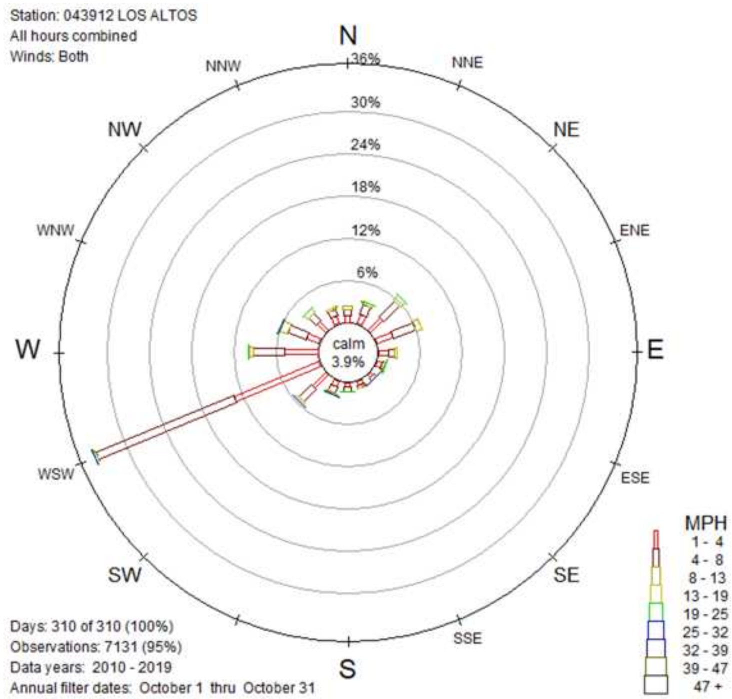
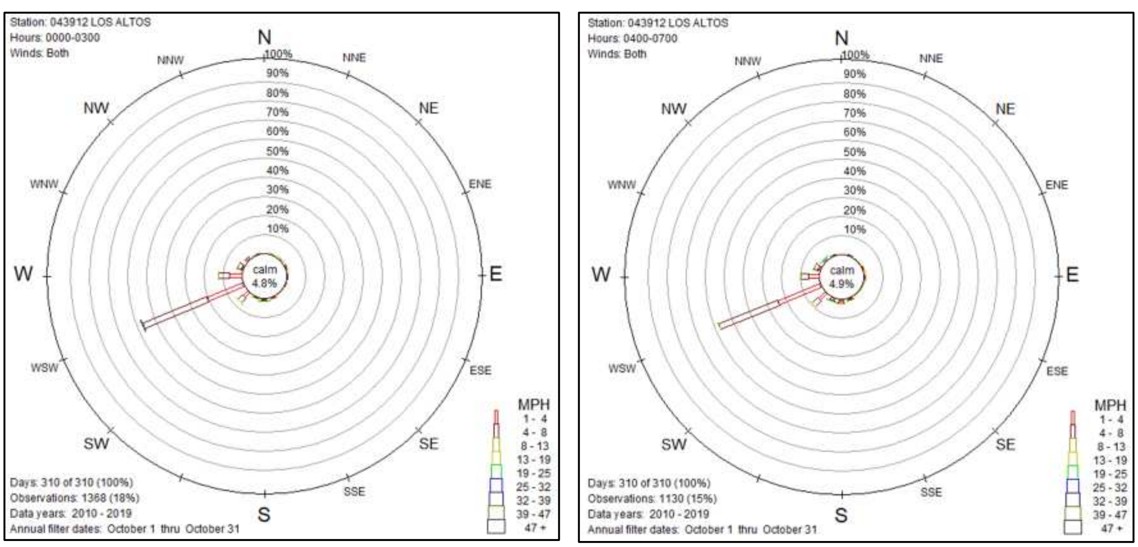


Figure 7. All hours combined, all winds (includes gusts) for October, Los Altos RAWS Station

When considering all hours of the day, winds from the WSW are predominant at the Los Altos RAWS station. This remains the case for the hours before dawn and the hours after dusk. However, the daytime hours experience relatively low winds predominantly from the NE and east-northeast (ENE). The afternoon winds can get up to 19 mph (Figure 8 below).



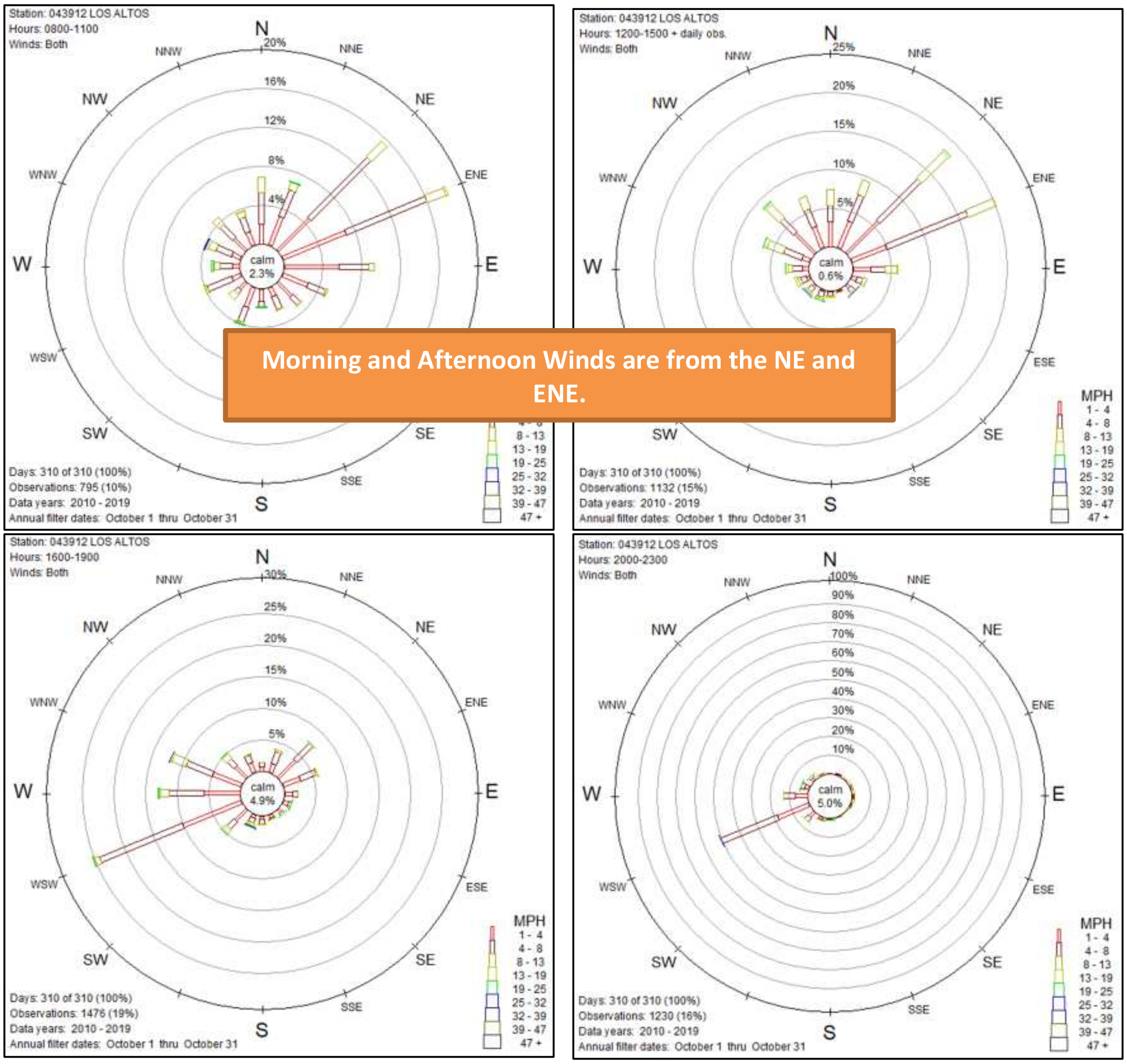


Figure 8. 4-hour diurnal winds showing shift in winds from the SW to the NE throughout the day, summary for October, Los Altos RAWS station.

Based on reviews of the wind data, we determined a NE wind falls within the 90th percentile conditions to use in our predictive models.

Our next step was finding percentile weather (or fuel moistures) for both the IC and ERC for that wind direction. To do this, we used the Percentile Weather module in FireFamily+ and produced the following summaries for both IC and ERC.

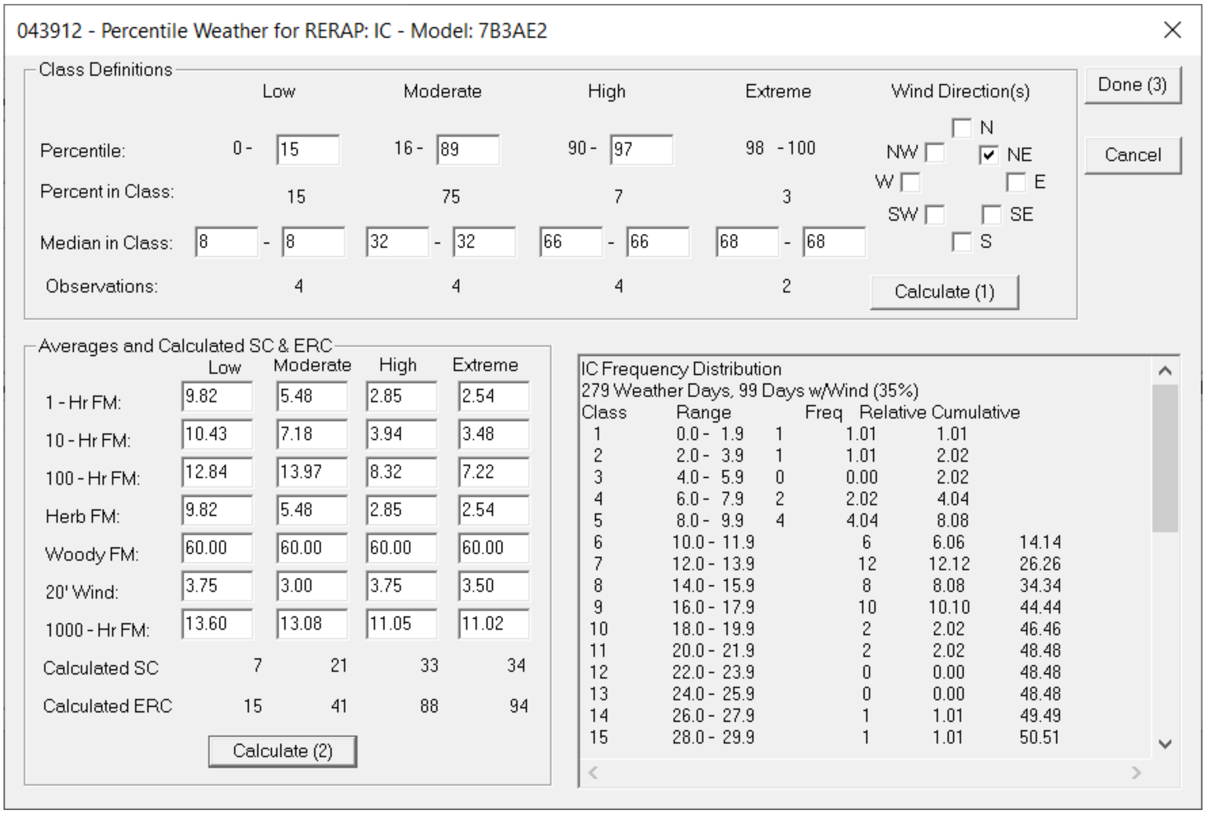


Figure 9. Percentile weather for October for calculated IC using a NE wind

When considering IC only, the 90th percentile (high) fuel moistures fall at 2.85% for 1hr, 3.94% for 10hr, and 8.32% for 100 hr fuel classes.

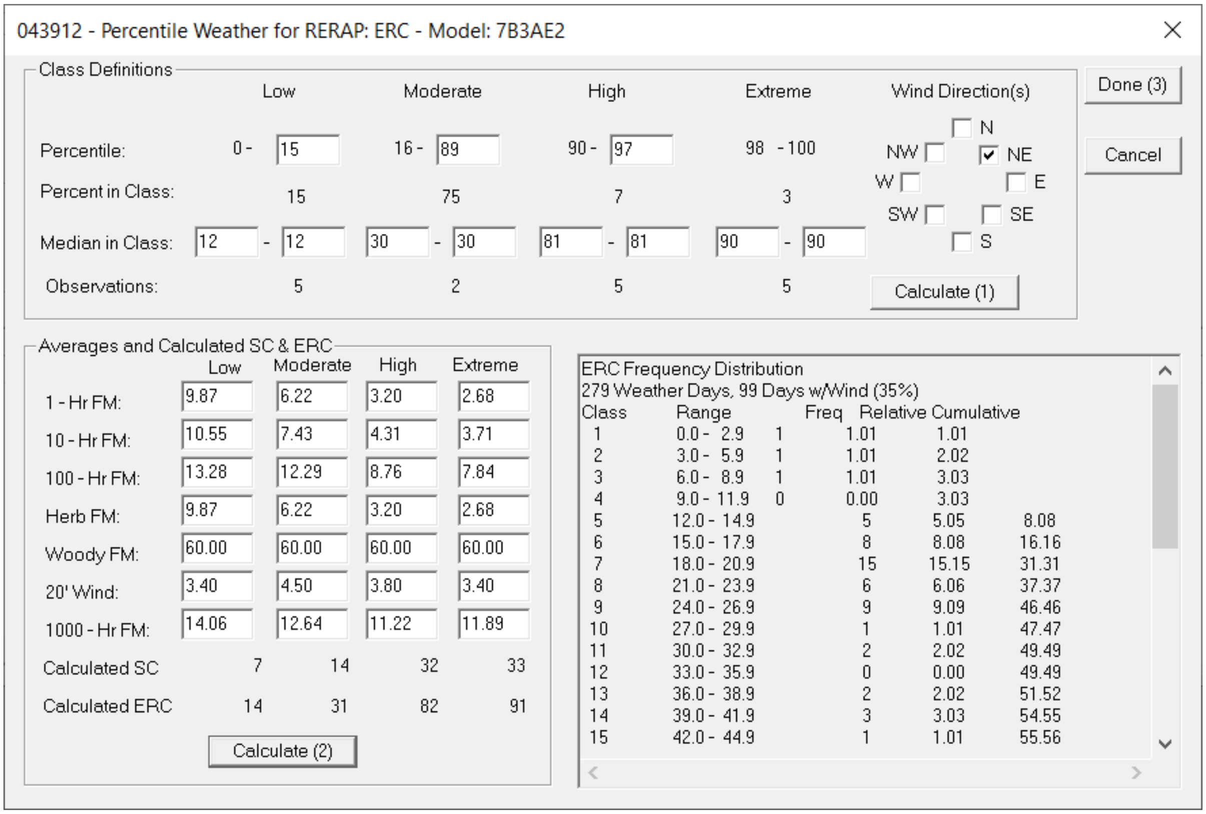


Figure 10. Calculated Energy Release Component

When considering ERC only, the 90th percentile fuel moistures fall at 3.20% for 1hr, 4.31% for 10hr, and 8.76% for 100 hr fuel classes. An average of the IC and ERC 90th percentile fuel moistures will be used for the initial fuel moisture file in our fire behavior prediction scenarios.

Lastly, we used the event locator in FireFamily+ to find conditions where maximum temperatures coincided with maximum winds and minimum relative humidity. Figure 15 on the next page shows these conditions were met in October in 2012, 2014, 2017, and 2019. Weather data observed on the days surrounding the later date (October 27th, 2019) on that list will be used to create the weather (WTR) and wind (WND) files needed for the fire behavior simulation.

```
FireFamily Plus Event Locator Report
   Listing of Selected Events
   printed on: 09/01/2020   at  09:32:51 AM  (from run # 1)
   using database: G:\fire_behavior_analysis\Stanford\StanfordWedge

------------------------------------------------------
Active Working Set:
   Station: 043912  - LOS ALTOS
   Data years:  2010 - 2019
   Analysis Period Length: 1 days
   Annual filter dates:  October 1  thru  October 31
------------------------------------------------------
Station Details:
   043912 LOS ALTOS              Fuel model: B   (Use 88?: N)

   Slope class: 3   Climate class: 2   Greenup: 03/28   Freeze: 12/31
   Start KBDI: 100  Start FM1000:20   Avg. Precip: 25.00
   FM1 = FM10?  N   Herb Annual?   Y   Deciduous?  N
   Aspect:       6  Slope posit.:  U   Elevation:  539
   Latitude:   37.36   Longitude: -122.14
   Weighed Stick Moistures Used:   Yes
   Dormancy Date Used: 09/15
   SOW:       Use SR_SOW if SOW is Missing
   WetFlag:   Use SR_WetFlag if WetFlag is Missing
------------------------------------------------------


Event Definition:
    Daily(Max Temperature) > 50.00 Percentile (79.00)
    AND Daily(Relative Humidity) < 50.00 Percentile (40.00)
    AND Daily(Wind Speed) > 50.00 Percentile (4.00)

         1-Day Periods

DATE         MaxT     RH   Wind
---------------------------------
10/18/2012   89.00  23.00   7.00
10/13/2014   91.00  20.00   5.00
10/30/2014   84.00  34.00   5.00
10/08/2017   87.00  19.00   5.00
10/27/2019   86.00  16.00   5.00

5 hits out of 310
0 rejects for no/missing observations

FF+5.0 build 20191211 09/01/2020-09:32
```

Figure 11. Results of event locator in FireFamily+ showing when maximum temperature, low relative humidity and relatively high winds coincided in October.

The 90th percentile dead fuel moisture contents are reasonable values to use for the near-maximum condition. Moisture content values for live herbaceous and live woody fuel particles must be determined from experience. A live herbaceous moisture content of 30 – 45 percent, representing fully to near-fully cured grass and herbaceous fuel, and a live woody moisture content of 60 – 90 percent, should work well for the near-maximum condition.

We recognize that climate change may invalidate an historical analysis of weather data. However, climate change is a slow phenomenon. Its' changes on our local weather should be captured in the last 10 years of data. Regardless, in an abundance of caution, we are also simulating fire behavior using weather data from the August 2020 lightning strike complex of fires that recently threaten the southern portion of San Mateo County. These two sets of weather conditions – one derived from 90th percentile data from the historical record (historic conditions) and the other a direct use of the conditions during the August 2020 fires (current conditions) – will be used to generate fire prediction scenarios.

APPENDIX B: FIRE BEHAVIOR MODELING SUPPLEMENTAL INFORMATION

A. FIRE BEHAVIOR MODELING LANDSCAPE CURRENT CONDITIONS

A fire modeling landscape is a raster-format geospatial characterization of the fuel, vegetation, and topography inputs needed for simulating the full range of wildfire behavior – from surface fire through active crown fire – based on separate models of surface fire spread (Rothermel 1972), crown fire spread (Rothermel 1991), and the transition between them (Van Wagner 1977). Those inputs include surface fuel characteristics (fire behavior fuel model), canopy fuel characteristics (canopy base height, canopy bulk density), forest vegetation (forest canopy cover and height), and topography (slope steepness, aspect, and elevation).
Geospatial fire modeling systems require the fire modeling landscape data be in the form of a fire modeling landscape file (LCP), the file format originally developed for FARSITE (Finney 1998) but now also used in FlamMap and other fire modeling software. The LCP file consists of several raster data layers – one for each characteristic listed above.

For this effort, a customized landscape file was created using LiDAR derived vegetation data to determine fuel model, LiDAR derived topographic data to determine elevation, slope, and aspect, and California Forest Observatory (CFO 2020) data to determine canopy characteristics such as canopy base height, canopy bulk density, canopy cover, and canopy height. This landscape file had a 10-meter resolution and takes advantage of updated floristics and recently captured LiDAR data to derive terrain characteristics at a finer scale. The resulting LCP file was re-sampled downed to 1m to better capture treatment activities.

Our custom LCP file has the following parameters:

- Latitude 37
- Distance Units are Meters
- Lower Left X: 569650.000000001
- Lower Left Y: 4136630
- Columns: 3230
- Rows: 3230
- Cell Width: 1.000000
- Cell Height: 1.000000
- Elevation File: meters, 69-249
- Slope File: degrees, 0-54
- Aspect File: Degrees Azimuth, 0-359
- Fuel File: Fuel Models, Numbers: 91 93 98 99 101 102 103 106 121 122 124 141 142 145 147 161 162 163 165 181 182 183 184 185 186 187 188 189 202
- Canopy Cover: Percent, 0-100 (from California Forest Observatory data)
- Canopy Height: Meters, 0-60 (from California Forest Observatory data)
- Crown Base: Meters, 0-10 (from California Forest Observatory data)
- Crown Bulk Density: kg/m3*100, 0-23 (from California Forest Observatory data

Table 1. Scenario Matrix for the Stanford Wedge

Scenario Name/Number	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO
Scenario Description	FlamMap run with October 2019 weather/winds at 90th percentile fuel moisture	FlamMap run with August 2020 weather/winds at 90th percentile fuel moisture	Fire starting behind property along Westridge, along northern boundary	Fire starting at roadside, near trailhead on Minoca Road, along western boundary	Fire starting at end of proposed road in interior of property from illegal activity (i.e. party, arson, etc)
LCP	stanfordwedge_cfo1.lcp	stanfordwedge_cfo1.lcp	stanfordwedge_cfo1.lcp	stanfordwedge_cfo1.lcp	stanfordwedge_cfo1.lcp
FMS	90th_percentile_3_4_8_30_60.fms	90th_percentile_3_4_8_30_60.fms	90th_percentile_3_4_8_30_60.fms	90th_percentile_3_4_8_30_60.fms	90th_percentile_3_4_8_30_60.fms
Wind Speed (FlamMap only)	10mph	10mph	n/a	n/a	n/a
Wing Direction (FlamMap only)	NE (45)	NE (45)	n/a	n/a	n/a
Type of Wind	Wind Direction	Wind Direction	n/a	n/a	n/a
WTR	LOAC1_2019-10-22to2019-10-26.wtr	LOAC1_2020-08-13to2020-08-19.wtr	LOAC1_2019-10-22to2019-10-26.wtr	LOAC1_2019-10-22to2019-10-26.wtr	LOAC1_2019-10-22to2019-10-26.wtr
WND	LOAC1_2019-10-22to2019-10-26 (peak).wnd	LOAC1_2020-08-13to2020-08-19 (peak).wnd	LOAC1_2019-10-22to2019-10-26 (peak).wnd	**Changed wind direction to SW**	**Changed wind direction to SE**
FUEL MOISTURE CONDITION PERIOD:					
START	10/23 1000	08/14 1000	10/23 1000	10/23 1000	10/23 1000

Scenario Name/Number	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO
DATE/TIME END DATE/TIME	10/25 1000	08/18 1000	10/25 1000	10/25 1000	10/25 1000
IGN PT	n/a	n/a	571478.939624 m, 4138568.503538 m	571095.537575 m, 4137991.660321 m	571270.034951 m, 4138241.587144 m
PERIMETER RESOLUTION	n/a	n/a	5 meters	5 meters	5 meters
DISTANCE RESOLUTION	n/a	n/a	1 meters	1 meters	1 meters
TIME STEP	n/a	n/a	15 minutes	15 minutes	15 minutes
EMBER SPOT PROBABILITY	n/a	n/a	0.05	0.05	0.05
MINIMUM SPOT DISTANCE	n/a	n/a	5 meters	5 meters	5 meters
BACKGROUND SPOTTING GRID RESOLUTION	n/a	n/a	15 meters	15 meters	15 meters
FOLIAR MOISTURE CONTENT	60	60	60	60	60
CROWN FIRE CALCULATION	Scott/Reinhardt(2001)	Scott/Reinhardt(2001)	Scott/Reinhardt(2001)	Scott/Reinhardt(2001)	Scott/Reinhardt(2001)
START DATE/TIME	n/a	n/a	10/23 1300	10/23 1300	10/23 1300
END	n/a	n/a	10/23 1700	10/23 1700	10/23 1700

Scenario Name/Number	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO	FIRE POTENTIAL AUGUST SCENARIO	FIRE POTENTIAL OCTOBER SCENARIO
DATE/TIME					
OUTPUTS:					
FlamMap Outputs:					
Flame Length	Yes	Yes	n/a	n/a	n/a
Rate of Spread	Yes	Yes	n/a	n/a	n/a
Crown Fire Activity	Yes	Yes	n/a	n/a	n/a
Fireline Intensity	Yes	Yes	n/a	n/a	n/a
Heat/unit Area	Yes	Yes	n/a	n/a	n/a
FARSITE Outputs:					
Arrival Time	n/a	n/a	Yes	Yes	Yes
Perimeters	n/a	n/a	Yes	Yes	Yes
Fireline Intensity	n/a	n/a	Yes	Yes	Yes
COMMENTS	Using the weather/wind files instead of fixed fuel moistures lessens fire activity	Using the weather/wind files instead of fixed fuel moistures lessens fire activity	Fire completely traverses property all the way to Minoca Road within the burn period (4 hours); Alpine Road is compromised early in fire	Fire completely traverses property all the way to Westridge Road and beyond within the burn period (4 hours); Alpine Road is not compromised	Fire moves far into neighborhoods to the north within burn period, Alpine Road is not compromised, but many residential roads to the north are compromised

Statistics Associated with Fire Behavior Scenarios – Current Conditions

Table 2. Flame length acres by flame length range for FIRE POTENTIAL OCTOBER SCENARIO.

FLAME LENGTH RANGE	ACRES	PERCENT
NO PREDICTED FIRE	0.05	0.01%
0 – 1 FEET	11.2	15%
1 – 4	19.7	26%
4 – 8	5.8	8%
8 – 11	9.9	13%
11 – 25	27.5	37%
GREATER THAN 25 FEET	0.9	1.3%

Table 3. Flame length acres by flame length range for FIRE POTENTIAL AUGUST SCENARIO.

FLAME LENGTH RANGE	ACRES	PERCENT
NO PREDICTED FIRE	0.3	0.4%
0 – 1 FEET	14.5	19%
1 – 4	19.4	26%
4 – 8	8.4	11%
8 – 11	19.3	26%
11 – 25	12.9	17%
GREATER THAN 25 FEET	0.25	0.3%

Table 4. Fireline intensity acres by logarithmic range for FIRE POTENTIAL OCTOBER SCENARIO.

FIRELINE INTENSITY RANGE (KW/M)	ACRES	PERCENT
NON-BURNABLE	0.02	0.03%
1 – 10 KW/M	1.2	2%
10 – 100	15.2	20%
100 – 1,000	20.5	27%
1,000 – 10,000	38.1	51%
> 10,000	0.04	0.06%

Table 5. Fireline intensity acres by logarithmic range for FIRE POTENTIAL AUGUST SCENARIO.

FIRELINE INTENSITY RANGE (KW/M)	ACRES	PERCENT
NON-BURNABLE	0.02	0.03%
1 – 10 KW/M	2.2	3%
10 – 100	20.5	27%
100 – 1,000	21.4	28%
1,000 – 10,000	30.9	41%
> 10,000	0.01	0.01%

Table 6. Acres table for type of fire (crown fire activity) for FIRE POTENTIAL OCTOBER SCENARIO.

TYPE OF FIRE	ACRES	PERCENT
NON – BURNABLE (0)	0.02	0.03%
SURFACE FIRE (1)	21.6	29%
PASSIVE CROWN FIRE (2)	53.5	71%
ACTIVE CROWN FIRE (3)	0	0%

Table 7. Acres table for type of fire (crown fire activity) for FIRE POTENTIAL AUGUST SCENARIO.

TYPE OF FIRE	ACRES	PERCENT
NON – BURNABLE (0)	0.02	0.03%
SURFACE FIRE (1)	26.3	35%
PASSIVE CROWN FIRE (2)	48.8	65%
ACTIVE CROWN FIRE (3)	0	0%

Table 8. Fire growth acreage table for FIRE POTENTIAL OCTOBER SCENARIO.

Elapsed Time	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	6	0	0.34	0.34
00 00:30	10/23 13:30	45	4	2.49	2.15
00 00:45	10/23 13:45	111	15	7.37	4.88
00 01:00	10/23 14:00	131	31	18.30	10.93
00 01:15	10/23 14:15	224	58	34.35	16.05
00 01:30	10/23 14:30	262	94	50.09	15.74
00 01:45	10/23 14:45	212	90	61.45	11.35
00 02:00	10/23 15:00	188	78	72.17	10.72
00 02:15	10/23 15:15	199	81	89.22	17.06
00 02:30	10/23 15:30	288	101	104.37	15.14
00 02:45	10/23 15:45	270	113	120.97	16.61
00 03:00	10/23 16:00	311	125	134.30	13.33
00 03:15	10/23 16:15	329	114	150.50	16.20
00 03:30	10/23 16:30	458	139	172.04	21.54
00 03:45	10/23 16:45	649	184	200.57	28.53

Table 9. Fire growth acreage table for FIRE POTENTIAL AUGUST SCENARIO.

Elapsed Time	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	2	0	0.10	0.10
00 00:30	10/23 13:30	16	0	0.50	0.40
00 00:45	10/23 13:45	32	0	2.98	2.48
00 01:00	10/23 14:00	99	23	10.90	7.92
00 01:15	10/23 14:15	128	48	21.35	10.45
00 01:30	10/23 14:30	152	46	30.89	9.54
00 01:45	10/23 14:45	229	66	47.49	16.60
00 02:00	10/23 15:00	257	121	71.44	23.94

00 02:15	10/23 15:15	308	169	99.58	28.15
00 02:30	10/23 15:30	232	138	127.75	28.17
00 02:45	10/23 15:45	223	143	162.02	34.27
00 03:00	10/23 16:00	188	116	200.55	38.53
00 03:15	10/23 16:15	174	105	231.36	30.82
00 03:30	10/23 16:30	178	109	260.22	28.85
00 03:45	10/23 16:45	195	103	287.43	27.21

Table 10. Fire growth acreage table for FIRE POTENTIAL OCTOBER SCENARIO..

Elapsed Time	**Date/Time**	**# of Fires**	**Enclaves**	**Total Acres**	**Timestep Acres**
00 00:15	10/23 13:15	21	0	0.50	0.50
00 00:30	10/23 13:30	124	7	6.10	5.59
00 00:45	10/23 13:45	197	36	17.72	11.63
00 01:00	10/23 14:00	218	51	30.68	12.95
00 01:15	10/23 14:15	166	83	42.81	12.13
00 01:30	10/23 14:30	157	80	52.70	9.89
00 01:45	10/23 14:45	176	54	63.59	10.89
00 02:00	10/23 15:00	199	55	75.21	11.62
00 02:15	10/23 15:15	197	60	88.02	12.81
00 02:30	10/23 15:30	177	83	102.62	14.60
00 02:45	10/23 15:45	174	79	118.16	15.54
00 03:00	10/23 16:00	248	113	132.67	14.51
00 03:15	10/23 16:15	259	115	147.52	14.85
00 03:30	10/23 16:30	405	138	170.33	22.80
00 03:45	10/23 16:45	445	147	196.56	26.24

A. FIRE BEHAVIOR MODELING LANDSCAPE CURRENT CONDITIONS

The resulting LCP has the following parameters:

- Latitude 37
- Distance Units are Meters
- Lower Left X: 569650.000000001
- Lower Left Y: 4136630
- Columns: 3230
- Rows: 3230
- Cell Width: 1.000000
- Cell Height: 1.000000
- Elevation File: meters, 69-249
- Slope File: degrees, 0-54
- Aspect File: Degrees Azimuth, 0-359
- Fuel File: Fuel Models, Numbers: 91 93 98 99 101 102 103 106 121 122 124 141 142 145 147 161 162 163 165 181 182 183 184 185 186 187 188 189 202
- Canopy Cover: Percent, 0-100 (from California Forest Observatory data)
- Canopy Height: Meters, 0-60 (from California Forest Observatory data)
- Crown Base: Meters, 0-10 (from California Forest Observatory data)
- Crown Bulk Density: kg/m3*100, 0-23 (from California Forest Observatory data)

Statistics Associated with Fire Behavior Scenarios – Post-Treatment Conditions

Table 11. Fire growth acreage table for Fire Potential October Scenarios– post treatment.

Elapsed Time	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	3	0	0.41	0.41
00 00:30	10/23 13:30	25	2	2.33	1.92
00 00:45	10/23 13:45	95	10	6.48	4.15
00 01:00	10/23 14:00	121	15	12.82	6.34
00 01:15	10/23 14:15	154	53	24.49	11.67
00 01:30	10/23 14:30	174	75	34.40	9.91
00 01:45	10/23 14:45	171	69	43.64	9.24
00 02:00	10/23 15:00	152	60	54.16	10.52
00 02:15	10/23 15:15	123	47	67.86	13.70
00 02:30	10/23 15:30	168	68	79.37	11.51
00 02:45	10/23 15:45	210	59	91.42	12.05
00 03:00	10/23 16:00	273	85	109.00	17.57
00 03:15	10/23 16:15	266	98	124.35	15.35
00 03:30	10/23 16:30	410	134	143.37	19.02
00 03:45	10/23 16:45	545	153	167.70	24.33

Table 12. Fire growth acreage table for Fire Potential August Scenarios – post treatment.

Elapsed Time	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	2	0	0.10	0.10
00 00:30	10/23 13:30	15	0	0.56	0.46
00 00:45	10/23 13:45	12	0	2.00	1.43
00 01:00	10/23 14:00	18	4	4.33	2.34
00 01:15	10/23 14:15	31	11	6.73	2.39
00 01:30	10/23 14:30	14	4	9.54	2.81
00 01:45	10/23 14:45	23	7	12.87	3.33
00 02:00	10/23 15:00	25	12	15.91	3.05
00 02:15	10/23 15:15	38	19	19.95	4.04
00 02:30	10/23 15:30	37	25	24.08	4.13
00 02:45	10/23 15:45	55	19	30.40	6.32
00 03:00	10/23 16:00	87	19	37.39	6.99
00 03:15	10/23 16:15	112	34	45.91	8.52
00 03:30	10/23 16:30	128	41	54.67	8.76
00 03:45	10/23 16:45	114	48	63.02	8.35

Table 13. Fire growth acreage table for Fire Potential October Scenarios – post treatment.

Elapsed Time	Date/Time	# of Fires	Enclaves	Total Acres	Timestep Acres
00 00:15	10/23 13:15	1	0	0.03	0.03
00 00:30	10/23 13:30	1	0	0.20	0.17
00 00:45	10/23 13:45	1	0	0.46	0.26
00 01:00	10/23 14:00	1	0	0.84	0.38
00 01:15	10/23 14:15	22	1	1.59	0.75
00 01:30	10/23 14:30	43	2	3.62	2.03
00 01:45	10/23 14:45	22	9	6.48	2.86
00 02:00	10/23 15:00	6	3	8.38	1.90
00 02:15	10/23 15:15	24	3	10.61	2.23
00 02:30	10/23 15:30	44	7	13.73	3.12
00 02:45	10/23 15:45	126	8	21.25	7.51
00 03:00	10/23 16:00	156	23	33.53	12.28
00 03:15	10/23 16:15	186	57	45.89	12.36

00 03:30	10/23 16:30	237	76	64.56	18.67
00 03:45	10/23 16:45	228	99	77.60	13.04