

# Fire Behavior Analysis Report

## Cielo Vista



Prepared for:  
**Orange County Fire Authority**  
Planning and Development Services  
Prepared By:



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## Purpose of Report

Firesafe Planning Solutions performed an assessment of the risks related wildland fire and to establish the appropriate criteria for a defensible space installation and maintenance program that will reduce the intensity of a wildfire approaching the Cielo Vista residential community. This report will provide the results of the assessment and provide objective support of the defensible space installation and maintenance program for this community that is equal to or greater than the risk which would be encountered in a worst case scenario. The study takes into consideration existing/future vegetative interface fuels, topography, and weather conditions during a fire. The report provides results of computer calculations that measured the fire intensity from a worst case scenario wildfire in both the extreme (Santa Ana- NE wind) and the predominate (Onshore – Southwest wind) conditions. The results of fire behavior calculations have been incorporated into the fire protection design built into the Cielo Vista development.

## Geographic Description

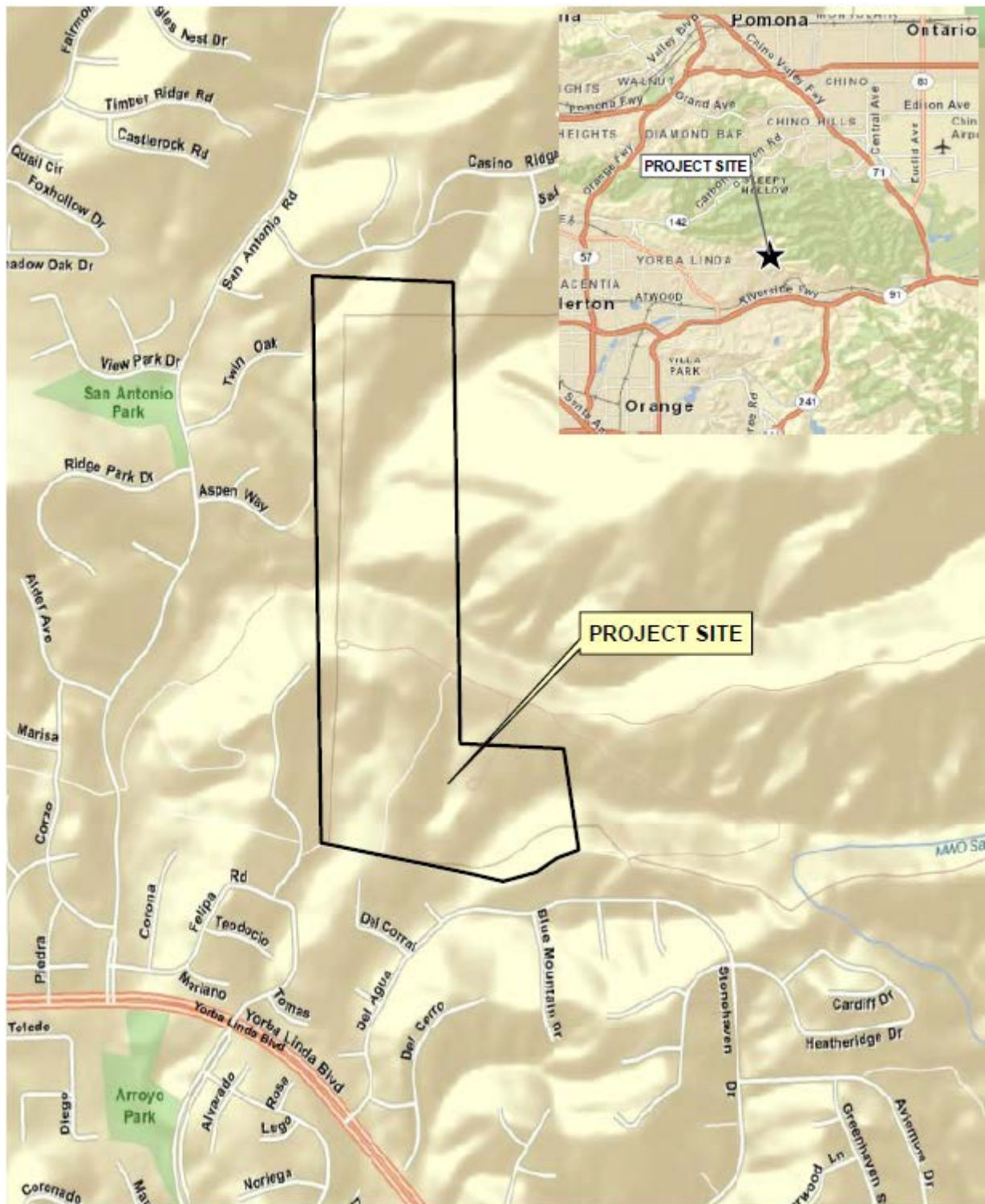
The Cielo Vista site is located in a Fire Hazard Severity Zone in Orange County within the City of Yorba Linda's sphere of influence but within the unincorporated area of Orange County. The Cielo Vista Project proposes to develop a maximum of 112 single-family dwellings on approximately 84 acres located in unincorporated Orange County. The proposed dwellings and associated infrastructure would occupy approximately 47.6 acres of the project site, while approximately 36.3 acres of the site would be preserved as permanent open space. The permanent open space would consist of the site's natural habitat as well as the Project's fuel modification zones, but exclusive of private slopes, water quality basins and roadways.



The proposed project is bordered by existing development to the west, north and south. The west and south sides of Cielo Vista has interface areas which are typical of existing development in the area. The east and north sides of the proposed community are bounded by open space areas which will create wildland interfaces at these locations. Further to the north is the existing Casino Ridge development.

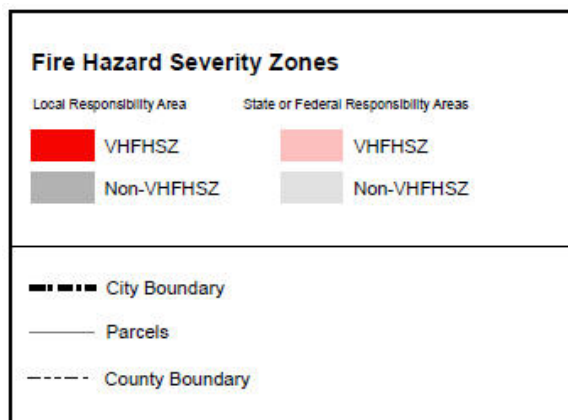
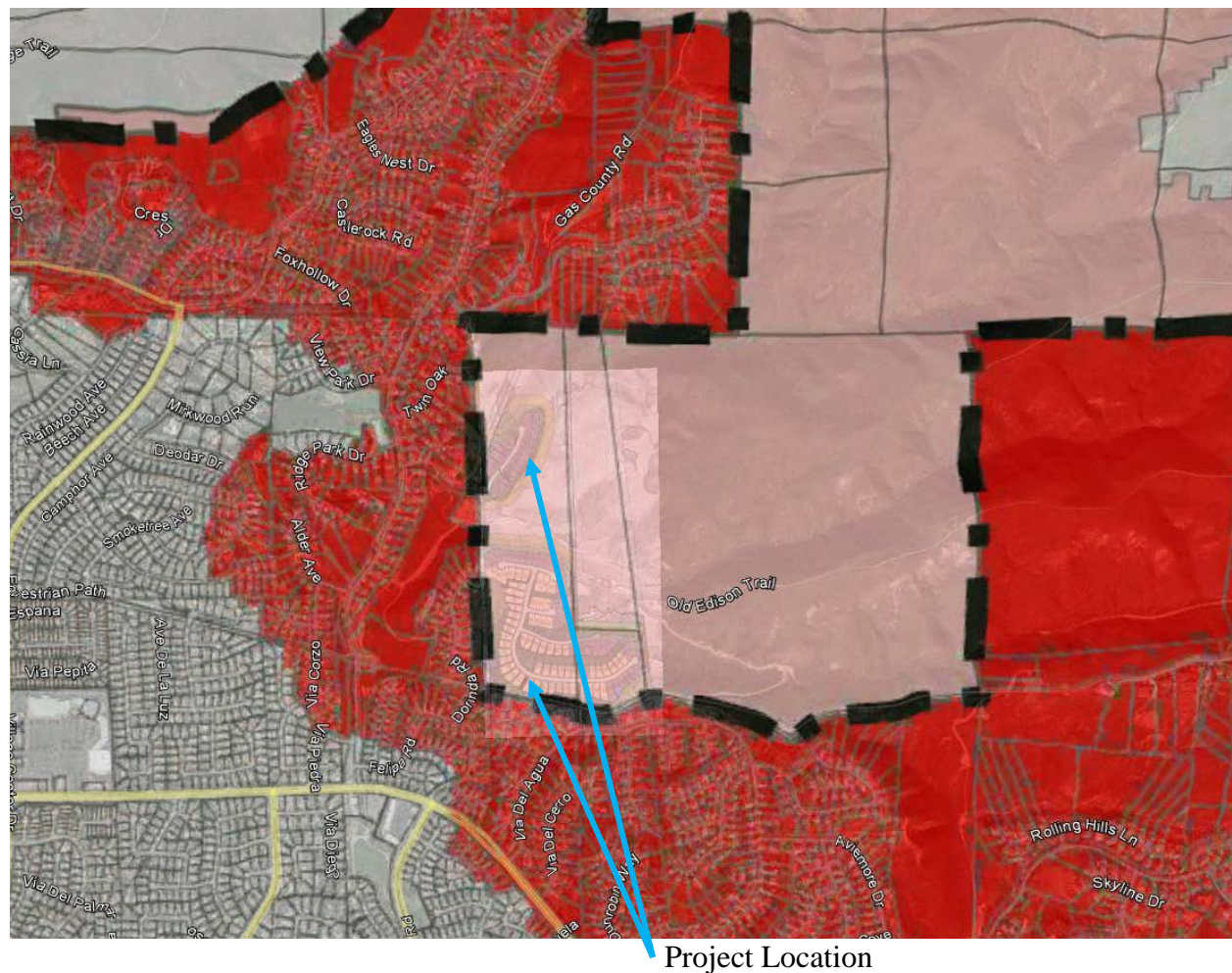
On the next page, the *Regional Location and Project Vicinity Map* from the draft EIR has been provide for reference. To the left is the project super imposed on an aerial photo of the project area.





Regional Location and Project Vicinity Map from the draft EIR

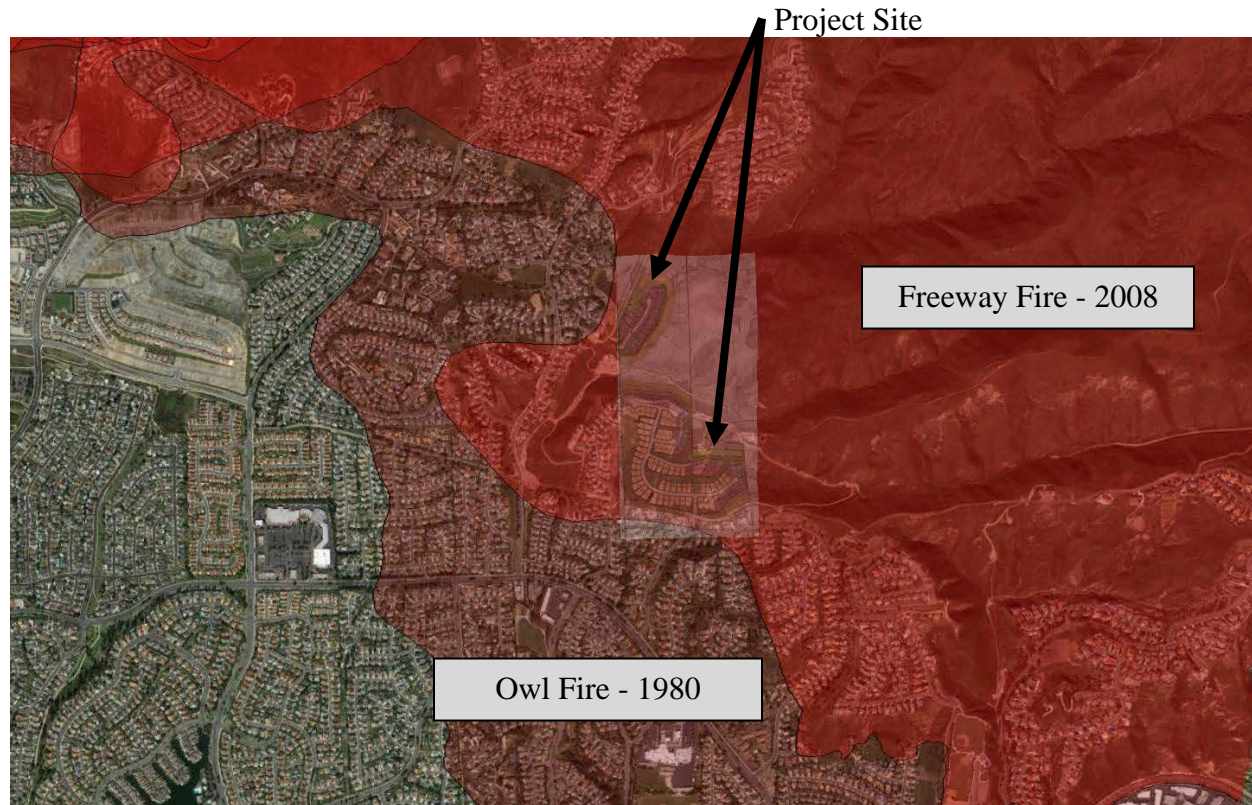
## CAL FIRE Local Responsibility Area Very High Fire Hazard Severity Zone Map



As shown above, the project site is in the State Responsibility Area (SRA) as identified by CAL FIRE per state law and is completely within Very High Fire Hazard Severity Zone of that map.



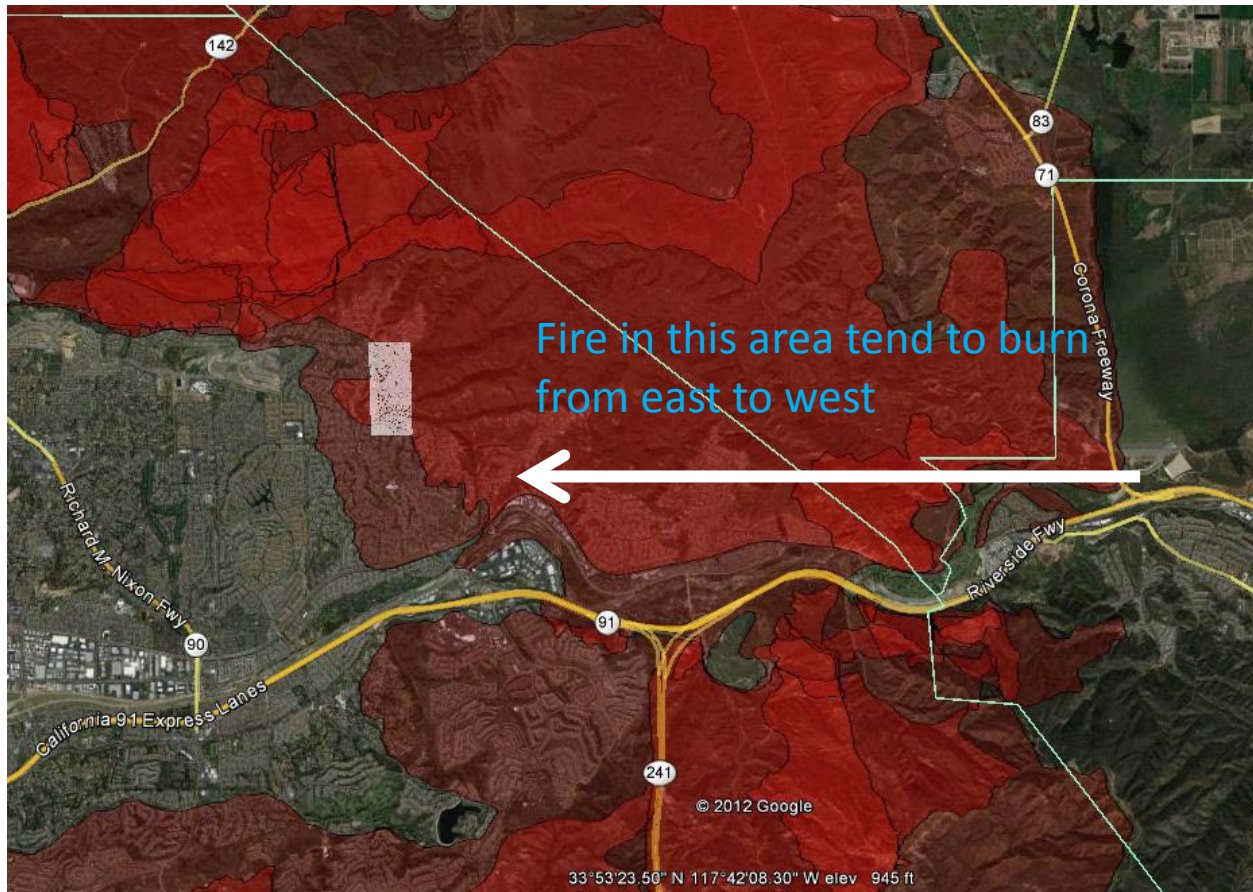
## Fire History



Only two fires have occurred on the project site that are within the CalFire database. The first began on October 28, 1980; the Owl fire consumed over 18,330 acres in Orange and Riverside counties while the Freeway Complex started on November 15, 2008 and burned 30,305 acres. The Owl fire destroyed three structures, which were scheduled for demolition before the fire. The Freeway Complex destroyed 187 homes, damaged another 127 homes. Two commercial structures were destroyed and two others damaged. It should be noted that structures that survived the 1980 fire, were destroyed during the 2008 fire. According to the After Action Report from the Orange County Fire Authority, all structures damaged or destroyed were impacted by ember intrusion rather than by radiant heat or direct flame contact from the wildland. Some structures did burn through fire communicating from one burning structure to the next.

Historical fire corridors exist to the north and south of the project site. The large majority of the fires within the area in the CalFire database have burned from the east to the west under high wind conditions and normally in the fall. The graphic on the next page shows some of these fires and the ultimate fire perimeters when they were finally contained.

## Fire Travel within the Historic Fire Corridors



## Fire Behavior

Firesafe Planning Solutions used a computer software program titled, “BehavePlus Fire Modeling System 5.0.4” to predict the level of wildfire intensity for a fire approaching Cielo Vista. BehavePlus, is a fire behavior prediction and fuel modeling system and is one of the most accurate methods for predicting wildland fire behavior. The BehavePlus fire behavior computer modeling system is utilized by wildland fire experts nationwide. Vegetative fuels are recognized as fuel models within the BehavePlus program. The fuel models in the computer program, are also referenced from the book titled, “Aids to Determining Fuel Models for Estimating Fire Behavior”. The fuel models were designed to aid in determining fuel types and are used in calculating and estimating fire behavior. We used BehavePlus to measure the intensity of a fire moving towards this development.

The fire model describes the fire behavior only within the flaming front of the fire. The primary moving force in the fire is dead fuel less than ¼” in diameter. These are the finest fuels that carry the fire. Fuels larger than ¼” contribute to fire intensity, but not necessarily to fire spread as much as the fine fuels. The BehavePlus fire model describes a wildfire spreading through surface fuels, which are the burnable materials within 6’ of the ground and contiguous to the ground.

This type of modeling will demonstrate that the proposed protection is the best fire defense system for Cielo Vista. The Modeling will show that the structures are significantly further away than the most extreme flame lengths and intensity that would be produced. Instead of estimating with the exact fuel models for calculating fire behavior, we have used worst case scenario factors and fuel models to ensure a further safety cushion in the computer fire behavior calculations and results analysis.

### BehavePlus Related References:

1. Aids to Determining Fuel Models for Estimating Fire Behavior, Hal E. Anderson. General Technical Report INT-122 April 1982. United States Department of Agriculture - Forest Service, Intermountain Station, Ogden, Utah 84401.
2. BehavePlus: Fire Behavior Prediction and Fuel Modeling System - BURN Subsystem. General Technical Report INT-194. Patricia L. Andrews, United States Department of Agriculture - Forest Service, Intermountain Station, Ogden, Utah 84401

### Wildland Interface Fuel Types

For the purposes of modeling in the plan, Fuel Models gs2, sh5, model 4 and SCAL18 were used:

Fuel **Model GS2** is shrubs that are 1 to 3 feet high and a moderate grass load. Spread rate high; flame length moderate.

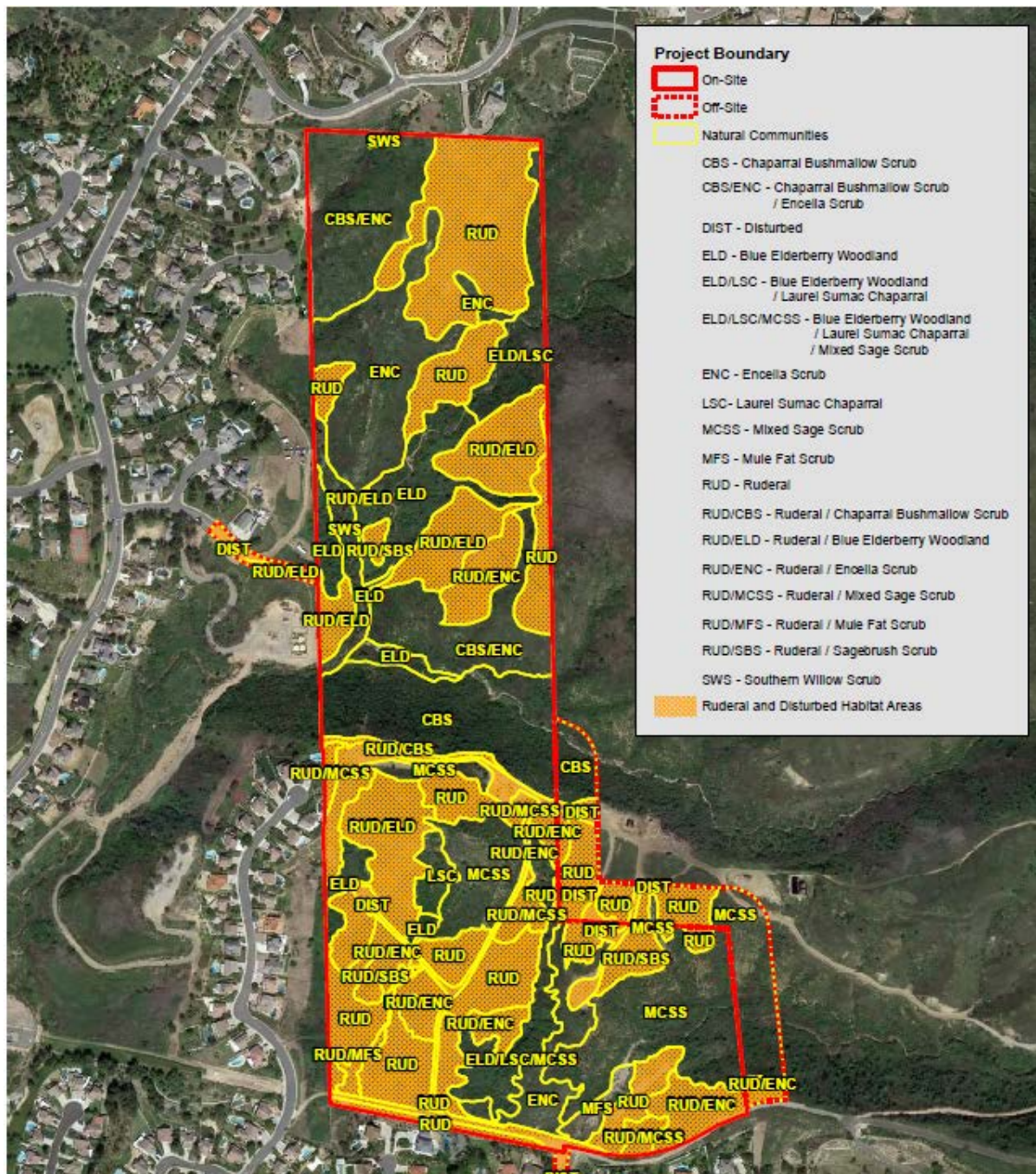
Fuel **Model SH5** is a heavy shrub load, depth 4-6 feet – representative of area of brush growth on and offsite (all aspects) where slope is not significant enough for Fuel Model 4 growth.



Fuel **Model 4** is a heavy southern mixed chaparral – representative of the north aspect natural hillside where brush is growing offsite of the project in a typical southern California wildland interface.

Fuel **Model SCAL18** is a southern California specific model for coastal sage scrub and northern mixed chaparral with an average fuel depth of 3 feet.

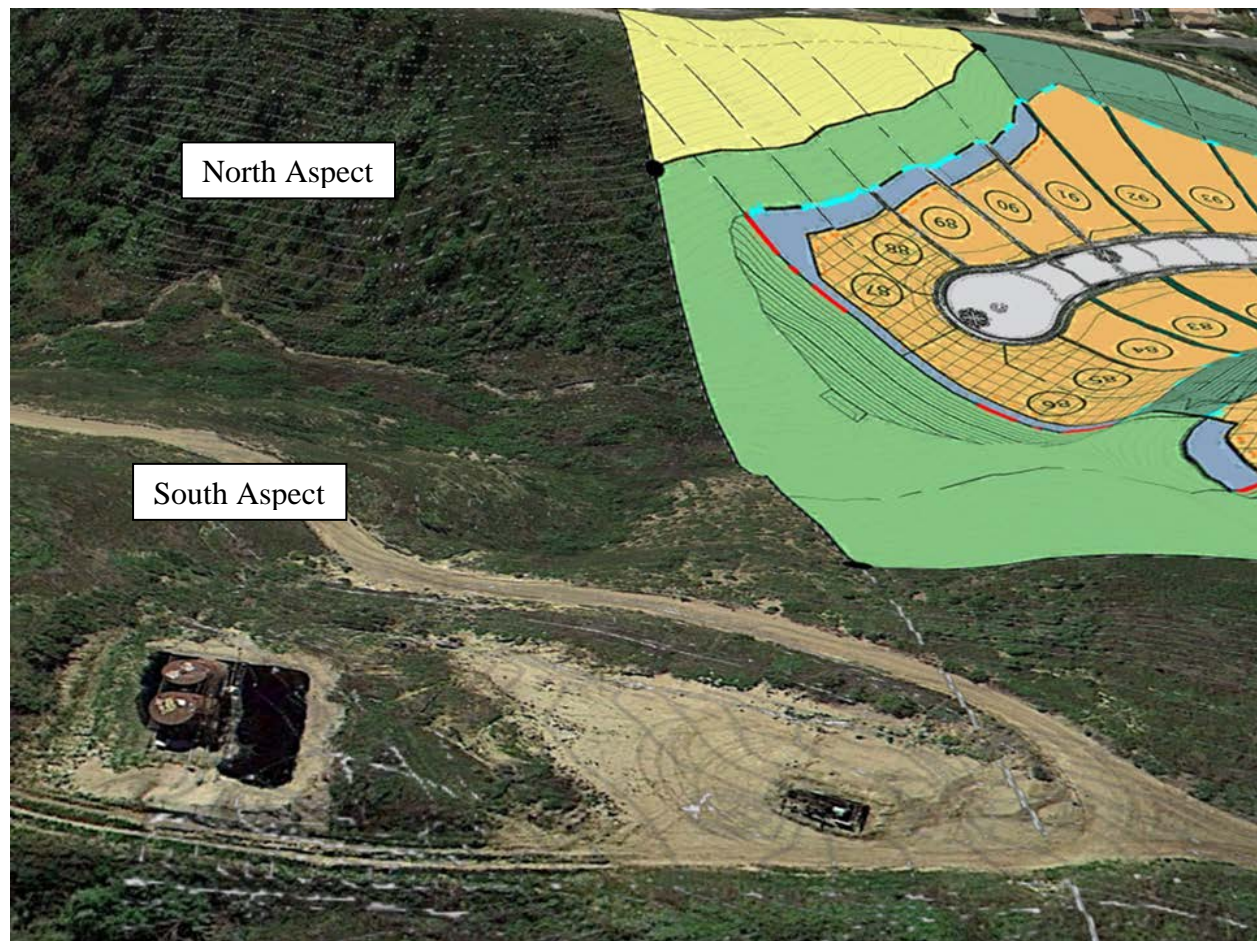
The map below shows the site overlaid on an aerial photo. Plant communities are shown in the legend. A larger copy is provided in the Appendix A





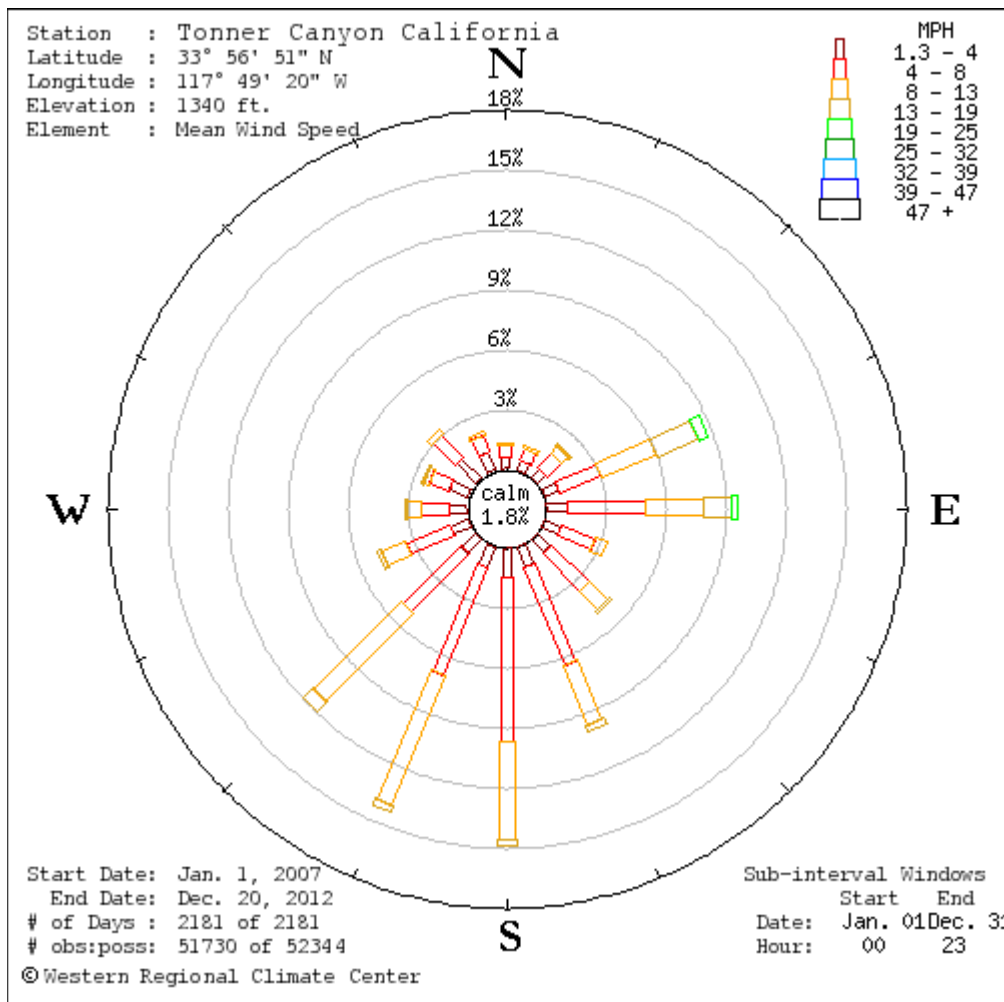
### **Fuels Summary**

The predominate fuels in the project site are grasses, grass/scrub mixtures and chaparral. The only locations which have areas of moderate to heavy fuels are on the northern aspects of the steeper canyon. Some of these areas will be adjacent to the project site but none are below or immediately aligned to the with the wind/topograhpy so as to create a condition where slope, wind and fuel are in full alignment. All of the fuels within the development area will be removed and replaced with plants from the approved palette. A series of photos are used to show the predominate vegetation on the site in Appendix B of this report. The graphic below illustrates the difference in fuel loading on the north and south aspects adjacent to the project site.



### **Wind Patterns and Weather Inputs**

After a review of the local RAWS (Remote Access Weather Station) data, the most extreme wind patterns and speeds relating to wildfires were enter into the modeling programs (BEHAVE and Wind Ninja). All other lesser wind patterns and wind speeds normally produce less fire intensity based on a fire in wildland fuels. Several RAWS are available in the area of the project but the one closest only has two years of data so one a few miles away has been used. Since some data gaps exist, data from two sites have been used. First is Tonner Canyon, for which a wind rose has been completed and is shown the following page. This graphic clearly shows that the predominate wind is south to southwest and the strongest winds are from the east and east-northeast. The other graphic is from the RAWS in Brea which has five years of data. The summary is shown and graphed on the following page.



## History for KCABREA1

Northern Brea, Brea, CA — [Current Conditions](#)

Daily Summary for January 20, 2007 - December 21, 2012

January 20 2007 - TO - December 21 2012 [Go](#)

[Daily](#) [Weekly](#) [Monthly](#) [Yearly](#) **Custom**

	High:	Low:	Average:
Temperature:	106.6 °F	0.0 °F	64.2 °F
Dew Point:	72.8 °F	-99.9 °F	49.5 °F
Humidity:	100.0%	1.0%	64.9%
Wind Speed:	14.0mph from the North	-	1.4mph
Wind Gust:	31.0mph from the North	-	-
Wind:	-	-	SSW
Pressure:	30.47in	29.09in	-
Precipitation:	61.60in		

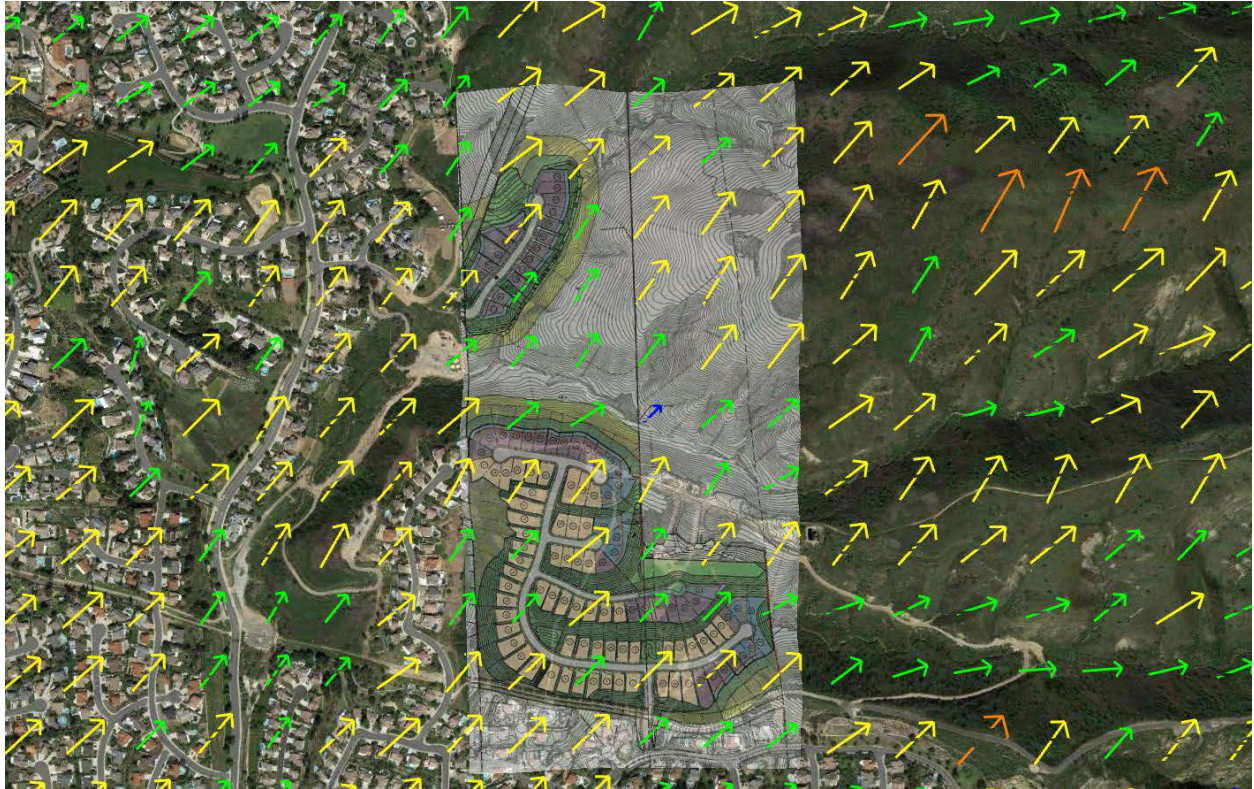


The two most extreme wind patterns/wildland fuel alignments are:

- Temperature and relative humidity max/min are also taken from the RAWS data.

Using the Wind Ninja software, the wind and the relationship to the topography has been determined to NOT be a factor with this development. Limited wind channeling is achieved on any wind pattern at the project site. The changes in topography at the project site are simply too minor to overcome the wind in any scenario. The predominate wind (from the southwest) intersection the project boundaries from developed areas where no significant wildland fuel bed exist as shown below.

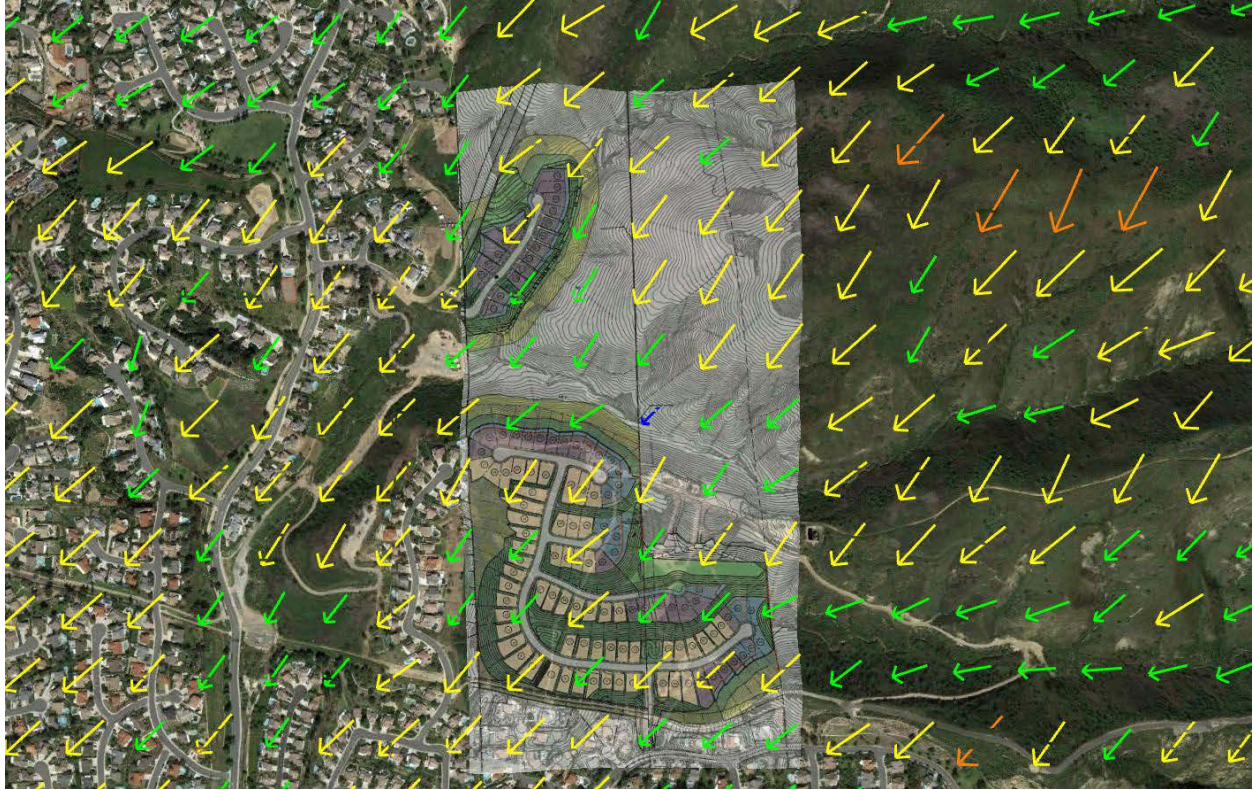
#### Southwest Wind



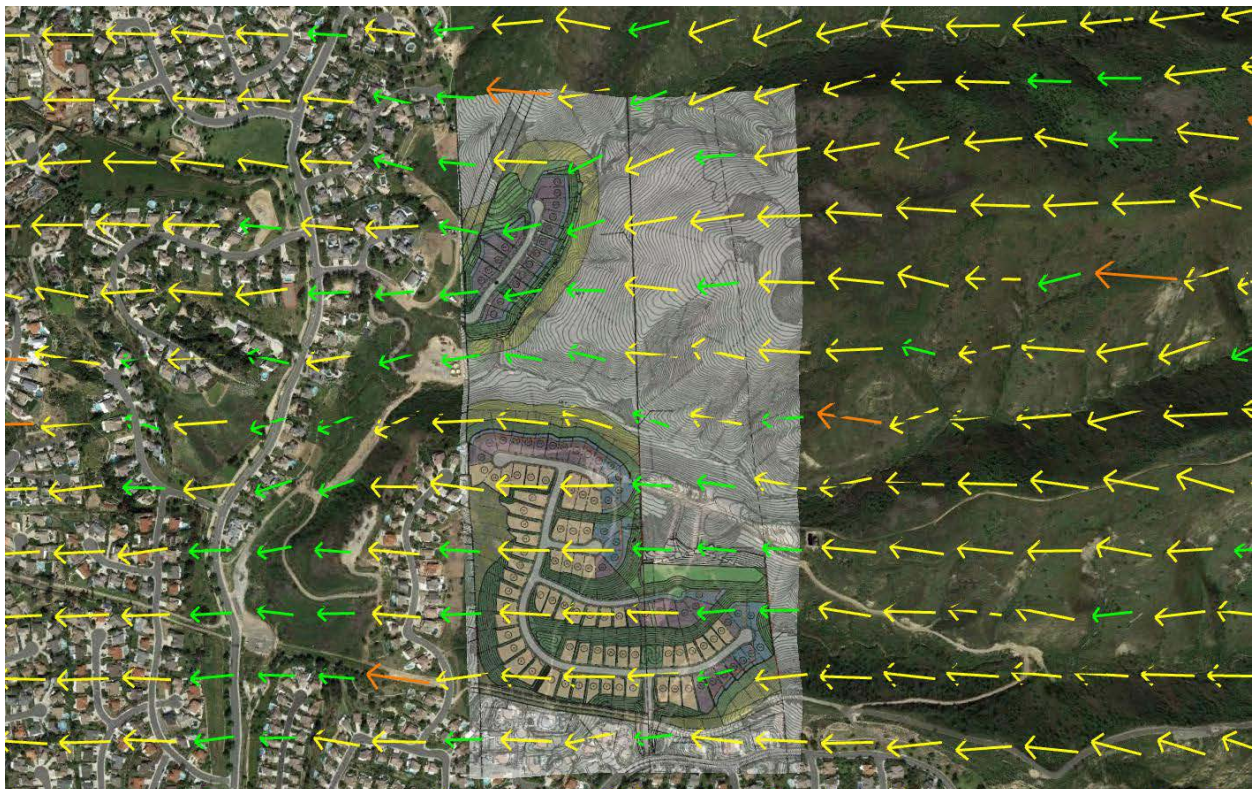
The graphics on the next page show a northeast wind (top) and an east wind (bottom). More wind channeling occurs with the NE wind than the E wind as the E wind runs parallel with the canyons thereby creating very little resistance to change the direction. Some ridgeline acceleration (orange arrows) occurs away from the development site and above the project site elevation. Some minor wind sheltering (green and blue arrows) occurs in the deeper drainages between the two development sites. Yellow arrows are average wind speed and the modeling showed no extreme acceleration (red arrows) near the project site.



### Northeast Wind



### East Wind



Note: no wind acceleration or wind channeling on the site.





Wind from the east will travel down the two canyons east of the project site as shown above. Any fire within these canyons will be influenced by the wind and by the topography of the canyon. Once again the difference in fuel load on the north and south aspects is clearly visible and it should also be noted that the slope of the northern aspects is also significantly greater.

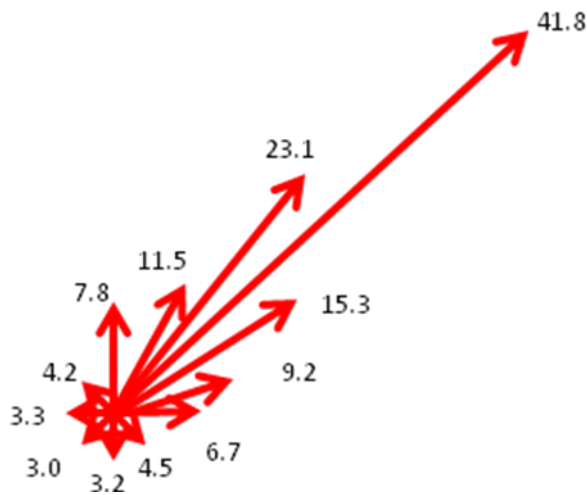
#### **BehavePlus Fire Behavior Inputs and Results:**

Inputs for the Behave Plus Fire Behavior Model were as follows:

Moisture scenarios used are extreme. One-hour fuels at 3%, ten-hour at 4% and hundred-hour at 5%. Herbaceous live fuels are modeled at fully cured (30%) and woody fuels at 50%. Model runs have been completed for various aspects on the two wind scenarios and for an east wind with slope influences. All scenarios assumed a 100% (1:1 slope), except the north aspect influence which used 200% as the worst case. Aspects are shown on the model scenario and the spread direction is shown in 15 degree increments to show the slope effect and when and/or if it over powers the wind.

Behave runs have been completed for both the NE Santa Ana wind and the onshore SW wind. The moisture scenario are unchanged to simulate the rear dry onshore that can occur when the Santa Ana winds break down and on shore flow is resumed but the air immediately offshore is the dry air that has been pushed out to sea by the NE wind event. This condition is rare and only last for a short period of time as the air further out to sea, will have increased moisture level when then return to the land by the onshore breeze. An east wind has been modeled to show the effects of fuel and slope in the canyons to the east of the project site and to get a better idea of how the fire will behave in these interface areas.

The Behave outputs are attached in the appendixes but have been summarized here for discussion purposes. The fire that has been modeled here is a fast running wind driven fire that burns in an elliptical pattern shown below by the red arrows. To the right are the calculated flame lengths for each of the directions of spread for the worst case scenarios modeled. We find that a maximum flame length for SCAL18 of 41.8 feet is possible at the head of the fire, when the fire is running across the slope with a continuous fuel bed that is consistent enough to produce a self-sustaining, self propagating fire. It is important to note that flames only 15 degrees out of the perfect alignment of all the factors are about one-half the size if the flaming point of the fire. Another 15 degrees drops the flame lengths to less than 1/3 of the flaming point. Fire to the flanks and backing fire are small enough to extinguished using hand tools.



Flame Length (ft)			
Spread	Fuel Model		
Dir			
deg	SCAL18	gs2	sh5
0	3.2	2.1	4.2
15	3.1	2	4
30	3	1.9	3.9
45	3	1.9	3.8
60	3	1.8	3.8
75	3.1	1.9	3.9
90	3.3	1.9	4
105	3.5	2	4.2
120	3.8	2.1	4.5
135	4.2	2.3	4.9
150	4.9	2.6	5.6
165	6	2.9	6.5
180	7.8	3.5	8.1
195	11.5	4.5	10.8
210	23.1	6.5	16.8
225	41.8	11.6	37.3
240	15.3	23.1	34.2
255	9.2	10.3	16.1
270	6.7	6	10.5
285	5.4	4.3	7.9
300	4.5	3.4	6.4
315	4	2.9	5.5
330	3.6	2.5	4.9
345	3.4	2.3	4.5
360	3.2	2.1	4.2

A summary matrix of the modeling result is found on the next four pages

	SouthWest 30 mph				East 50mph				East 50 mph - N Aspect					East 50 mph - S Aspect	
Surface Rate of Spread (ch/h)															
Spread	Fuel				Fuel				Fuel					Fuel	
Dir															
deg	SCAL18	gs2	sh5		SCAL18	gs2	sh5		SCAL18	gs2	sh5	4		SCAL18	gs2
0	8.7	14.9	24.5		1.9	4.1	6		0.9	2.7	3.6	7.8		3.2	4.9
15	18.2	30.6	50.6		1.5	3.2	4.8		0.9	2.4	3.2	7		2.4	3.8
30	58	90.7	153.9		1.3	2.7	4		0.8	2.2	3	6.4		1.9	3.1
45	229.2	275.4	505.9		1.1	2.4	3.5		0.8	2.1	2.9	6.1		1.6	2.6
60	58	90.7	153.9		1	2.2	3.2		0.8	2	2.9	6.1		1.4	2.4
75	18.2	30.6	50.6		1	2.1	3.1		0.9	2.1	3	6.2		1.3	2.2
90	8.7	14.9	24.5		1	2	3		1	2.2	3.3	6.6		1.2	2.1
105	5.2	8.9	14.6		1	2.1	3.1		1.1	2.4	3.6	7.3		1.2	2.1
120	3.5	6.1	10		1	2.2	3.2		1.4	2.7	4.2	8.4		1.2	2.2
135	2.6	4.5	7.4		1.1	2.4	3.5		1.7	3.3	5.2	10.1		1.2	2.3
150	2.1	3.6	5.9		1.3	2.7	4		2.4	4.1	6.8	12.9		1.4	2.6
165	1.8	3	5		1.5	3.2	4.8		3.7	5.6	9.5	17.6		1.5	3
180	1.5	2.7	4.4		1.9	4.1	6		6.5	8.4	15	26.7		1.8	3.6
195	1.4	2.4	4		2.6	5.5	8		15.3	14.3	28.3	46.9		2.3	4.7
210	1.3	2.3	3.8		3.8	8.1	11.9		70	31.2	74.3	107.2		3.1	6.5
225	1.3	2.3	3.7		6.4	13.6	20.1		252.8	111.6	419.8	431.3		4.5	10.1
240	1.3	2.3	3.8		13.8	28.9	42.6		28.5	497.7	347.2	1296.4		7.5	18.5
255	1.4	2.4	4		48.1	97.3	145.2		9.5	85.5	67	208.7		15.5	45.2
270	1.5	2.7	4.4		322.9	504.5	814.2		4.7	26.8	26.5	70.9		49.5	202.7
285	1.8	3	5		48.1	97.3	145.2		2.9	12.9	14.4	35.6		258	268.7
300	2.1	3.6	5.9		13.8	28.9	42.6		2	7.8	9.2	21.9		60.2	53.9
315	2.6	4.5	7.4		6.4	13.6	20.1		1.5	5.3	6.6	15.2		17.4	20.6
330	3.5	6.1	10		3.8	8.1	11.9		1.2	4	5.1	11.5		8.1	11
345	5.2	8.9	14.6		2.6	5.5	8		1	3.2	4.2	9.2		4.7	6.9
360	8.7	14.9	24.5		1.9	4.1	6		0.9	2.7	3.6	7.8		3.2	4.9



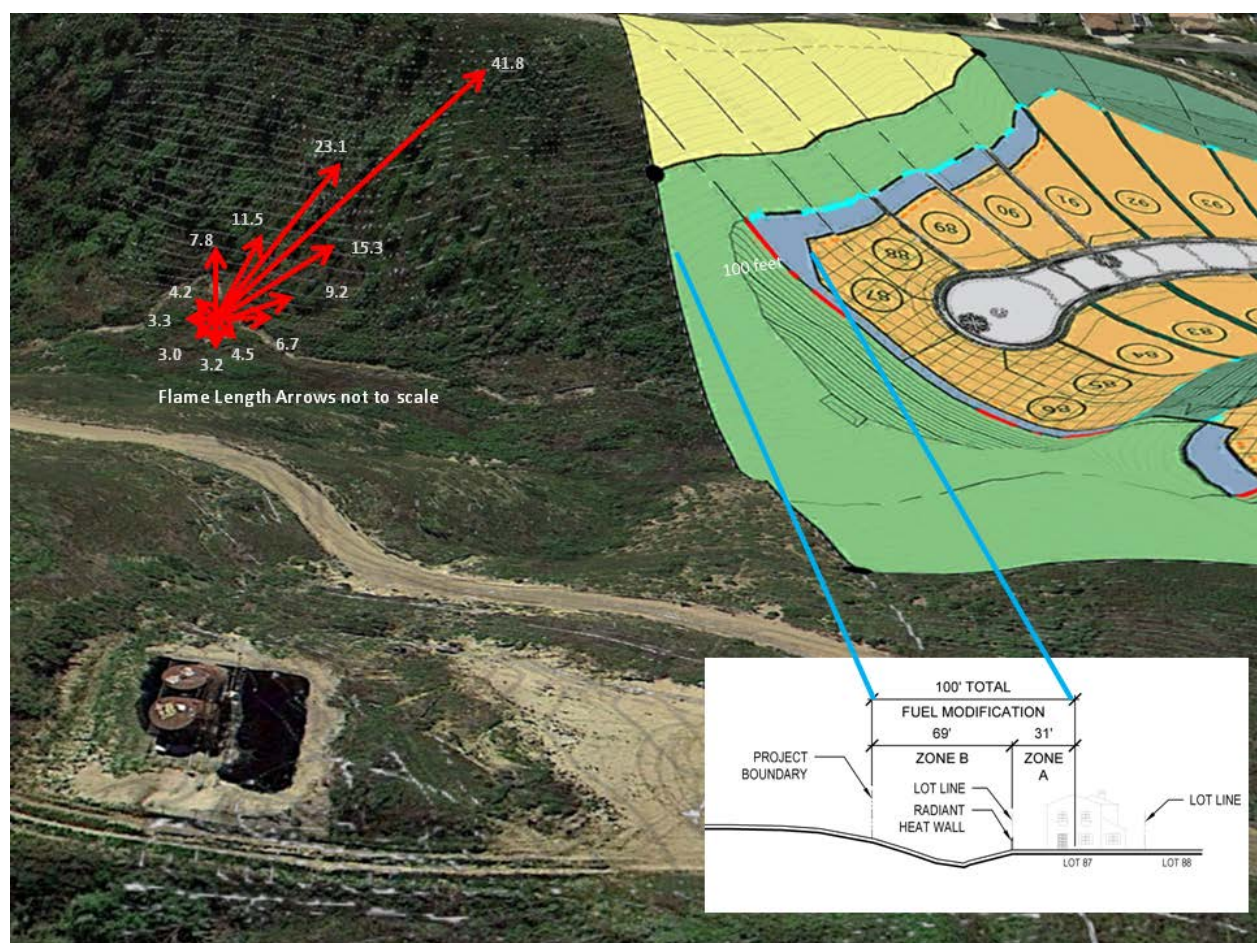
	SouthWest 30 mph					East 50mph					East 50 mph - N Aspect					East 50 mph - S Aspect	
Fireline Intensity (Btu/ft/s)																	
Spread	Fuel Model					Fuel Model					Fuel Model					Fuel	
Dir																	
deg	SCAL18	gs2	sh5		SCAL18	gs2	sh5		SCAL18	gs2	sh5	4		SCAL18	gs2		
0	652	156	866		143	43	212		70	28	127	469		239	52		
15	1363	321	1791		114	34	168		65	25	114	416		177	40		
30	4348	953	5446		96	29	141		62	23	107	384		140	32		
45	17182	2893	17901		84	25	124		61	22	103	368		118	28		
60	4348	953	5446		77	23	114		63	21	104	364		103	25		
75	1363	321	1791		73	22	108		67	22	107	373		94	23		
90	652	156	866		72	21	106		74	23	115	397		89	22		
105	388	94	518		73	22	108		85	25	129	437		88	22		
120	264	64	353		77	23	114		102	29	150	502		89	23		
135	196	48	263		84	25	124		131	35	183	604		93	24		
150	156	38	209		96	29	141		180	44	239	770		102	27		
165	131	32	176		114	34	168		274	59	337	1055		115	31		
180	115	28	155		143	43	212		487	88	531	1596		137	38		
195	106	26	142		193	58	285		1146	150	1000	2805		172	49		
210	100	24	135		285	85	420		5247	327	2627	6412		230	69		
225	99	24	132		483	143	710		18950	1172	14854	25794		336	106		
240	100	24	135		1031	304	1507		2134	5229	12283	77530		561	194		
255	106	26	142		3604	1022	5139		709	898	2370	12481		1163	475		
270	115	28	155		24210	5300	28809		356	281	938	4240		3713	2129		
285	131	32	176		3604	1022	5139		218	136	508	2130		19342	2823		
300	156	38	209		1031	304	1507		152	82	326	1307		4513	566		
315	196	48	263		483	143	710		115	56	233	907		1303	217		
330	264	64	353		285	85	420		93	42	180	685		605	115		
345	388	94	518		193	58	285		79	33	148	553		355	73		
360	652	156	866		143	43	212		70	28	127	469		239	52		

	SouthWest 30 mph					East 50mph					East 50 mph - N Aspect					East 50 mph - S Aspect	
Flame Length (ft)																	
Spread	Fuel Model					Fuel Model					Fuel Model					Fuel	
Dir																	
deg	SCAL18	gs2	sh5		SCAL18	gs2	sh5		SCAL18	gs2	sh5	4		SCAL18	gs2		
0	8.9	4.6	10.1		4.4	2.5	5.3		3.2	2.1	4.2	7.6		5.6	2.8		
15	12.4	6.4	14.1		4	2.3	4.8		3.1	2	4	7.2		4.9	2.4		
30	21.2	10.6	23.5		3.7	2.1	4.4		3	1.9	3.9	7		4.4	2.2		
45	39.9	17.6	40.7		3.5	2	4.1		3	1.9	3.8	6.8		4	2.1		
60	21.2	10.6	23.5		3.3	1.9	4		3	1.8	3.8	6.8		3.8	2		
75	12.4	6.4	14.1		3.2	1.9	3.9		3.1	1.9	3.9	6.9		3.6	1.9		
90	8.9	4.6	10.1		3.2	1.8	3.8		3.3	1.9	4	7.1		3.6	1.9		
105	7	3.6	8		3.2	1.9	3.9		3.5	2	4.2	7.4		3.5	1.9		
120	5.8	3	6.7		3.3	1.9	4		3.8	2.1	4.5	7.9		3.5	1.9		
135	5.1	2.7	5.8		3.5	2	4.1		4.2	2.3	4.9	8.6		3.6	2		
150	4.6	2.4	5.3		3.7	2.1	4.4		4.9	2.6	5.6	9.6		3.8	2.1		
165	4.2	2.2	4.9		4	2.3	4.8		6	2.9	6.5	11.1		4	2.2		
180	4	2.1	4.6		4.4	2.5	5.3		7.8	3.5	8.1	13.4		4.3	2.4		
195	3.8	2	4.4		5.1	2.9	6.1		11.5	4.5	10.8	17.3		4.8	2.7		
210	3.7	2	4.3		6.1	3.5	7.2		23.1	6.5	16.8	25.4		5.5	3.2		
225	3.7	1.9	4.3		7.7	4.4	9.2		41.8	11.6	37.3	48.1		6.5	3.9		
240	3.7	2	4.3		10.9	6.2	13		15.3	23.1	34.2	79.9		8.3	5.1		
255	3.8	2	4.4		19.5	10.9	22.9		9.2	10.3	16.1	34.5		11.6	7.7		
270	4	2.1	4.6		46.8	23.2	50.7		6.7	6	10.5	21		19.7	15.3		
285	4.2	2.2	4.9		19.5	10.9	22.9		5.4	4.3	7.9	15.3		42.2	17.4		
300	4.6	2.4	5.3		10.9	6.2	13		4.5	3.4	6.4	12.2		21.6	8.3		
315	5.1	2.7	5.8		7.7	4.4	9.2		4	2.9	5.5	10.3		12.2	5.3		
330	5.8	3	6.7		6.1	3.5	7.2		3.6	2.5	4.9	9.1		8.6	4		
345	7	3.6	8		5.1	2.9	6.1		3.4	2.3	4.5	8.2		6.7	3.2		
360	8.9	4.6	10.1		4.4	2.5	5.3		3.2	2.1	4.2	7.6		5.6	2.8		

	SouthWest 30 mph					East 50mph					East 50 mph - N Aspect					East 50 mph - S Aspect	
Direction of Maximum Spread																	
Spread	Fuel Model					Fuel Model					Fuel Model					Fuel	
Dir																	
deg	SCAL18	gs2	sh5		SCAL18	gs2	sh5		SCAL18	gs2	sh5	4		SCAL18	gs2		
0	45	45	45		270	270	270		221	239	232	237		286	279		
15	45	45	45		270	270	270		221	239	232	237		286	279		
30	45	45	45		270	270	270		221	239	232	237		286	279		
45	45	45	45		270	270	270		221	239	232	237		286	279		
60	45	45	45		270	270	270		221	239	232	237		286	279		
75	45	45	45		270	270	270		221	239	232	237		286	279		
90	45	45	45		270	270	270		221	239	232	237		286	279		
105	45	45	45		270	270	270		221	239	232	237		286	279		
120	45	45	45		270	270	270		221	239	232	237		286	279		
135	45	45	45		270	270	270		221	239	232	237		286	279		
150	45	45	45		270	270	270		221	239	232	237		286	279		
165	45	45	45		270	270	270		221	239	232	237		286	279		
180	45	45	45		270	270	270		221	239	232	237		286	279		
195	45	45	45		270	270	270		221	239	232	237		286	279		
210	45	45	45		270	270	270		221	239	232	237		286	279		
225	45	45	45		270	270	270		221	239	232	237		286	279		
240	45	45	45		270	270	270		221	239	232	237		286	279		
255	45	45	45		270	270	270		221	239	232	237		286	279		
270	45	45	45		270	270	270		221	239	232	237		286	279		
285	45	45	45		270	270	270		221	239	232	237		286	279		
300	45	45	45		270	270	270		221	239	232	237		286	279		
315	45	45	45		270	270	270		221	239	232	237		286	279		
330	45	45	45		270	270	270		221	239	232	237		286	279		
345	45	45	45		270	270	270		221	239	232	237		286	279		
360	45	45	45		270	270	270		221	239	232	237		286	279		



The fire behavior relative to the topography and structures within the project is an important factor in the development of the fire protection system for this development. Shown below, the north aspect due east of the southerly portion of the project site has significant fuels but is not in a location that will create an expose to the project site. The red arrows (not to scale) show that an east wind carrying fire down this canyon would be influenced by the slope and fuel to have the largest flame length be upslope away from the project site structures. Flames coming at the project site would be significantly less. The vegetation in the bottom of the canyon and on the south aspect, simply do not have enough fuel to produce the large flame lengths of the north aspect. The largest flame length impacting the fuel modification zone would be less than 25 feet and well within the 2:1 ratio needed for protecting the structures. In fact, the ration would be more in line with the 4:1 ratio required for a “safety zone” where personnel and equipment would be safe without the use of radiant heat shelters.



## **Fire Behaviour Summary**

While the modeling indicates that flame lengths of just under 50 feet are possible under perfect conditions, this is unlikely due to predominate winds that drive wildland fires and arrangement of the slopes and fuel relative to the structures. The fuels are not aligned with the slope and wind and fuels are not continuous enough to drive fire behavior to the level of the equilibrium spread rates used in the modeling in most of the areas adjacent to the fuel modification zones. Flanking fire of six to eight feet maximum is expected at the property line of the lots within the development or at the base of the fuel modification zones or radiant heat walls. In all areas, the 2:1 safety ratio is achieved and in most areas the ratio is 4:1 or more.

Most of the fuels that would have been an issue with the development will be removed and replaced with approved vegetation as a part of the grading and project development.

Associated with the fuel modification plan, the Project would incorporate a landscape plan that utilizes a plant palette consisting of fire resistant plants, native and appropriate non-native drought tolerant species in accordance with Orange County Fire Authority (OCFA) guidelines. The Project's fuel modification plan would provide fire protection for the Project, as well for the existing residences to the south and west of the project site. A detailed description of the fire protection plan to be implemented for the Project and illustrations of the Project's fuel modification zones is included in Section 4.7, *Hazards and Hazardous Materials*, in this Draft EIR.

The technical results provided as part of the Fire Behavior Analysis within this report were obtained using Behave Plus version 5.0.5. and Wind Ninja software.



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Tim Chavez  
Wildland Interface Specialist

## **Fuel Modification Zones/Fire Protection Features**

The Project would implement a fire protection plan that would comply with or exceed the Orange County Fire Authority's (OCFA) standards for Very High Fire Hazard Severity Zone/Special Fire Protection Areas. Fire protection measures as part of the project would include, but are not limited to, fire-resistant structures adjoining natural open space areas and fuel modification/management to help suppress wildland fires. Several areas of the project site would require fuel modification. Fuel modification would occur within four zones with each zone designed specifically to help suppress a fire in different ways. The zones would include requirements for minimum structure setbacks, permanent irrigation systems, fire resistant plants from an approved plant list by the County, landscape and planting maintenance (i.e., thinning and removal of dead plants). On the following page is a description of the fuel modification zones.

### **ZONE A - NON-COMBUSTIBLE CONSTRUCTION:**

10'-0" to 95'-0" setback zone for non-combustible construction only. Zone A shall be maintained by the Homeowners Association.

### **ZONE B - WET ZONE (100% REMOVAL UNDESIRABLE SHRUBS):**

First 5'-0" to 186'-0" from Zone A. Zone B shall be cleared of all undesirable plant species, irrigated, and planted with species from Attachment 8. Exceptions to save desirable species may be submitted for approval by the OCFA on a site specific basis.

### **ZONE C - THINNING ZONE (50% THINNING NATIVE SHRUBS):**

21'-0" - 100'-0" out from Zone B. Zone C shall be non-irrigated and required horizontal and vertical spacing of plant groups in accordance with Attachment 6 and removal of all dead and dying vegetation and undesirable species from Attachment 7. Minimum thinning percentage of plant removal is 50%. Zone C area shall be maintained the Homeowners Association.

### **SPECIAL MAINTENANCE AREA - WET ZONE AND DRY ZONE:**

The Special Maintenance Areas have maintenance requirements to reduce the chances of ignition from wildfires. They need maintenance just as fuel modification zones do and shall be maintained on a year round basis, with removal of all dead and dying plant material, replacement of dead or diseased species with plant material with the same growth characteristics from the approved landscape plans. Irrigation shall be verified on a regular basis to ensure it is in a working condition and the plants shall be irrigated as necessary to keep them healthy with their appropriate moisture content. A copy of the approved Landscape Plans shall be provided to the HOA by the developer and remain on record indefinitely with the HOA. Copies of plans shall be provided to the contracted maintenance company. It is the responsibility of the HOA to forward a copy of the approved Landscape Plans to any new property management company. The HOA shall inspect the special maintenance areas twice a year to ensure the special maintenance areas retain the original design of the areas.

The following are further Special Maintenance Area (SMA) requirements:

- Other than trees, a large percentage of the special maintenance area shall consist of a ground cover that naturally grows no taller than 2 feet in height.

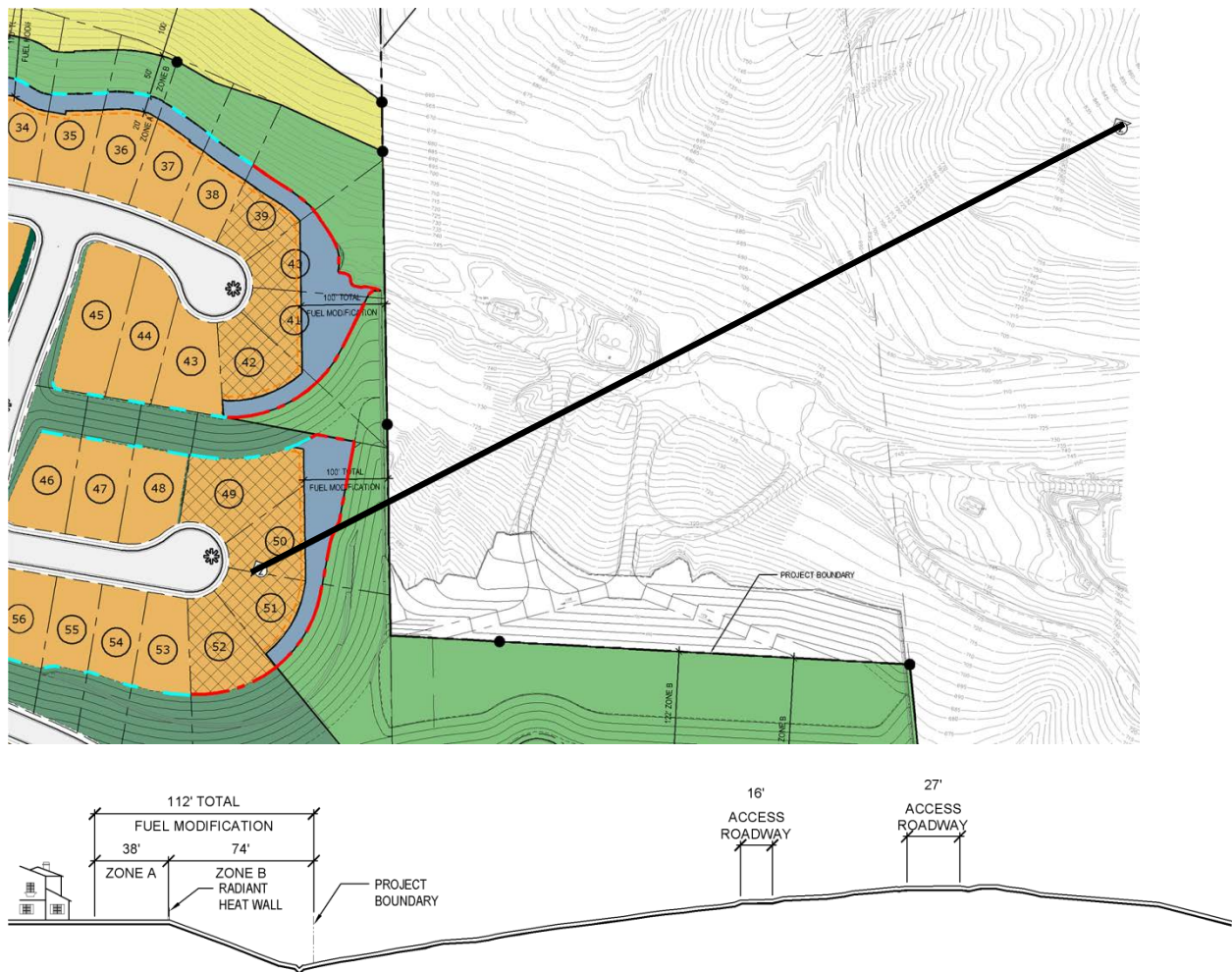


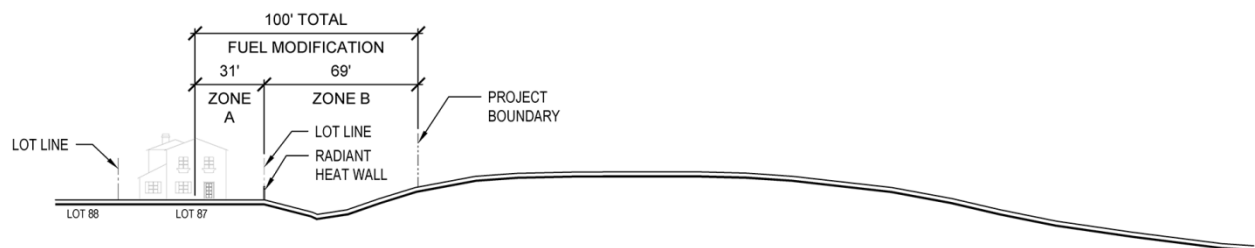
- The areas are completely irrigated and have plants that need irrigation to retain healthy fuel moisture.
- Any dead and dying specimens and branches shall be removed.
- Leaf litter on top of vegetative cover shall be removed.
- Landscape design Plans shall be retained by the HOA indefinitely and the slopes shall always remain as they were designed.
- As plants migrate or new plants seed-in, those shall be removed to retain the original design.
- Future changes to slope designs shall be approved by OCFA.
- The maintenance requirements of the special maintenance areas shall be factored into the funding with the fuel modification zones.
- Special Maintenance Areas shall be designed and also maintained as to not provide direct flame or an excessive amount of radiant heat on structures.
- Special Maintenance Areas will have a limited use of native grasses as approved by OCFA.

#### **PRIVATE HOMEOWNER SIDE YARD SLOPES:**

Planting Plans for the private homeowner side yard slopes shall be reviewed by the HOA and shall be devoid of eucalyptus, juniper, cedar, cypress, washingtonia robusta (mexican fan palm), acacia (except for acacia desert carpet) and pine trees, California sagebrush, chamise, buckwheat and black and white sage (Salvia spp.). Additionally California Fescue (Festuca californica) shall not be planted or included within any seed mix as recorded within the CC&R's.

Two areas within the project site will not be capable of providing a typical 170 foot fuel modification zone. These areas would be protected in an equal but alternative method by increasing the irrigated zone(s) to 100 feet and providing a six foot high radiant heat wall at the bottom of the fuel modification zone (indicated by dotted red line).

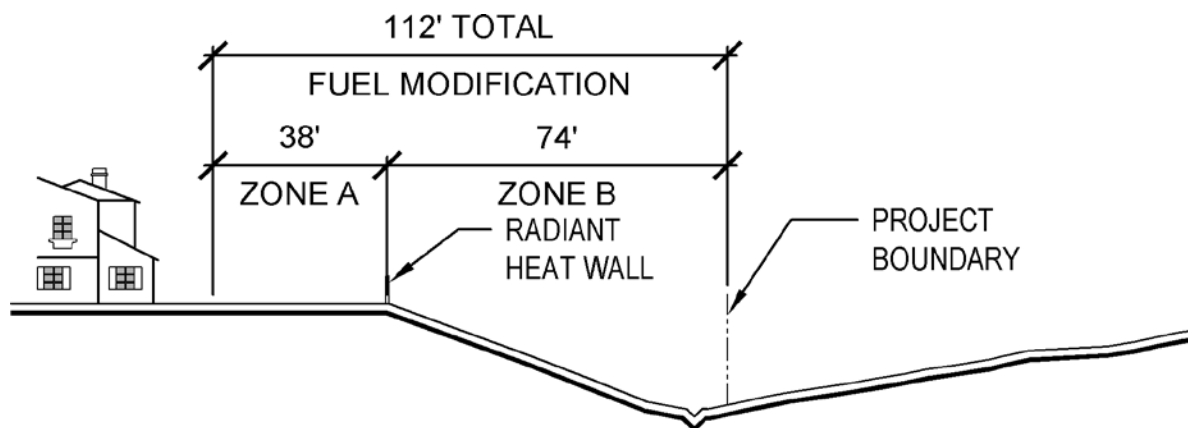
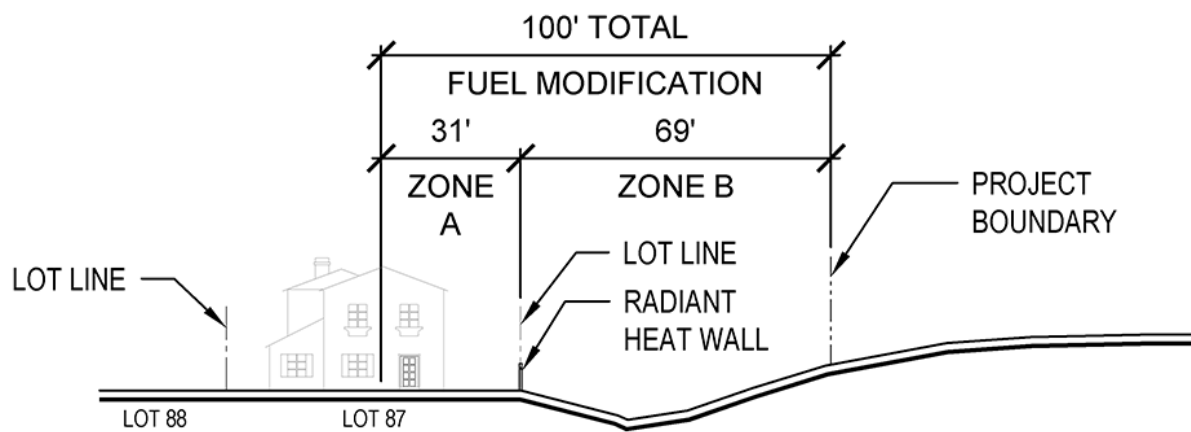




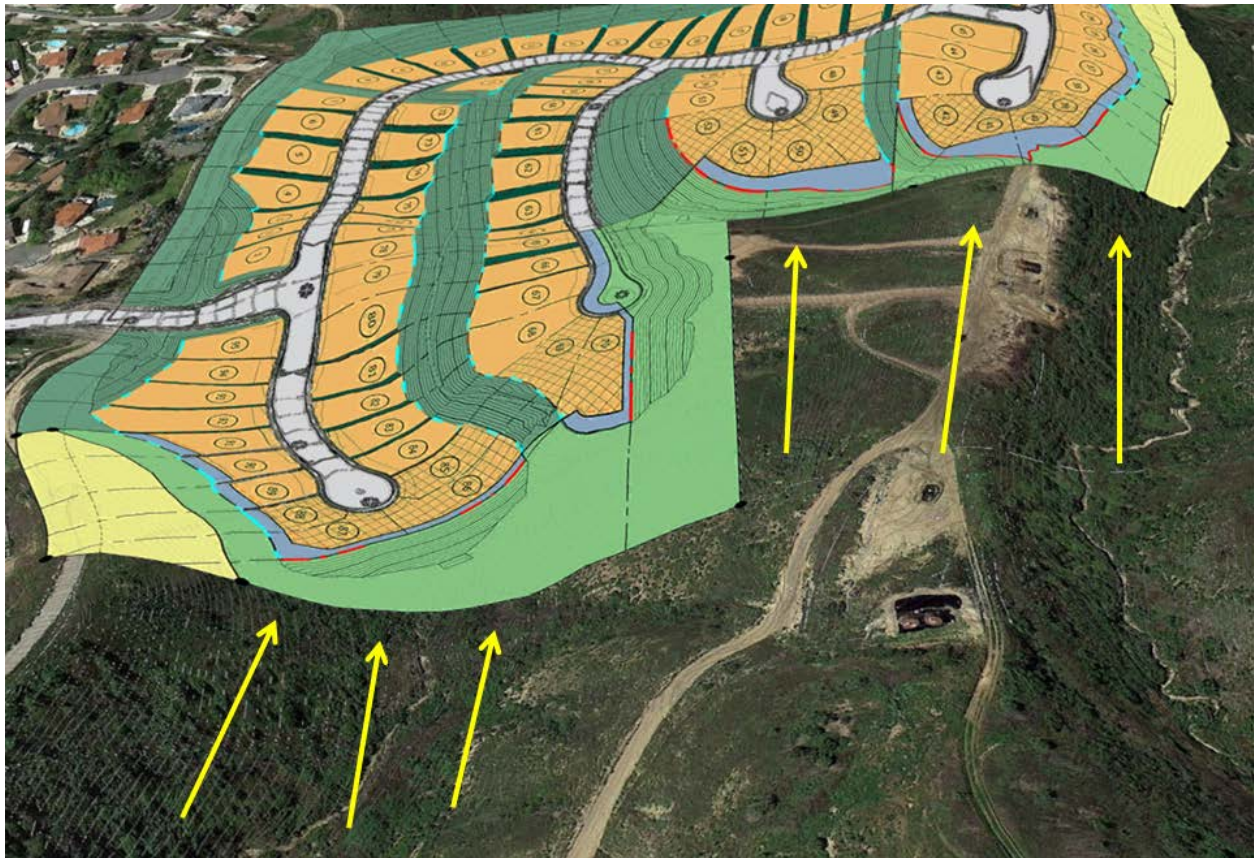


### **Radiant Heat Walls**

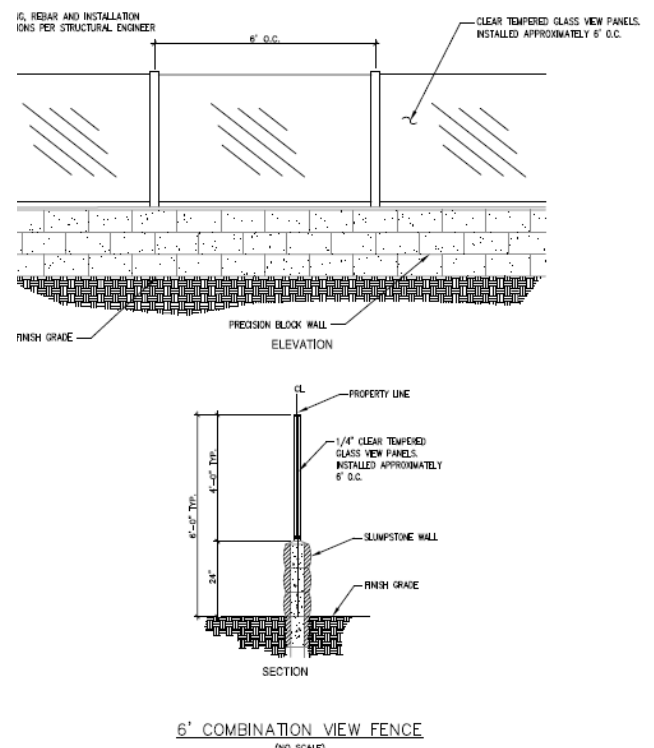
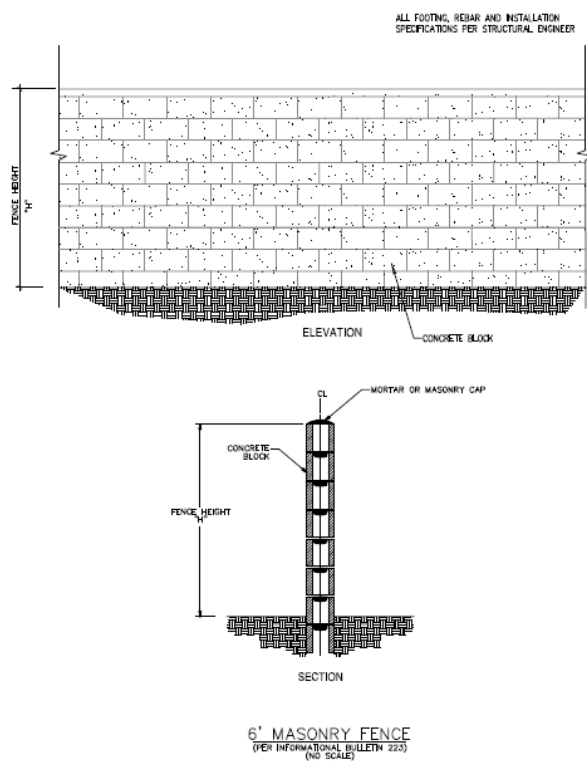
As indicated in the defensible space design, a block wall/radiant heat wall will be constructed when a fuel modification zone is not possible without offsite improvements. In all cases, the wall has been placed where the fuels below the structure is not of a continuous nature, not in alignment with the slope and Santa Ana winds or the predominate wind (S). In most cases, the radiant heat wall is at the base of the irrigated zone and down slope from the native vegetation



The radiant heat walls are perpendicular to the wind but parallel with the slope. This is shown on the graphic on the following page where the radiant heat wall locations are in red and the east wind shown in yellow. The radiant heat walls are at the property line and will be constructed on what is essentially the native slope that is shown in the graphic.



These walls will be either block or tempered glass over block similar to those shown below.



These types of walls are extremely effective when used at the top of the slope in light to moderate fuels. The extreme fire behavior that can be produced by high winds also bends the fire over making it travel more parallel to the ground. The harder the wind, the more the flame angle will be and the more effective the radiant heat wall will become.

## Report Summary

The Cielo Vista project will have a number of features and factors which make the community safer than any other development currently in the area. These include:

- New homes will provide a buffer against the flame front for home to the west (historic fire comes from the east)
- All homes lost in Freeway Complex in this area were lost to ember intrusion not the flaming fire front but the new project will have a minimum 2:1 ratio of flame length to fuel modification zone. Most areas will be 4:1 ratio.
- All homes will be fully protected by automatic fire sprinklers and are unlikely to produce ember plumes as they will not likely burn to a point of having a downwind ember cast
- Evacuation routes have at least two directions of travel from the project entrance(s) and many options within a relative short distance
- Water system, wide roads, wildland access points, Full 170 foot fuel modification (or equivalent) make this project as defensible as possible and will not need a large number of resources during a fire.

The Cielo Vista project is has been designed and protected by the most recently adopted codes and practices. Firesafe has used the BEHAVE model to measure the intensity of a fire moving towards this development to design a protection system that will ensure that the project will be safe from wildland fires even without fire department suppression activities . Flame lengths and fire intensity are ultimately reduced by the installation and maintenance of the fuel modification plan through the use of the irrigated Zone A and B, the removal of fuels in the Zone C and the radiant heat walls surrounding the homes on the perimeter where 170 foot zone cannot be achieved.

Based on the scientific fire bahavior analysis, exterior portions of future structures or attic spaces will not ignite from the exterior fire exposure from a wildland vegetation fire. This is primarily because the greatest fire energy is too far away from the structures due to the low plant densities within the fuel modification zones and the construction feature requirements.

The codes enforced by the Orange County Fire Authority for Fuel Modification were developed to handle the exact type of fuels that are interfacing with this future development.



We recommend approval of this Fire Behavior Report as an accurate and acceptable assessment of the hazard and risk factors for the Cielo Vista development as they relate to wildland fire protection.

Respectfully;



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Tim Chavez  
Wildland Interface Specialist

Concurrence;

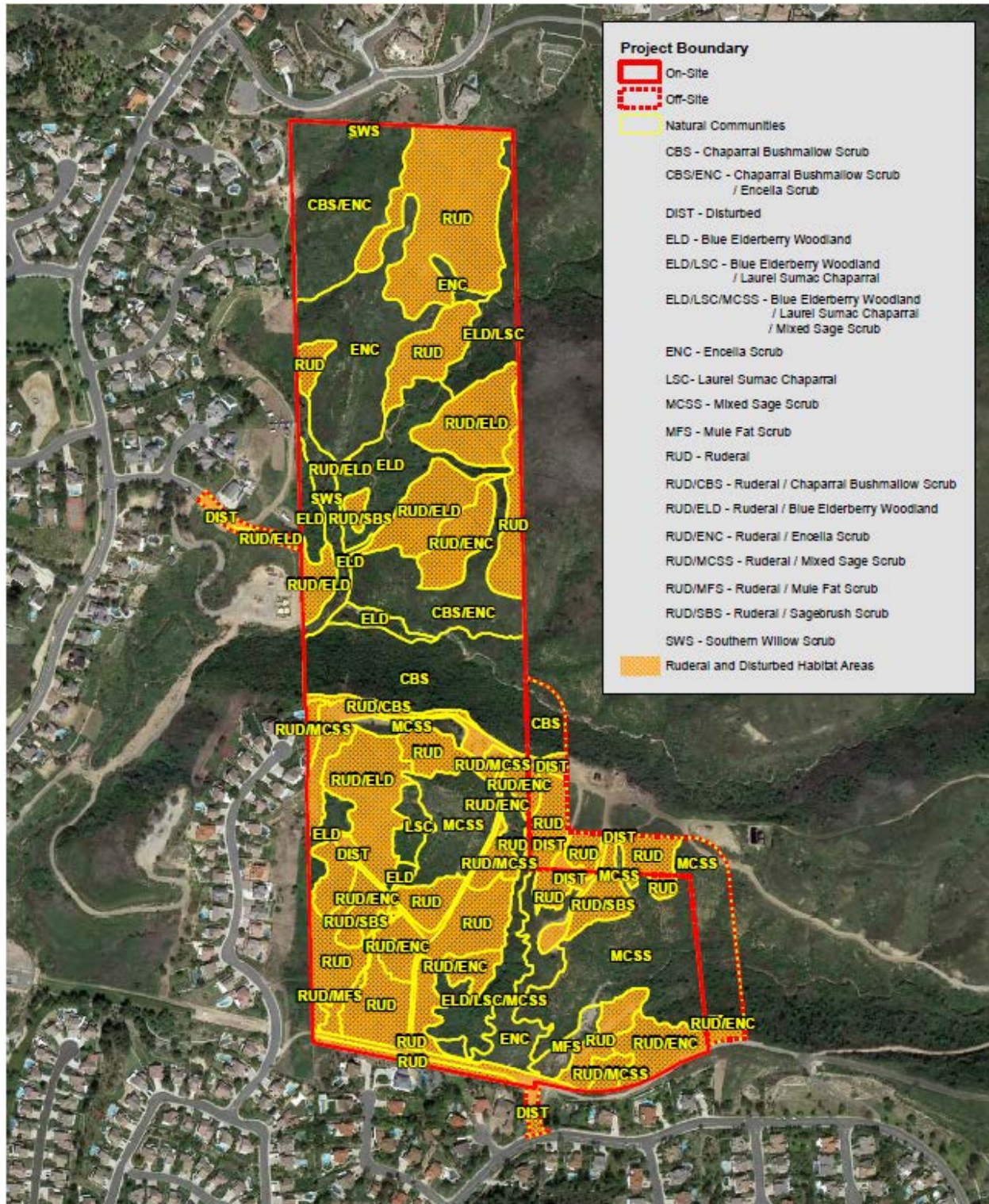


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David Oatis  
Principal, Firesafe Planning Solutions

## Appendix A

### Plant Communities





## Appendix B

### Site Photos







Photograph 1: Northerly view of project site from Via Del Agua at primary entrance to Planning Area 1.



Photograph 3: Northwesterly view from southern-central portion of project site (Planning Area 4) towards adjacent residential uses along Dorinda Road.



Photograph 2: Easterly view of project site from Dorinda Road. Dorinda Road is adjacent to Planning Area 1, just west of the project site.



Photograph 4: Southerly view from central portion of project site (Planning Area 1).





Photograph 5: Easterly view of existing on-site oil well located within central portion of Planning Area 1.



Photograph 7: Northwesterly view towards Aspen Way. Aspen Way would provide access to Planning Area 2.





Photograph 6: Westerly view of existing on-site oil well located within northern portion of Planning Area 1.



Photograph 8: Easterly view of project site from terminus of Aspen Way at entrance point to Planning Area 2.



Photograph 9: Easterly view towards project site from end of cul-de-sac of Dorinda road (Planning Area 1).



Photograph 10: Northerly view towards project site (Planning Area 1) from Via Del Agua/Via De Lakosa intersection.



Photograph 11: Southerly view of project site from Casino Ridge Road.



## Visual Simulations of Project Interface



Existing View



Proposed View

Dorinda Road looking southeast



Existing View



Proposed View

Dorinda Road looking northeast





Existing View



Proposed View

Aspen Way looking to the northeast towards Casino Ridge.



## **Appendix C**

### **Behave Reports**

**Inputs: SURFACE**

Description	Cielo Vista Section 1 East Wind 50 mph
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**Fuel/Vegetation, Surface/Understory**

Fuel Model	SCAL18, gs2, sh5, 4
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**Fuel Moisture**

1-h Moisture	%	3
10-h Moisture	%	4
100-h Moisture	%	5
Live Herbaceous Moisture	%	30
Live Woody Moisture	%	50

**Weather**

Midflame Wind Speed	mi/h	25
Wind Direction (from north)	deg	90

**Terrain**

Slope Steepness	%	200
Aspect	deg	0

**Fire**

Spread Direction (from north)	deg	0, 15, 30, 45, 60, 75, 90, 105, 1
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**Run Option Notes**

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are for the specified spread directions [SURFACE].

Fireline intensity, flame length, and spread distance are always  
for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

**Output Variables**

Surface Rate of Spread (ch/h) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Direction of Maximum Spread (from north) (deg) [SURFACE]

Flame Residence Time (min) [SURFACE]

(continued on next page)



## Input Worksheet (continued)

### Notes

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**Cielo Vista Section 1 East Wind 50 mph**  
**Surface Rate of Spread (ch/h)**

Spread Dir deg	Fuel Model			
	SCAL18	gs2	sh5	4
0	0 . 9	2 . 7	3 . 6	7 . 8
15	0 . 9	2 . 4	3 . 2	7 . 0
30	0 . 8	2 . 2	3 . 0	6 . 4
45	0 . 8	2 . 1	2 . 9	6 . 1
60	0 . 8	2 . 0	2 . 9	6 . 1
75	0 . 9	2 . 1	3 . 0	6 . 2
90	1 . 0	2 . 2	3 . 3	6 . 6
105	1 . 1	2 . 4	3 . 6	7 . 3
120	1 . 4	2 . 7	4 . 2	8 . 4
135	1 . 7	3 . 3	5 . 2	10 . 1
150	2 . 4	4 . 1	6 . 8	12 . 9
165	3 . 7	5 . 6	9 . 5	17 . 6
180	6 . 5	8 . 4	15 . 0	26 . 7
195	15 . 3	14 . 3	28 . 3	46 . 9
210	70 . 0	31 . 2	74 . 3	107 . 2
225	252 . 8	111 . 6	419 . 8	431 . 3
240	28 . 5	497 . 7	347 . 2	1296 . 4
255	9 . 5	85 . 5	67 . 0	208 . 7
270	4 . 7	26 . 8	26 . 5	70 . 9
285	2 . 9	12 . 9	14 . 4	35 . 6
300	2 . 0	7 . 8	9 . 2	21 . 9
315	1 . 5	5 . 3	6 . 6	15 . 2
330	1 . 2	4 . 0	5 . 1	11 . 5
345	1 . 0	3 . 2	4 . 2	9 . 2
360	0 . 9	2 . 7	3 . 6	7 . 8



Cielo Vista Section 1 East Wind 50 mph  
Fireline Intensity (Btu/ft/s)

Spread Dir deg	Fuel Model			
	SCAL18	gs2	sh5	4
0	70	28	127	469
15	65	25	114	416
30	62	23	107	384
45	61	22	103	368
60	63	21	104	364
75	67	22	107	373
90	74	23	115	397
105	85	25	129	437
120	102	29	150	502
135	131	35	183	604
150	180	44	239	770
165	274	59	337	1055
180	487	88	531	1596
195	1146	150	1000	2805
210	5247	327	2627	6412
225	18950	1172	14854	25794
240	2134	5229	12283	77530
255	709	898	2370	12481
270	356	281	938	4240
285	218	136	508	2130
300	152	82	326	1307
315	115	56	233	907
330	93	42	180	685
345	79	33	148	553
360	70	28	127	469



Cielo Vista Section 1 East Wind 50 mph  
Flame Length (ft)

Spread Dir deg	Fuel Model			
	SCAL18	gs2	sh5	4
0	3 . 2	2 . 1	4 . 2	7 . 6
15	3 . 1	2 . 0	4 . 0	7 . 2
30	3 . 0	1 . 9	3 . 9	7 . 0
45	3 . 0	1 . 9	3 . 8	6 . 8
60	3 . 0	1 . 8	3 . 8	6 . 8
75	3 . 1	1 . 9	3 . 9	6 . 9
90	3 . 3	1 . 9	4 . 0	7 . 1
105	3 . 5	2 . 0	4 . 2	7 . 4
120	3 . 8	2 . 1	4 . 5	7 . 9
135	4 . 2	2 . 3	4 . 9	8 . 6
150	4 . 9	2 . 6	5 . 6	9 . 6
165	6 . 0	2 . 9	6 . 5	11 . 1
180	7 . 8	3 . 5	8 . 1	13 . 4
195	11 . 5	4 . 5	10 . 8	17 . 3
210	23 . 1	6 . 5	16 . 8	25 . 4
225	41 . 8	11 . 6	37 . 3	48 . 1
240	15 . 3	23 . 1	34 . 2	79 . 9
255	9 . 2	10 . 3	16 . 1	34 . 5
270	6 . 7	6 . 0	10 . 5	21 . 0
285	5 . 4	4 . 3	7 . 9	15 . 3
300	4 . 5	3 . 4	6 . 4	12 . 2
315	4 . 0	2 . 9	5 . 5	10 . 3
330	3 . 6	2 . 5	4 . 9	9 . 1
345	3 . 4	2 . 3	4 . 5	8 . 2
360	3 . 2	2 . 1	4 . 2	7 . 6





Cielo Vista Section 1 East Wind 50 mph  
Direction of Maximum Spread (from north) (deg)

Spread Dir deg	Fuel Model			
	SCAL18	gs2	sh5	4
0	221	239	232	237
15	221	239	232	237
30	221	239	232	237
45	221	239	232	237
60	221	239	232	237
75	221	239	232	237
90	221	239	232	237
105	221	239	232	237
120	221	239	232	237
135	221	239	232	237
150	221	239	232	237
165	221	239	232	237
180	221	239	232	237
195	221	239	232	237
210	221	239	232	237
225	221	239	232	237
240	221	239	232	237
255	221	239	232	237
270	221	239	232	237
285	221	239	232	237
300	221	239	232	237
315	221	239	232	237
330	221	239	232	237
345	221	239	232	237
360	221	239	232	237

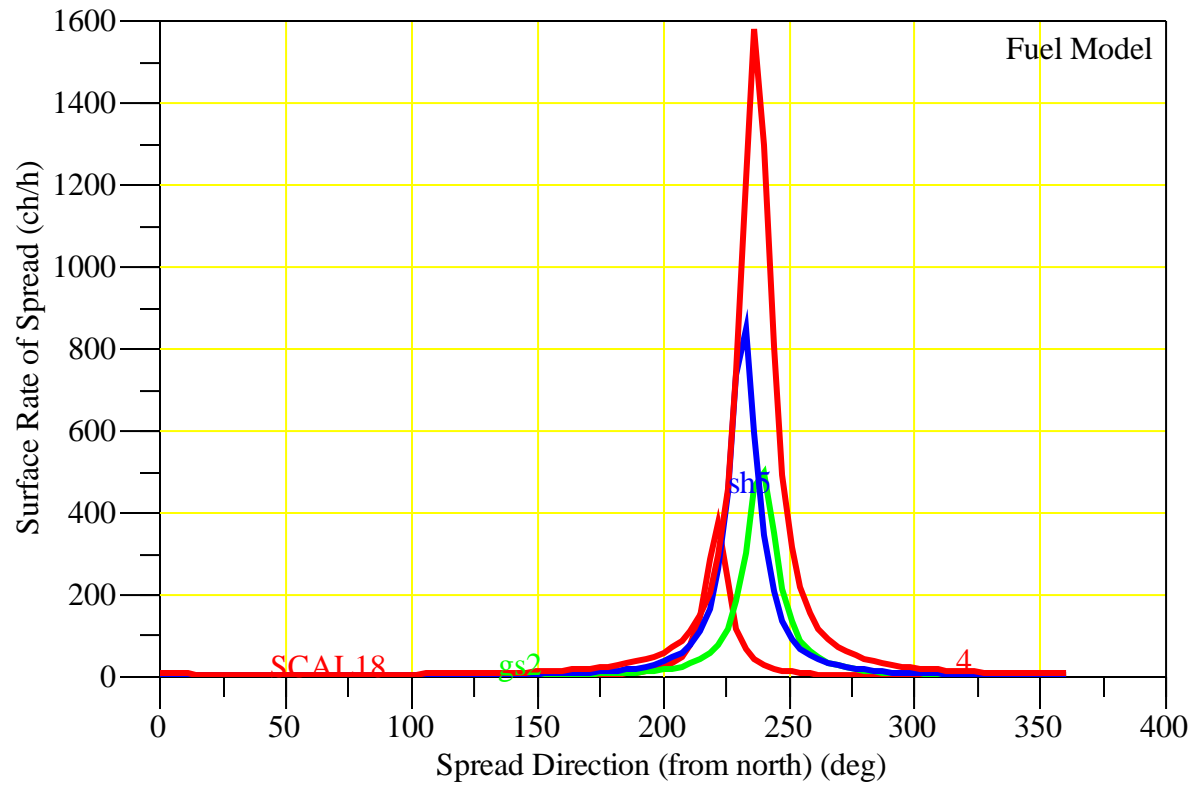


Cielo Vista Section 1 East Wind 50 mph  
Flame Residence Time (min)

Spread Dir deg	Fuel Model			
	SCAL18	gs2	sh5	4
0	0.49	0.21	0.31	0.22
15	0.49	0.21	0.31	0.22
30	0.49	0.21	0.31	0.22
45	0.49	0.21	0.31	0.22
60	0.49	0.21	0.31	0.22
75	0.49	0.21	0.31	0.22
90	0.49	0.21	0.31	0.22
105	0.49	0.21	0.31	0.22
120	0.49	0.21	0.31	0.22
135	0.49	0.21	0.31	0.22
150	0.49	0.21	0.31	0.22
165	0.49	0.21	0.31	0.22
180	0.49	0.21	0.31	0.22
195	0.49	0.21	0.31	0.22
210	0.49	0.21	0.31	0.22
225	0.49	0.21	0.31	0.22
240	0.49	0.21	0.31	0.22
255	0.49	0.21	0.31	0.22
270	0.49	0.21	0.31	0.22
285	0.49	0.21	0.31	0.22
300	0.49	0.21	0.31	0.22
315	0.49	0.21	0.31	0.22
330	0.49	0.21	0.31	0.22
345	0.49	0.21	0.31	0.22
360	0.49	0.21	0.31	0.22



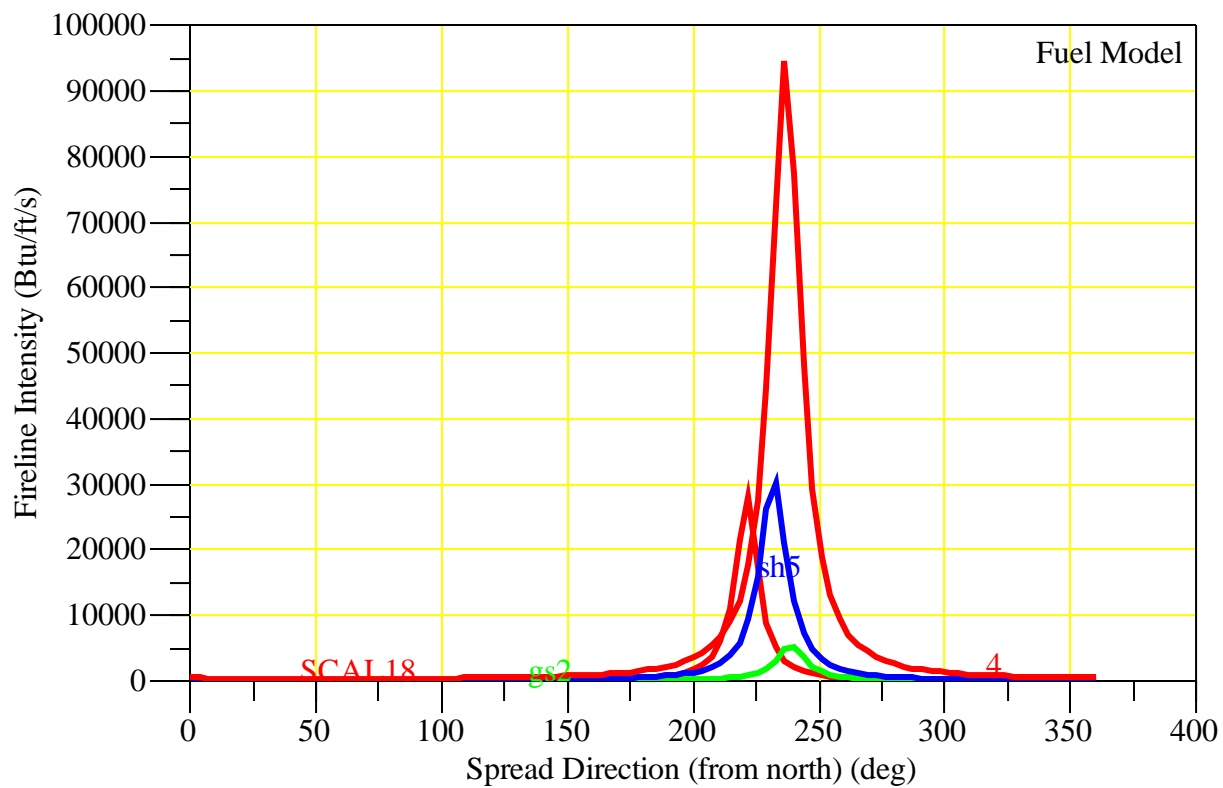
## Cielo Vista Section 1 East Wind 50 mph





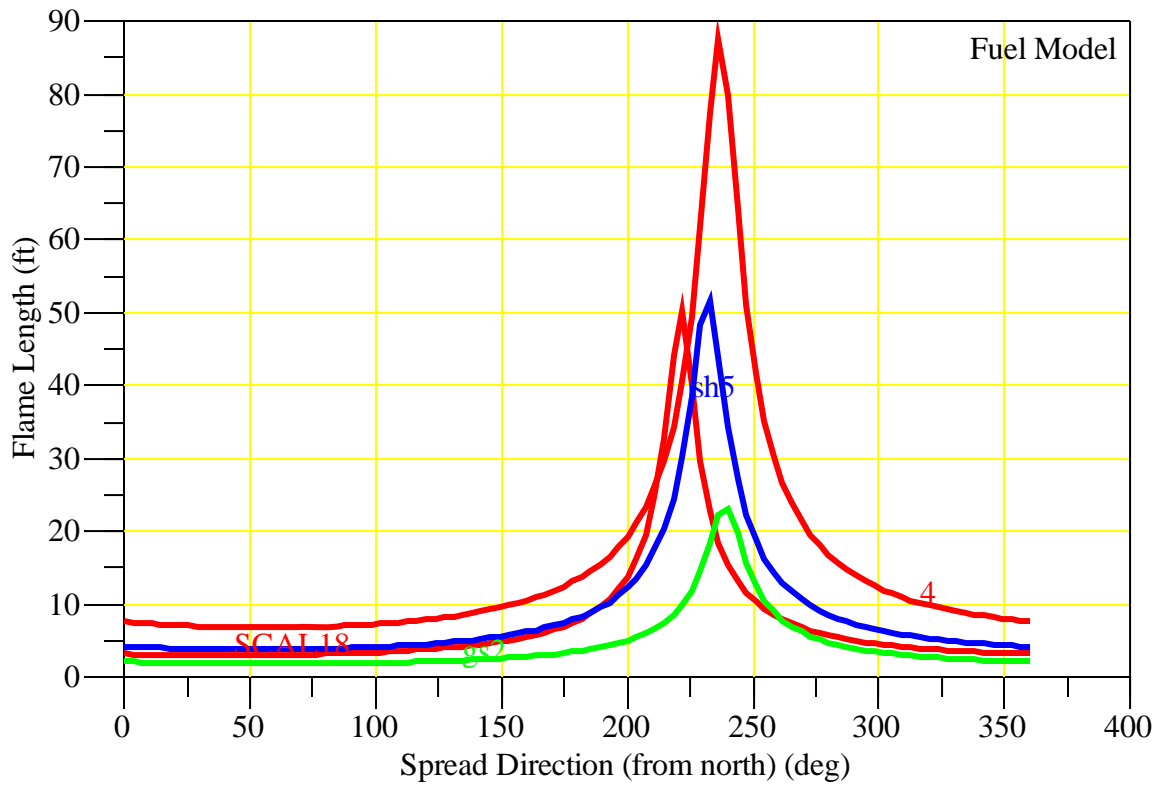


## Cielo Vista Section 1 East Wind 50 mph



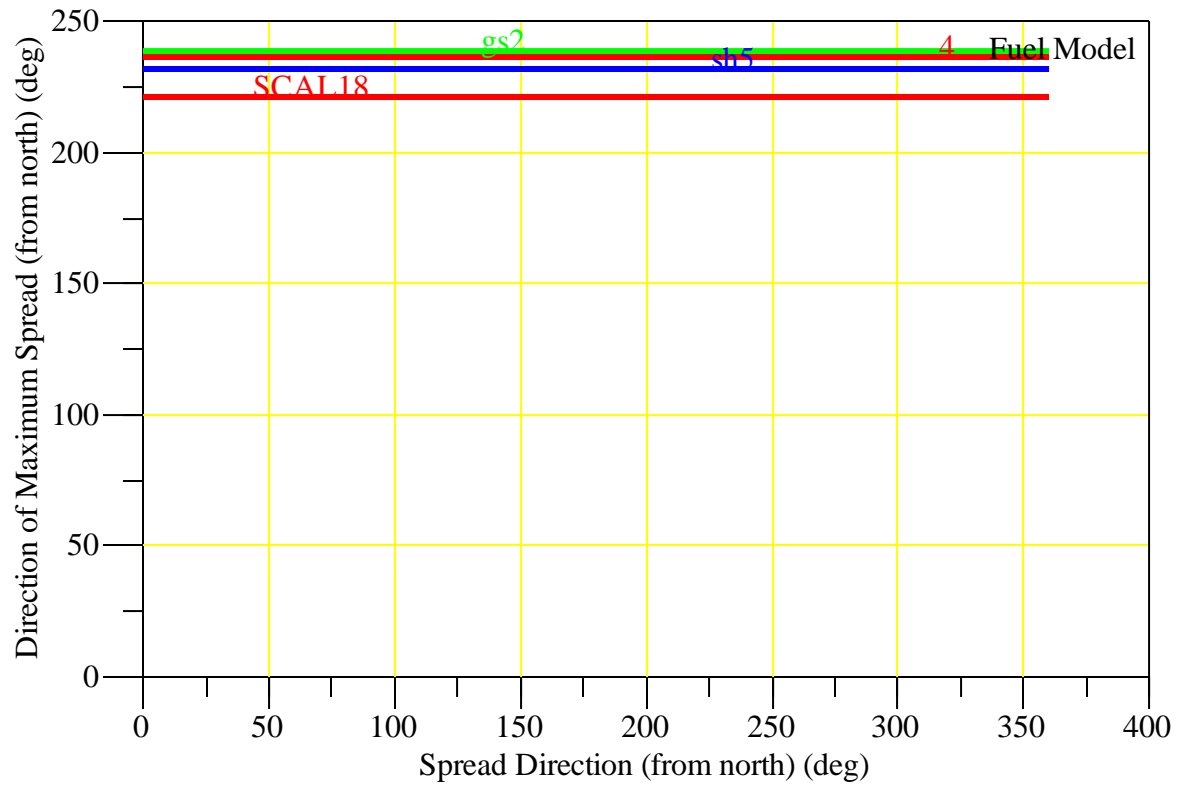


## Cielo Vista Section 1 East Wind 50 mph





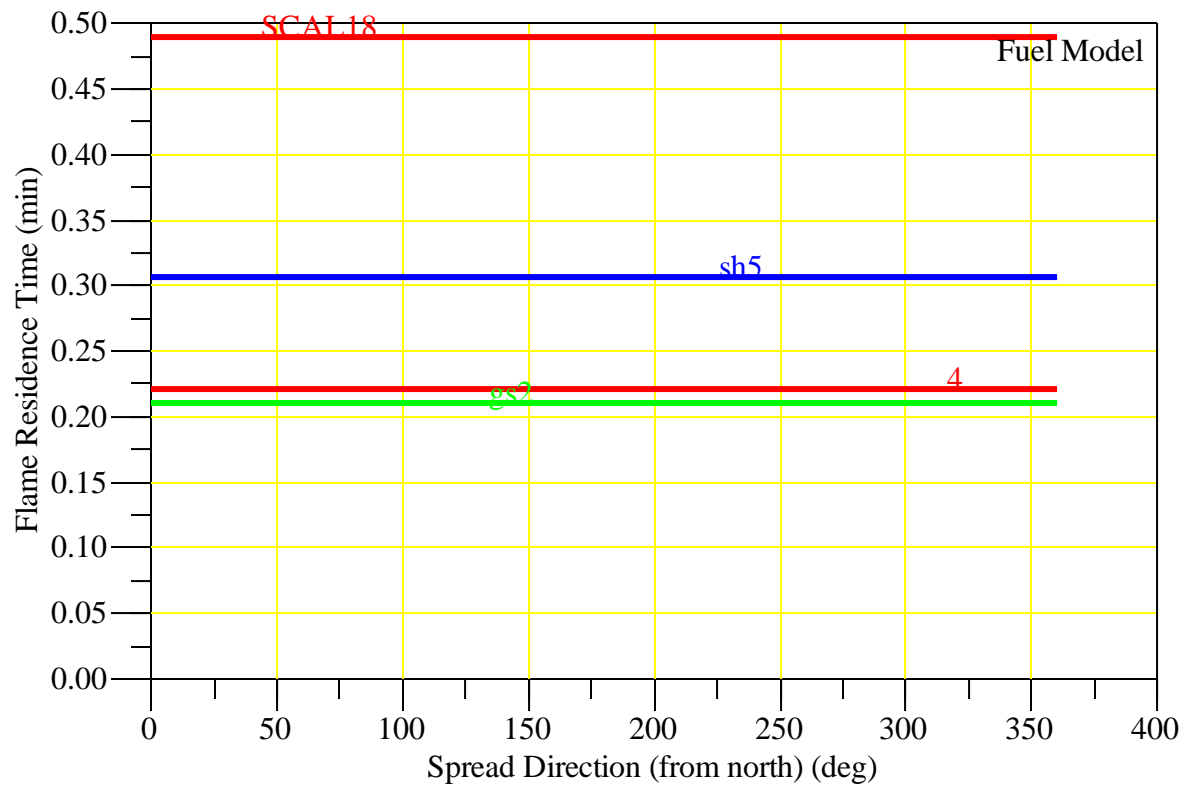
## Cielo Vista Section 1 East Wind 50 mph







## Cielo Vista Section 1 East Wind 50 mph





## Discrete Variable Codes Used

### Cielo Vista Section 1 East Wind 50 mph

#### Fuel Model

SCAL18	Sage / Buckwheat
gs2	Moderate load, dry climate grass-shrub (D) (122)
sh5	High load, dry climate shrub (S) (145)
4	Chaparral (S)

**Inputs: SURFACE**Description Cielo Vista Section 1 East 50 mph S Aspect**Fuel/Vegetation, Surface/Understory**Fuel Model SCAL18, gs2**Fuel Moisture**

1-h Moisture	%	<u>3</u>
10-h Moisture	%	<u>4</u>
100-h Moisture	%	<u>5</u>
Live Herbaceous Moisture	%	<u>30</u>
Live Woody Moisture	%	<u>50</u>

**Weather**

Midflame Wind Speed	mi/h	<u>25</u>
Wind Direction (from north)	deg	<u>90</u>

**Terrain**

Slope Steepness	%	<u>100</u>
Aspect	deg	<u>180</u>

**Fire**

Spread Direction (from north)	deg	<u>0, 15, 30, 45, 60, 75, 90, 105, 1</u>
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**Run Option Notes**

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are for the specified spread directions [SURFACE].

Fireline intensity, flame length, and spread distance are always  
for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

**Output Variables**

Surface Rate of Spread (ch/h) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Direction of Maximum Spread (from north) (deg) [SURFACE]

Flame Residence Time (min) [SURFACE]

(continued on next page)



Input Worksheet (continued)

Notes

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Cielo Vista Section 1 East 50 mph S Aspect  
Surface Rate of Spread (ch/h)

Spread Dir deg	Fuel Model	
	SCAL18	gs2
0	3 . 2	4 . 9
15	2 . 4	3 . 8
30	1 . 9	3 . 1
45	1 . 6	2 . 6
60	1 . 4	2 . 4
75	1 . 3	2 . 2
90	1 . 2	2 . 1
105	1 . 2	2 . 1
120	1 . 2	2 . 2
135	1 . 2	2 . 3
150	1 . 4	2 . 6
165	1 . 5	3 . 0
180	1 . 8	3 . 6
195	2 . 3	4 . 7
210	3 . 1	6 . 5
225	4 . 5	10 . 1
240	7 . 5	18 . 5
255	15 . 5	45 . 2
270	49 . 5	202 . 7
285	258 . 0	268 . 7
300	60 . 2	53 . 9
315	17 . 4	20 . 6
330	8 . 1	11 . 0
345	4 . 7	6 . 9
360	3 . 2	4 . 9



Cielo Vista Section 1 East 50 mph S Aspect  
Fireline Intensity (Btu/ft/s)

Spread Dir deg	Fuel Model	
	SCAL18	gs2
0	239	52
15	177	40
30	140	32
45	118	28
60	103	25
75	94	23
90	89	22
105	88	22
120	89	23
135	93	24
150	102	27
165	115	31
180	137	38
195	172	49
210	230	69
225	336	106
240	561	194
255	1163	475
270	3713	2129
285	19342	2823
300	4513	566
315	1303	217
330	605	115
345	355	73
360	239	52



Cielo Vista Section 1 East 50 mph S Aspect  
Flame Length (ft)

Spread Dir deg	Fuel Model	
	SCAL18	gs2
0	5 . 6	2 . 8
15	4 . 9	2 . 4
30	4 . 4	2 . 2
45	4 . 0	2 . 1
60	3 . 8	2 . 0
75	3 . 6	1 . 9
90	3 . 6	1 . 9
105	3 . 5	1 . 9
120	3 . 5	1 . 9
135	3 . 6	2 . 0
150	3 . 8	2 . 1
165	4 . 0	2 . 2
180	4 . 3	2 . 4
195	4 . 8	2 . 7
210	5 . 5	3 . 2
225	6 . 5	3 . 9
240	8 . 3	5 . 1
255	11 . 6	7 . 7
270	19 . 7	15 . 3
285	42 . 2	17 . 4
300	21 . 6	8 . 3
315	12 . 2	5 . 3
330	8 . 6	4 . 0
345	6 . 7	3 . 2
360	5 . 6	2 . 8



Cielo Vista Section 1 East 50 mph S Aspect  
Direction of Maximum Spread (from north) (deg)

Spread Dir deg	Fuel Model	
	SCAL18	gs2
0	286	279
15	286	279
30	286	279
45	286	279
60	286	279
75	286	279
90	286	279
105	286	279
120	286	279
135	286	279
150	286	279
165	286	279
180	286	279
195	286	279
210	286	279
225	286	279
240	286	279
255	286	279
270	286	279
285	286	279
300	286	279
315	286	279
330	286	279
345	286	279
360	286	279



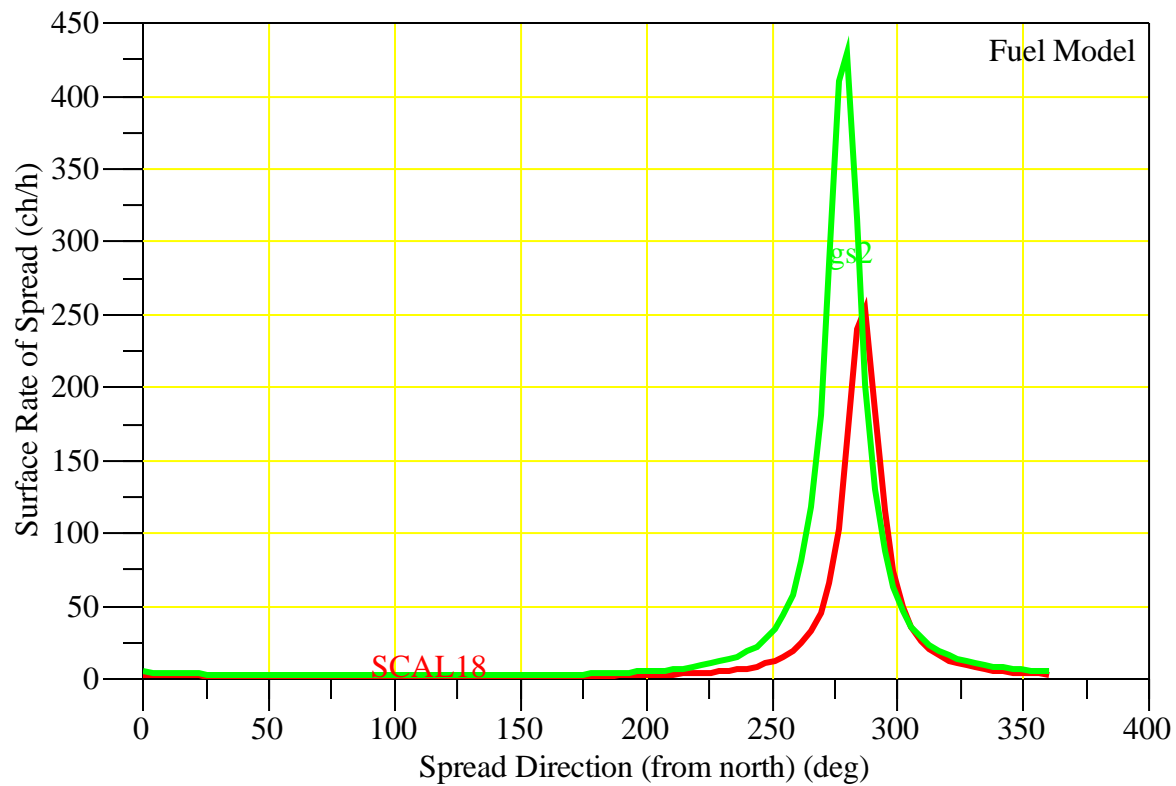


Cielo Vista Section 1 East 50 mph S Aspect  
Flame Residence Time (min)

Spread Dir deg	Fuel Model	
	SCAL18	gs2
0	0 . 4 9	0 . 2 1
15	0 . 4 9	0 . 2 1
30	0 . 4 9	0 . 2 1
45	0 . 4 9	0 . 2 1
60	0 . 4 9	0 . 2 1
75	0 . 4 9	0 . 2 1
90	0 . 4 9	0 . 2 1
105	0 . 4 9	0 . 2 1
120	0 . 4 9	0 . 2 1
135	0 . 4 9	0 . 2 1
150	0 . 4 9	0 . 2 1
165	0 . 4 9	0 . 2 1
180	0 . 4 9	0 . 2 1
195	0 . 4 9	0 . 2 1
210	0 . 4 9	0 . 2 1
225	0 . 4 9	0 . 2 1
240	0 . 4 9	0 . 2 1
255	0 . 4 9	0 . 2 1
270	0 . 4 9	0 . 2 1
285	0 . 4 9	0 . 2 1
300	0 . 4 9	0 . 2 1
315	0 . 4 9	0 . 2 1
330	0 . 4 9	0 . 2 1
345	0 . 4 9	0 . 2 1
360	0 . 4 9	0 . 2 1

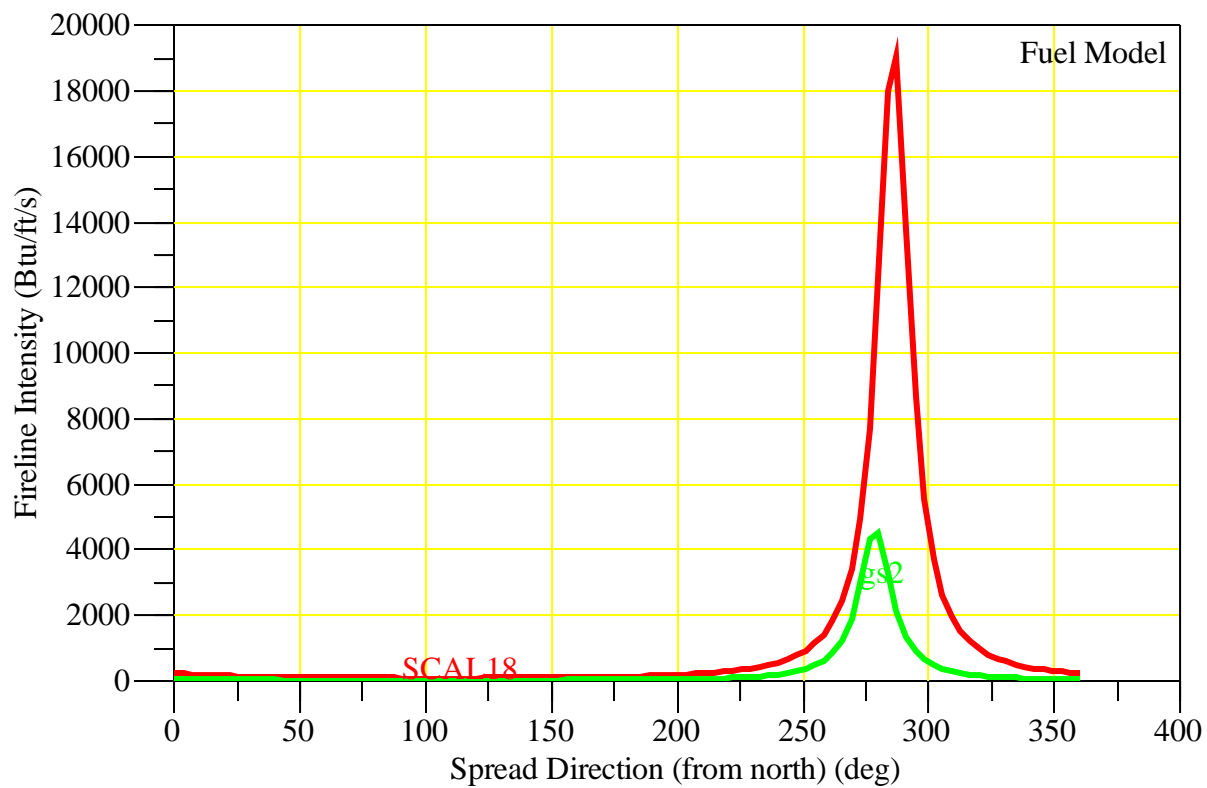


## Cielo Vista Section 1 East 50 mph S Aspect



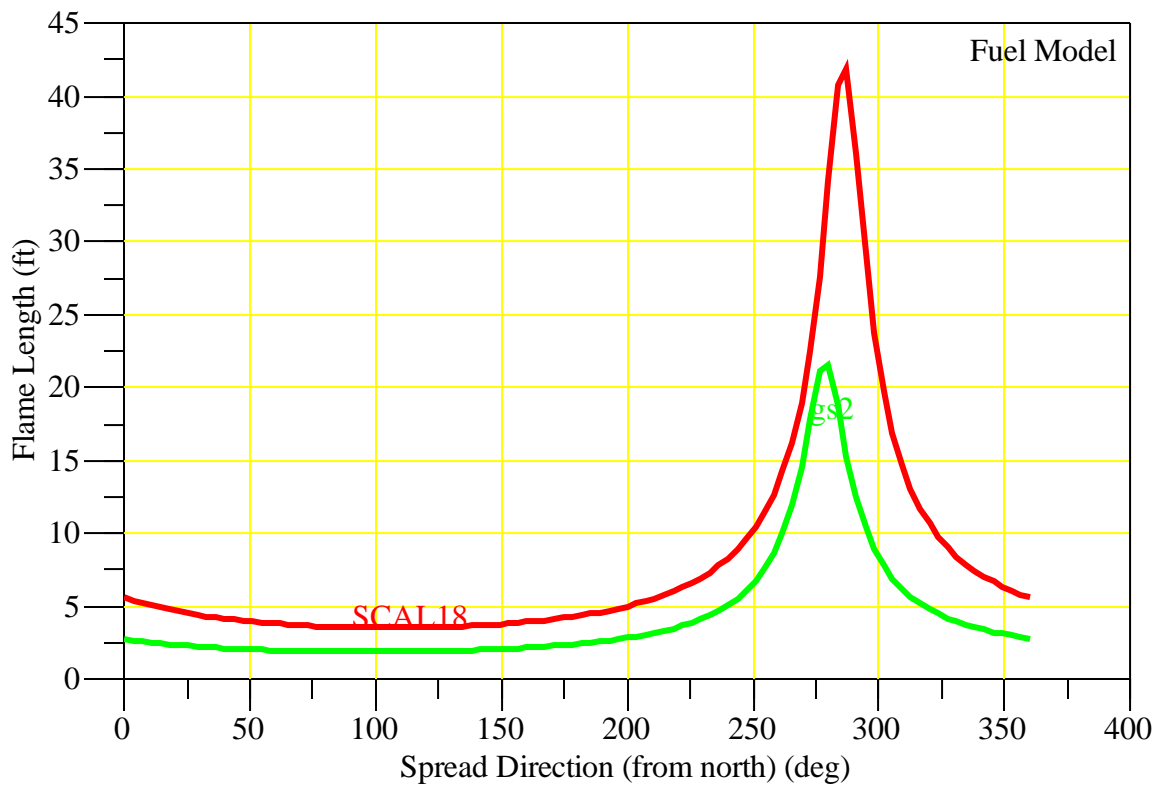


## Cielo Vista Section 1 East 50 mph S Aspect





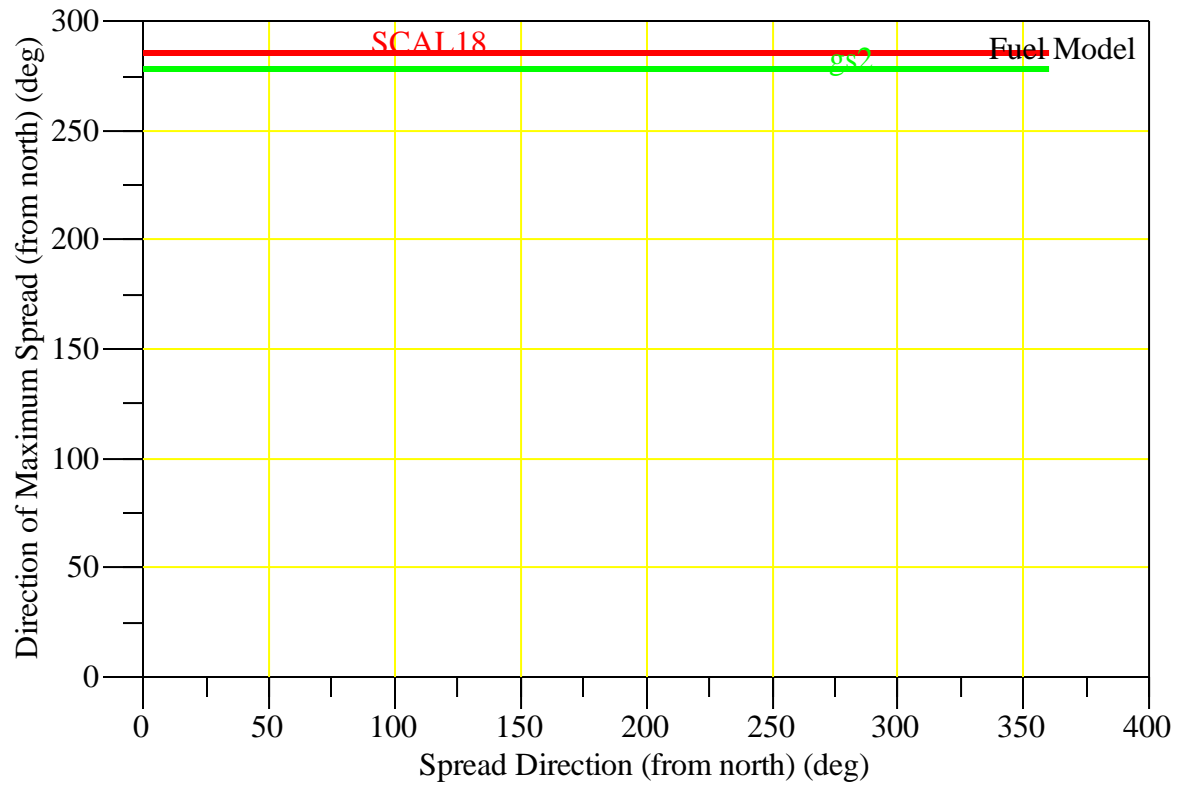
## Cielo Vista Section 1 East 50 mph S Aspect





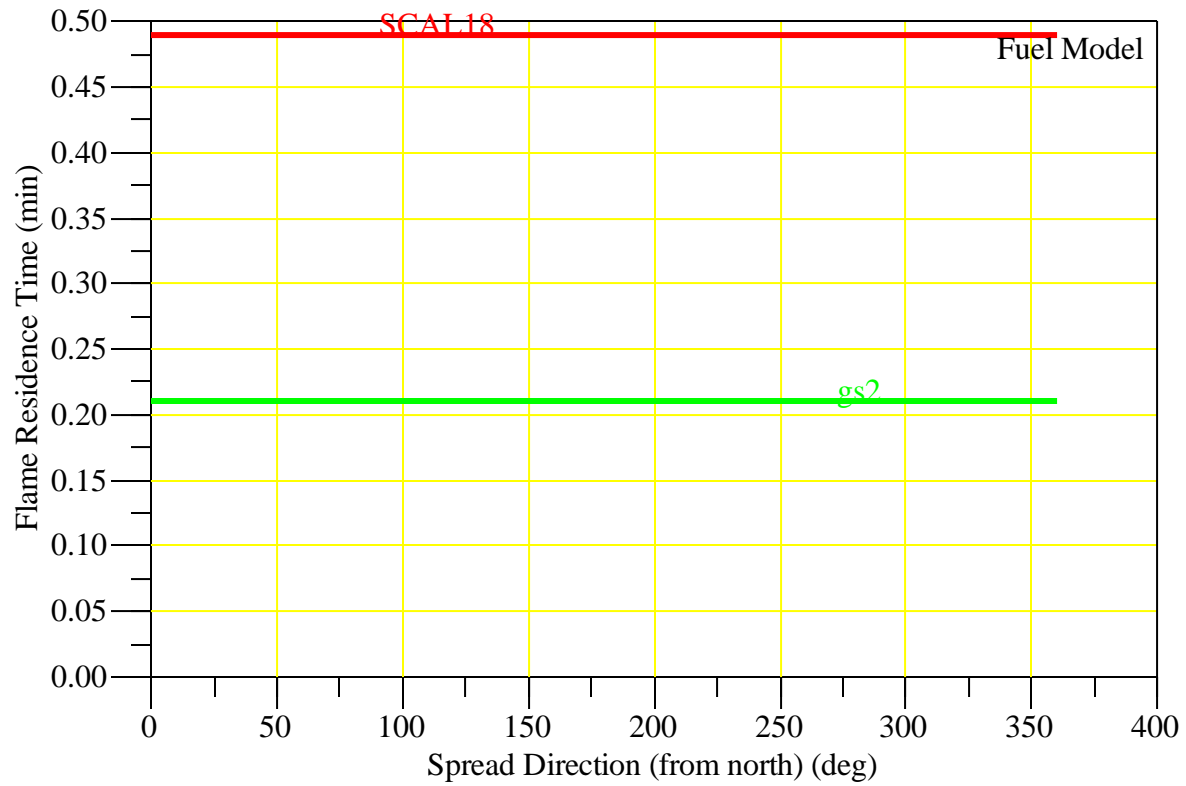


## Cielo Vista Section 1 East 50 mph S Aspect





## Cielo Vista Section 1 East 50 mph S Aspect





## Discrete Variable Codes Used

### Cielo Vista Section 1 East 50 mph S Aspect

#### Fuel Model

SCAL18

Sage / Buckwheat

gs2

Moderate load, dry climate grass-shrub (D) (122)

**Inputs: SURFACE**

Description	Cielo Vista East 50mph worst case
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**Fuel/Vegetation, Surface/Understory**

Fuel Model	SCAL18, gs2,sh5
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**Fuel Moisture**

1-h Moisture	%	3
10-h Moisture	%	4
100-h Moisture	%	5
Live Herbaceous Moisture	%	30
Live Woody Moisture	%	50

**Weather**

Midflame Wind Speed	mi/h	25
Wind Direction (from north)	deg	90

**Terrain**

Slope Steepness	%	100
Aspect	deg	90

**Fire**

Spread Direction (from north)	deg	0, 15, 30, 45, 60, 75, 90, 105, 1
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**Run Option Notes**

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are for the specified spread directions [SURFACE].

Fireline intensity, flame length, and spread distance are always  
for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

**Output Variables**

Surface Rate of Spread (ch/h) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Direction of Maximum Spread (from north) (deg) [SURFACE]

Flame Residence Time (min) [SURFACE]

(continued on next page)





Input Worksheet (continued)

Notes

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Cielo Vista East 50mph worst case  
Surface Rate of Spread (ch/h)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	1 . 9	4 . 1	6 . 0
15	1 . 5	3 . 2	4 . 8
30	1 . 3	2 . 7	4 . 0
45	1 . 1	2 . 4	3 . 5
60	1 . 0	2 . 2	3 . 2
75	1 . 0	2 . 1	3 . 1
90	1 . 0	2 . 0	3 . 0
105	1 . 0	2 . 1	3 . 1
120	1 . 0	2 . 2	3 . 2
135	1 . 1	2 . 4	3 . 5
150	1 . 3	2 . 7	4 . 0
165	1 . 5	3 . 2	4 . 8
180	1 . 9	4 . 1	6 . 0
195	2 . 6	5 . 5	8 . 0
210	3 . 8	8 . 1	11 . 9
225	6 . 4	13 . 6	20 . 1
240	13 . 8	28 . 9	42 . 6
255	48 . 1	97 . 3	145 . 2
270	322 . 9	504 . 5	814 . 2
285	48 . 1	97 . 3	145 . 2
300	13 . 8	28 . 9	42 . 6
315	6 . 4	13 . 6	20 . 1
330	3 . 8	8 . 1	11 . 9
345	2 . 6	5 . 5	8 . 0
360	1 . 9	4 . 1	6 . 0



Cielo Vista East 50mph worst case  
Fireline Intensity (Btu/ft/s)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	143	43	212
15	114	34	168
30	96	29	141
45	84	25	124
60	77	23	114
75	73	22	108
90	72	21	106
105	73	22	108
120	77	23	114
135	84	25	124
150	96	29	141
165	114	34	168
180	143	43	212
195	193	58	285
210	285	85	420
225	483	143	710
240	1031	304	1507
255	3604	1022	5139
270	24210	5300	28809
285	3604	1022	5139
300	1031	304	1507
315	483	143	710
330	285	85	420
345	193	58	285
360	143	43	212



## Cielo Vista East 50mph worst case

## Flame Length (ft)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	4 . 4	2 . 5	5 . 3
15	4 . 0	2 . 3	4 . 8
30	3 . 7	2 . 1	4 . 4
45	3 . 5	2 . 0	4 . 1
60	3 . 3	1 . 9	4 . 0
75	3 . 2	1 . 9	3 . 9
90	3 . 2	1 . 8	3 . 8
105	3 . 2	1 . 9	3 . 9
120	3 . 3	1 . 9	4 . 0
135	3 . 5	2 . 0	4 . 1
150	3 . 7	2 . 1	4 . 4
165	4 . 0	2 . 3	4 . 8
180	4 . 4	2 . 5	5 . 3
195	5 . 1	2 . 9	6 . 1
210	6 . 1	3 . 5	7 . 2
225	7 . 7	4 . 4	9 . 2
240	10 . 9	6 . 2	13 . 0
255	19 . 5	10 . 9	22 . 9
270	46 . 8	23 . 2	50 . 7
285	19 . 5	10 . 9	22 . 9
300	10 . 9	6 . 2	13 . 0
315	7 . 7	4 . 4	9 . 2
330	6 . 1	3 . 5	7 . 2
345	5 . 1	2 . 9	6 . 1
360	4 . 4	2 . 5	5 . 3



Cielo Vista East 50mph worst case  
Direction of Maximum Spread (from north) (deg)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	270	270	270
15	270	270	270
30	270	270	270
45	270	270	270
60	270	270	270
75	270	270	270
90	270	270	270
105	270	270	270
120	270	270	270
135	270	270	270
150	270	270	270
165	270	270	270
180	270	270	270
195	270	270	270
210	270	270	270
225	270	270	270
240	270	270	270
255	270	270	270
270	270	270	270
285	270	270	270
300	270	270	270
315	270	270	270
330	270	270	270
345	270	270	270
360	270	270	270





Cielo Vista East 50mph worst case  
Flame Residence Time (min)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	0.49	0.21	0.31
15	0.49	0.21	0.31
30	0.49	0.21	0.31
45	0.49	0.21	0.31
60	0.49	0.21	0.31
75	0.49	0.21	0.31
90	0.49	0.21	0.31
105	0.49	0.21	0.31
120	0.49	0.21	0.31
135	0.49	0.21	0.31
150	0.49	0.21	0.31
165	0.49	0.21	0.31
180	0.49	0.21	0.31
195	0.49	0.21	0.31
210	0.49	0.21	0.31
225	0.49	0.21	0.31
240	0.49	0.21	0.31
255	0.49	0.21	0.31
270	0.49	0.21	0.31
285	0.49	0.21	0.31
300	0.49	0.21	0.31
315	0.49	0.21	0.31
330	0.49	0.21	0.31
345	0.49	0.21	0.31
360	0.49	0.21	0.31



## Discrete Variable Codes Used

### Cielo Vista East 50mph worst case

#### Fuel Model

SCAL18	Sage / Buckwheat
gs2	Moderate load, dry climate grass-shrub (D) (122)
sh5	High load, dry climate shrub (S) (145)

**Inputs: SURFACE**

Description	Cielo Vista SouthWest 30mph Onshore
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**Fuel/Vegetation, Surface/Understory**

Fuel Model	SCAL18, gs2, sh5
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**Fuel Moisture**

1-h Moisture	%	3
10-h Moisture	%	4
100-h Moisture	%	5
Live Herbaceous Moisture	%	30
Live Woody Moisture	%	50

**Weather**

Midflame Wind Speed	mi/h	15
Wind Direction (from north)	deg	225

**Terrain**

Slope Steepness	%	100
Aspect	deg	225

**Fire**

Spread Direction (from north)	deg	0, 15, 30, 45, 60, 75, 90, 105, 1
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**Run Option Notes**

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are for the specified spread directions [SURFACE].

Fireline intensity, flame length, and spread distance are always  
for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

**Output Variables**

Surface Rate of Spread (ch/h) [SURFACE]

Fireline Intensity (Btu/ft/s) [SURFACE]

Flame Length (ft) [SURFACE]

Direction of Maximum Spread (from north) (deg) [SURFACE]

Flame Residence Time (min) [SURFACE]

(continued on next page)



Input Worksheet (continued)

Notes

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Cielo Vista SouthWest 30mph Onshore  
Surface Rate of Spread (ch/h)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	8 . 7	14 . 9	24 . 5
15	18 . 2	30 . 6	50 . 6
30	58 . 0	90 . 7	153 . 9
45	229 . 2	275 . 4	505 . 9
60	58 . 0	90 . 7	153 . 9
75	18 . 2	30 . 6	50 . 6
90	8 . 7	14 . 9	24 . 5
105	5 . 2	8 . 9	14 . 6
120	3 . 5	6 . 1	10 . 0
135	2 . 6	4 . 5	7 . 4
150	2 . 1	3 . 6	5 . 9
165	1 . 8	3 . 0	5 . 0
180	1 . 5	2 . 7	4 . 4
195	1 . 4	2 . 4	4 . 0
210	1 . 3	2 . 3	3 . 8
225	1 . 3	2 . 3	3 . 7
240	1 . 3	2 . 3	3 . 8
255	1 . 4	2 . 4	4 . 0
270	1 . 5	2 . 7	4 . 4
285	1 . 8	3 . 0	5 . 0
300	2 . 1	3 . 6	5 . 9
315	2 . 6	4 . 5	7 . 4
330	3 . 5	6 . 1	10 . 0
345	5 . 2	8 . 9	14 . 6
360	8 . 7	14 . 9	24 . 5





Cielo Vista SouthWest 30mph Onshore  
Fireline Intensity (Btu/ft/s)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	652	156	866
15	1363	321	1791
30	4348	953	5446
45	17182	2893	17901
60	4348	953	5446
75	1363	321	1791
90	652	156	866
105	388	94	518
120	264	64	353
135	196	48	263
150	156	38	209
165	131	32	176
180	115	28	155
195	106	26	142
210	100	24	135
225	99	24	132
240	100	24	135
255	106	26	142
270	115	28	155
285	131	32	176
300	156	38	209
315	196	48	263
330	264	64	353
345	388	94	518
360	652	156	866



Cielo Vista SouthWest 30mph Onshore  
Flame Length (ft)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	8 . 9	4 . 6	10 . 1
15	12 . 4	6 . 4	14 . 1
30	21 . 2	10 . 6	23 . 5
45	39 . 9	17 . 6	40 . 7
60	21 . 2	10 . 6	23 . 5
75	12 . 4	6 . 4	14 . 1
90	8 . 9	4 . 6	10 . 1
105	7 . 0	3 . 6	8 . 0
120	5 . 8	3 . 0	6 . 7
135	5 . 1	2 . 7	5 . 8
150	4 . 6	2 . 4	5 . 3
165	4 . 2	2 . 2	4 . 9
180	4 . 0	2 . 1	4 . 6
195	3 . 8	2 . 0	4 . 4
210	3 . 7	2 . 0	4 . 3
225	3 . 7	1 . 9	4 . 3
240	3 . 7	2 . 0	4 . 3
255	3 . 8	2 . 0	4 . 4
270	4 . 0	2 . 1	4 . 6
285	4 . 2	2 . 2	4 . 9
300	4 . 6	2 . 4	5 . 3
315	5 . 1	2 . 7	5 . 8
330	5 . 8	3 . 0	6 . 7
345	7 . 0	3 . 6	8 . 0
360	8 . 9	4 . 6	10 . 1



**Cielo Vista SouthWest 30mph Onshore**  
**Direction of Maximum Spread (from north) (deg)**

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	45	45	45
15	45	45	45
30	45	45	45
45	45	45	45
60	45	45	45
75	45	45	45
90	45	45	45
105	45	45	45
120	45	45	45
135	45	45	45
150	45	45	45
165	45	45	45
180	45	45	45
195	45	45	45
210	45	45	45
225	45	45	45
240	45	45	45
255	45	45	45
270	45	45	45
285	45	45	45
300	45	45	45
315	45	45	45
330	45	45	45
345	45	45	45
360	45	45	45



Cielo Vista SouthWest 30mph Onshore  
Flame Residence Time (min)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	0.49	0.21	0.31
15	0.49	0.21	0.31
30	0.49	0.21	0.31
45	0.49	0.21	0.31
60	0.49	0.21	0.31
75	0.49	0.21	0.31
90	0.49	0.21	0.31
105	0.49	0.21	0.31
120	0.49	0.21	0.31
135	0.49	0.21	0.31
150	0.49	0.21	0.31
165	0.49	0.21	0.31
180	0.49	0.21	0.31
195	0.49	0.21	0.31
210	0.49	0.21	0.31
225	0.49	0.21	0.31
240	0.49	0.21	0.31
255	0.49	0.21	0.31
270	0.49	0.21	0.31
285	0.49	0.21	0.31
300	0.49	0.21	0.31
315	0.49	0.21	0.31
330	0.49	0.21	0.31
345	0.49	0.21	0.31
360	0.49	0.21	0.31



## Discrete Variable Codes Used

### Cielo Vista SouthWest 30mph Onshore

#### Fuel Model

SCAL18	Sage / Buckwheat
gs2	Moderate load, dry climate grass-shrub (D) (122)
sh5	High load, dry climate shrub (S) (145)



## Cielo Vista Behave Output Summary

### SouthWest 30 mph

### East 50mph

### East 50 mph - N Aspect

### East 50 mph - S Aspect

#### Surface Rate of Spread (ch/h)

Spread Dir deg	Fuel			Fuel			Fuel				Fuel	
	SCAL18	gs2	sh5	SCAL18	gs2	sh5	SCAL18	gs2	sh5	4	SCAL18	gs2
0	8.7	14.9	24.5	1.9	4.1	6	0.9	2.7	3.6	7.8	3.2	4.9
15	18.2	30.6	50.6	1.5	3.2	4.8	0.9	2.4	3.2	7	2.4	3.8
30	58	90.7	153.9	1.3	2.7	4	0.8	2.2	3	6.4	1.9	3.1
45	229.2	275.4	505.9	1.1	2.4	3.5	0.8	2.1	2.9	6.1	1.6	2.6
60	58	90.7	153.9	1	2.2	3.2	0.8	2	2.9	6.1	1.4	2.4
75	18.2	30.6	50.6	1	2.1	3.1	0.9	2.1	3	6.2	1.3	2.2
90	8.7	14.9	24.5	1	2	3	1	2.2	3.3	6.6	1.2	2.1
105	5.2	8.9	14.6	1	2.1	3.1	1.1	2.4	3.6	7.3	1.2	2.1
120	3.5	6.1	10	1	2.2	3.2	1.4	2.7	4.2	8.4	1.2	2.2
135	2.6	4.5	7.4	1.1	2.4	3.5	1.7	3.3	5.2	10.1	1.2	2.3
150	2.1	3.6	5.9	1.3	2.7	4	2.4	4.1	6.8	12.9	1.4	2.6
165	1.8	3	5	1.5	3.2	4.8	3.7	5.6	9.5	17.6	1.5	3
180	1.5	2.7	4.4	1.9	4.1	6	6.5	8.4	15	26.7	1.8	3.6
195	1.4	2.4	4	2.6	5.5	8	15.3	14.3	28.3	46.9	2.3	4.7
210	1.3	2.3	3.8	3.8	8.1	11.9	70	31.2	74.3	107.2	3.1	6.5
225	1.3	2.3	3.7	6.4	13.6	20.1	252.8	111.6	419.8	431.3	4.5	10.1
240	1.3	2.3	3.8	13.8	28.9	42.6	28.5	497.7	347.2	1296.4	7.5	18.5
255	1.4	2.4	4	48.1	97.3	145.2	9.5	85.5	67	208.7	15.5	45.2
270	1.5	2.7	4.4	322.9	504.5	814.2	4.7	26.8	26.5	70.9	49.5	202.7
285	1.8	3	5	48.1	97.3	145.2	2.9	12.9	14.4	35.6	258	268.7
300	2.1	3.6	5.9	13.8	28.9	42.6	2	7.8	9.2	21.9	60.2	53.9
315	2.6	4.5	7.4	6.4	13.6	20.1	1.5	5.3	6.6	15.2	17.4	20.6
330	3.5	6.1	10	3.8	8.1	11.9	1.2	4	5.1	11.5	8.1	11
345	5.2	8.9	14.6	2.6	5.5	8	1	3.2	4.2	9.2	4.7	6.9
360	8.7	14.9	24.5	1.9	4.1	6	0.9	2.7	3.6	7.8	3.2	4.9

## Cielo Vista Behave Output Summary

<u>SouthWest 30 mph</u>				<u>East 50mph</u>			<u>East 50 mph - N Aspect</u>				<u>East 50 mph - S Aspect</u>	
Fireline Intensity (Btu/ft/s)												
Spread	Fuel Model			Fuel Model			Fuel Model				Fuel	
Dir												
deg	SCAL18	gs2	sh5	SCAL18	gs2	sh5	SCAL18	gs2	sh5	4	SCAL18	gs2
0	652	156	866	143	43	212	70	28	127	469	239	52
15	1363	321	1791	114	34	168	65	25	114	416	177	40
30	4348	953	5446	96	29	141	62	23	107	384	140	32
45	17182	2893	17901	84	25	124	61	22	103	368	118	28
60	4348	953	5446	77	23	114	63	21	104	364	103	25
75	1363	321	1791	73	22	108	67	22	107	373	94	23
90	652	156	866	72	21	106	74	23	115	397	89	22
105	388	94	518	73	22	108	85	25	129	437	88	22
120	264	64	353	77	23	114	102	29	150	502	89	23
135	196	48	263	84	25	124	131	35	183	604	93	24
150	156	38	209	96	29	141	180	44	239	770	102	27
165	131	32	176	114	34	168	274	59	337	1055	115	31
180	115	28	155	143	43	212	487	88	531	1596	137	38
195	106	26	142	193	58	285	1146	150	1000	2805	172	49
210	100	24	135	285	85	420	5247	327	2627	6412	230	69
225	99	24	132	483	143	710	18950	1172	14854	25794	336	106
240	100	24	135	1031	304	1507	2134	5229	12283	77530	561	194
255	106	26	142	3604	1022	5139	709	898	2370	12481	1163	475
270	115	28	155	24210	5300	28809	356	281	938	4240	3713	2129
285	131	32	176	3604	1022	5139	218	136	508	2130	19342	2823
300	156	38	209	1031	304	1507	152	82	326	1307	4513	566
315	196	48	263	483	143	710	115	56	233	907	1303	217
330	264	64	353	285	85	420	93	42	180	685	605	115
345	388	94	518	193	58	285	79	33	148	553	355	73
360	652	156	866	143	43	212	70	28	127	469	239	52

## Cielo Vista Behave Output Summary

<u>SouthWest 30 mph</u>				<u>East 50mph</u>			<u>East 50 mph - N Aspect</u>				<u>East 50 mph - S Aspect</u>	
Flame Length (ft)												
Spread	Fuel Model			Fuel Model			Fuel Model				Fuel	
Dir												
deg	SCAL18	gs2	sh5	SCAL18	gs2	sh5	SCAL18	gs2	sh5	4	SCAL18	gs2
0	8.9	4.6	10.1	4.4	2.5	5.3	3.2	2.1	4.2	7.6	5.6	2.8
15	12.4	6.4	14.1	4	2.3	4.8	3.1	2	4	7.2	4.9	2.4
30	21.2	10.6	23.5	3.7	2.1	4.4	3	1.9	3.9	7	4.4	2.2
45	39.9	17.6	40.7	3.5	2	4.1	3	1.9	3.8	6.8	4	2.1
60	21.2	10.6	23.5	3.3	1.9	4	3	1.8	3.8	6.8	3.8	2
75	12.4	6.4	14.1	3.2	1.9	3.9	3.1	1.9	3.9	6.9	3.6	1.9
90	8.9	4.6	10.1	3.2	1.8	3.8	3.3	1.9	4	7.1	3.6	1.9
105	7	3.6	8	3.2	1.9	3.9	3.5	2	4.2	7.4	3.5	1.9
120	5.8	3	6.7	3.3	1.9	4	3.8	2.1	4.5	7.9	3.5	1.9
135	5.1	2.7	5.8	3.5	2	4.1	4.2	2.3	4.9	8.6	3.6	2
150	4.6	2.4	5.3	3.7	2.1	4.4	4.9	2.6	5.6	9.6	3.8	2.1
165	4.2	2.2	4.9	4	2.3	4.8	6	2.9	6.5	11.1	4	2.2
180	4	2.1	4.6	4.4	2.5	5.3	7.8	3.5	8.1	13.4	4.3	2.4
195	3.8	2	4.4	5.1	2.9	6.1	11.5	4.5	10.8	17.3	4.8	2.7
210	3.7	2	4.3	6.1	3.5	7.2	23.1	6.5	16.8	25.4	5.5	3.2
225	3.7	1.9	4.3	7.7	4.4	9.2	41.8	11.6	37.3	48.1	6.5	3.9
240	3.7	2	4.3	10.9	6.2	13	15.3	23.1	34.2	79.9	8.3	5.1
255	3.8	2	4.4	19.5	10.9	22.9	9.2	10.3	16.1	34.5	11.6	7.7
270	4	2.1	4.6	46.8	23.2	50.7	6.7	6	10.5	21	19.7	15.3
285	4.2	2.2	4.9	19.5	10.9	22.9	5.4	4.3	7.9	15.3	42.2	17.4
300	4.6	2.4	5.3	10.9	6.2	13	4.5	3.4	6.4	12.2	21.6	8.3
315	5.1	2.7	5.8	7.7	4.4	9.2	4	2.9	5.5	10.3	12.2	5.3
330	5.8	3	6.7	6.1	3.5	7.2	3.6	2.5	4.9	9.1	8.6	4
345	7	3.6	8	5.1	2.9	6.1	3.4	2.3	4.5	8.2	6.7	3.2
360	8.9	4.6	10.1	4.4	2.5	5.3	3.2	2.1	4.2	7.6	5.6	2.8

## Cielo Vista Behave Output Summary

### Flame Length (ft)

Spread Dir deg	Fuel Model		
	SCAL18	gs2	sh5
0	3.2	2.1	4.2
15	3.1	2	4
30	3	1.9	3.9
45	3	1.9	3.8
60	3	1.8	3.8
75	3.1	1.9	3.9
90	3.3	1.9	4
105	3.5	2	4.2
120	3.8	2.1	4.5
135	4.2	2.3	4.9
150	4.9	2.6	5.6
165	6	2.9	6.5
180	7.8	3.5	8.1
195	11.5	4.5	10.8
210	23.1	6.5	16.8
225	41.8	11.6	37.3
240	15.3	23.1	34.2
255	9.2	10.3	16.1
270	6.7	6	10.5
285	5.4	4.3	7.9
300	4.5	3.4	6.4
315	4	2.9	5.5
330	3.6	2.5	4.9
345	3.4	2.3	4.5
360	3.2	2.1	4.2

## Cielo Vista Behave Output Summary

<u>SouthWest 30 mph</u>				<u>East 50mph</u>			<u>East 50 mph - N Aspect</u>				<u>East 50 mph - S Aspect</u>	
Direction of Maximum Spread												
Spread	Fuel Model			Fuel Model			Fuel Model				Fuel Model	
Dir												
deg	SCAL18	gs2	sh5	SCAL18	gs2	sh5	SCAL18	gs2	sh5	4	SCAL18	gs2
0	45	45	45	270	270	270	221	239	232	237	286	279
15	45	45	45	270	270	270	221	239	232	237	286	279
30	45	45	45	270	270	270	221	239	232	237	286	279
45	45	45	45	270	270	270	221	239	232	237	286	279
60	45	45	45	270	270	270	221	239	232	237	286	279
75	45	45	45	270	270	270	221	239	232	237	286	279
90	45	45	45	270	270	270	221	239	232	237	286	279
105	45	45	45	270	270	270	221	239	232	237	286	279
120	45	45	45	270	270	270	221	239	232	237	286	279
135	45	45	45	270	270	270	221	239	232	237	286	279
150	45	45	45	270	270	270	221	239	232	237	286	279
165	45	45	45	270	270	270	221	239	232	237	286	279
180	45	45	45	270	270	270	221	239	232	237	286	279
195	45	45	45	270	270	270	221	239	232	237	286	279
210	45	45	45	270	270	270	221	239	232	237	286	279
225	45	45	45	270	270	270	221	239	232	237	286	279
240	45	45	45	270	270	270	221	239	232	237	286	279
255	45	45	45	270	270	270	221	239	232	237	286	279
270	45	45	45	270	270	270	221	239	232	237	286	279
285	45	45	45	270	270	270	221	239	232	237	286	279
300	45	45	45	270	270	270	221	239	232	237	286	279
315	45	45	45	270	270	270	221	239	232	237	286	279
330	45	45	45	270	270	270	221	239	232	237	286	279
345	45	45	45	270	270	270	221	239	232	237	286	279
360	45	45	45	270	270	270	221	239	232	237	286	279



## Cielo Vista Behave Output Summary

<u>SouthWest 30 mph</u>				<u>East 50mph</u>			<u>East 50 mph - N Aspect</u>				<u>East 50 mph - S Aspect</u>	
Flame Residence Time (min)												
Spread	Fuel Model			Fuel Model			Fuel Model				Fuel Model	
Dir												
deg	SCAL18	gs2	sh5	SCAL18	gs2	sh5	SCAL18	gs2	sh5	4	SCAL18	gs2
0	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
15	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
30	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
45	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
60	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
75	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
90	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
105	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
120	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
135	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
150	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
165	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
180	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
195	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
210	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
225	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
240	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
255	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
270	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
285	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
300	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
315	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
330	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
345	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21
360	0.49	0.21	0.31	0.49	0.21	0.31	0.49	0.21	0.31	0.22	0.49	0.21

**SECTION R327**  
**MATERIALS AND CONSTRUCTION METHODS FOR**  
**EXTERIOR WILDFIRE EXPOSURE**

**SECTION R327.1**  
**SCOPE, PURPOSE AND APPLICATION**

**R327.1.1 Scope.** *This chapter applies to building materials, systems and or assemblies used in the exterior design and construction of new buildings located within a Wildland-Urban Interface Fire Area as defined in Section R327.2.*

**R327.1.2 Purpose.** *The purpose of this Chapter is to establish minimum standards for the protection of life and prop-*

erty by increasing the ability of a building located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area to resist the intrusion of flame or burning embers projected by a vegetation fire and contributes to a systematic reduction in conflagration losses.

**R327.1.3. Application.** *New buildings located in any Fire Hazard Severity Zone or any Wildland-Urban Interface Fire Area designated by the enforcing agency constructed after the application date shall comply with the provisions of this chapter.*

**Exceptions:**

1. *Buildings of an accessory character classified as a Group U occupancy and not exceeding 120 square feet in floor area, when located at least 30 feet from an applicable building.*
2. *Buildings of an accessory character classified as Group U occupancy of any size located least 50 feet from an applicable building.*
3. *Buildings classified as a Group U Agricultural Building, as defined in Section 202 of this code (see also Appendix C – Group U Agricultural Buildings), when located at least 50 feet from an applicable building.*
4. *Additions to and remodels of buildings originally constructed prior to the applicable application date.*

**R327.1.3.1 Application date and where required.** *New buildings for which an application for a building permit is submitted on or after July 1, 2008 located in any Fire Hazard Severity Zone or Wildland Interface Fire Area shall comply with all sections of this chapter, including all of the following areas:*

1. *All unincorporated lands designated by the State Board of Forestry and Fire Protection as State Responsibility Area (SRA) including:*
  - 1.1. *Moderate Fire Hazard Severity Zones*
  - 1.2. *High Fire Hazard Severity Zones*
  - 1.3. *Very-High Fire Hazard Severity Zones*
2. *Land designated as Very-High Fire Hazard Severity Zone by cities and other local agencies.*
3. *Land designated as Wildland Interface Fire Area by cities and other local agencies.*

**Exceptions:**

1. *New buildings located in any Fire Hazard Severity Zone within State Responsibility Areas, for which an application for a building permit is submitted on or after January 1, 2008, shall comply with all sections of this chapter.*

2. *New buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland Interface Fire Area designated by cities and other local agencies for which an application for a building permit is submitted on or after December 1, 2005 but prior to July 1, 2008 shall only comply with the following sections of this chapter:*

2.1. *Section R327.5 – Roofing*

2.2. *Section R327.6 – Vents*

**R327.1.4 Inspection and certification.** *Building permit applications and final completion approvals for buildings within the scope and application of this chapter shall comply with the following:*

1. *Building permit issuance. The local building official shall, prior to construction, provide the owner or applicant a certification that the building as proposed to be built complies with all applicable state and local building standards, including those for materials and construction methods for wildfire exposure as described in this chapter. Issuance of a building permit by the local building official for the proposed building shall be considered as complying with this section.*
2. *Building permit final. The local building official shall, upon completion of construction, provide the owner or applicant with a copy of the final inspection report that demonstrates the building was constructed in compliance with all applicable state and local building standards, including those for materials and construction methods for wildfire exposure as described in this Chapter. Issuance of a certificate of occupancy by the local building official for the proposed building shall be considered as complying with this section.*

**R327.1.5 Vegetation management compliance.** *Prior to building permit final approval, the property shall be in compliance with the vegetation management requirements prescribed in California Fire Code section 4906, including California Public Resources Code 4291 or California Government Code Section 51182. Acceptable methods of compliance inspection and documentation shall be determined by the enforcing agency and may include any of the following:*

1. *Local, state or federal fire authority or designee authorized to enforce vegetation management requirements*
2. *Enforcing agency*
3. *Third-party inspection and certification authorized to enforce vegetation management requirements*
4. *Property owner certification authorized by the enforcing agency*

## BUILDING PLANNING

**SECTION R327.2  
DEFINITIONS**

For the purposes of this chapter, certain terms are defined below:

**CDF DIRECTOR** means the Director of the California Department of Forestry and Fire Protection.

**EXTERIOR COVERING.** The exposed siding or cladding material applied to the exterior side of an exterior wall, roof eave soffit, floor projection or exposed underfloor framing.

**FIRE PROTECTION PLAN** is a document prepared for a specific project or development proposed for a Wildland-Urban Interface Fire Area. It describes ways to minimize and mitigate potential for loss from wildfire exposure. The Fire Protection Plan shall be in accordance with this chapter and the California Fire Code, Chapter 49. When required by the enforcing agency for the purposes of granting modifications, a fire protection plan shall be submitted. Only locally adopted ordinances that have been filed with the California Building Standards Commission or the Department of Housing and Community Development in accordance with Section 1.1.8 shall apply.

**FIRE HAZARD SEVERITY ZONES** are geographical areas designated pursuant to California Public Resources Codes Sections 4201 through 4204 and classified as Very-High, High or Moderate in State Responsibility Areas or as Local Agency Very-High Fire Hazard Severity Zones designated pursuant to California Government Code Sections 51175 through 51189. See California Fire Code Article 86.

The California Code of Regulations, Title 14, Section 1280 entitles the maps of these geographical areas as "Maps of the Fire Hazard Severity Zones in the State Responsibility Area of California."

**HEAVY TIMBER.** A type of construction classification specified in Section 602 of the California Building Code. For use in this chapter, heavy timber shall be sawn lumber or glue laminated wood with the smallest minimum nominal dimension of 4 inches (102 mm). Heavy timber walls or floors shall be sawn or glue-laminated planks splined, tongue-and-grove, or set close together and well spiked.

**IGNITION-RESISTANT MATERIAL** A type of building material that resists ignition or sustained flaming combustion sufficiently so as to reduce losses from wildland-urban interface conflagrations under worst-case weather and fuel conditions with wildfire exposure of burning embers and small flames, as prescribed in Section R327.3 and SFM Standard 12-7A-5, Ignition-Resistant Material.

**LOCAL AGENCY VERY-HIGH FIRE HAZARD SEVERITY ZONE** means an area designated by a local agency upon the recommendation of the CDF Director pursuant to Government Code Sections 51177(c), 51178 and 5118 that is not a state responsibility area and where a local agency, city, county, city and county, or district is responsible for fire protection.

**LOG WALL CONSTRUCTION.** A type of construction in which exterior walls are constructed of solid wood members and where the smallest horizontal dimension of each solid wood member is at least 6 inches (152 mm).

**RAFTER TAIL.** The portion of roof rafter framing in a sloping roof assembly that projects beyond and overhangs an exterior wall.

**ROOF EAVE.** The lower portion of a sloping roof assembly that projects beyond and overhangs an exterior wall at the lower end of the rafter tails. Roof eaves may be either "open" or "enclosed." Open roof eaves have exposed rafter tails and an unenclosed space on the underside of the roof deck. Enclosed roof eaves have a boxed-in roof eave soffit with a horizontal underside or sloping rafter tails with an exterior covering applied to the underside of the rafter tails.

**ROOF EAVE SOFFIT.** An enclosed boxed-in soffit under a roof eave with exterior covering material applied to the soffit framing creating a horizontal surface on the exposed underside.

**STATE RESPONSIBILITY AREA** means lands that are classified by the Board of Forestry pursuant to Public Resources Code Section 4125 where the financial responsibility of preventing and suppressing forest fires is primarily the responsibility of the state.

**WILDFIRE** is any uncontrolled fire spreading through vegetative fuels that threatens to destroy life, property or resources as defined in Public Resources Code Sections 4103 and 4104.

**WILDFIRE EXPOSURE** is one or a combination of radiant heat, convective heat, direct flame contact and burning embers being projected by vegetation fire to a structure and its immediate environment.

**WILDLAND-URBAN INTERFACE FIRE AREA** is a geographical area identified by the state as a "Fire Hazard Severity Zone" in accordance with the Public Resources Code Sections 4201 through 4204 and Government Code Sections 51175 through 51189, or other areas designated by the enforcing agency to be at a significant risk from wildfires.

**SECTION R327.3  
STANDARDS OF QUALITY**

**R327.3.1 General.** Building material, systems, assemblies and methods of construction used in this chapter shall be in accordance with Section R327.3.

**R327.3.2 Qualification by testing.** Material and material assemblies tested in accordance with the requirements of Section R327.3 shall be accepted for use when the results and conditions of those tests are met. Product evaluation testing of material and material assemblies shall be approved or listed by the State Fire Marshal, or identified in a current report issued by an approved agency.

**R327.3.3 Approved agency.** Product evaluation testing shall be performed by an approved agency as defined in Section 1702 of the California Building Code. The scope of accreditation for the approved agency shall include building product compliance with code.

**R327.3.4 Labeling.** Material and material assemblies tested in accordance with the requirements of section R327.3 shall bear an identification label showing the fire test results. That identification label shall be issued by a



testing and/or inspecting agency approved by the State Fire Marshal.

1. Identification mark of the approved testing and/or inspecting agency
2. Contact and identification information of the manufacturer
3. Model number or identification of the product or material
4. Pre-test weathering specified in this chapter
5. Compliance standard as described under Section R327.3.7

#### **R327.3.5 Weathering and surface treatment protection.**

**R327.3.5.1 General.** Material and material assemblies tested in accordance with the requirements of Section R327.3 shall maintain their fire test performance under conditions of use when installed in accordance with the manufacturers instructions.

**R327.3.5.2 Weathering.** Fire-retardant-treated wood and fire-retardant-treated wood shingles and shakes shall meet the fire test performance requirements of this chapter after being subjected to the weathering conditions contained in the following standards, as applicable to the materials and the conditions of use.

**R327.3.5.2.1 Fire-retardant-treated wood.** Fire-retardant-treated wood shall be tested in accordance with ASTM D 2898, "Standard Practice for Accelerated Weathering of Fire-Retardant Treated Wood for Fire Testing (Method A)" and the requirements of Section 2303.2 of the California Building Code.

**R327.3.5.2.2 Fire-retardant-treated wood shingles and shakes.** Fire-retardant-treated wood shingles and shakes shall be approved and listed by the State Fire Marshal in accordance with Section 208(c), Title 19 California Code of Regulations.

**R327.3.5.3 Surface treatment protection.** The use of paints, coatings, stains or other surface treatments are not an approved method of protection as required in this section.

**R327.3.6 Alternates for materials, design, tests and methods of construction.** The enforcing agency is permitted to modify the provisions of this chapter for site-specific conditions in accordance with Section 1.11.2.4. When required by the enforcing agency for the purposes of granting modifications, a fire protection plan shall be submitted in accordance with the California Fire Code, Chapter 49.

**R327.3.7 Standards of quality.** The State Fire Marshal standards for exterior wildfire exposure protection listed below and as referenced in this chapter are located in the California Referenced Standards Code, Part 12 and Chapter 44 of this code.

**SFM Standard 12-7A-1, Exterior Wall Siding and Sheathing.** A fire resistance test standard consisting of a

150 kW intensity direct flame exposure for a 10 minutes duration.

**SFM Standard 12-7A-2, Exterior Windows.** A fire resistance test standard consisting of a 150 kW intensity direct flame exposure for a 8 minutes duration.

**SFM Standard 12-7A-3, Horizontal Projection Under-side.** A fire resistance test standard consisting of a 300 kW intensity direct flame exposure for a 10 minute duration.

**SFM Standard 12-7A-4, Decking.** A two-part test consisting of a heat release rate (Part A) deck assembly combustion test with an under deck exposure of 80 kW intensity direct flame for a 3 minute duration, and a (Part B) sustained deck assembly combustion test consisting of a deck upper surface burning ember exposure with a 12 mph wind for 40 minutes using a 2.2lb (1kg) burning "Class A" size 12 inch x 12 inch x 2.25inch (300 mm x 300 mm x 57mm) roof test brand.

**SFM Standard 12-7A-4A, Decking Alternate Method A.** A heat release rate deck assembly combustion test with an under deck exposure of 80 kW intensity direct flame for a 3 minute duration,

**SFM Standard 12-7A-5, Ignition-resistant Material.** A generic building material surface burning flame spread test standard consisting of an extended 30 minute ASTM E 84 or UL 723 test method as is used for Fire-Retardant-Treated wood.

### **SECTION R327.4 IGNITION RESISTANT CONSTRUCTION**

**R327.4.1 General.** The materials prescribed herein for ignition resistance shall conform to the requirements of this chapter.

**R327.4.2 Ignition-resistant material.** Ignition-resistant material shall be determined in accordance with the test procedures set forth in SFM Standard 12-7A-5 "Ignition-Resistant Material" or in accordance with this section.

**R327.4.3 Alternative methods for determining ignition-resistant material.** Any one of the following shall be accepted as meeting the definition of ignition-resistant material:

1. Noncombustible material. Material that complies with the definition for noncombustible materials in Section R202.
2. Fire-retardant-treated wood. Fire-retardant-treated wood identified for exterior use that complies with the requirements of Section 2303.2 of the California Building Code.
3. Fire-retardant-treated wood shingles and shakes. Fire-retardant-treated wood shingles and shakes, as defined in Section 1505.6 of the California Building Code and listed by State Fire Marshal for use as "Class B" roof covering, shall be accepted as an igni-

## BUILDING PLANNING

tion-resistant wall covering material when installed over solid sheathing.

### SECTION R327.5 ROOFING

**R327.5.1 General.** Roofs shall comply with the requirements of Sections R327 and R902. Roofs shall have a roofing assembly installed in accordance with its listing and the manufacturer's installation instructions.

**R327.5.2 Roof coverings.** Where the roof profile allows a space between the roof covering and roof decking, the spaces shall be constructed to prevent the intrusion of flames and embers, be firestopped with approved materials or have one layer of minimum 72 pound (32.4 kg) mineral-surfaced nonperforated cap sheet complying with ASTM D 3909 installed over the combustible decking.

**R327.5.3 Roof valleys.** Where valley flashing is installed, the flashing shall be not less than 0.019-inch (0.48 mm) No. 26 gage galvanized sheet corrosion-resistant metal installed over not less than one layer of minimum 72-pound (32.4 kg) mineral-surfaced nonperforated cap sheet complying with ASTM D 3909, at least 36-inch-wide (914 mm) running the full length of the valley.

**R327.5.4 Roof gutters.** Roof gutters shall be provided with the means to prevent the accumulation of leaves and debris in the gutter.

### SECTION R327.6 VENTS

**R327.6.1 General.** Where provided, ventilation openings for enclosed attics, enclosed eave soffit spaces, enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters, and underfloor ventilation shall be in accordance with Section 1203 of the California Building Code and Sections R327.6.1 through R327.6.3 of this section to resist building ignition from the intrusion of burning embers and flame through the ventilation openings.

**R327.6.2 Requirements.** Ventilation openings for enclosed attics, enclosed eave soffit spaces, enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters, and underfloor ventilation openings shall be fully covered with metal wire mesh, vents, other materials or other devices that meet the following requirements:

1. The dimensions of the openings therein shall be a minimum of  $\frac{1}{16}$ th inch (1.6 mm) and shall not exceed  $\frac{1}{8}$ th inch (3.2mm).
2. The materials used shall be noncombustible.  
*Exception:* Vents located under the roof covering, along the ridge of roofs, with the exposed surface of the vent covered by noncombustible wire mesh, may be of combustible materials.
3. The materials used shall be corrosion resistant.

**R327.6.3 Ventilation openings on the underside of eaves and cornices:** Vents shall not be installed on the underside of eaves and cornices.

#### Exceptions:

1. The enforcing agency may accept or approve special eave and cornice vents that resist the intrusion of flame and burning embers.
2. Vents complying with the requirements of Section R327.6.2 may be installed on the underside of eaves and cornices in accordance with either one of the following conditions:
  - 2.1. The attic space being ventilated is fully protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 of the California Building Code or,
  - 2.2. The exterior wall covering and exposed underside of the eave are of noncombustible material, or ignition-resistant materials as determined in accordance with SFM Standard 12-7A-5 Ignition-Resistant Material and the vent is located more than 12 feet from the ground or walking surface of a deck, porch, patio, or similar surface.

### SFM-SECTION R327.7 EXTERIOR COVERING

**R327.7.1 Scope.** The provisions of this section shall govern the materials and construction methods used to resist building ignition and/or safeguard against the intrusion of flames resulting from small ember and short-term direct flame contact exposure.

**R327.7.2 General.** The following exterior covering materials and/or assemblies shall comply with this section:

1. Exterior wall covering material
2. Exterior wall assembly
3. Exterior exposed underside of roof eave overhangs
4. Exterior exposed underside of roof eave soffits
5. Exposed underside of exterior porch ceilings
6. Exterior exposed underside of floor projections
7. Exterior underfloor areas

#### Exceptions:

1. Exterior wall architectural trim, embellishments, fascias, and gutters
2. Roof or wall top cornice projections and similar assemblies
3. Roof assembly projections over gable end walls



4. Solid wood rafter tails and solid wood blocking installed between rafters having minimum dimension 2 inch (50.8 mm) nominal
5. Deck walking surfaces shall comply with Section R327.9 only

**R327.7.3. Exterior walls.** The exterior wall covering or wall assembly shall comply with one of the following requirements:

1. Noncombustible material
2. Ignition-resistant material
3. Heavy-timber exterior wall assembly
4. Log wall construction assembly
5. Wall assemblies that meet the performance criteria in accordance with the test procedures for a 10-minute direct flame contact exposure test set forth in SFM Standard 12-7A-1

**Exceptions:** Any of the following shall be deemed to meet the assembly performance criteria and intent of this section:

1. One layer of  $\frac{5}{8}$ -inch Type X gypsum sheathing applied behind the exterior covering or cladding on the exterior side of the framing.
2. The exterior portion of a 1-hour fire resistive exterior wall assembly designed for exterior fire exposure including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual.

**R327.7.3.1 Extent of exterior wall covering.** Exterior wall coverings shall extend from the top of the foundation to the roof, and terminate at 2 inch (50.8 mm) nominal solid wood blocking between rafters at all roof overhangs, or in the case of enclosed eaves, terminate at the enclosure.

**R327.7.4 Open roof eaves.** The exposed roof deck on the underside of unenclosed roof eaves shall consist of one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $\frac{5}{8}$ -inch Type X gypsum sheathing applied behind an exterior covering on the underside exterior of the roof deck
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the roof deck designed for exterior fire exposure including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual

**Exceptions:** The following materials do not require protection:

1. Solid wood rafter tails on the exposed underside of open roof eaves having a minimum nominal dimension of 2 inch (50.8 mm)

2. Solid wood blocking installed between rafter tails on the exposed underside of open roof eaves having a minimum nominal dimension of 2 inch (50.8 mm)
3. Gable end overhangs and roof assembly projections beyond an exterior wall other than at the lower end of the rafter tails
4. Fascia and other architectural trim boards

**R327.7.5 Enclosed roof eaves and roof eave soffits.** The exposed underside of enclosed roof eaves having either a boxed-in roof eave soffit with a horizontal underside, or sloping rafter tails with an exterior covering applied to the underside of the rafter tails, shall be protected by one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $\frac{5}{8}$ -inch Type X gypsum sheathing applied behind an exterior covering on the underside of the rafter tails or soffit
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the rafter tails or soffit including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual
5. Boxed-in roof eave soffit assemblies with a horizontal underside that meet the performance criteria in accordance with the test procedures set forth in SFM Standard 12-7A-3

**Exceptions:** The following materials do not require protection:

1. Gable end overhangs and roof assembly projections beyond an exterior wall other than at the lower end of the rafter tails
2. Fascia and other architectural trim boards

**R327.7.6 Exterior porch ceilings.** The exposed underside of exterior porch ceilings shall be protected by one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $\frac{5}{8}$ -inch Type X gypsum sheathing applied behind the exterior covering on the underside of the ceiling
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the ceiling assembly including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual
5. Porch ceiling assemblies with a horizontal underside that meet the performance criteria in accordance with the test procedures set forth in SFM Standard 12-7A-3

**Exception:** Architectural trim boards.

## BUILDING PLANNING

**R327.7.7 Floor projections.** The exposed underside of a cantilevered floor projection where a floor assembly extends over an exterior wall shall be protected by one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $5/8$ -inch Type X gypsum sheathing applied behind an exterior covering on the underside of the floor projection
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the floor projection including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual
5. The underside of a floor projection assembly that meet the performance criteria in accordance with the test procedures set forth in SFM Standard 12-7A-3

**Exception:** Architectural trim boards.

**R327.7.8. Underfloor protection.** The underfloor area of elevated or overhanging buildings shall be enclosed to grade in accordance with the requirements of this chapter or the underside of the exposed underfloor shall consist of one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $5/8$ -inch Type X gypsum sheathing applied behind an exterior covering on the underside of the floor projection
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the floor including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual
5. The underside of a floor assembly that meets the performance criteria in accordance with the test procedures set forth in SFM Standard 12-7A-3

**Exception:** Heavy-timber structural columns and beams do not require protection.

**R327.7.9 Underside of appendages.** When required by the enforcing agency the underside of overhanging appendages shall be enclosed to grade in accordance with the requirements of this chapter or the underside of the exposed underfloor shall consist of one of the following:

1. Noncombustible material
2. Ignition-resistant material
3. One layer of  $5/8$ -inch Type X gypsum sheathing applied behind an exterior covering on the underside of the floor projection
4. The exterior portion of a 1-hour fire resistive exterior wall assembly applied to the underside of the floor including assemblies using the gypsum panel and sheathing products listed in the Gypsum Association Fire Resistance Design Manual

5. The underside of a floor assembly that meets the performance criteria in accordance with the test procedures set forth in SFM Standard 12-7A-3

**Exception:** Heavy-timber structural columns and beams do not require protection.

## SECTION R327.8 EXTERIOR WINDOWS AND DOORS

### R327.8.1 General.

**R327.8.2 Exterior glazing.** The following exterior glazing materials and/or assemblies shall comply with this section:

1. Exterior windows
2. Exterior glazed doors
3. Glazed openings within exterior doors
4. Glazed openings within exterior garage doors
5. Exterior structural glass veneer

**R327.8.2.1 Exterior windows and exterior glazed door assembly requirements.** Exterior windows and exterior glazed door assemblies shall comply with one of the following requirements:

1. Be constructed of multipane glazing with a minimum of one tempered pane meeting the requirements of Section 2406 Safety Glazing, or
2. Be constructed of glass block units, or
3. Have a fire-resistance rating of not less than 20 minutes when tested according to NFPA 257, or
5. Be tested to meet the performance requirements of SFM Standard 12-7A-2.

**R327.8.2.2 Structural glass veneer.** The wall assembly behind structural glass veneer shall comply with Section R327.7.3.

**R327.8.3 Exterior doors.** Exterior doors shall comply with one of the following:

1. The exterior surface or cladding shall be of noncombustible or ignition-resistant material, or
2. Shall be constructed of solid core wood that comply with the following requirements:
  - 2.1. Stiles and rails shall not be less than  $1\frac{3}{8}$  inches thick
  - 2.2. Raised panels shall not be less than  $1\frac{1}{4}$  inches thick, except for the exterior perimeter of the raised panel that may taper to a tongue not less than  $3/8$  inch thick.
3. Shall have a fire-resistance rating of not less than 20 minutes when tested according to NFPA 252.
4. Shall be tested to meet the performance requirements of SFM Standard 12-7A-1.

**R327.8.3.1 Exterior door glazing.** Glazing in exterior doors shall comply with Section R327.8.2.1.

## **SECTION R327.9 DECKING**

**R327.9.1 General.** The walking surface material of decks, porches, balconies and stairs shall comply with the requirements of this section.

**R327.9.2 Where required.** The walking surface material of decks, porches, balconies and stairs shall comply with the requirements of this section when any portion of such surface is within 10 feet (3048 mm) of the building.

**R327.9.3 Decking surfaces.** The walking surface material of decks, porches, balconies and stairs shall be constructed with one of the following materials:

1. Ignition-resistant material that complies with the performance requirements of both SFM Standard 12-7A-4 and SFM Standard 12-7A-5
2. Exterior fire retardant treated wood
3. Noncombustible material
4. Any material that complies with the performance requirements of SFM Standard 12-7A-4A when attached exterior wall covering is also either noncombustible or ignition-resistant material

**Exception:** Wall material may be of any material that otherwise complies with this chapter when the decking surface material complies with the performance requirements ASTM E 84 with a Class B flame spread rating.

## **SECTION R327.10 ACCESSORY STRUCTURES**

**R327.10.1 General.** Accessory and miscellaneous structures, other than buildings covered by Section R327.1.3, which pose a significant exterior exposure hazard to applicable buildings during wildfires shall be constructed to conform to the ignition resistance requirements of this section.

**R327.10.2 Applicability.** The provisions of this section shall apply to trellises, arbors, patio covers, carports, gazebos and similar structures of an accessory or miscellaneous character.

### **Exceptions:**

1. Decks shall comply with the requirements of Section R327.9.
2. Awnings and canopies shall comply with the requirements of Section 3105 of the California Building Code.

**R327.10.3 Where required.** Accessory structures shall comply with the requirements of this section.

**R327.10.3.1 Attached accessory structures** shall comply with the requirements of this section.

**R327.10.3.2** When required by the enforcing agency, detached accessory structures within 50 feet of an applicable building shall comply with the requirements of this section.

**R327.10.4. Requirements.** When required by the enforcing agency accessory structures shall be constructed of noncombustible or ignition-resistant materials.





# ORANGE COUNTY FIRE AUTHORITY

## *Vegetation Management Maintenance Guidelines For Property Owners*

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COASTAL



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Yourself, Your Family, Your Property,  
and Your Community.**

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**READY, SET, GO!**

# ***Vegetation Management Maintenance Guidelines For Property Owners***

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**Accept Responsibility to Protect:  
Yourself, Your Family, Your Property,  
and Your Community.**

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# ***Vegetation Management - It's Up to You To Get Ready!***



## ***Introduction***

The Orange County Fire Authority understands that many of our high wildfire risk areas are also our most beautiful and in many cases the reason people choose to live where they do. Each year, thousands of acres of wildland and hundreds of homes are destroyed by wildfires. It is up to you, the property owner, to take responsibility for preparing your home. By applying knowledge of Vegetation Management and home hardening, you will be closer to ensuring your home's survivability and your family's safety. When your work is done you will have also done your part in making your community a safer place in which to live.

## ***Guideline Purpose***

Orange County Fire Authority takes every precaution to help protect you and your property from wildfire. In the event of a major wildfire, however, firefighting resources will be stretched. Please prepare now to protect yourself, your family, and your property from a devastating wildfire by taking time to learn about Vegetation Management.

## ***What do I have, Defensible Space or Fuel Modification?***

Vegetation Management practices are implemented and enforced in two ways. These two practices are titled Defensible Space and Fuel Modification. California state-wide law requires that land owners in areas at risk from wildfires implement and maintain a Defensible Space landscape area between buildings and potential approaching wildfires. Since 1979, local agencies served by Orange County Fire Authority (OCFA) have adopted provisions in local fire codes requiring new buildings to be protected by Fuel Modification Zone. During the design and construction process, land owners and builders are required to design, implement, and maintain a landscape Fuel Modification Zone. Generally, buildings built prior to 1979 have Defensible Space and buildings built after 1979 have a Fuel Modification Zone.

## ***What is Vegetation Management?***

Vegetation Management is the controlling of plant materials for the prevention of fire spread. Vegetation Management is simply removing dead and dying fuels, thinning heavy brush, and trimming trees that could contribute to a fire's spread towards your home.

## ***Did you know?***

During a wildfire, thousands of embers can rain down on your roof and pelt the side of your home like hail during a storm. If these embers become lodged in something easily ignited on or near your house, the home will be in jeopardy of burning. Embers coming into contact with vegetation or combustible construction material are the major reason homes are destroyed during wildfires.

*The objective of VEGETATION MANAGEMENT is to reduce the wildfire threat to a home by changing the characteristics of the vegetation adjacent to the home.*

***Vegetation Management practices include:***

1. Increasing the moisture content of vegetation.
2. Decreasing the amount of vegetation within 100' of your house.
3. Shortening plant height. Keep plants within 10' of a building below 2'.
4. Altering the arrangement of plants.
5. Installing plants that use less water.



## ***FOUR R's of Vegetation Management***

### ***REMOVAL:***

- Remove all dead vegetation within 100' of your home.
- Remove plants found on the undesirable plant list.

### ***REDUCTION:***

- Reduce the amount of vegetation by pruning and thinning within 100' of your home.
- Trees and shrubs need to be pruned to provide separation (See Vertical Separation Requirements).
- Shrubs over 2' can be in groups of 3 plants with a minimum spacing between groups of 15' or 3 times the tallest in the group.
- Plants within 10' of your home should be 2' or lower to reduce the flame length.
- Additional spacing may be recommended on steeper slopes.

### ***REPLACEMENT:***

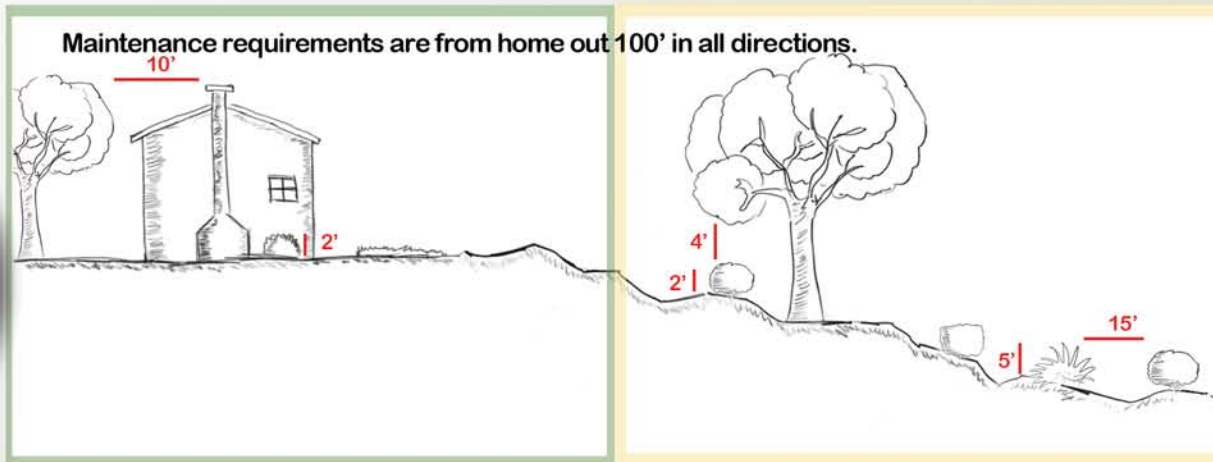
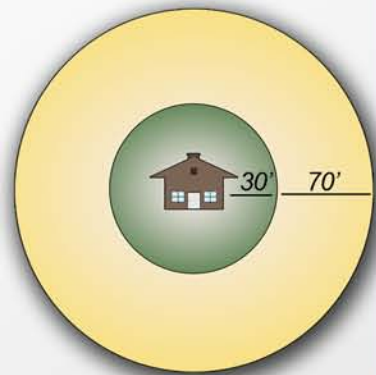
- Remove highly combustible plants within 100' of your home.
- Keep in mind that if you use the recommended plants, you must still reduce the amount of plant material by thinning per the spacing guidelines for both vertical separation and horizontal separation.
- When installing new plants make sure to plant them with spacing and mature plant size in mind.

### ***RESISTANT:***

- Utilize fire resistive plants whenever possible.
- Keep in mind that if you use recommended plants, you must still reduce the amount of plant material by thinning per the spacing guidelines for both vertical separation and horizontal separation.



# STRUCTURE AT TOP OF SLOPE



Remove all tree branches or vegetation within 10' of chimney outlet.

Trees within 100' of your home or neighbor's home should be kept free of dead branches and debris.

Provide vertical separation between shrubs and trees.

Provide horizontal separation for plants over 2' in height. Plants that are 2' or lower need no space between each other.

Maintain palm trees clear of dead fronds.

Remove all dead or dying plant material including dead material within vines.

It is recommended that you keep all shrubs within 10' of your home 2' or lower and keep plants away from windows.

Move wood piles at least 30' away from your home or to property line.

Keep annual grasses and weeds cut to 4".

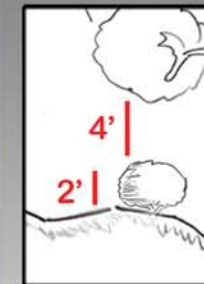
Wood fences, patio covers, and gazebos need to be free of dead vines.

If you own within this area, you must maintain the plants / trees according to the separation requirements within the document.

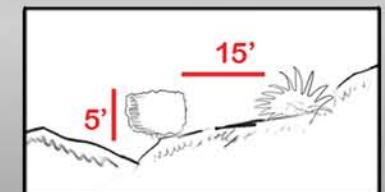
This area may be maintained by the homeowner association or adjacent landowner.



## VERTICAL SEPARATION

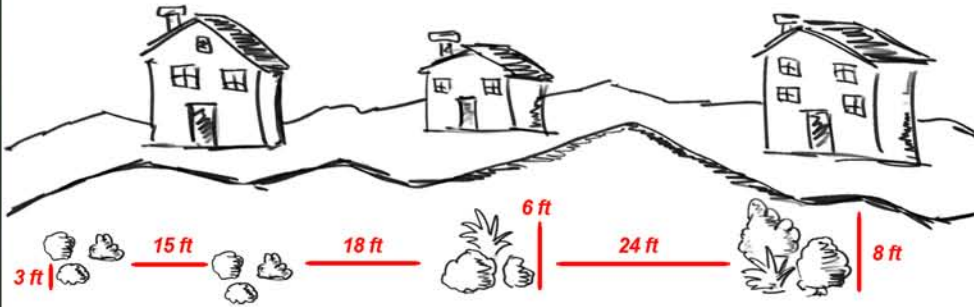


## HORIZONTAL SEPARATION

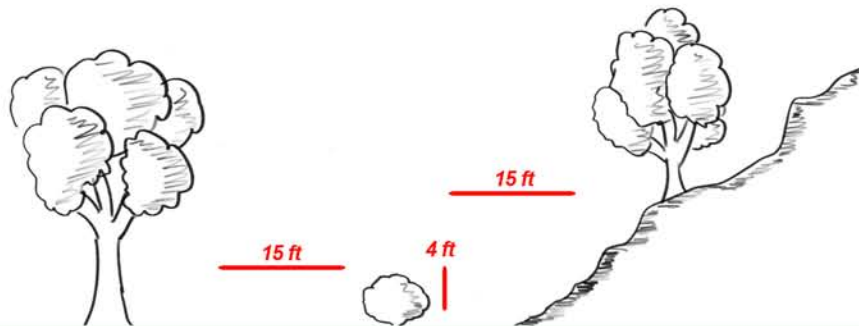


## HORIZONTAL SEPARATION

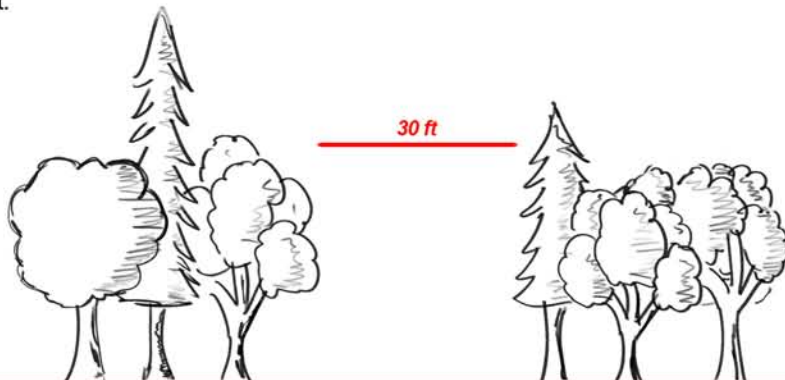
All shrubs greater than 2 feet in height shall be in a maximum grouping of 3 plants and separated by a distance of 3 times the height of the tallest shrub in the group, or 15 feet, whichever is greater.



Shrubs greater than 2 feet in height shall be no closer than 15 feet from the edge of the tree canopy(s) measured horizontally.

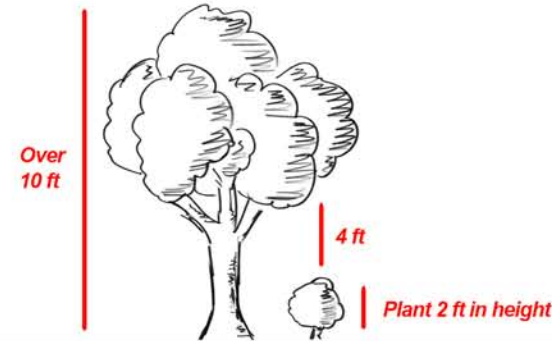


All trees shall be in a maximum grouping of 3 and shall be separated by a distance of 30 feet.

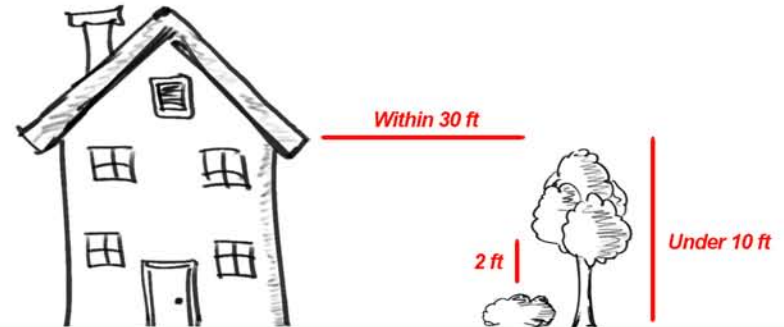


## VERTICAL SEPARATION

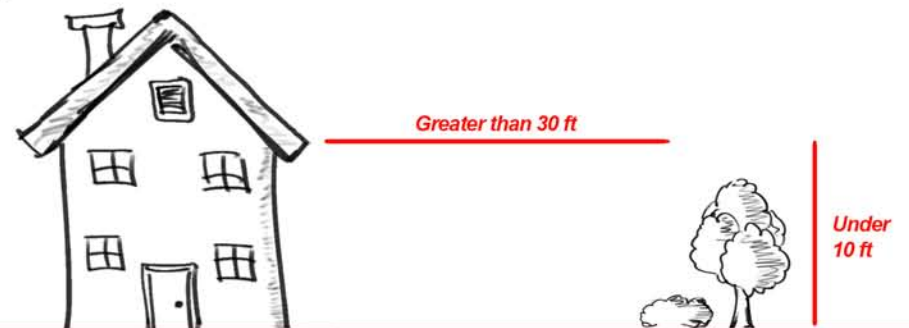
Trees and shrubs more than 10 feet in height require vertical separation of 4 feet between the plant material and the lowest branch of the tree or shrub.



Trees and shrubs less than 10 feet in height, and are located within 30 feet of the home, require vertical separation of 2 feet between the plant material below and the lowest branch of the tree or shrub.

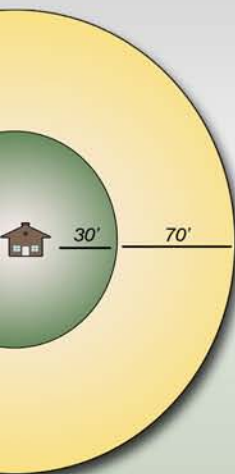


No vertical separation is required between the plant material below when trees or shrubs are located more than 30 feet from the home and they are less than 10 feet in height.





# DEFENSIBLE SPACE Planting Guide



Carpet Bugle  
Caucasian Artemisia  
Century Plant  
Chalk Dudleya  
Chinese Houses  
Coast Cholla  
Coreopsis  
Creeping Coprosma  
Creeping Sage  
Desert Lupine  
Desert Marigold  
Dewflower  
Dwarf Goldfields  
Dwarf Periwinkle  
Edging Candytuft  
Elephant's Food  
English Ivy  
Evergreen Plantain  
Foothill Needlegrass  
Germander  
Giant Bird of Paradise  
Giant Wild Rye  
Globe Candytuft  
Globe Gilia  
Goldmoss Sedum  
Grass Tree  
Green Carpet Natal Plum  
Green Stonecrop  
Gum Plant  
Hard Stem Bulrush  
Hoary California Fuschia  
Hyron Rose Clover  
Ivy Geranium  
Jade Tree  
Kangaroo Paw  
Lance-leaved Dudleya  
Lavender Cotton  
Lemon Thyme  
Lilac Vine  
Little Sur Manzanita  
Loosely Flowered Annual  
Lupine/Coulter's Lupine  
Medicinal Aloe  
Mexican Evening Primrose  
Mexican Poppy  
Mojave Woolly Star

Mondo Grass  
Monkeyflower  
Northern Woolly Lotus  
O'Connor's Legume  
Oracle Cactus  
Oxeye Daisy  
Pacific Mist Manzanita  
Prickly Pear  
Prostrate Coprosma  
Purple Needlegrass  
Purple Nightshade  
Puya  
Red Apple Aptenia  
Red Hot Poker  
Red Yucca  
Redondo Creeper  
Rosea Ice Plant  
Rush Rose  
Salt Heliotrope  
San Miguel Savory  
Sea Fig Ice Plant  
Sea Lavender  
Shaw's Century Plant  
Show Evening Primrose  
Showy Fairwell to Spring  
Showy Gilia  
Sky Lupine  
Snow-in-Summer  
South African Daisy  
(Gazania)  
Spider Lupine  
Spiny Rush  
Spring Cinquefoil  
Sunrose  
Trailing Ice Plant  
Training African Daisy  
Training Gazania  
Training Ice Plant  
Verbena  
Western Vervain  
White Trailing Ice Plant  
Wild Snapdragon  
Wild Strawberry/  
Sand Strawberry  
Winter Creeper Euonymus  
Wishbone Bush

## TREES

African Sumac  
American Sweet Gum  
Big Leaf Maple  
California Black Walnut  
California Laurel  
California Sycamore  
Carob  
Chinese Pistache  
Citrus  
Coast Live Oak  
Coral Tree  
Cork Oak  
Crape Myrtle  
Engelmann Oak  
Fernleaf Ironwood  
Firewheel Tree  
Italian Alder  
Loquat  
Macadamia Nut  
Maidenhair Tree  
Mayten Tree  
Mexican Elderberry  
Mexican Palo Verde  
New Zealand Christmas Tree  
Primrose Tree  
Strawberry Tree  
Tulip Tree  
Victorian Box  
Western Cottonwood  
White Alder

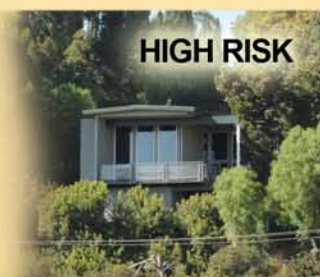
Woolly Plantain  
Yankee Point  
Yucca  
Zorro Annual Fescue  
Hall's Japanese Honeysuckle

## SHRUBS

Pink Rockrose  
Aaron's Beard  
Australian Tea Tree  
Autums Sage  
Big Pod Ceanothus  
Bladderpod  
Blue Hibiscus  
Blue Stemmed Bush Penstemon  
Boobyalla  
Bougainvillea  
Brewer Saltbush  
Bush Morning Glory  
Bush Poppy  
Bush Snapdragon  
Bushrue (Bush Rue)  
California Coffee Berry  
California Encelia  
California Flannelbush  
California Scrub Oak  
Carmel Creeper Ceanothus  
Carolina Cherry Laurel  
Chaparral Bloom  
Chapparral Mallow  
Chapparral Nolina  
Coastal Goldenbush  
Coastal Scrub Oak  
Common Yarrow  
Creeping Snowberry  
Deerweed  
Douglas Nightshade  
Eastwood Manzanita  
Emory Baccharis  
Evergreen Currant  
Firethorn  
Four-Wing Saltbush  
French Lavender

Fuschia Flowering Gooseberry  
Golden Abundance Oregon Grape  
Golden Currant  
Green Bark Ceanothus  
Green Lavender Cotton  
Greensphere Manzanita  
Heart Leaved Penstemon  
Holly Leafed Cherry  
Hollyleaf Redberry  
Hopseed Bush  
Indian Hawthorne  
Italian Buckthorn  
Lemonade Berry  
Louis Edmunds Ceanothus  
Matilija Poppy  
Mexican Grasstree  
Monterey Carpet Manzanita  
Mulefat  
Nevin Mahonia  
Oleander  
Orchid Rockrose  
Pineapple Guava  
Pink Melaleuca  
Plumbago Cape  
Point Reyes Ceanothus  
Pomegranate  
Redberry  
Refugio Manzanita  
Sageleaf Rockrose  
Shiny Xylosma  
Silktassel  
Silverberry  
Squaw Carpet Ceanothus  
Star Jasmine  
Star-Lower

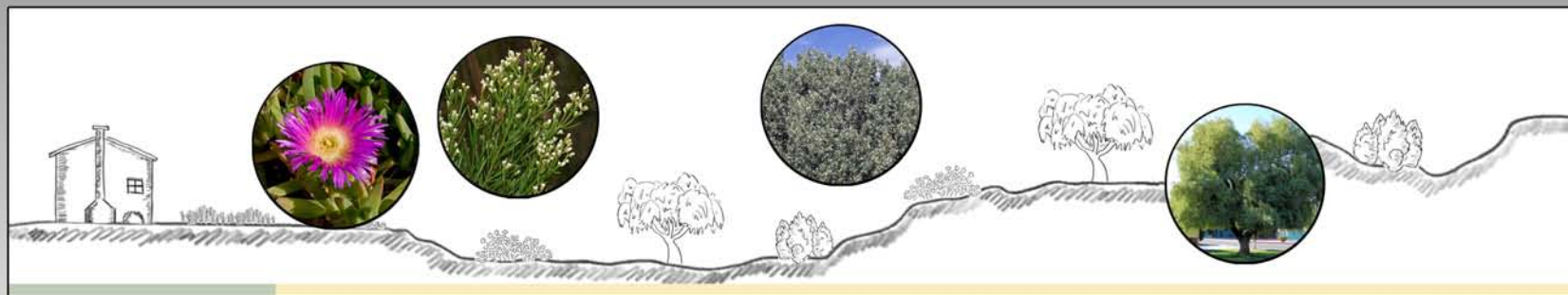
Sugarbush  
Summer Holly  
Sweet Hakea  
Sweet Olive  
Texas privet  
Texas Ranger  
Thick Leaf Yerba Santa  
Toyon  
Trailing Lantana  
Tree Aloe  
Wart-Stem Ceanothus  
Western False Indigobush  
Western Redbud  
White Cloud Matilija Poppy  
White Flowering Currant  
White Rockrose  
Wild Honeysuckle  
Woolly Blue Curls  
Woolly Yarrow  
Yellow Bells  
Yellow Bush Penstemon  
Yellow Sage



**HIGH RISK**



**LOW RISK**





## Undesirable Plant Species (Target Species)

The plants listed below are more susceptible to burning, due to rough or peeling bark, production of large amounts of litter, vegetation that contains oils, resin, wax, or pitch, large amounts of dead material in the plant, or plantings with a high dead to live fuel ratio. Many of these species, if existing on the property and adequately maintained (pruning, thinning, irrigation, litter removal, and weeding), may remain as long as the potential for spreading a fire has been reduced or eliminated. Some of these plants may be considered undesirable because of their ability to naturalize and become a pest. These types of plants should be avoided, especially in sensitive riparian or coastal areas where they could become established and compete with native vegetation.

**Arborvitae**



**Artichoke Thistle**



**Bamboo**



**Black Mustard**



**Black Sage**



**Buckwheat**



**Burning Nettle**



**California Sagebrush**



**Caster Bean Plant**



**Chamise**



**Cypress**



**Eucalyptus**



**Fountain Grass**



**Horseweed**



**Indian Tobacco**



**Juniper**



**Undesirable Plant Species** (Target Species) CONTINUED

**Mayweed**



**Milk Thistle**



**Noary Cress / Peppergrass**



**Meixcan Palm**



**Pampa Grass**



**Pine Tree**



**Prickley Lettuce**



**Red Shanks**



**Russian Thistle / Tumbleweed**



**Telegraph Plant**



**Tree Tobacco**



**Wild Turnip**



**Yellow Mustard**





## Things To Think About When Thinning Vegetation

When working with hand tools it is best to have personal protection, which includes proper long-sleeved clothing, gloves, hardhat, boots, eye protection, and noise protection equipment. The sharpest tools are best, since dull tools cause more accidents due to worker fatigue and frustration. Saws, loppers, and other cutting tools should be handled carefully and never put into anything except the wood they are to cut. When people work together they can get in each other's way, so it is best to work separated by at least two lengths of the vegetation reach. Thus, if you are cutting out 6 foot tall shrubs, you should be working at least 12 feet apart.



Often, having one person cutting and one or more people pulling the cut brush to a pile works most productively and safely. Piles should have vegetation laid parallel for later ease of handling. Working with power tools means having another person present and having greater communication so that all understand what the course of work is going to be. If someone tries to engage you in conversation while you are working with a chainsaw or other power tools, stop the equipment if you need to respond. Distractions can cause injury. Working safely means having fire extinguishers and first aid help close by the work site.

Cutting of large trees (larger than 8 inch stump diameter) needs skill and know-how. These trees can weigh over half a ton and can crush cars and things of value. Someone skilled with a chainsaw and full safety gear needs to do the actual work and often needs other ground assistance. This cutting should not be done without planning and forethought. Certified arborists are available for this kind of work and getting bids from licensed and insured contractors generally ensures the best value. Be sure to specify what you want the finished site to look like before work begins.

## Stop the Start of a Wildfire!

- Use tools with non-metallic blades to eliminate sparks.
- Have a garden hose available and turned on while operating all power tools.
- Dispose of cuttings and debris promptly to reduce the amount of fuel on property.
- Do not park cars in tall grass. The hot catalytic converter can ignite dry plant materials.
- Do not cut during a red flag warning or dry windy day.
- Spark arresters are required on gasoline, diesel, and propane-powered engines.





# FREQUENTLY ASKED QUESTIONS

## ***What is Defensible Space?***

Defensible Space refers to the area between a house and an oncoming wildfire where the vegetation has been modified to reduce the wildfire threat and which provides an opportunity for firefighters to effectively defend your house. Oftentimes, Defensible Space is simply your backyard.

## ***What is Fuel Modification?***

Fuel Modification is a strip of land where combustible native or ornamental vegetation has been modified and partially or totally replaced with drought tolerant, fire resistant plants.

## ***What is the relationship between vegetation and wildfire threat?***

Many people do not view the plants growing on their property as a threat. But in terms of wildfire, what is growing adjacent to your home can have considerable influence upon its survivability. All vegetation, including naturally occurring native plants and ornamental plants in the residential landscape, is potential fuel for a wildfire. If the vegetation is properly spaced and maintained, a wildfire can be slowed down, the flame lengths are reduced, and the amount of heat reduced, all of which contribute to your house surviving a wildfire.

## ***Why is Defensible Space necessary? Won't the fire department protect my house?***

Some individuals incorrectly assume that a fire truck will be parked in their driveway and firefighters will be actively defending their home when a wildfire approaches. During a major wildfire, it is unlikely that there will be fire fighting resources available to defend your home. Even with adequate resources, some wildfires may be so intense that there may be little that firefighters can do to prevent your house from burning. The key is to reduce fire intensity as a wildfire nears your house. This can be accomplished by reducing the amount of flammable vegetation surrounding your home.

## ***Does Defensible Space require a lot of bare ground around the house?***

NO. While bare ground would certainly provide effective Defensible Space, it's unnecessary and unattractive. Bare ground may also cause soil to erode. Many homes have yards with both effective Defensible Space and attractive landscapes with little or no bare ground.

## ***Does creating Defensible Space require special skills or equipment?***

NO. For the most part, creating Defensible Space requires routine gardening and landscape maintenance practices such as pruning, mowing, weeding, plant removal, appropriate plant selection, and irrigation. The necessary equipment consists of common tools like a chain saw, pruning saw, pruning shears, shovel, and rake. Pay close attention to sparks this equipment may generate. Try not to do this maintenance during hot and windy weather.

## ***How big is an effective Defensible Space?***

Defensible Space size is usually expressed as the distance from your house in which vegetation is managed to reduce the wildfire threat. The necessary distance for effective Defensible Space is not the same for everyone, but varies by slope and type of vegetation growing near your house, at a minimum distance of 100' from the structure. Visit [ReadySetGoOC.org](http://ReadySetGoOC.org) to schedule an OCFA representative to come out and go over any special conditions associated with your house.



# FREQUENTLY ASKED QUESTIONS

***Does having Defensible Space guarantee my home will survive a wildfire?***

NO. Under extreme conditions, almost any house can burn. Having Defensible Space along with a good Hardened Home will significantly improve the odds of your home surviving a wildfire.

***Why doesn't everyone living in a high wildfire hazard area create Defensible Space?***

The specific reasons for not creating Defensible Space are varied. Some individuals believe that "it won't happen to my family." Others think the cost of maintenance outweighs the benefits. Some have failed to implement Defensible Space practices because of lack of knowledge. For those individuals wanting to learn more about Defensible Space and how to harden their homes, please go to [ReadySetGoOC.org](http://ReadySetGoOC.org)

***Does having an effective Defensible Space make a difference?***

YES. Homes with effective Defensible Space are much more likely to survive a wildfire. Furthermore, Hardened Homes (go to [ReadySetGoOC.org](http://ReadySetGoOC.org)) with effective Defensible Space have an even greater chance to survive a wildfire than homes where no wildfire preparations have been taken.

***What should I do to make my property Defensible?***

Remove all tree branches or vegetation within 10' of chimney outlet.  
Trees within 100' of your home or neighbor's home should be kept free of dead branches and debris.  
Provide vertical clearance between shrubs and trees. Clearance may need to increase on steeper slopes.  
Provide horizontal separation for plants over 2' in height.  
Keep palm trees clear of dead fronds. Palms trees are not recommended within 100' of your home.  
Remove all dead or dying plant material including dead material within vines.  
Move wood piles at least 30' away from your home or to property line.  
Keep annual grasses and weeds cut to 4".  
Wood fences, patio covers, and gazebos need to be free of dead vines.  
It is *recommended* that you keep all shrubs within 10' of your home 2' or lower and keep plants away from windows.

***Why Vegetation Management?***

In the event of a catastrophic wildfire, the fire department may not have the resources to protect your home. Wildfires fueled by dry vegetation and driven by hot, dry winds are extremely dangerous and impossible to control. Many residents have built their homes and landscaped in fire-prone areas without fully understanding the impact a fire could have on them. Wildland-urban fire emergency strategy and tactics differ from both the standard wildland and the standard urban fire suppression practices. Wildland fire suppression largely attempts to keep a fire from spreading beyond its current location. Urban fire suppression initially addresses life safety (principally building occupants) and then fire containment within a portion of the structure and/or prevents adjacent structure involvement. Neither wildland nor urban suppression practices typically provide for home ignition potential reduction given an encroaching wildfire.



# FREQUENTLY ASKED QUESTIONS

## *What can you do?*

The success of this program and more importantly, its ability to reduce the high probability of fatalities and multiple structure loss, depends upon each property owner's aggressive participation in maintaining vegetation around their property. It's not a question of "if" but "when" the next major wildfire will occur in Orange County. That's why the most important person in protecting your life and property is not the firefighter, but you. Through advance planning and preparation, we can all be ready for wildfire. We hope you find the tips included in this publication helpful in creating heightened situational awareness and a fire safe environment for you and your family. For more information visit our website at [ReadySetGoOC.org](http://ReadySetGoOC.org) or [ocfa.org](http://ocfa.org).

