Appendix K
Fire Protection

8866 Saint Anthony Court, Elk Grove, CA 95624
916-689-5363

May 25, 2010

To: Fire Chief Steve Parker

From: Ronny J. Coleman and Mike Price

Subject: Study to Evaluate Impact on Fire Department Response Times due to the Relocation of Existing Fire Station

Executive Summary

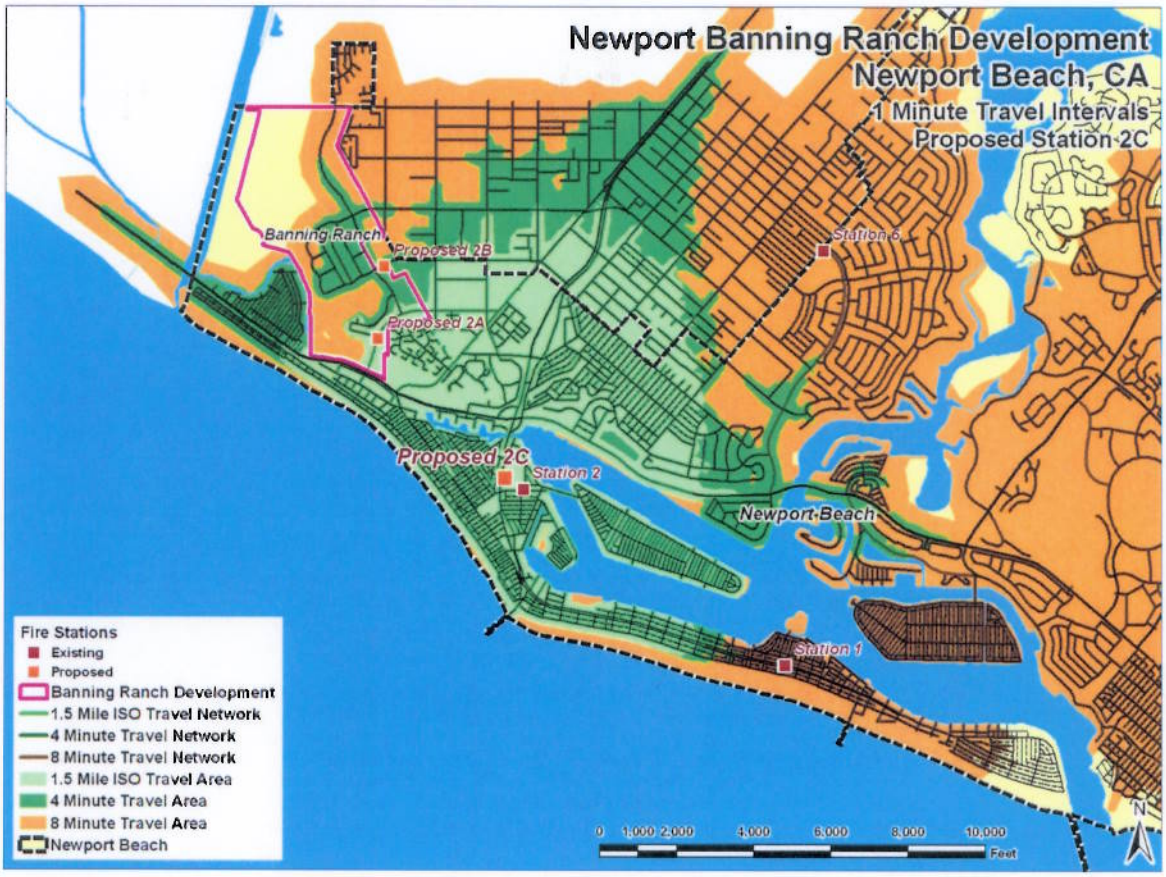
This report evaluates the Newport Beach Fire Department coverage in a specific study area. This report was written in support of the potential decision to relocate fire station 2. The report also addresses the impact of three potential sites for enhancing coverage of an area soon to be developed in the city. The report outlines the following: the purpose and background of the project, definition of the study area, methodology employed, map descriptions, recommendations and references.

This report contains recommendations that include:

1. We are recommending that fire station 2 be relocated to a more strategic site in its existing general area. We are proposing that the station be re-built on the City Hall property when it is re-developed. The recommendation is that the station be placed on the opposite side of the property from its current location. Its new location would be on the main boulevard. This is defined as station site 2C.
2. With respect to the two remaining sites, the site defined as 2A is more desirable than 2B for serving the overall area. Site 2A does have the effect of pulling the center of the stations response area further away from a traditional high value district which is a negative influence.

3. Fire station site 2B is the least desirable from an overall distribution basis. This location positions the station in such a manner that it affects the net gains and losses of the department in a negative way and is not being recommended for further consideration.

This map illustrates the coverage provided by the proposed site 2C.



The fire station coverage attributes are explained thoroughly in the analysis of the existing and proposed sites in this report. This station site provides the best overall distribution for the City of Newport Beach to protect both existing and newly developed areas.

Purpose

The purpose of this report is to provide written documentation that evaluates existing fire station sites and three potential locations for future stations. This report also evaluates the coverage into a proposed new development area to determine whether the Newport Beach Fire Department is likely to achieve its goals for distribution consistent with response time standards found in the 2010 Edition of the NFPA Standard 1710.

Background

The City of Newport Beach has adopted the response time goals contained in NFPA 1710. According to that document, Section 5.2.4.1.1 "the fire departments fire suppression resources shall be deployed to provide for the arrival of an engine company within a 240-second travel time to 90 percent of the incidents as established in Chapter 4".

Furthermore, Section 4.1.2.1 establishes the following objectives:

1. Alarm handling time to be completed in accordance with 4.1.2.3
2. 80 seconds for turnout time for fire and special operations response and 60 seconds turnout time for EMS response
3. 240 seconds or less travel time for the arrival of the first arriving engine company at a fire suppression incident and 480 seconds or less travel time for the deployment of an initial full alarm assignment at a fire suppression incident
4. 240 seconds or less travel time for the arrival of a unit with first responder with automatic external defibrillator (AED) or higher level capability at an emergency medical incident.
5. 480 seconds or less travel time for the arrival of an advanced life support (ALS) unit at an emergency medical incident, where this service is provided by the fire department provided a first responder with AED or basic life support (BLS) unit arrived in 240 seconds or less travel time.

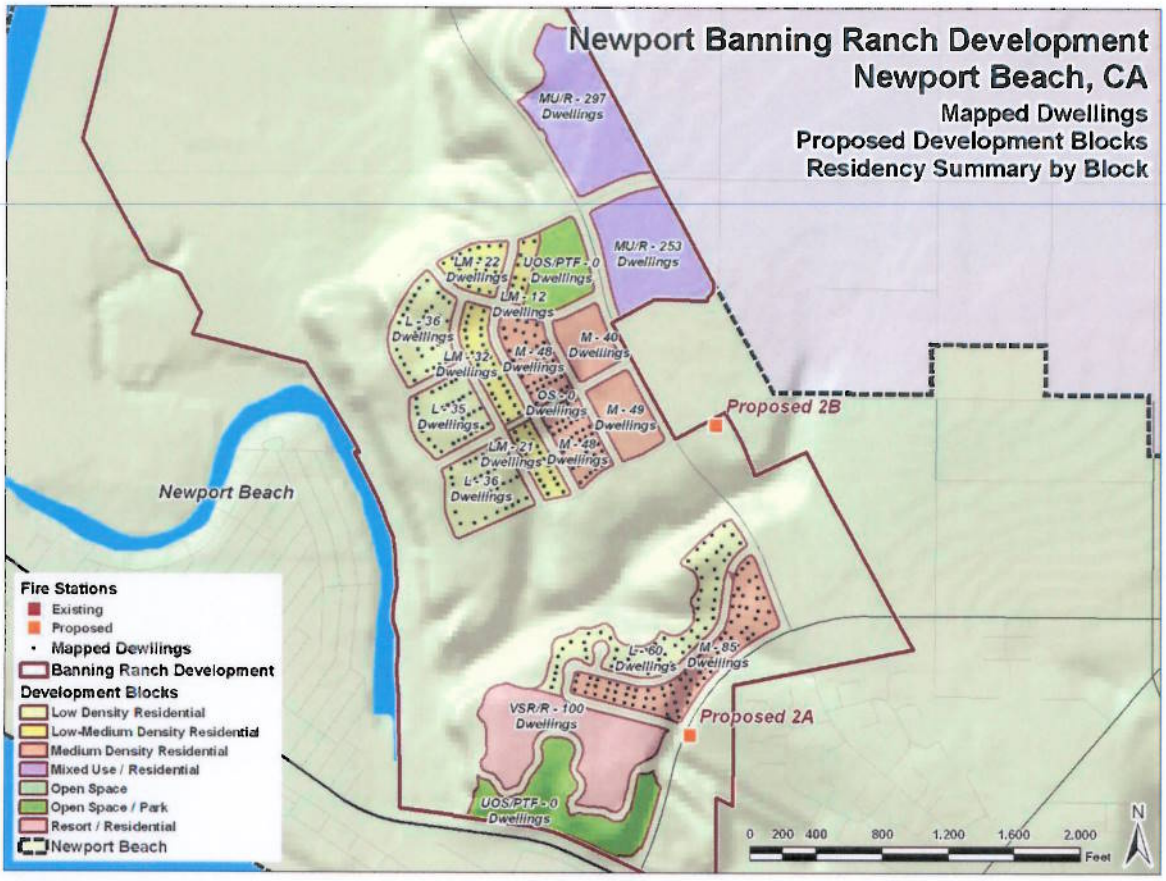
Notably, this standard is intended to apply to a structure fire in a typical 2000 square foot, 2-story, single family dwelling. This risk level appears to be consistent with the nature of the new development for the majority of the area to be protected.

Annexation

The City intends to annex a portion of land known as the "Newport Banning Ranch" (NBR). The NBR is a property that extends from the West Coast Highway in Newport Beach north to approximately 19th Street in Costa Mesa. The southeastern portion of the development is approx 400 feet west to the intersection of Superior and West Coast Highway. This description assumes a change in city boundaries upon completion of annexation.

The developers of NBR intended to construct 1,375 residential units, homes, a resort hotel that consists of 75 rooms and 75,000 square feet of commercial occupancies on 97.1 acres of land. Using the California Average Population Density per single-family dwelling of 2.5, this will add an additional 3,438 people to be protected. The presence of a resort will add a transient population that will be dependent upon the capacity of any hotel or other housing facility or commercial structure. For purposes of this report, we are assuming an occupant load that would raise the protected population to 4,000. The Newport Beach Fire Department's last year's response call workload was 8,472 calls. Based on your city's current population of 86,000, that results in an average of 96 calls per 1,000 population. This is within the range of the statewide average of between 90-100 calls per thousand. The addition of this population is anticipated to raise the call workload specifically to station 2's area by an additional 384 calls per annum.

Figure 1 - Proposed Banning Development and Residences



This map illustrates the development plan in the Banning Ranch Development. The map illustrates our assessment of the location, distribution and concentration of the development blocks. Each dot on the map represents a mapped dwelling. According to our assessment of the development blocks, the Banning Development will generate within its boundary an estimated 4,000 persons living, working or visiting in the area in dwelling occupancies.

The legend provides for the potential location of the various occupancy types. This map was digitized so that we could evaluate the road network in the Banning tract. The digitized roads were provided by the City of Newport Beach GIS department. There is a constraint on the location of future structures because of an underlying inundation map. But this zone does not limit the fire departments response needs because this area may involve emergency medical services calls especially those associated with hiking, biking and open space oriented incidents.

Study Area

The study area for this analysis only involves fire stations 1, 2 and 6. All of the proposed sites are within fire station 2's current response area. The remaining fire stations in Newport Beach's inventory were not mapped, nor analyzed. In order to define the study area as closely as possible, the map boundaries were clipped to avoid creating response polygons that were related to stations outside of the study area. For example, station 6 boundary was limited to the San Diego drainage and the Back Bay. The maps were also clipped to Costa Mesa's boundaries. It is recognized that there is an automatic aid agreement in effect in this area, but for the purposes of this study automatic aid was not included as a factor.

The primary station for assessment of current conditions is station 2, commonly called "Lido Fire Station" located at 475 32nd Street. This station is approximately 60 years old and does not meet current seismic standards. It is due to be demolished in the future.

Methodology

Information was obtained from the City's GIS department[1], and records obtained from the ISO regarding basic fire flow. The computer assisted dispatch (CAD) system provided actual response travel time and incident types. Other data layers were obtained from the City of Newport Beach GIS Department.

This data was utilized in an ARC View Mapping program, which resulted in the development of maps illustrated in this report. A series of maps were developed to evaluate the various factors associated with each option under consideration. This included establishing a baseline of coverage as it currently exists.

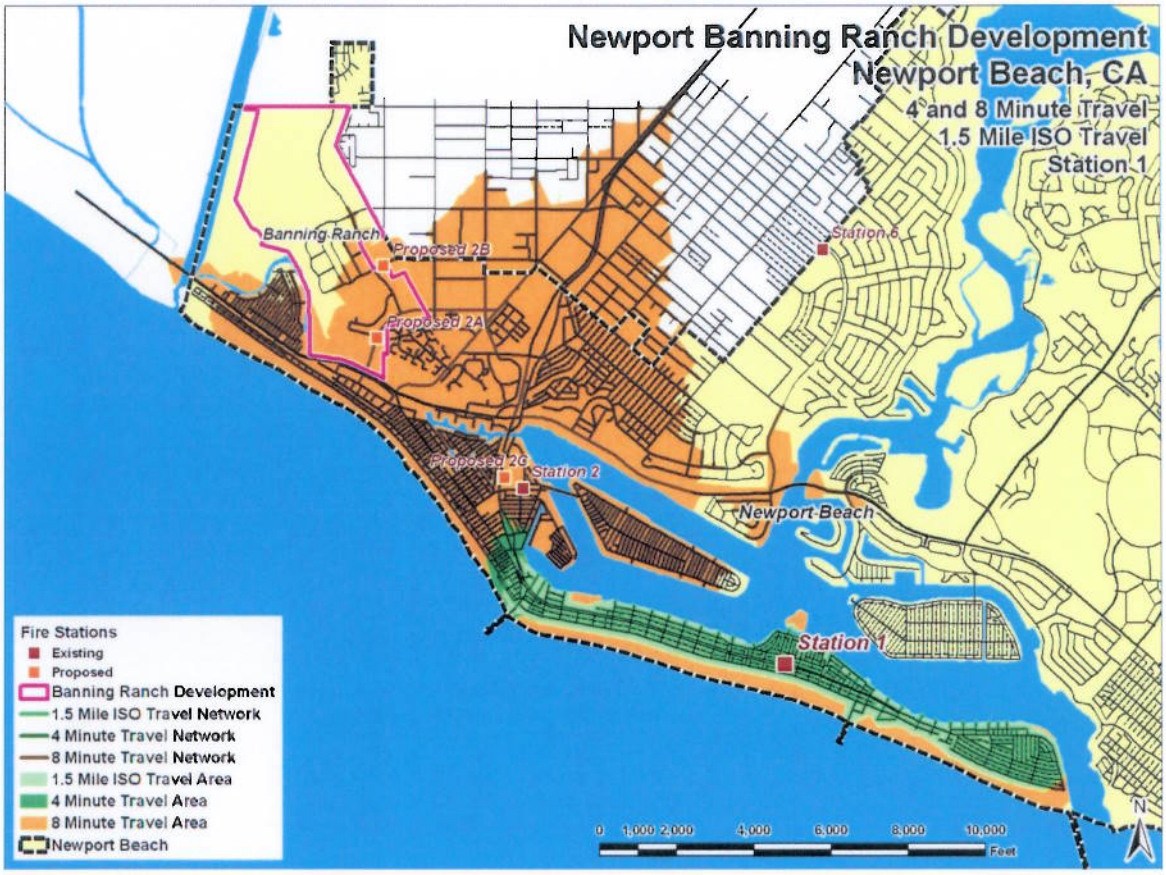
Fire station coverage in any specific area involves looking at area, road miles and the distribution of occupancies within that coverage area. The presence of incident locations and types varies from year to year but are still evaluated with respect to density. The concept of distribution of fire stations is based upon balancing out all of these factors to ensure a maximum number of occupancies receive service within the designated response time goals. Mapping tools are used to identify and calculate these factors.

[1] Scott Watkins, City GIS Department

Map Description

The first map describes the response polygons for existing fire station 1. This stations response area will be affected by any move of fire station 2.

Figure 2- 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Existing Station 1



Utilizing the NFPA Travel time criterion of 4 minutes and overlaying the ISO travel distance of 1.5 miles, this map illustrates the primary response polygon for fire station 1. This station is located on the peninsula. The address is 110 East Balboa Blvd. Its GPS coordinates are Lat: 33.60389°, Lon: -117.90583°. The existing fire station 1 covers 0.647 square miles within the city. This is about 9.23% of the study area. This response polygon covers 22.530 miles of street, which is about 15% of the total length on the road miles in the study area. There is an area on this map that is colored orange that is actually in the city limits of Costs Mesa. That area is NOT CALCULATED as part of the measurements of the district's coverage attributes.

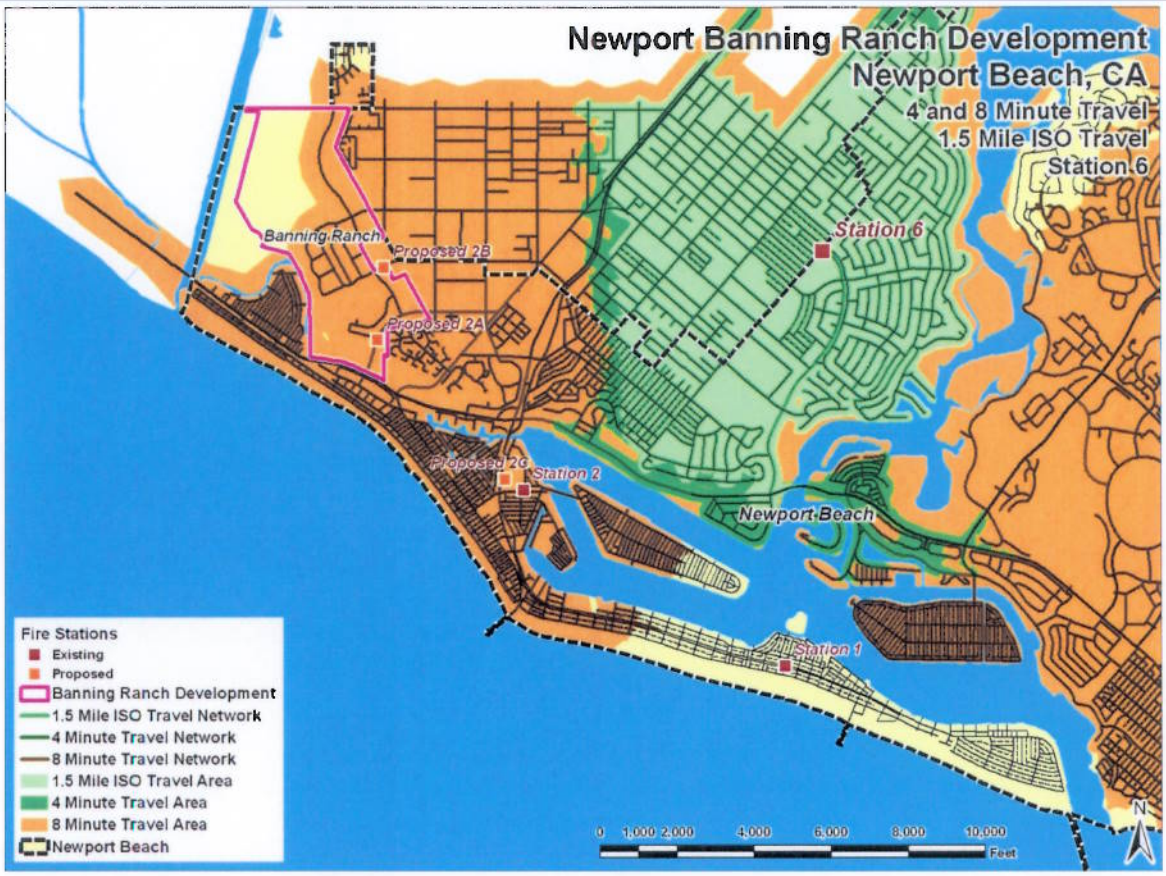
The orange colored area is the area where this station can provide second due response within 8 minutes. This station thereby primarily serves the Balboa Peninsula. It serves portions of station 2 and station 6 response zones as a second due. The orange area along the beach on the westward side of the peninsula is merely a reflection of the fact that there are no roads there. There is an area commonly called "the beach area" and Bay Island on the inward side that does not have roads for vehicular traffic. They appear orange also.

Figure 3 - 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Existing Station 2

This map illustrates the 4 and 8-minute travel polygons for fire station 2. This station is located at 475 32nd Street. Its GPS coordinates are Lon: 33.61620°, Lat: -117.92838°. Both proposed stations for consideration are plotted on this map to give a perspective as to where they fall in relation to existing station 2. This response polygon encompasses 2.768 square miles in its 4-minute response polygon. This is about 39.45% of the study area. The road length in miles for this area is 71.876, which is 47.51% of the study area. 4-minute polygons for Station 2 and Station 1 overlap coverage on the peninsula. The

orange area describes station 2's second in area. In its current location, this station does not provide 8-minute travel to the end of the Balboa Peninsula. Its 4-minute polygon does encompass all of Lido Island.

Figure 4 - 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Existing Station 6



This map illustrates the 4 and 8 minute travel and ISO 1.5 mile overlap for station 6. This station is located at 1348 Irvine Avenue. Its GPS Coordinates are Lat: 33.63362°, Lon: -117.90315°. Station 6 response polygon overlaps with the City of Costa Mesa. The City has an Automatic Aid Agreement with Costa Mesa. This aid agreement involves Costa Mesa providing truck service to Newport Beach when required. It is estimated that within the City of Newport Beach, station 6 is first due for about 3.601 square miles which is about 51.32% of the study area. This station covers about 56.881 of the road lengths, which is about 37.60% of the street miles.

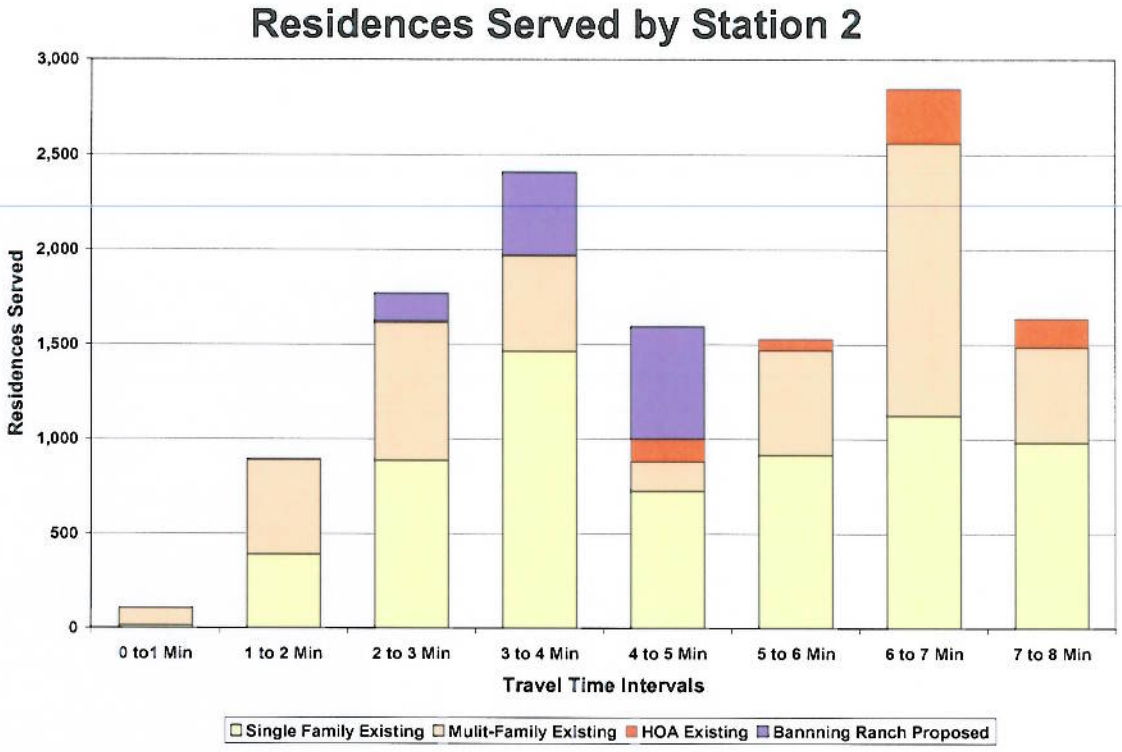
The orange area representing the 8-minute travel is mostly in support of station 2. Station 6 would likely be third due to an event in Station 1's area.

Figure 5 - Coverage by Existing Stations

Station Name	Area, Sq Mi	Percent of Total Area	Road Length, Miles	Percent of Total Length
Existing Station 1	0.647	9.23%	22.530	14.89%
Existing Station 2	2.768	39.45%	71.876	47.51%
Existing Station 6	3.601	51.32%	56.881	37.60%
Total of the Study area	7.017	100.00%	151.287	100.00%

The table above illustrates the coverage of the City of Newport Beach by the configuration of the existing stations. The 7.017 square mile area is 100 percent of the study area. The distribution of area between these three stations is defined in column A. Notably, station 2 and station 6 constitute the majority of the area. The road length in miles reflects this same difference in size. The next charts evaluate the actual number of occupancies contained within this area.

Figure 6 – Analysis of Residences Served by Current Deployment



Based upon the area, and the road lengths and the actual location of residences being served, this chart illustrates the relationship between where the residences are physically located and the timeframe by which they can normally be served. There are four components in each column. They are the single family existing, multi-family existing, the homeowner association existing and the Banning Ranch Development. What this chart illustrates is that the residences served in the first four minutes are primarily the existing residences. The Banning Ranch begins to start being served in the 4 to 5 minute intervals up to and including the 8 minute interval.

Figure 7 - Detailed Data of Residences (Fire Station 2)

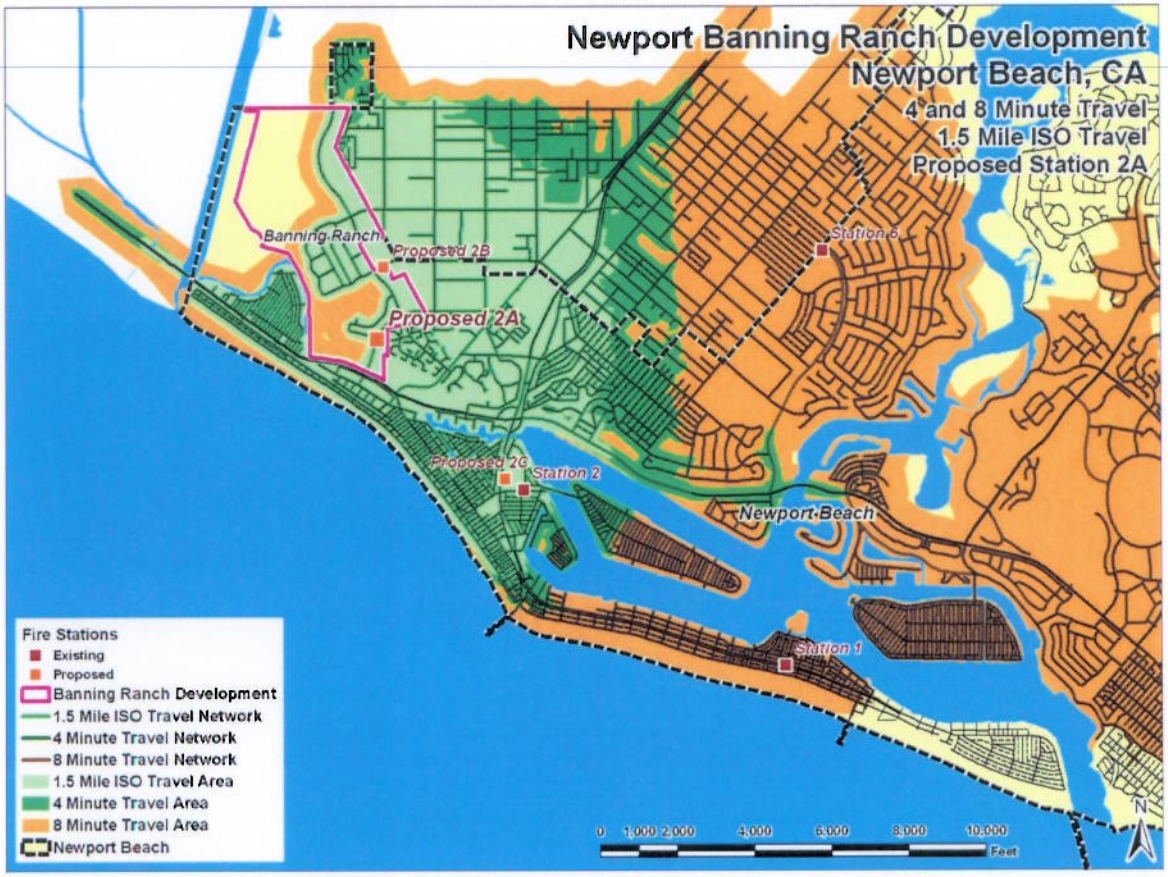
Station 2	Interval	Single Family Existing	Multi-Family Existing	HOA Existing	Banning Ranch Proposed	Existing and Proposed Total	Weighting Factor	Weighted Score	Weighted Rank
Station 2	0 to 1 Min	14	91	0	0	105	4.00	420.0	
Station 2	1 to 2 Min	390	500	2	0	892	3.00	2,676.0	
Station 2	2 to 3 Min	886	729	7	146	1,768	2.50	4,420.0	
Station 2	3 to 4 Min	1,462	505	4	436	2,407	2.00	4,814.0	
Station 2	4 to 5 Min	725	156	119	592	1,592	1.75	2,786.0	
Station 2	5 to 6 Min	914	554	58	0	1,526	1.50	2,289.0	
Station 2	6 to 7 Min	1,122	1,439	284	0	2,845	1.25	3,556.3	
Station 2	7 to 8 Min	980	506	149	0	1,635	1.00	1,635.0	
Station 2	**0 to 8 Min**	**6,493**	**4,480**	**623**	**1,174**	**12,770**		**22,596.3**	**2**

The figure above provides the actual number of residences contained within each shell (based on 1 minute intervals). As will be noted later in the report, this table illustrates that among the four options, station 2 is ranked as the number 2 option to protect both the existing community and new development.

Review of Proposed Sites

The following section addresses a review of the proposed sites under consideration.

Figure 8 - 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Proposed Station 2A



This map illustrates the response coverage in the event that a fire station was to be located at proposed site 2A. This proposed site is located at GIS Coordinate Lat: 33.62676°, Lon: -117.94098°. This site is located approximately 1 mile to the west and north of existing fire station number 2. On this map, Station 2 is retained but is not used in the calculations of the coverage.

The inference of this map is that the use of proposed site 2A changes the coverage in two respects. The area covered for Station 1 increases to .75 square miles increasing the road length under Station 1 to 26.452 miles, which now means it covers 17.48% of the area. (an increase in road length of 3.92 miles.)

Station 6 is affected by this location very little. The area and road length is virtually the same for Station 6 in the previous set of maps. Responding to the specific area of Lido Island the response times would be approximately 1 – 1.5 minutes longer.

This stations ability to provide second due support for Station 1 on Balboa Peninsula is extended by approximately 2 minutes. Proposed 2A improves response times to the Banning Ranch and the island to the north of the Banning Ranch (Newport Condos). This configuration would result in proposed 2A covering 2.678 square miles, which is 38.16% of the study area. It would have 66.774 road miles which is 44.14%.

Figure 9 – Attributes for Proposed 2A

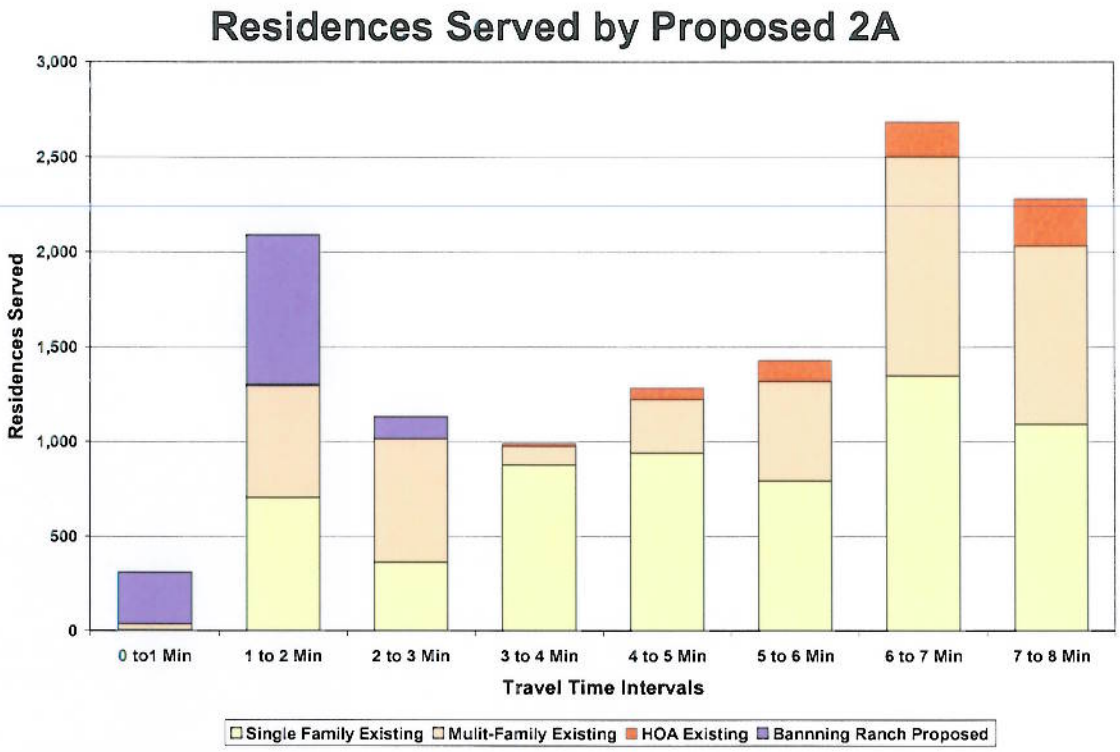
Station Name	Area, Sq Mi	Percent of Total Area	Road Length, Miles	Percent of Total Length
Station 1	0.752	10.72%	26.452	17.48%
Proposed 2A	2.678	38.16%	66.774	44.14%
Station 6	3.586	51.11%	58.062	38.38%
Total	7.016	100.00%	151.287	100.00%

Yellow = slight increase

Blue = slight decrease

This chart illustrates the net gains and losses in terms of coverage of the area and street miles to be protected. There is a slight increase in Station 1 and a slight decrease in Station 6.

Figure 10 - Analysis of Residences Served by Proposed 2A



This chart illustrates the shift in actual coverage from the current deployment. Utilizing proposed 2A, the 1, 2 and 3 minute shell begins to place the focus on the Banning Ranch Development and results in a longer response time to existing single family, multi-family and homeowner association locations within the current response area.

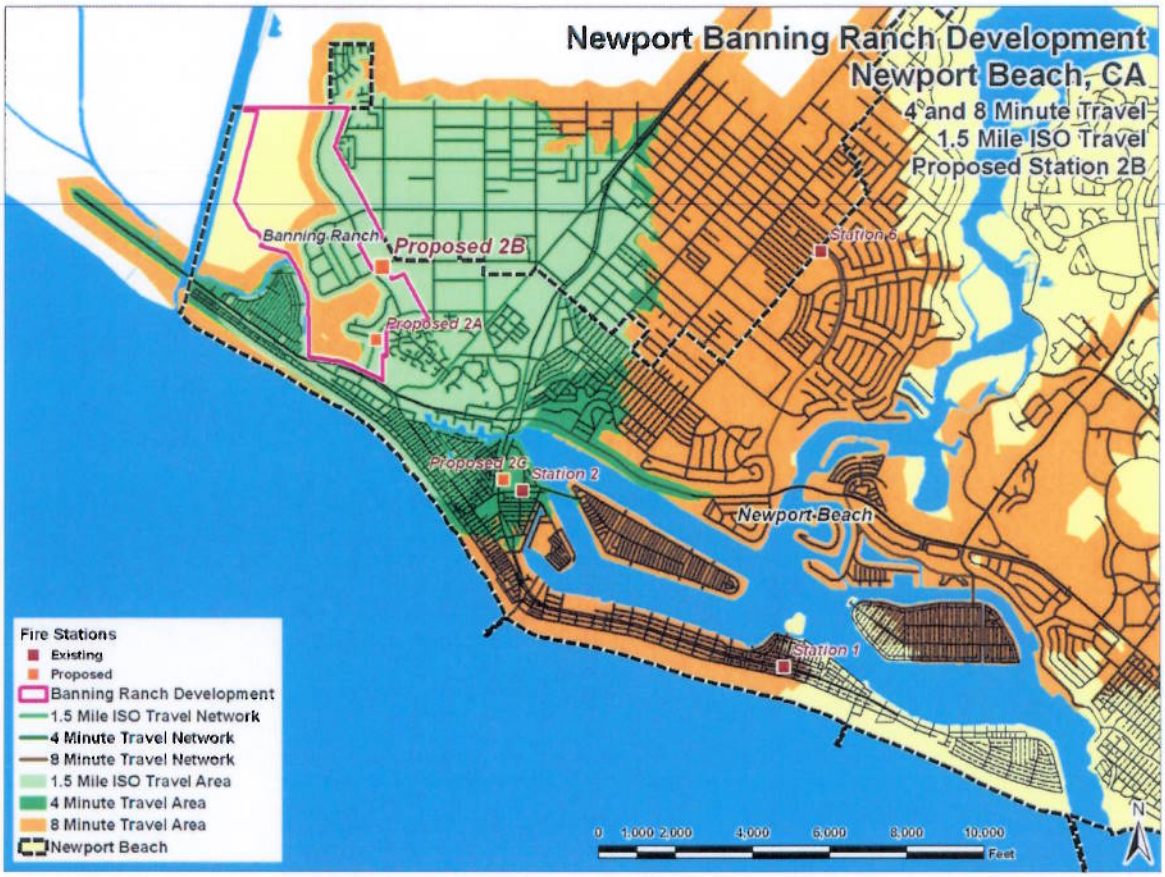
Figure 11 - Detailed Data of Residences (Site 2A)

Station	Interval	Single Family Existing	Multi-Family Existing	HOA Existing	Banning Ranch Proposed	Existing and Proposed Total	Weighting Factor	Weighted Score[2]	Weighted Rank
Prop 2A	0 to 1 Min	3	32	0	273	308	4.00	1,232.0	
Prop 2A	1 to 2 Min	704	591	8	786	2,089	3.00	6,267.0	
Prop 2A	2 to 3 Min	363	652	0	115	1,130	2.50	2,825.0	
Prop 2A	3 to 4 Min	877	101	13	0	991	2.00	1,982.0	
Prop 2A	4 to 5 Min	940	283	60	0	1,283	1.75	2,245.3	
Prop 2A	5 to 6 Min	792	528	108	0	1,428	1.50	2,142.0	
Prop 2A	6 to 7 Min	1,348	1,155	180	0	2,683	1.25	3,353.8	
Prop 2A	7 to 8 Min	1,092	941	247	0	2,280	1.00	2,280.0	
Prop 2A	**0 to 8 Min**	**6,119**	**4,283**	**616**	**1,174**	**12,192**		**22,327.0**	**3**

This table illustrates the shift of where the 1 minute shells provide coverage to the existing community. The Banning Ranch Development benefits from this deployment to the degree that it places the majority of the Banning Ranch proposal into the first 4 minutes. As will be stated in the summary, this configuration is ranked as number 3 as a choice for the community to maintain equity in its balance.

[2] The term "weighted score" is defined as a method of evaluating the density of structures being protected within each one minute response shell. Those facilities closest to the station are ranked higher than those that are further away from the station. This weighted score is an indication of how density improves the ability of a station to protect the maximum number of occupancies.

Figure 12 - 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Proposed Station 2B



This map illustrates the response polygon if the department were to locate a station at proposed site 2B. This location is designated at GIS Coordinates Lat: 33.63194°, Lon: -117.94056°. This site is approximately 1.2 miles to the north and west of existing fire station 2. The response polygon for 4-minute coverage shifts in that same direction as stated.

This configuration now increases the area for Station 1 to 0.802 square miles, which is 11.43% of the study area. The number of road miles increases to 28.819, which 19.05% of the study area. The area for proposed 2B is about the same as proposed 2A. The road length protected by Station 2B is 61.357 miles. This is about 40.56% of the study area. Station 6 is reduced to an area of 3.703 square miles. This is about 52.77% of the study area. Station 6 now covers 61.111 road miles, which is about 40.39% of the study area.

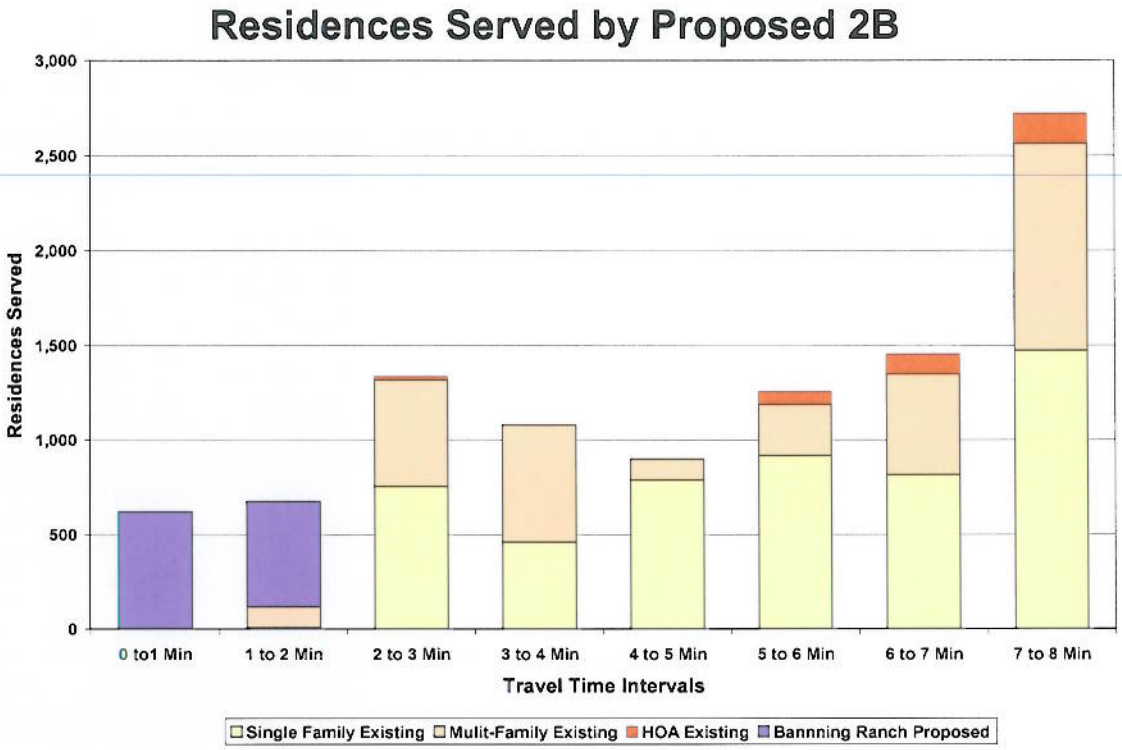
The inference in this map is that the coverage of Lido Island and Lido Peninsula is now in excess of 5 minutes. In addition, the ability for station 2 to provide support for station 1 on the lower Balboa Peninsula is extended by an additional minute of travel time.

Figure 13 - Attributes for Proposed 2B

Station Name	Area, Sq Mi	Percent of Total Area	Road Length, Miles	Percent of Total Length
Station 1	0.802	11.43%	28.819	19.05%
Proposed 2B	2.512	35.80%	61.357	40.56%
Station 6	3.703	52.77%	61.111	40.39%
Total	7.016	100.00%	151.287	100.00%

Yellow = slight increase

Figure 14 - Analysis of Residences Served by Proposed 2B



This chart represents the shift in the response time in the same fashion that 2A does. The majority of Banning Ranch is encompassed by the first two columns with the remainder of the community experiencing slightly longer response times.

Figure 15 - Detailed Data of Residences (Site 2B)

Single Family Existing	Multi-Family Existing	HOA Existing	Banning Ranch Proposed	Existing and Proposed Total	Weighting Factor	Weighted Score	Weighted Rank
0	2	0	617	619	4.00	2,476.0	
7	110	0	557	674	3.00	2,022.0	
754	564	17	0	1,335	2.50	3,337.5	
459	620	0	0	1,079	2.00	2,158.0	
788	109	4	0	901	1.75	1,576.8	
916	271	68	0	1,255	1.50	1,882.5	
814	534	104	0	1,452	1.25	1,815.0	
1,471	1,093	156	0	2,720	1.00	2,720.0	
5,209	**3,303**	**349**	**1,174**	**10,035**		**17,987.8**	**4**

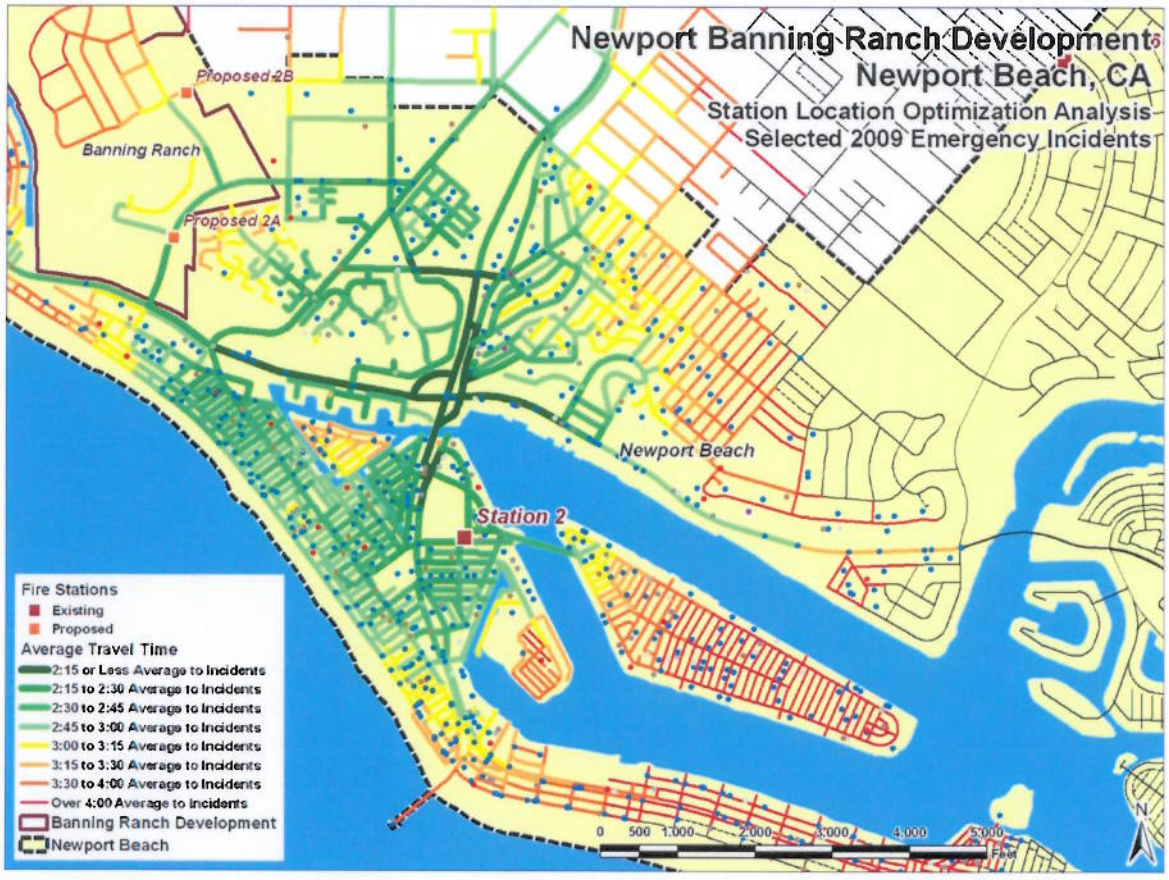
This chart illustrates the balance of structures in relationship to the time interval. This site provides shorter response times in Banning Ranch but lengthier response times to existing single and multi-family existing. This configuration is ranked as the number 4 priority to maintain equity in balance for the community.

Optimization

When evaluating any fire station for a possible relocation, it is desirable to find the optimal location in that area. After viewing the maps for the two sites that were originally proposed a question was asked as to where an "optimal" location might be found in the area.

This is calculated by using the map tools in reverse. Optimization looks at how long it takes to get to specific locations. By calculating average response times to incidents to specific locations, a "best" site can be determined.

Figure 16 - Station Location Optimization Analysis



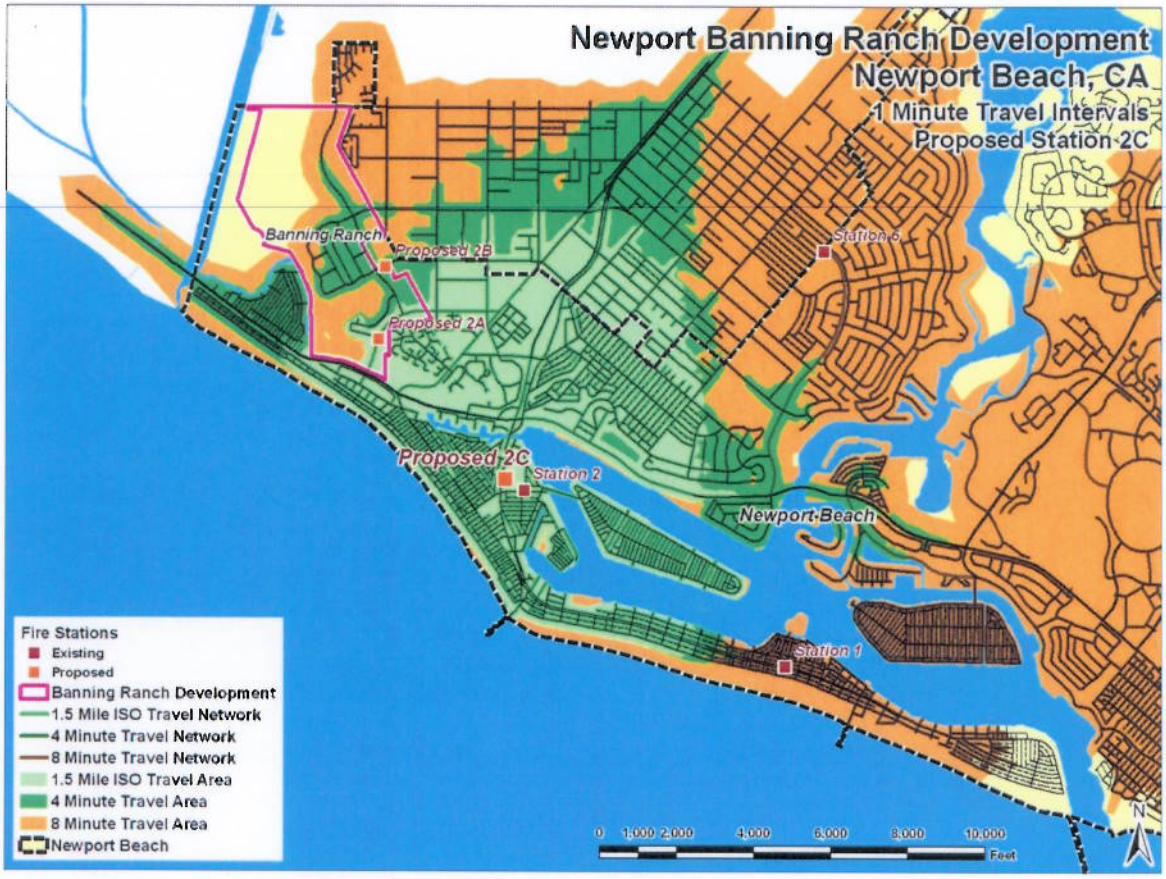
The dark green area on this map illustrates what would be considered the most optimum location to put a fire station in order to respond with the most equitable allocation within that district of the city.

This type of analysis is not based on fire stations but rather travel time to the locations. It is developed in reverse to station location. Essentially, what this map provides is an illustration of where the most equitable location could be by the average response to each area.

This map does not consider current availability of station site but rather optimizes the balance between stations. If a fire station were to be located at the approximate intersection of Coast Highway and Newport Blvd, the map indicates that a response time to a majority of the calls in the district can be achieved within 3 minutes and 30 seconds to 4 minutes and 0 seconds average. This is seen as the very dark green area on the map. In response to this map Fireforceone discussed preparing a third site for consideration.

As a result of this mapping exercise, a third location was identified as a possibility. This site is defined as station location 2C.

Figure 17- 4 and 8 Minute Travel; 1.5 Mile ISO Travel; Proposed Station 2C



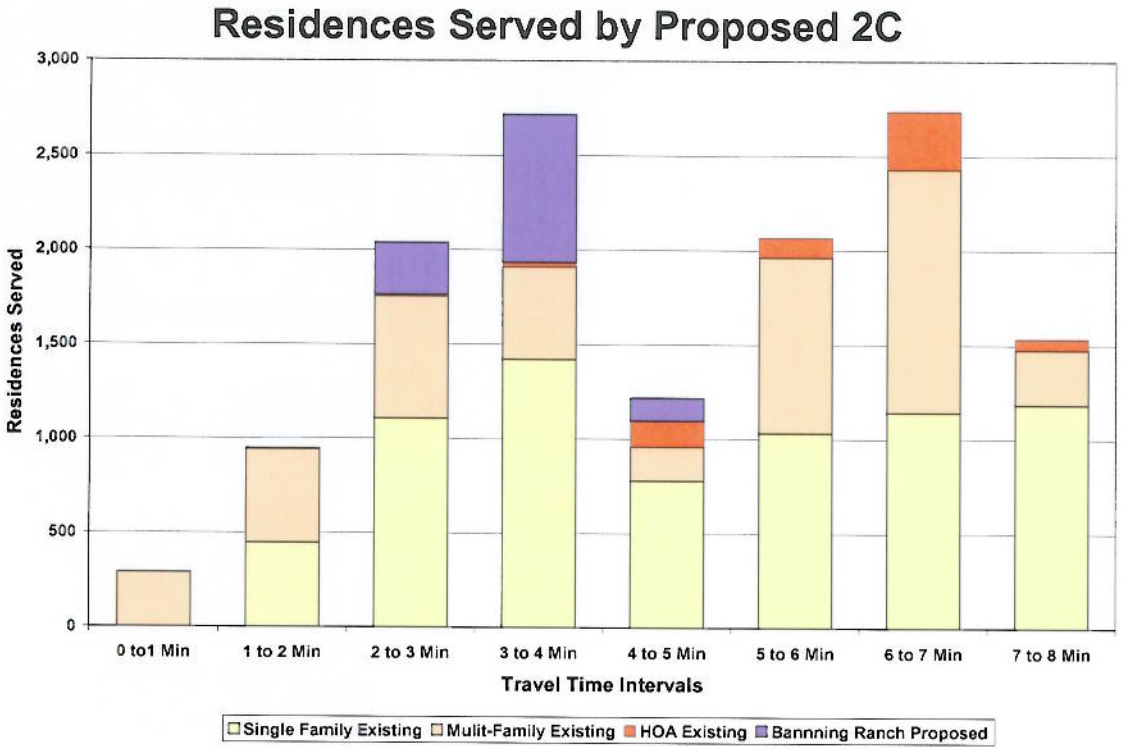
This map illustrates the response polygon if the department were to locate a station at proposed site 2C. This location is designated at GIS coordinates LAT n33°.37.01, LON: 117°.55.48. This site is approximately .25 miles to the north and west of existing fire station 2. The response polygon for 4 minute coverage shifts in that direction as stated.

This map addresses the possibility that moving the existing fire station to another location on the city owned property would balance out the net gains and losses identified in the use of the other two sites. This site contemplates moving the station to a location that would position the station furtherer to the east and to the north from the current location. This map provides minute by minute assessment of the impact of that selection. It results in only a 30 second difference from the existing site, but provides a balance that does little to disrupt services to the island and peninsula area to the south.

Figure 18 - Attributes for Proposed 2C

Station Name	Area, Sq Mi	Percent of Total Area	Road Length, Miles	Percent of Total Length
Station 1	0.642	9.15%	22.371	14.79%
Proposed 2C	3.486	49.66%	73.468	48.56%
Station 6	2.891	41.19%	55.448	36.65%
Total	7.019	100.00%	151.287	100.00%
Added Impact				

Figure 19 - Analysis of Residences Served by Proposed 2C



This chart illustrates the reallocation of the time intervals with emphasis on existing residences. The Banning Ranch is introduced into this chart in the third, fourth and fifth interval. This minimizes the impact on the existing community and simultaneously places the Banning Ranch within acceptable standards.

Figure 20 - Detailed Data of Residences (2C)

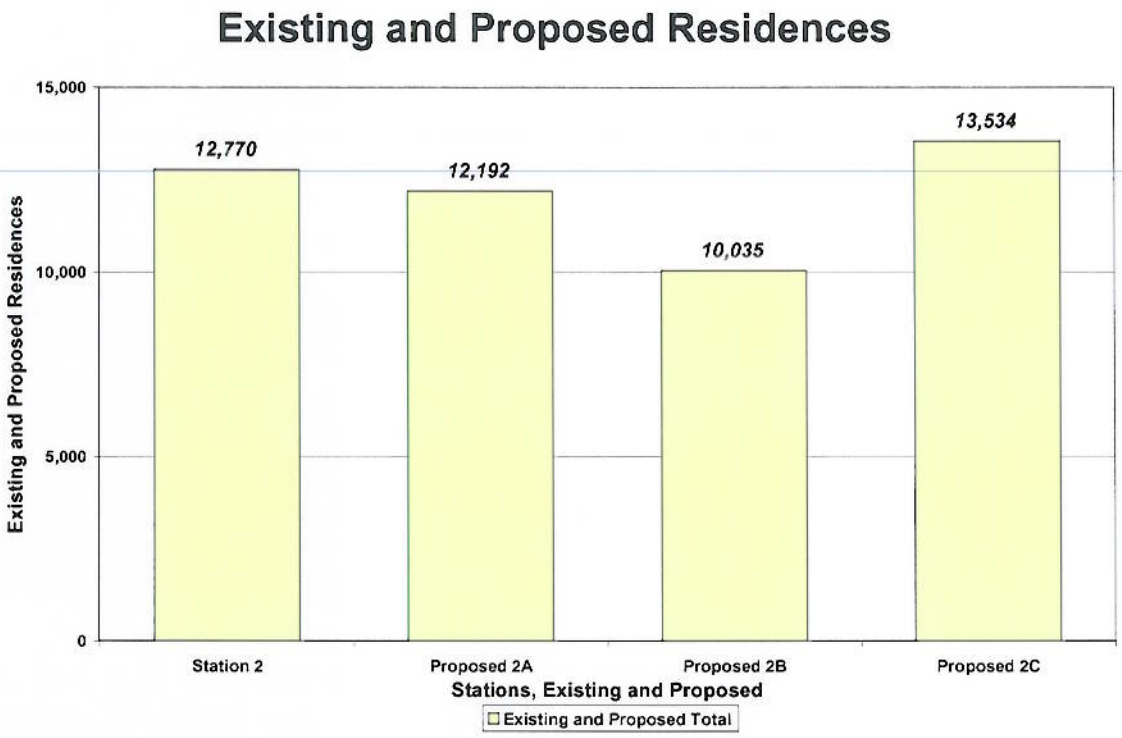
Station	Interval	Single Family Existing	Multi-Family Existing	HOA Existing	Banning Ranch Proposed	Existing and Proposed Total	Weighting Factor	Weighted Score	Weighted Rank
Prop 2C	0 to1 Min	1	288	0	0	289	4.00	1,156.0	
Prop 2C	1 to 2 Min	445	497	2	0	944	3.00	2,832.0	
Prop 2C	2 to 3 Min	1,106	648	9	273	2,036	2.50	5,090.0	
Prop 2C	3 to 4 Min	1,418	491	25	781	2,715	2.00	5,430.0	
Prop 2C	4 to 5 Min	776	182	137	120	1,215	1.75	2,126.3	
Prop 2C	5 to 6 Min	1,031	932	103	0	2,066	1.50	3,099.0	
Prop 2C	6 to 7 Min	1,141	1,288	306	0	2,735	1.25	3,418.8	
Prop 2C	7 to 8 Min	1,184	291	59	0	1,534	1.00	1,534.0	
Prop 2C	**0 to 8 Min**	**7,102**	**4,617**	**641**	**1,174**	**13,534**		**24,686.0**	1

This table illustrates the allocation of the time intervals within the existing residences and simultaneously illustrates that a majority of the Banning Ranch is within a reasonable timeframe. This allocation is defined as the top priority to maintain the net gains and losses from a potential relocation of Fire Station 2.

The Balance of Coverage

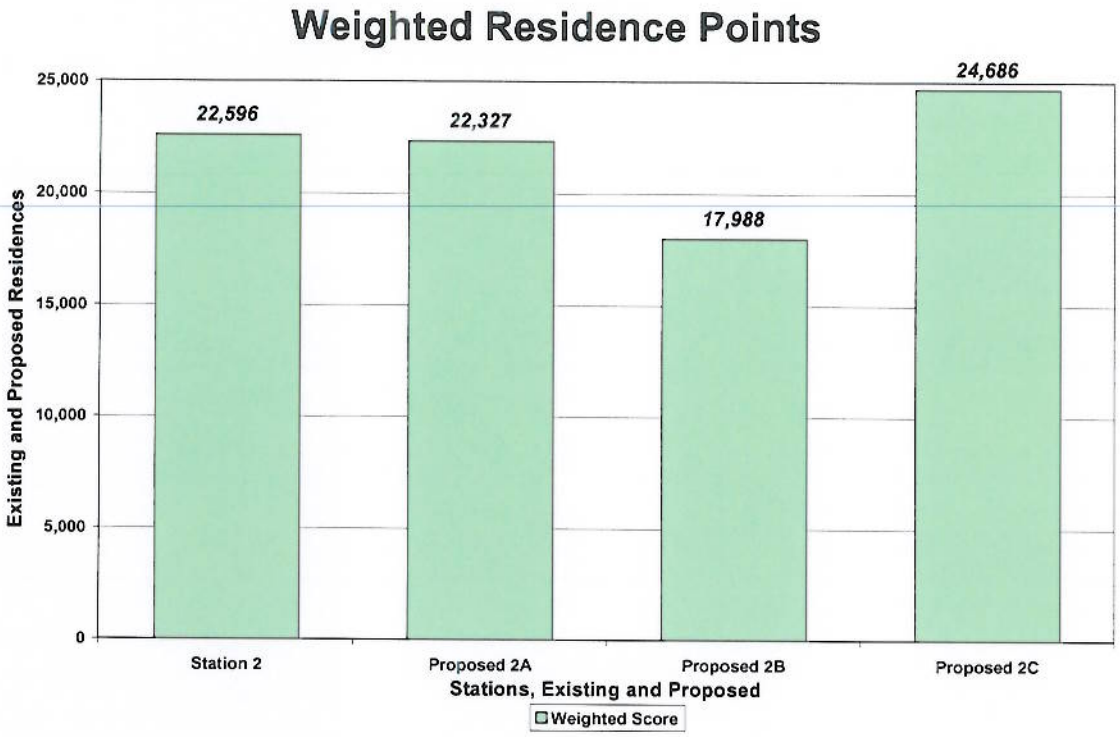
The relocation of fire station 2 to 2A, 2B or 2C does not make a significant statistical difference in the size of the area to be protected or the number of road miles contained within the first in districts. However, it does shift the response time intervals from the current residences in an adverse fashion. The following table is a comparison of the three alternatives. These two charts illustrate that the best location for protecting the community is to consider proposed location 2C over either of the other potential sites.

Figure 21 – Comparison of Residences by Absolute Number



This chart illustrates the absolute number of structures being protected under the three scenarios. Proposed 2C provides the highest number.

Figure 22 – Comparison of Locations Based on Time Interval Weighting



This chart illustrates the comparison of locations when you take into consideration the time interval. Essentially this chart illustrates that the baseline for station 2 encompasses 22,596 occupancies within the 4 minute time shell. Proposed 2C encompasses 24,686. This weighted score clearly indicates that more occupancies will be protected within the response goal from this site.

Figure 23 - Detailed Comparison of Residences

Station	Interval	Single Family Existing	Multi-Family Existing	HOA Existing	Banning Ranch Proposed	Existing and Proposed Total	Weighted Score	Weighted Rank
Station 2	0 to 8 Min	6,493	4,480	623	1,174	12,770	22,596	2
Proposed 2A	0 to 8 Min	6,119	4,283	616	1,174	12,192	22,327	3
Proposed 2B	0 to 8 Min	5,209	3,303	349	1,174	10,035	17,988	4
Proposed 2C	0 to 8 Min	7,102	4,617	641	1,174	13,534	24,686	1

This chart above summarizes the detailed comparison of residences of all four locations. When considering the time intervals involved, the weighted rank clearly indicates that proposed 2C provides the best coverage of the proposed study area.

Statistically the configuration being recommended involves Station 1, proposed 2C and station 6. The distribution of attributes is outlined in the following chart.

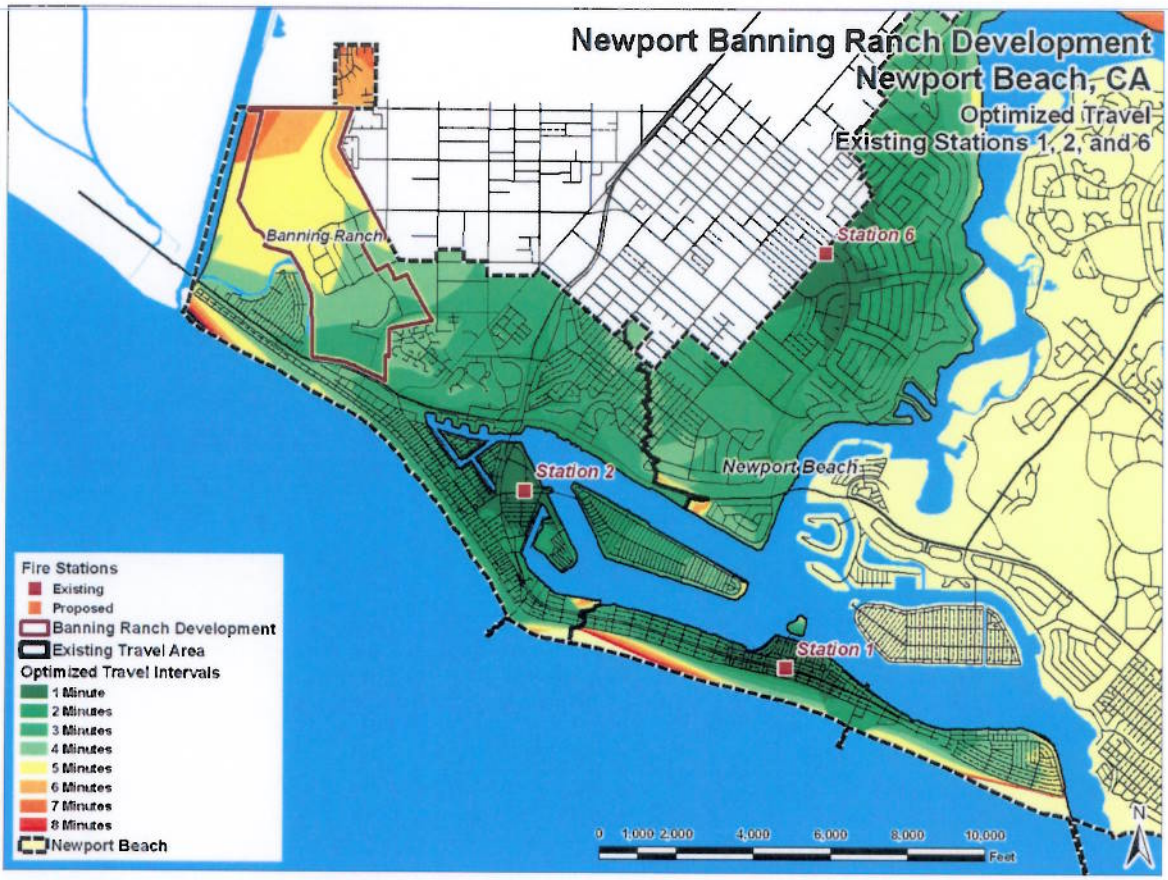
Figure 24 –Attributes of Recommendation

Station Name	Area, Sq Mi	Percent of Total Area	Road Length, Miles	Percent of Total Length	2009 Incidents Total	2009 Incidents Fire, Expl, Haz Mat	2009 Incidents Rescue, EMS	2009 Incidents Other	ISO Needed Fire Flow
Station 1	0.642	9.15%	22.371	14.79%	438	24	342	72	37,750
Proposed 2C	3.486	49.66%	73.468	48.56%	2,213	105	1,773	335	400,500
Station 6	2.891	41.19%	55.448	36.65%	1,238	61	931	246	372,500
Total	7.019	100.00%	151.287	100.00%	3,889	190	3,046	653	810,750
Added Impact					4,465				

Additional Mapping

In support of this decision process additional map runs were accomplished to help determine how to best analyze the department study area.

Figure 25 - Optimized Travel - Existing Stations 1, 2, and 6

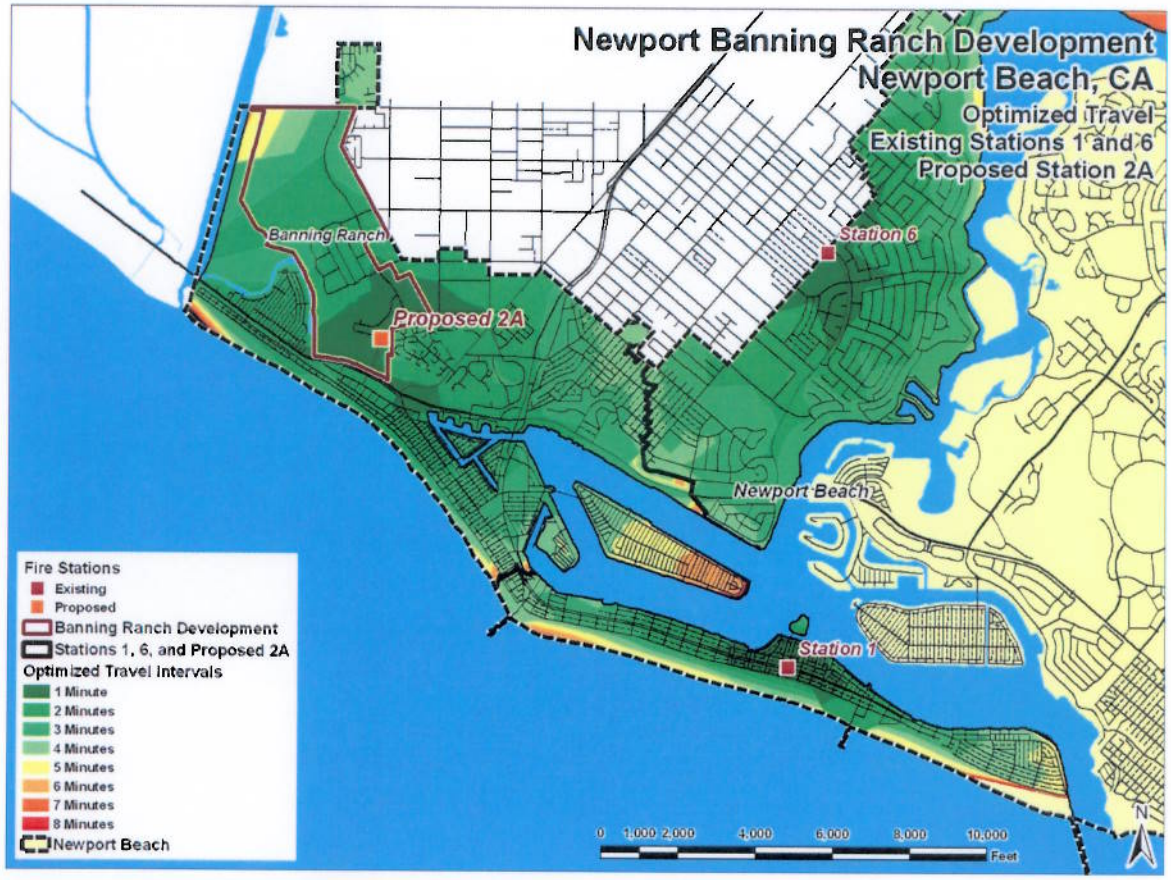


This map illustrates the relative coverage of the existing fire stations if the response areas are optimized within the study area. The manner in which this map was developed is to start each engine from its existing location and to run the network until each station arrives at a location where both apparatus will arrive at exactly the same time. One might call this the 'deadheat" location.

For example, if station 1 and station 2 leave the station at exactly the same time there is a point on the peninsula where the arrival would be the same. The same consideration is being calculated between station 2 and station 6.

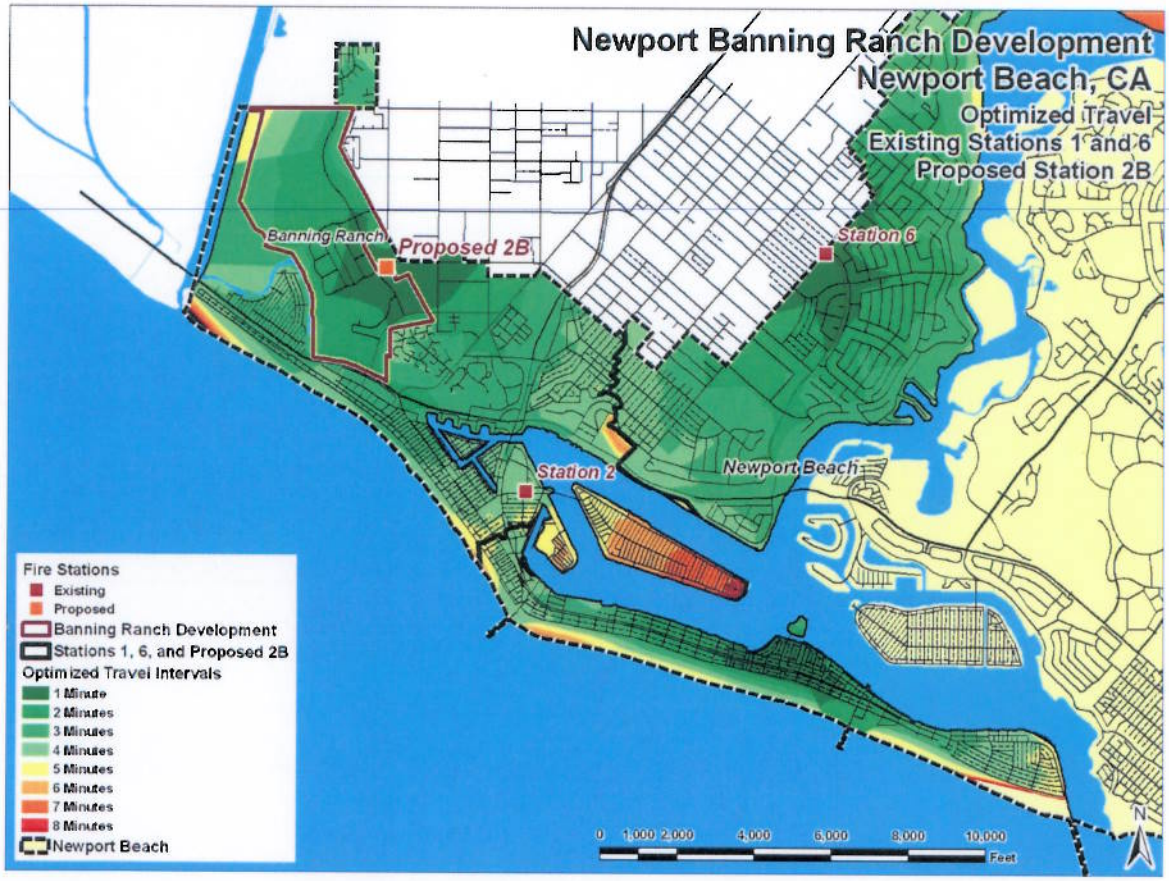
The closest travel area for each station 1 is dark green, the 5 minute boundary is yellow and underserved areas are shades of orange. There is a boundary between station 2 and 6 that runs approximately north and south that is defined by a heavy black line. .

Figure 26 - Optimized Travel - Existing Stations 1 and 6, Proposed Station 2A



This map illustrates what shifts would occur in coverage if proposed site 2A is selected. The major difference in this map and the previous map is that station 1's response area would move up on the peninsula to be approximately at the pier location adjacent to Lido Peninsula. Portions of Lido Island the response time could go to 5 and 6 minutes. The vertical boundary between each station is displayed as a Black Line. There are two of these on the map.

Figure 27 - Optimized Travel - Existing Stations 1 and 6, Proposed Station 2B

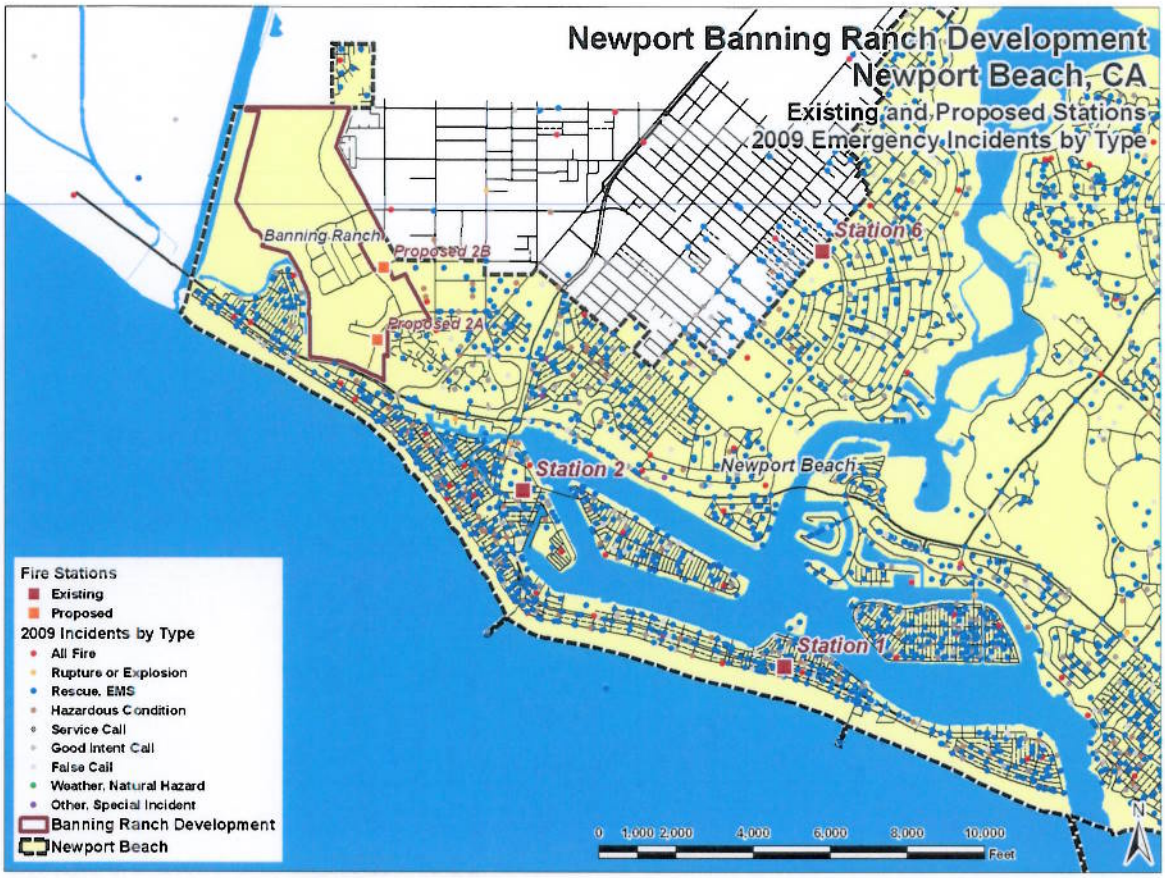


This map illustrates the change in polygons if proposed site 2B is selected. This site continues to move the distribution of the company to the north and west of the existing fire station. Lido Island now receives some response times in excess of 6 minutes. The inference of this pattern is that station 1 would now come up further on the peninsula. The vertical boundary between Station 2 and 6 would continue to stay about where it is on the map for Station 2A.

Emergency Incidents

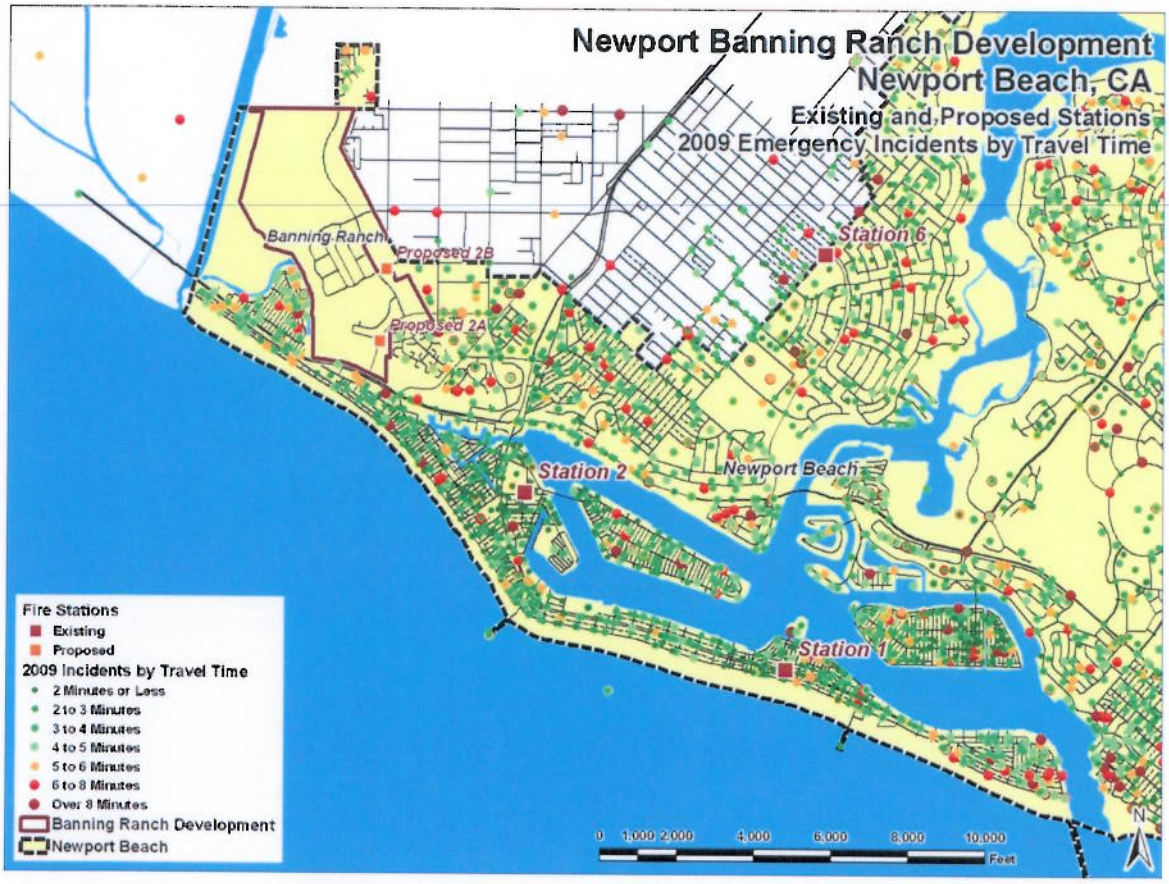
Another way of looking at response is by looking at the types of emergency incidents and to examine actual response times. The following two figures provide information on the 2009 Emergency Incidents by Type and the 2009 Incidents by Travel Time.

Figure 28 - 2009 Emergency Incidents by Type



This map illustrates the distribution and concentration of the various types of emergency demand on stations 1, 2 and 6 as they currently exist. The legend provides a color code that encompasses the major types of emergency calls. This map illustrates that rescue and emergency medical calls are the major demand for service. Secondarily, EMS calls are relatively evenly spread throughout the response zones. Areas of high-density population such as on Balboa and Lido Island indicate that emergency medical services will likely exist in the Banning Ranch Development at the same level. Newport Beach's history of call workload per thousand population was calculated by looking at the city-wide response call workload, which is 8,472 calls per year. The population that was used was 86,000. This calculates out to 96 calls per thousand population. Using this average, the area of Banning ranch could generate a workload of 576 calls per annum.

Figure 29 - 2009 Emergency Incidents by Travel Time



This map illustrates the distribution and concentration of actual travel times as indicated by CAD data. The legend provides a color code scheme. All dots that are a shade of green are within the departments adopted response time goal. Orange, red and dark red are those response times that fall out of the response time goal. This map is a companion to the emergency incidents by type. Concentrations of red dots indicate an area where response times may be effected by either distance or traffic condition. Travel times have not been looked at relative to time of day. Stations 1, 2 and 6, response times at the bottom of the peninsula and at the northern portion of the city adjacent to the Santa Ana riverbed are indicative of extended travel times. These are seen as red dots on the map

Summary of Current Incident Experience in Study Area

The following chart illustrates the distribution of call workload among the three existing stations.

Figure 30 - Existing Station 2 Response Pattern

Station Name	2009 Incidents Total	2009 Incidents Fire, Expl, Haz Mat	2009 Incidents Rescue, EMS	2009 Incidents Other
Station 1	440	24	344	72
Station 2	2,168	103	1,743	322
NBR Impact	576			
Station 6	1,281	63	959	259
Total	4,465	190	3,046	653

Figure 31 - Proposed Station 2A Potential Response Pattern

Station Name	2009 Incidents Total	2009 Incidents Fire, Expl, Haz Mat	2009 Incidents Rescue, EMS	2009 Incidents Other
Station 1	609	29	492	88
Proposed 2A	1,959	97	1,563	299
NBR Impact	576			
Station 6	1,321	64	991	266
Total	4,465	190	3,046	653

Figure 32 - Proposed Station 2B Potential Response Pattern

Station Name	2009 Incidents Total	2009 Incidents Fire, Expl, Haz Mat	2009 Incidents Rescue, EMS	2009 Incidents Other
Station 1	675	34	543	98
Proposed 2B	1,844	89	1,475	280
NBR Impact	576			
Station 6	1,370	67	1,028	275
Total	4,465	190	3,046	653

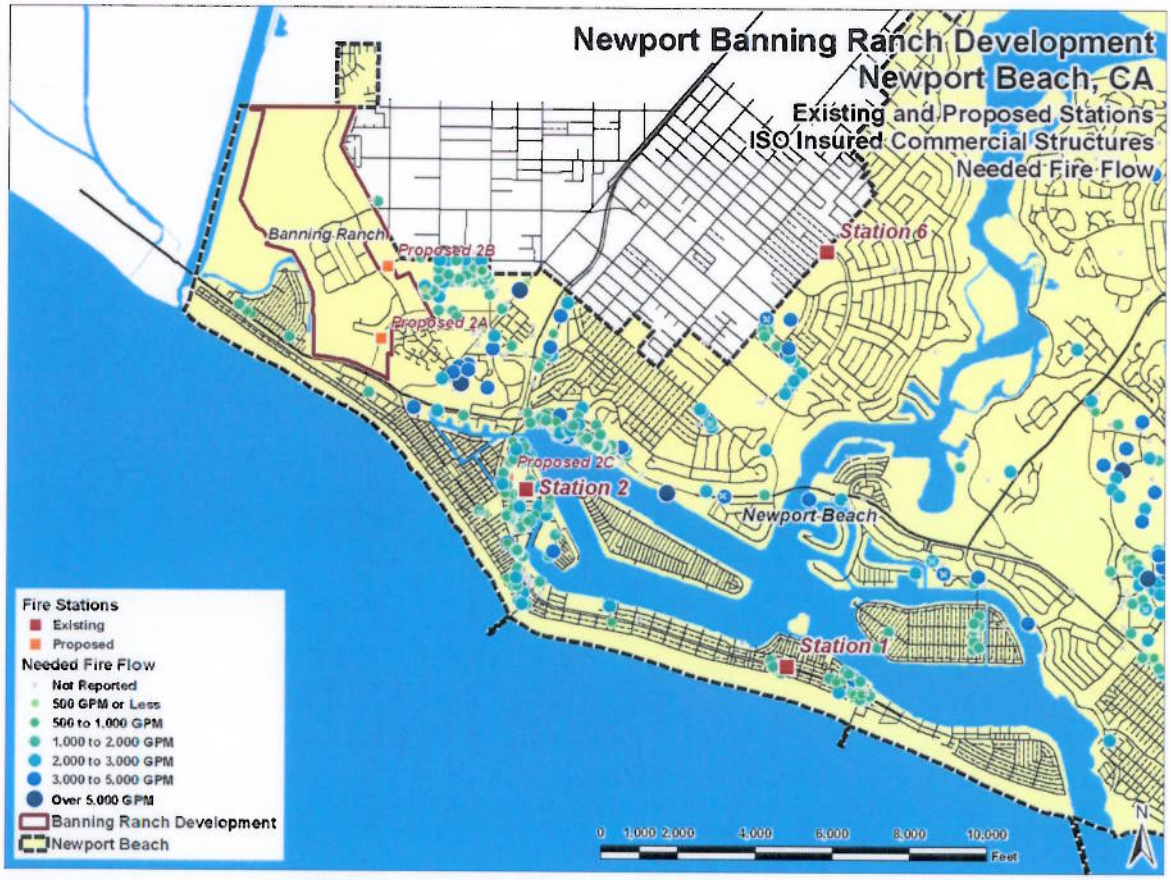
Summary of Response Patterns

The study area will likely see an increase in call workload from 3,046 to 4,448. Because the new call workload is likely to shift more responses to the north and to the west, keeping this station as centrally located in the current response area is desirable to keep from increasing response times in the current protected area.

Insurance Services Office (ISO)

Another fact relative to coverage is the existence of buildings that have been identified by the insurance industry as having specific fire flows. This is a reflection of the relative level of risk. The lower the fire flow, the less potential loss. The higher the fire flow, the higher the loss.

Figure 33 - ISO Insured Commercial Structures; Needed Fire Flow



This map illustrates the concentration and distribution of all buildings that are in the Insurance Services Office (ISO) database. These buildings are identified on the map

with a series of dots that are defined in the legend. The minimum fire flow that is recorded is 500 gpm. The maximum fire flow is 5,000 gpm. Within the response areas of stations 1, 2 and 6, there are 754 buildings that are identified by the ISO with needed fire flows. These represent potential resistance to control. The following table indicates the concentration of fire flows by the summation of the flows in each district.

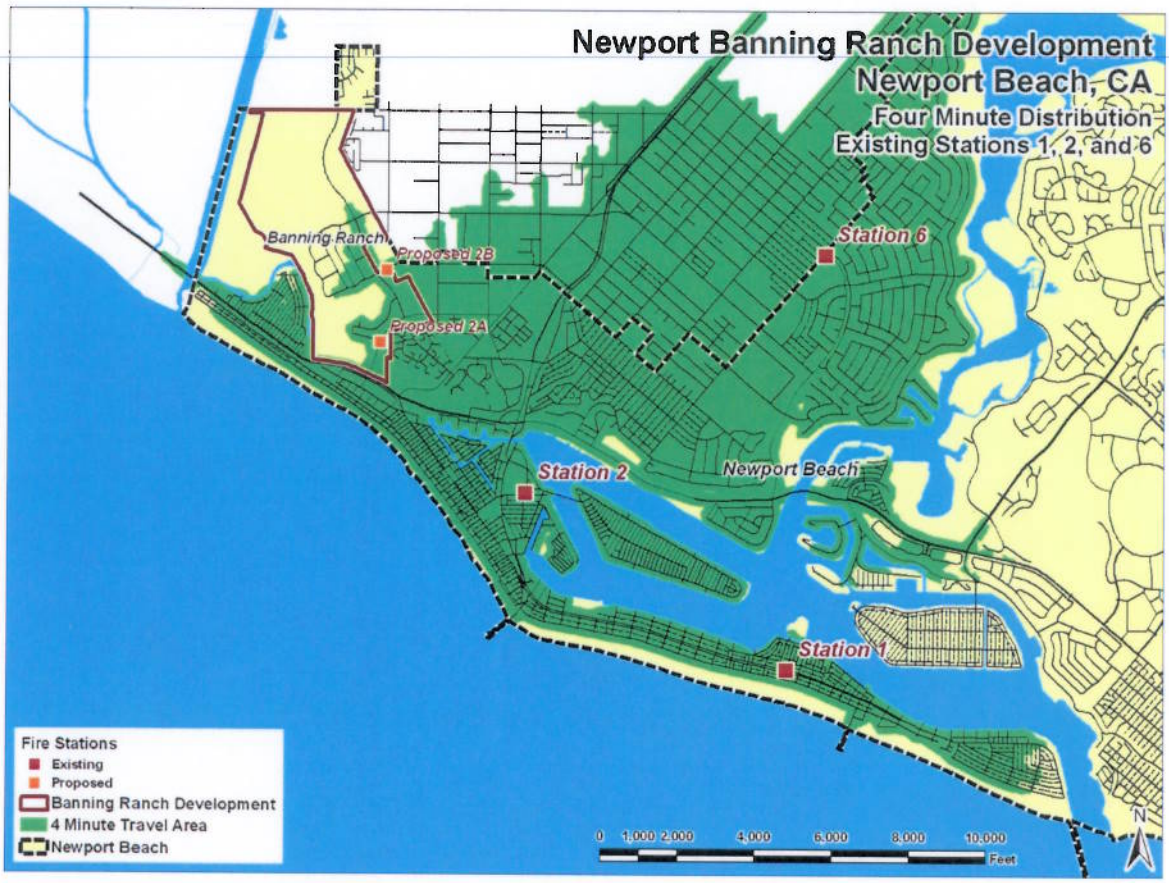
Figure 34 – Concentration of Fire Flows

Station Name	ISO Needed Fire Flow
Station 1	37,750
Station 2	394,750
Station 6	378,250
Total	810,750

4-Minute Distribution

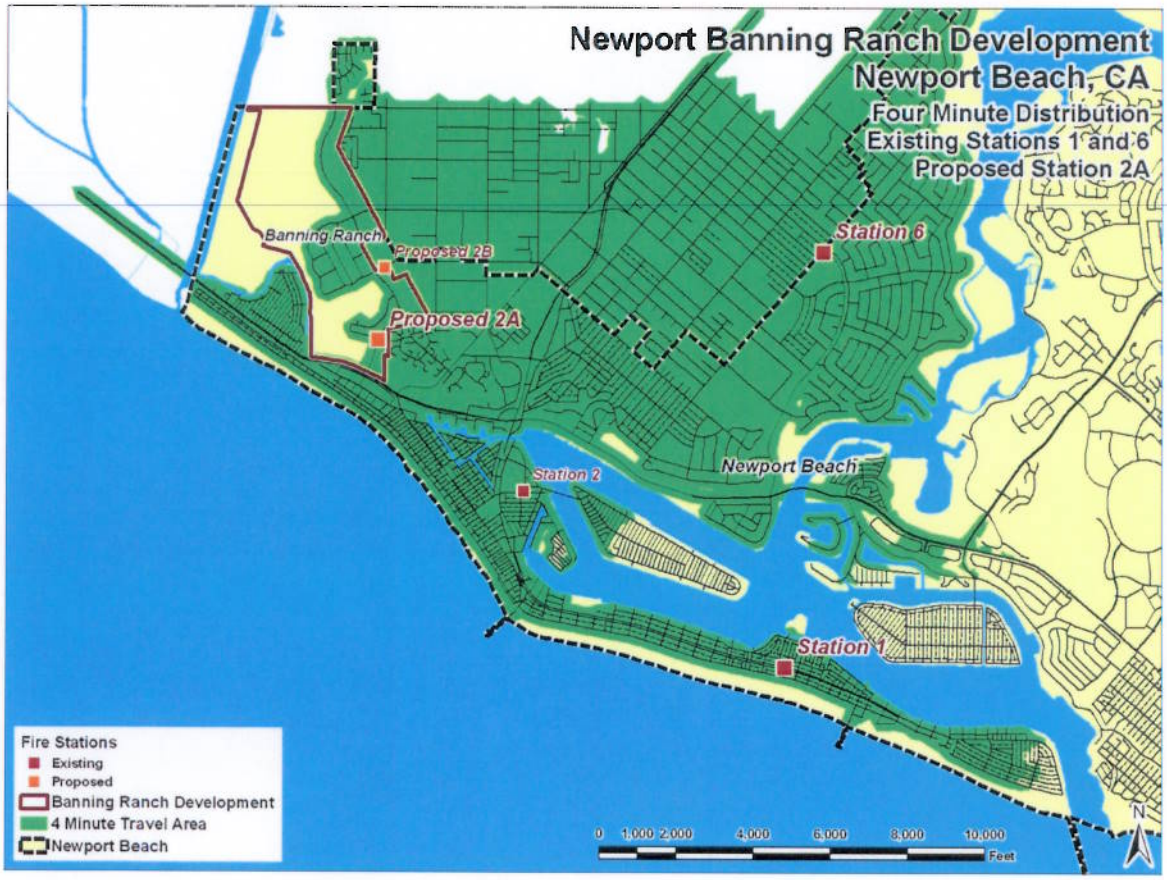
The following map was prepared to see what areas are underserved by existing stations 1, 2 and 6.

Figure 35- 4- Minute Distribution - Existing Stations 1, 2, and 6



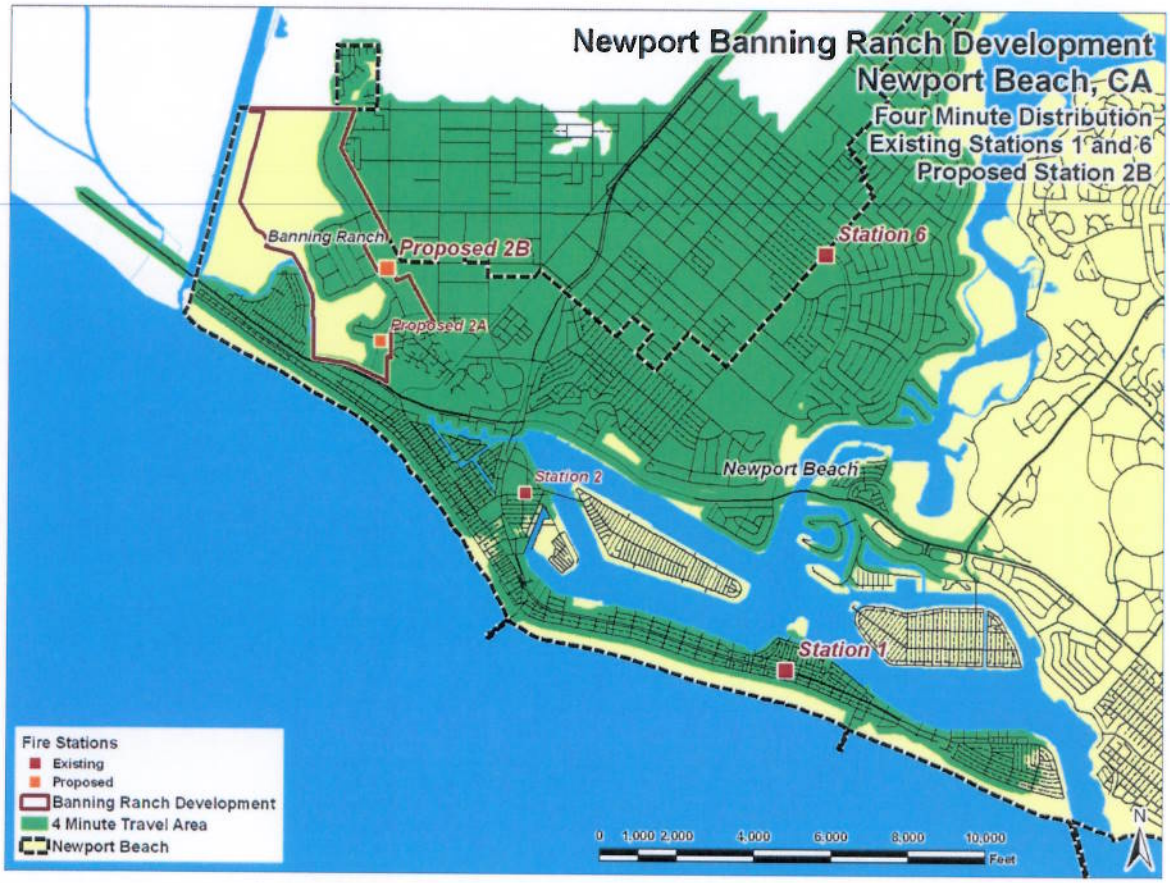
This map illustrates the coverage for the area if fire station 2 were to be retained in its current location. Clearly this location does not address response concerns on the Banning Ranch in its entirety or the island to the north of Banning Ranch.

Figure 36- 4- Minute Distribution - Existing Stations 1 and 6, Proposed Station 2A



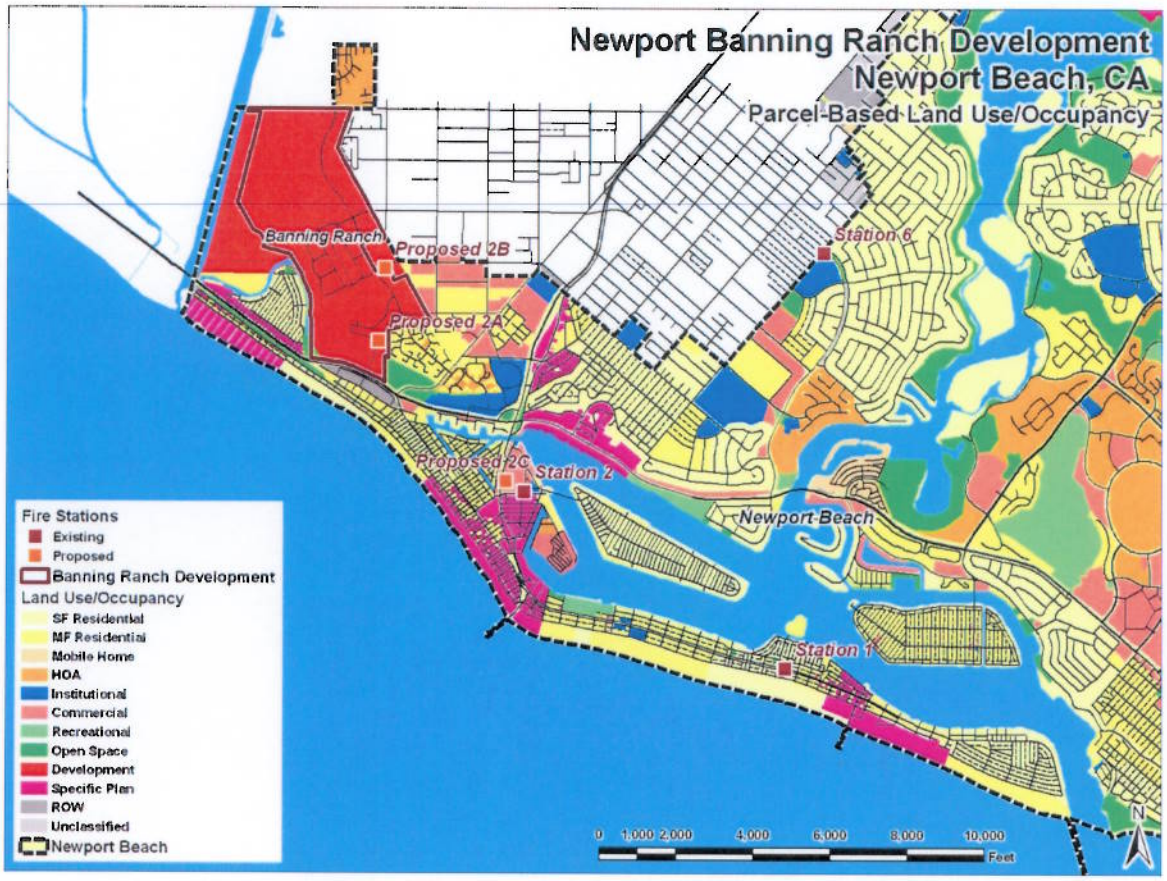
This map illustrates the shift in 4-minute response polygon to the west and north. The inference of this map is that it increases response time to Lido Island but adequately addresses Banning Ranch and the Newport Condos.

Figure 37 – 4- Minute Distribution - Existing Stations 1 and 6, Proposed Station 2B



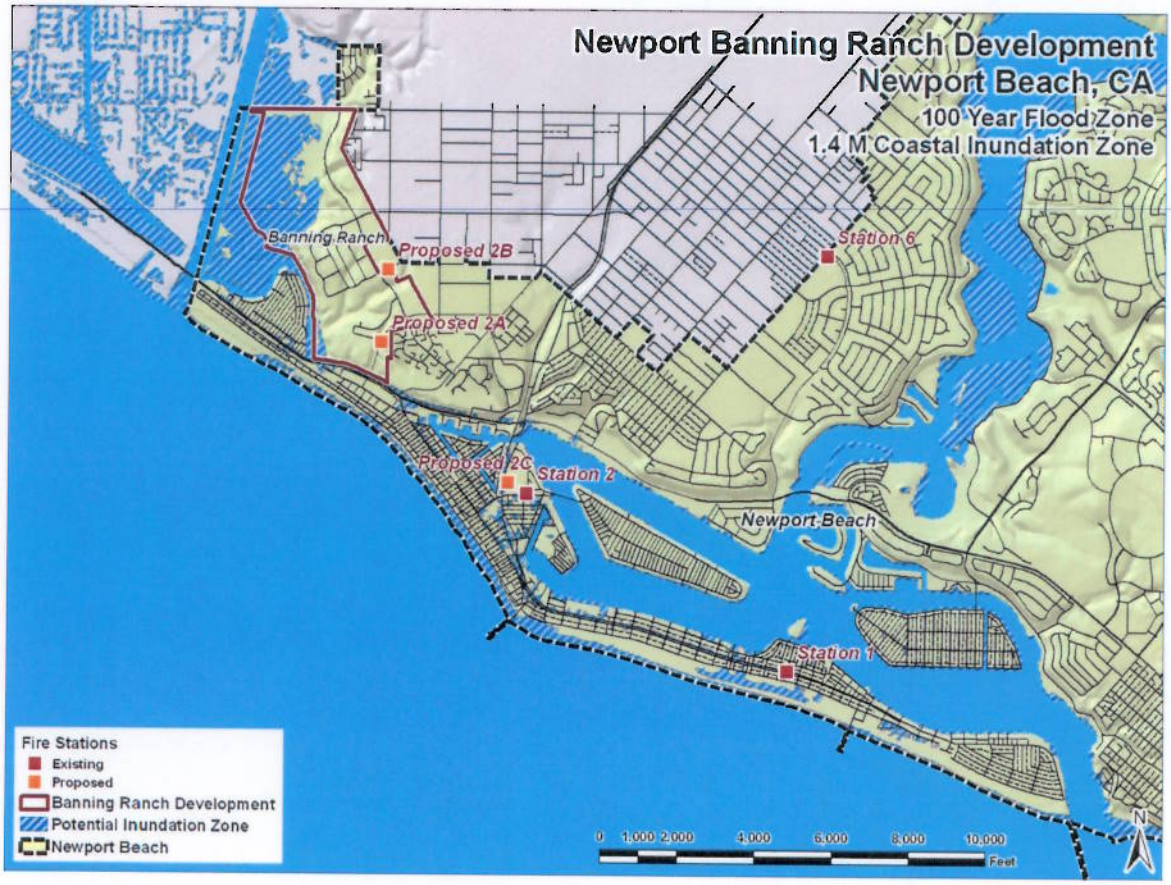
This map illustrates the shift in 4-minute response polygon to the west and north. The inference of this map is that it increases response times even more to Lido Island and shifts response times to Lido Peninsula.

Figure 38 - Parcel-Based Land Use/Occupancy



This map identifies the relative distribution of land use occupancies within the response study areas. This data was developed by the City of Newport Beach and provided to us for use in identifying the risk assessment profile in the study area.

Figure 39 - 100-Year Flood Zone, Coastal Inundation



This map illustrates the potential inundation zone because of the 100-year flood. The emphasis in this map is on the area in the Banning Ranch that will not be developed. This potential inundation zone places a constraint on the location and density of future emergency demand within the Banning Ranch.

Recommendations

The Newport Beach Fire Department desires to maintain an equitable balance of its resources to achieve a high fractal of coverage to all areas of the city within its adopted response goals. Balancing the distribution of resources, which provide a uniform opportunity to achieve travel demands within the response goal, is not an easy task. Topography, road network, road traffic conditions and many variables impact actual response times. For planning purposes, station sites therefore, need to be close enough together to support one another and far enough apart to cover the jurisdiction. Based upon the data in these maps, there is very little statistical difference in area or road miles. However, there is a consequence of each selection. For purposes of this discussion, we would rank these potential sites as follows:

1. The *least* desired site is proposed 2b. It has an effect on the initial attack response time to relatively dense areas that are un-sprinklered properties.
2. Station 2a has a lesser impact on response times back to Lido and Balboa Peninsula and shifts the center of the stations activity to the west and north.
3. Station 2's existing site is not a bad location for the station. It provides response times into areas of older construction and where the community fire flow hazards are located. However, it does not provide initial attack times into the development area that are consistent with the cities response goal.
4. The most desired site is to rebuild the station on the opposite side of the city owned property that currently houses City Hall. This is known as site 2C.

Regarding observation number 4, we have been advised that the city is vacating the City Hall property and that the entire area will undergo redevelopment. If that option were open for possible relocation to retain station 2 in its same geographical area, more desirable site would be based on the optimization map. Taking the station off a side street and moving it around the opposite side of the property would provide easy access to the transportation system. This would provide a most balanced and equitable location for fire station 2.

References

Correspondence, Steve Bunting, Fire Marshal, January 26, 2010

Improvement Statements for Newport Beach Orange County California, Insurance Services Office, Edition 2, 5-01-2002

ISO Needed Fire Flow Records, Excel Spreadsheet

NFPA Standard 1710

Professional Services Agreement for Fire Station Relocation Study

Fire and Life Safety Program

Newport Banning Ranch

Newport Beach, California

January 2011

Prepared by:

firesafe
::PLANNING SOLUTIONS

Fire and Life Safety Program

Newport Banning Ranch

Newport Beach, California

January 2011

Fire and Life Safety Program

Table of Contents

List of Exhibits

Attachments

1 PURPOSE AND INTENT

This Fire and Life Safety Program (F&LSP or Program) was prepared for the proposed Newport Banning Ranch community to analyze and mitigate for potential wildland fire hazards. This Program, prepared by Firesafe Planning Solutions in cooperation with the Newport Beach Fire Department, establishes fuel management requirements for publicly- and privately-maintained landscape, fire access requirements, fire sprinkler requirements, and enhanced construction requirements for structures both bordering and further removed from native vegetation areas.

The purpose and intent of the Program is to significantly reduce the potential risk to lives, homes, and personal property if and when wildfires occur, while allowing the development of well-planned public parks, homesites, and resort areas adjacent to fully-functional habitat areas, which are an important resource to the City and the California Coastal Commission.

This Fire and Life Safety Program sets forth the site planning, design, and administrative requirements for the Newport Banning Ranch community. The Program is based on adherence to the City of Newport Beach Fire Code (including amendments to State Codes) and to Fire Department Guidelines, as well as planning and review meetings with the City of Newport Beach Fire Department.

This Program establishes:

1.1 **Fuel Management Zones** – provide protection for homes and other uses adjoining the natural open space areas;

1.2 **Fire Access** – provide access to and through all structures and areas in the Project for both maintenance and all emergency needs; and

1.3 **Fire Safety Requirements for Structures** – provide an enhanced construction zone adjacent to the Fuel Management Zone and provide automatic fire sprinkler systems for all habitable structures within the Project.

2 BASIS FOR FIRE AND LIFE SAFETY PROGRAM

This Fire and Life Safety Program consolidates standards and summarizes requirements from a variety of sources:

2.1 City Municipal Fire Code/Fire Department Guidelines

This Fire and Life Safety Program is intended to meet or exceed the requirements set forth in the City of Newport Beach Fire Code and all its amendments to the 2007 California Building Code, 2007 California Fire Code, and the International Fire Code, 2006 Edition.

Attachment 1a provides the proposed plant palettes for the Fuel Management Zones that are used in the Fuel Management Plan described below. These proposed plant palettes are based on the City Fire Department's Fire Resistive Plant List, provided as Attachment 1b, with selective additions of less common but nonetheless fire resistive plants. Attachment 1c contains the City's list of undesirable (combustible) List of Plant Species requiring mandatory removal from Fuel Management Zones.

2.2 Wildland Urban Interface (WUI)

Newport Banning Ranch lies within a Special Fire Protection Area, as defined in the Newport Beach Fire Code Section 9.04.030 (as adopted). The State of California classifies the Project Site as a "moderate" and "high" fire hazard area, but not a very high fire hazard area.

Attachment 2a contains California Fire Code Chapter 47, Requirements for Wildland-Urban Interface Fire Areas. Attachment 2b contains California Building Code Chapter 7A, Materials and Construction Methods for Exterior Wildfire Exposure.

2.3 Newport Banning Ranch Fuel Management and Maintenance Program Analysis

This Fire and Life Safety Program incorporates the key provisions and standards from the Newport Banning Ranch Fuel Management and Maintenance Program Analysis drafted for the Newport Beach Fire Department by Firesafe Planning Solutions, a recognized wildland and fire and life safety consulting firm, specifically for the Newport Banning Ranch Project.

The Fuel Management Plan described below in Section 3 incorporates the findings of a fire behavior analysis performed with BEHAVE PLUS fire behavior prediction software. The BEHAVE PLUS program calculates a "worst case" fire behavior result with inputs for plant type, topography, weather, humidity and distance to predict fire behavior, size, and flame lengths. With these results, the fuel management zones can be designed to protect the community in the potential "worst case" fire.

Attachment 3 provides the Fuel Management and Maintenance Program Analysis for the Newport Banning Ranch.

3 FUEL MANAGEMENT PLAN (NEWPORT BANNING RANCH DEVELOPMENT PLAN)

Fire protection in landscape areas will be achieved by avoiding and reducing highly flammable plant material in open space areas adjacent to development. This will be accomplished by revegetation with low-fuel-volume plantings, removal or pruning and thinning of certain native plants, and/or selective irrigation.

Generally, Fuel Management Areas are a composite of three (3) to four (4) successive fuel management zones, which progressively provide an increasing amount of fire protection as they become closer to the homes or other habitable buildings that need to be protected.

This Fire and Life Safety Program establishes three (3) Fuel Management Zones: Zone "A", Zone "B", and Zone "C". These zones are described below in Section 3.1. For the Community's wildland development edge, a 120-foot minimum combined width of Fuel Management Zones will be provided, composed of a minimum 20-foot Zone "A", a minimum 50-foot Zone "B", and a minimum 50-foot Zone "C".

The Fuel Management Plan is illustrated on Exhibit 1. This plan locates and defines the three (3) Fuel Management Zones "A", "B", and "C". It also:

1. Locates cross-sections through the fuel management areas, which are provided as Exhibits 2 through 14 and illustrate the range of fuel management edge conditions within Newport Banning Ranch and how they will be addressed by the Project;

2. Locates firefighter and maintenance access points, and fuel management zone markers within the community; and

3. Locates an Enhanced Construction Zone within the development areas of the community, which requires increased architectural protections for all habitable structures.

3.1 Fuel Management Zones (FMZ) and Maintenance Responsibilities

Fuel management programs vary in complexity and design, depending upon the type and spacing of native vegetation as well as topography, weather conditions, and the placement of structures. The Newport Banning Ranch Fuel Management and Maintenance Program Analysis, based on BEHAVE PLUS fire behavior modeling, establishes that 120 feet of Fuel Management will exceed the protection required for this Project for the WUI areas.

The three (3) Fuel Management Zones illustrated on Exhibit 1 shall be installed and maintained within the Newport Banning Ranch as described below. The cross-sections located on Exhibit 1 are provided as Exhibits 2 through 14.

Zone "A"

Zone "A" is generally a minimum 20-foot-wide flat or level-grade defensible space consisting of irrigated landscape and/or hardscape. Zone "A" will be located on private lots, within the Bluff Park, and/or within road rights-of-way. As shown on Exhibit 1, Zone "A" is considerably wider in some areas than the minimum 20-foot width. In the North Bluff Park it varies considerably, in some cases being over 100 feet wide. This additional width provides greater flexibility in planting and designing the park for public recreational use and enjoyment.

Combustible structures are prohibited within Zone "A". Vegetation shall be consistent with the permitted plant palette and densities for Zone "A" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1c for "undesirable" plant list).

Depending upon the land use, Zone "A" shall be maintained by individual property owners, a Homeowners Association or similar community entity, or (for public roadways) by the City. There are no sensitive habitats within or adjacent to Zone "A", and thinning and/or removal of non-approved landscape shall be permitted throughout the year.

Zone "B"

Zone "B" is generally a minimum 50-foot-wide space adjacent to Zone "A" and closer to the native habitat areas. It consists of trails, hardscape, and/or irrigated low-fuel volume native vegetation within the portion of the Bluff Park adjacent to the Open Space Site Planning Areas. The irrigation system shall be designed to mimic normal/average rainfall and to provide the necessary moisture to the plants during dry periods or seasons.

As in Zone A, combustible structures are prohibited within Zone "B". Vegetation within Zone "B" shall be consistent with the permitted plant palette and densities for Zone "B" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1c for the "undesirable" plant list).

Zone "B" shall be maintained by a Homeowners Association or similar community entity. There are no sensitive habitats within Zone "B", and thinning and/or removal of non-approved landscape will be permitted throughout the year.

Zone "C"

Zone "C" is a minimum 50-foot-wide space between Zone "B" and existing or proposed native habitat. Zone "C" is itself part of the native habitat restoration area proposed by the Newport Banning Ranch Habitat Restoration Plan (HRP).

As in Zones "A" and "B", combustible structures and construction are not permitted within Zone "C". Zone "C" will be composed of a mosaic pattern of non-irrigated low grasses, succulents, cactus, and other low height/fuel volume native plants, as described for the Zone "C" plant palette in Attachment 1a. Existing non-native plants and species not approved by the HRP for this area, including those on the Fire Department's "undesirable" plant list contained in Attachment 1c, will be removed prior to restoration planting.

In the Upland Open Space Area north of the Urban Colony and west of the City of Costa Mesa, a 100-foot-wide Zone "C" will be created adjacent to existing neighborhoods, including California Seabreeze. Unmanaged vegetation currently comes up to the rear yards of the off-Project homes in this area. Newport Banning Ranch will provide an especially wide Fuel Management Zone "C" in this area as a component of the Habitat Restoration Plan. The Zone "C" plant palette for the 30 feet of this Zone "C" closest to the homes will be more limited than usual to specified grasses, cacti, succulents, and open rock areas as noted in the Zone "C" plant palette. Existing wetland vegetation within two arroyos that cross this Zone C area does not contribute to fire fuel load and will not require fuel management beyond the periodic removal of dead plant material.

It is anticipated that Zone "C" will be maintained by the Newport Banning Ranch Conservation Group, yet to be determined. Maintenance by a Homeowners Association or similar community entity may be proposed in certain locations.

Maintenance within Zone "C" will include removal of non-native/invasive species, removal of dead plant material, and removal of species inconsistent with the HRP, including those on the Fire Department's "undesirable" plant list. Maintenance within Zone "C" will not include the pruning, thinning, or removing of living HRP-approved native vegetation.

3.2 FMZ Identification Markers

As shown on Exhibit 1, permanent identification markers shall be installed to identify the limits of Fuel Management Zones "B" and "C" so that workers can undertake maintenance activities, knowing the limits of each zone. Minimum marker design shall be a 2"-diameter x 8'-long galvanized metal pipe, embedded a minimum 2'-6" into solid ground. The top 6" of the pipe shall be stenciled with a Letter B and/or C. The pipe shall be exposed a minimum 2'-0" above vegetation height.

Other FMZ identification marker systems (e.g., large boulders, decorative park elements, etc.) may be proposed and approved by the Newport Beach Fire Department, provided they are of equal permanence and clarity.

4 VERNAL POOL RESTORATION AND EDGES

An existing vernal pool southwest of the intersection of Bluff Road and 17th Street restoration will be restored as part of Project's Habitat Restoration Plan (HRP). The HRP will protect and restore the degraded habitat within the pool boundary and provide an open space buffer around the pool.

As shown below, the plant palettes for the Vernal Pool Restoration Area and for the Vernal Pool Watershed Area (surrounding the Pool) have both been designed as low-growing suites of native plant species that will provide appropriate habitat consistent with the habitat mitigation objectives for the Project.

The Vernal Pool Restoration and Watershed Areas are adjoined by the vernal pool interpretive park and adjacent public streets, including Bluff Road and Scenic Drive. One edge of the Vernal Pool Watershed Area will be developed with homes. A six-foot-high radiant heat wall shall be constructed along this residential edge.[1] This wall, in conjunction with plant heights of 12 inches or less, will provide protection for the homes from a fire originating in that area. The precise design and location of the radiant heat wall will be shown in the final Fire Master Plan (see Section 10).

PLANT PALETTE – VERNAL POOL RESTORATION AREA

Botanic Name	Common Name	Plant Height
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Frankenia salina	Alkali heath	4 to 8 inches
Heliotropum curassivicum	Seaside heliotrope	4 to 8 inches
Lasthenia californica	California goldfields	4 to 8 inches
Lupinus bicolor	Miniature lupine	4 to 8 inches
Malvella leprosa	Alkali side	2 to 6 in
Plantago erecta	Western plantain	3 to 6 inches
Spergularia marina	Saltmarsh sand spurrey	1 to 4 inches

[1] A radiant heat wall is typically a six-foot-high solid masonry wall. Certain types of insulated glass products may be incorporated into radiant heat walls to provide a "view wall." For example, Superlite II-XL, Pyrostop, Pyrobel, Contraflam, and Swissflam are glazing products rated 60-minute plus to ASTME119, limit temperature rise to 250F degrees, and reduce radiant heat flux to 0 kilowatts per square meter.

PLANT PALETTE – VERNAL POOL WATERSHED AREA

Botanic Name	Common Name	Plant Height
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Dudleya lanceolata (succulent)	Lance-leaved dudleya	12 inches
Dudleya pulverulenta (succulent)	Chalk dudleya	12 inches
Frankenia salina	Alkali seaheath	4 to 8 inches
Lasthenia californica	Dwarf goldfields	4 to 8 inches
Lupinus bicolor	Miniature lupine	4 to 8 inches
Malvella leprosa	Alkali side	2 to 6 inches
Melica imperfecta	Coast range melic	16 inches
Nassella pulchra	Purple needlegrass	18 inches
Opuntia littoralis (succulent)	Coast prickly-pear	36 inches
Opuntia prolifera (succulent)	Coast cholla	48 inches
Plantago erecta	Western plantain	3 to 6 inches
Suaeda taxifolia (succulent)	Wooly sea-blite	12 inches

5 ACCESS FOR FIRE FIGHTERS AND FUEL MANAGEMENT MAINTENANCE CREWS

As shown on Exhibit 1, fire and emergency access points from development areas to the Fuel Management Areas will be provided at maximum 500-foot intervals along the Fuel Management Edge. The access locations may be provided from streets, paseos, parks, easements within the Resort Colony and Urban Colony, and potentially in other locations as approved by the Newport Beach Fire Department. These access points will also provide access locations for the permitted and required maintenance of the Fuel Management Zones.

5.1 Emergency Ingress and Egress

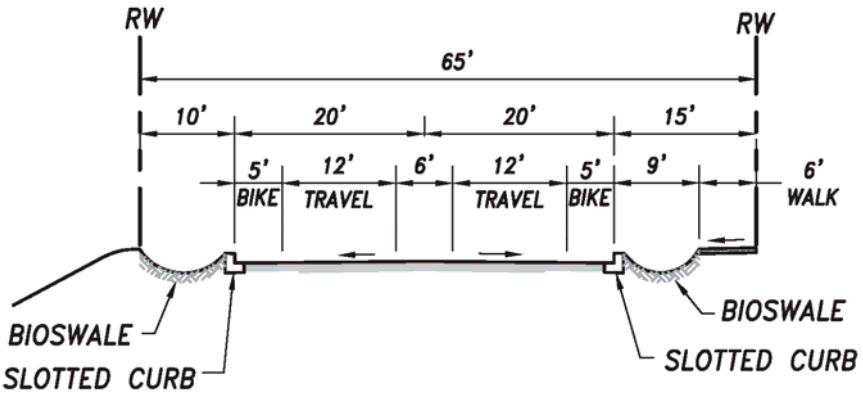
There will be two (2) primary and three (3) secondary ingress and egress routes into the Newport Banning Ranch Community.

Primary access will be at the southern end of the Project from West Coast Highway to Bluff Road, and from the northern end of the Project from 19th Street to North Bluff Road.

All three (3) secondary accesses will be from the east side of the Project, from 15th Street, 16th Street, and 17th Street, all which connect to Bluff Road. None of the secondary access points are in the vicinity of a UWI Area; however, both primary access points border a Fuel Management Area.

5.2 Roadside Clearance along North Bluff Road

A minimum 10 feet of roadside clearance shall be provided from the two travel lanes along North Bluff Road (north of 17 Street) to facilitate movement by fire fighters, residents, and visitors to and from 19th Street in the case of wildfire. Such clearance may be composed of street pavement, sidewalks/trails, and/or irrigated planting within the public right-of-way. The typical cross-section is shown below:



The preliminary plant palette for the bioswale adjacent to North Bluff Road is shown below. A final plant palette shall be provided as part of the Fire Master Plan required by Section 10.

PRELIMINARY PLANT PALETTE – NORTH BLUFF ROAD

Botanic Name	Common Name	Plant Height
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Frankenia salina	Alkali seaheath	4 to 8 inches
Malvella leprosa	Alkali side	2 to 6 inches
Spergularia marina	Saltmarsh sand spurrey	1 to 4 inches

5.3 Emergency Access Design Standards / Access Roads

All streets and cul-de-sacs, as well as arterial and collector road widths and grades, will comply with cross-sections and details shown in the Newport Banning Ranch Master Development Plan and Tentative Tract Map No. 17308.

Generally, the minimum width of a fire access road shall be 20 feet, with no vehicle parking allowed. The width will be increased to 26 feet within 30 feet of a hydrant, with no vehicle parking allowed. Parking on one (1) side will be permitted on 28-foot-wide streets. Parking on two (2) sides will be permitted on 36-foot-wide streets when approved by the City's Fire Code Official.

Roads must be constructed of a material that provides an all-weather driving surface capable of withstanding a vehicle weight of 72,000 pounds. Alternative road surfaces may be used in lieu of conventional asphalt and/or concrete.

6 FIRE SAFETY REQUIREMENTS FOR ALL STRUCTURES

Structures within Newport Banning Ranch shall conform to the following requirements:

6.1 Construction Zones

a. Enhanced Construction Zone

All structures on lots within 100' of the interior Fuel Management edge (i.e., FMZ "A") shall receive enhanced construction on all four (4) sides per 2007 California Building Code Chapter 7A and the 2007 California Fire Code Chapter 47 as locally amended by the City of Newport Beach. (CBC Chapter 7A and CFC Chapter 47 are provided as Attachments 2a and 2b, respectively, to this Fire and Life Safety Program.)

b. Open Landscape Structures

Open landscape structures such as gazebos and trellises within scenic lookouts and viewpoints within the Bluff Park and similar parks, which are decorative elements not habitable buildings, will be exempt from Enhanced Construction Zone requirements.

6.2 Sprinkler Systems

All single-family and multi-family homes shall be constructed with an approved modified NFPA 13D Automatic Fire Sprinkler System installed by a licensed fire sprinkler contractor. All commercial use buildings shall be constructed with an approved full NFPA 13R Automatic Fire Sprinkler System installed by a licensed fire sprinkler contractor. Separate plans shall be submitted to the Fire Department for approval prior to installation.

6.3 Agreement to Fire Restrictions in CC&Rs

All potential property owners shall be required to agree to the rules related to fire protection features, which shall be established in the CC&Rs, prior to purchase of property within Newport Banning Ranch.

6.4 Fire Apparatus Travel Time

All habitable structures shall be located within four (4) minutes of fire apparatus travel time from the closest Newport Beach Fire Station or mutual aid fire station, as determined by the City's Fire Code Official.

7 WATER SUPPLY / FIRE FLOW

The Water Division of the City of Newport Beach Utilities Department will serve the Newport Banning Ranch Project.

All underground fire flow water systems, mains, and water pressures within the Project shall be designed to fully comply with City of Newport Beach Fire Code Requirements, as well as with City of Newport Beach Public Works requirements.

8 HYDRANTS AND UTILITIES

All fire hydrants and all-weather access roads shall be approved and installed, leading to and in the specific building area where combustible materials will be delivered.

A temporary access plan may be designed and considered for approval of temporary access and hydrants.

Hydrants shall be spaced no greater than 500 feet from hydrant to hydrant, and 250 feet from the end of a cul-de-sac/street (dead-end) within the community. Hydrant spacing will be no greater than 1,000 feet from hydrant to hydrant on backbone streets not directly serving any habitable structures.

9 FIRE APPARATUS HOSE PULLS

The 2007 California Fire Code (CFC) states that fire apparatus access roads shall be provided for every building or portion of a building constructed when any portion of the building is located more than 150 feet from the fire apparatus access measured by an approved route around the exterior of the building. CFC Section 503.1.1 provides that the City's Fire Code Official is authorized to increase the dimension of 150' in certain instances. Any proposal to increase the dimension of 150' shall be included and justified in the final Fire Master Plan described in Section 10. The final decision on the required distances will be made by the Newport Beach Fire Department, which may or may not approve such a proposal.

10 FIRE MASTER PLAN

10.1 Requirement to Prepare

A final Fire Master Plan shall be prepared in conjunction with construction-level Site Development Plans for each phase of development, showing all fire access and life safety elements for the Project. The standards set forth in this Fire and Life Safety Program will be included as part of the Fire Master Plan.

10.2 Detailed Planting/Irrigation Plans

The Final Fuel Management Plan shall include detailed planting and irrigation plans at 1"=30' or larger scale for review by the Newport Beach Fire Department. The detailed plans shall include the pattern of native plants within FMZ "C" (e.g., the layout of grasses, cacti/succulents, and fire-resistive shrub species).

10.3 Alternative Design Standards/Means and Methods

Alternative Design Standards to the FMZ widths and plant palettes described in this Fire and Life Safety Program may be proposed as part of the Final Fuel Management Plan based on construction-level design and engineering information; more detailed micro-modeling of topography, fire fuels, and fire behavior, and/or Alternative Means and Methods (AM&Ms) that may be proposed at the time the Fire Master Plan is prepared for City Fire Department review and approval.

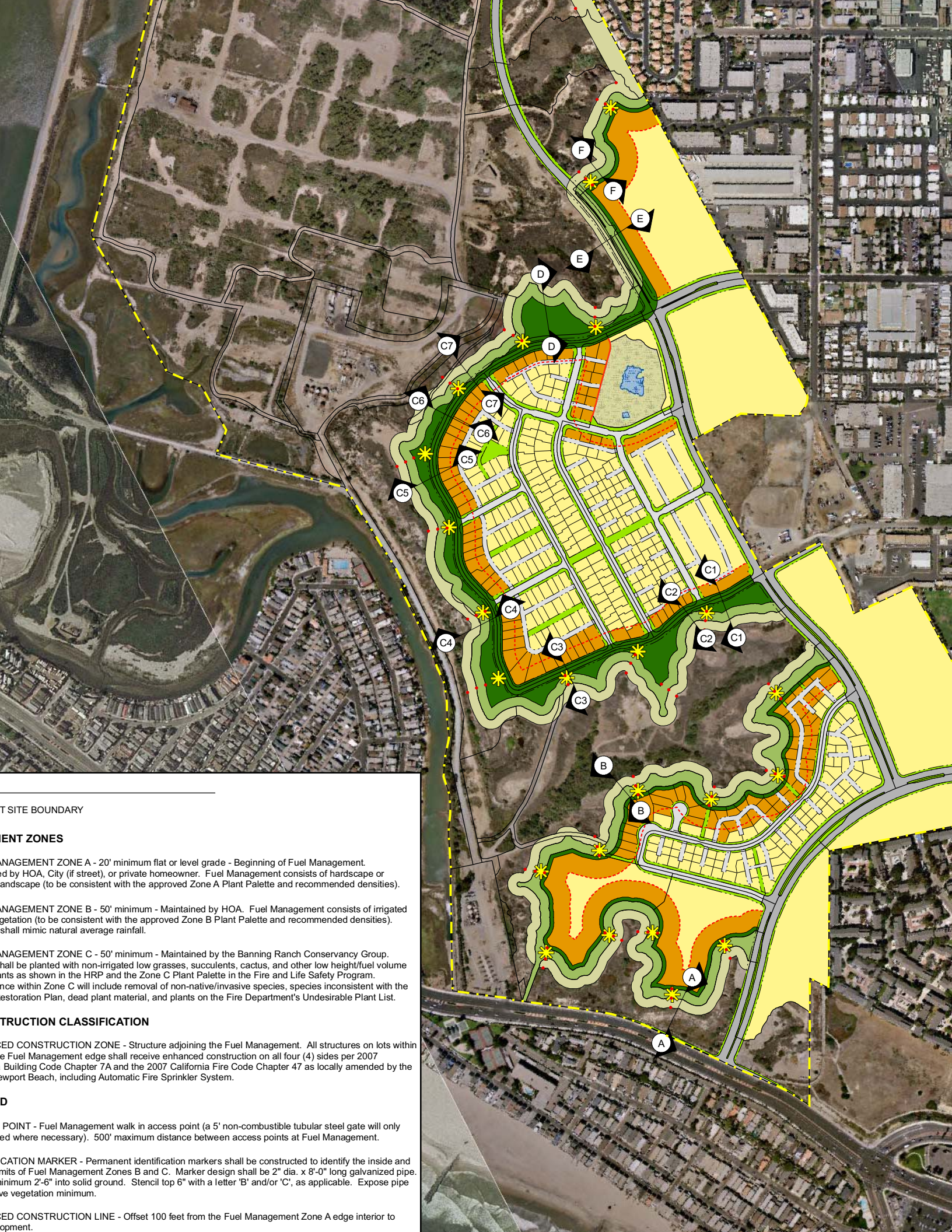
11 FIRE DEPARTMENT REFINEMENTS AND MODIFICATIONS OVER TIME

The Newport Beach Fire Department may refine or modify the requirements set forth in this Newport Banning Ranch Fire and Life Safety Program and subsequent Fire Master Plan and Final Fuel Management Plan to conform with City Ordinances, Fire Department Guidelines, and/or State Regulations as they may change in the future to better protect public health and safety. The Newport Beach Fire Department is empowered to interpret and clarify this Fire and Life Safety Program as necessary to protect public health and safety.

12 USE OF FIRE AND LIFE SAFETY PROGRAM

FMZ requirements, fire-resistant building requirements, and other fire protection measures shall be provided to the Landowner/Master Developer, project developers, builders, architects, landscape architects, Newport Banning Ranch Homeowners Associations (HOAs), and Newport Banning Ranch Conservancy Group to ensure all structures in the Newport Banning Ranch Project will be constructed and will remain over time reasonably safe from future wildland fires.

The information in this Fire and Life Safety Program shall also be provided to future individual homeowners, either as a stand-alone document or as part of a larger educational handout for Newport Banning Ranch residents.



T SITE BOUNDARY

ENT ZONES

ANAGEMENT ZONE A - 20' minimum flat or level grade - Beginning of Fuel Management.
ed by HOA, City (if street), or private homeowner. Fuel Management consists of hardscape or andscape (to be consistent with the approved Zone A Plant Palette and recommended densities).

ANAGEMENT ZONE B - 50' minimum - Maintained by HOA. Fuel Management consists of irrigated getation (to be consistent with the approved Zone B Plant Palette and recommended densities). shall mimic natural average rainfall.

ANAGEMENT ZONE C - 50' minimum - Maintained by the Banning Ranch Conservancy Group. hall be planted with non-irrigated low grasses, succulents, cactus, and other low height/fuel volume ants as shown in the HRP and the Zone C Plant Palette in the Fire and Life Safety Program. nce within Zone C will include removal of non-native/invasive species, species inconsistent with the estoration Plan, dead plant material, and plants on the Fire Department's Undesirable Plant List.

TRUCTION CLASSIFICATION

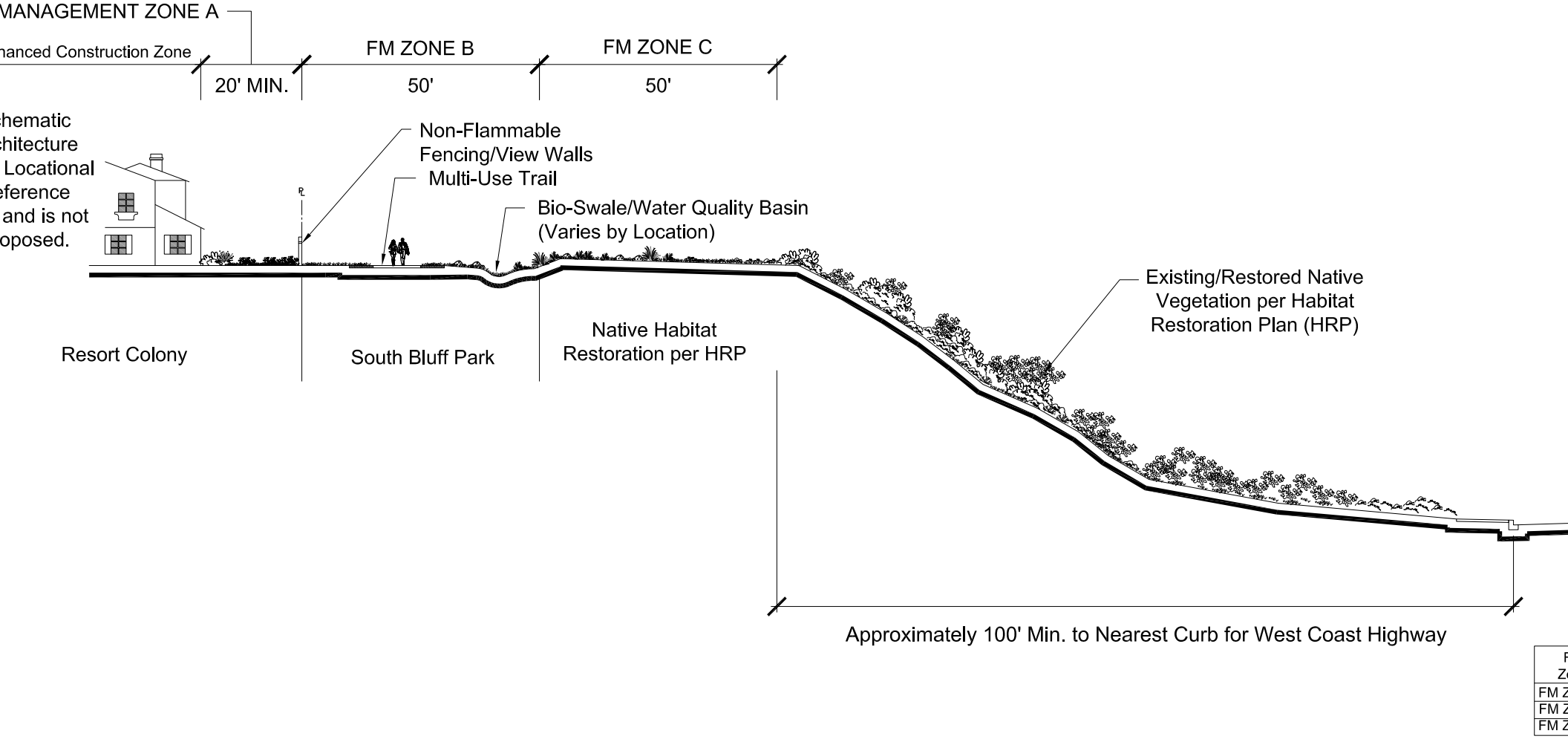
CED CONSTRUCTION ZONE - Structure adjoining the Fuel Management. All structures on lots within e Fuel Management edge shall receive enhanced construction on all four (4) sides per 2007 Building Code Chapter 7A and the 2007 California Fire Code Chapter 47 as locally amended by the ewport Beach, including Automatic Fire Sprinkler System.

D

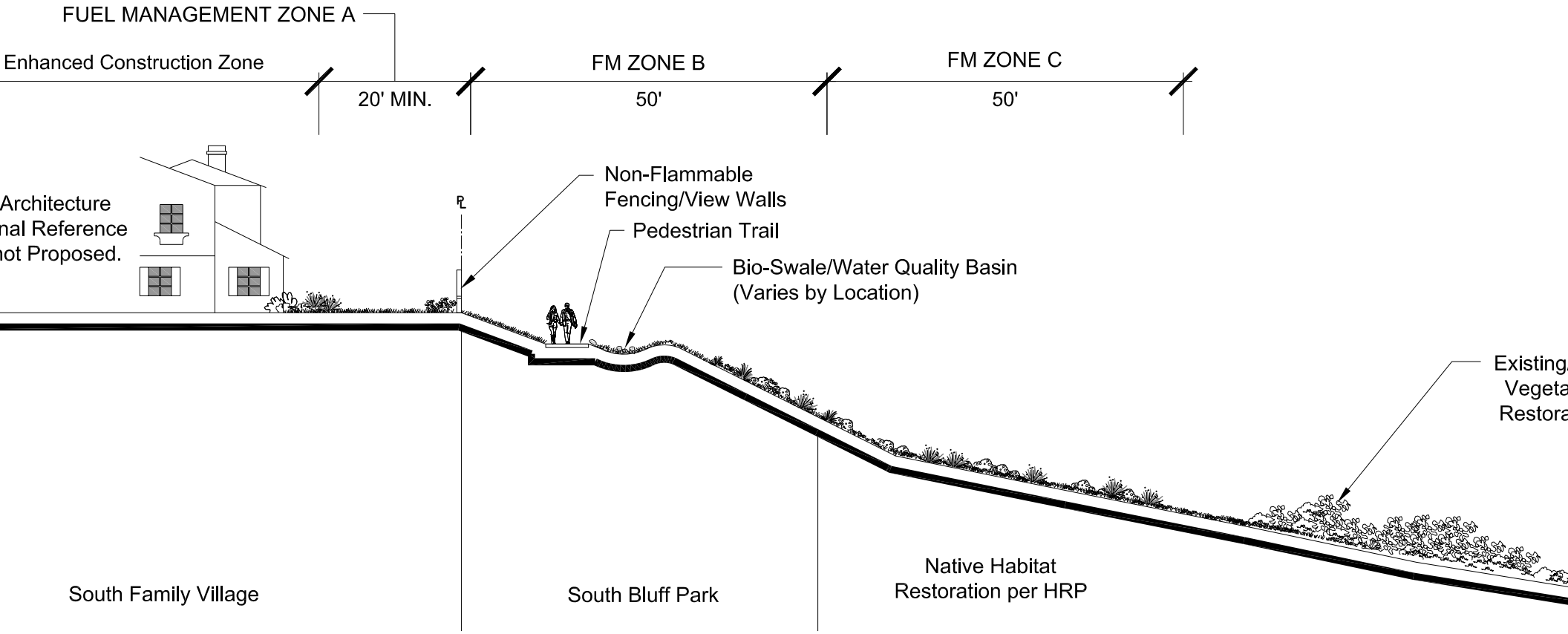
POINT - Fuel Management walk in access point (a 5' non-combustible tubular steel gate will only ed where necessary). 500' maximum distance between access points at Fuel Management.

CATION MARKER - Permanent identification markers shall be constructed to identify the inside and mits of Fuel Management Zones B and C. Marker design shall be 2" dia. x 8'-0" long galvanized pipe. inimum 2'-6" into solid ground. Stencil top 6" with a letter 'B' and/or 'C', as applicable. Expose pipe ve vegetation minimum.

CED CONSTRUCTION LINE - Offset 100 feet from the Fuel Management Zone A edge interior to opment.

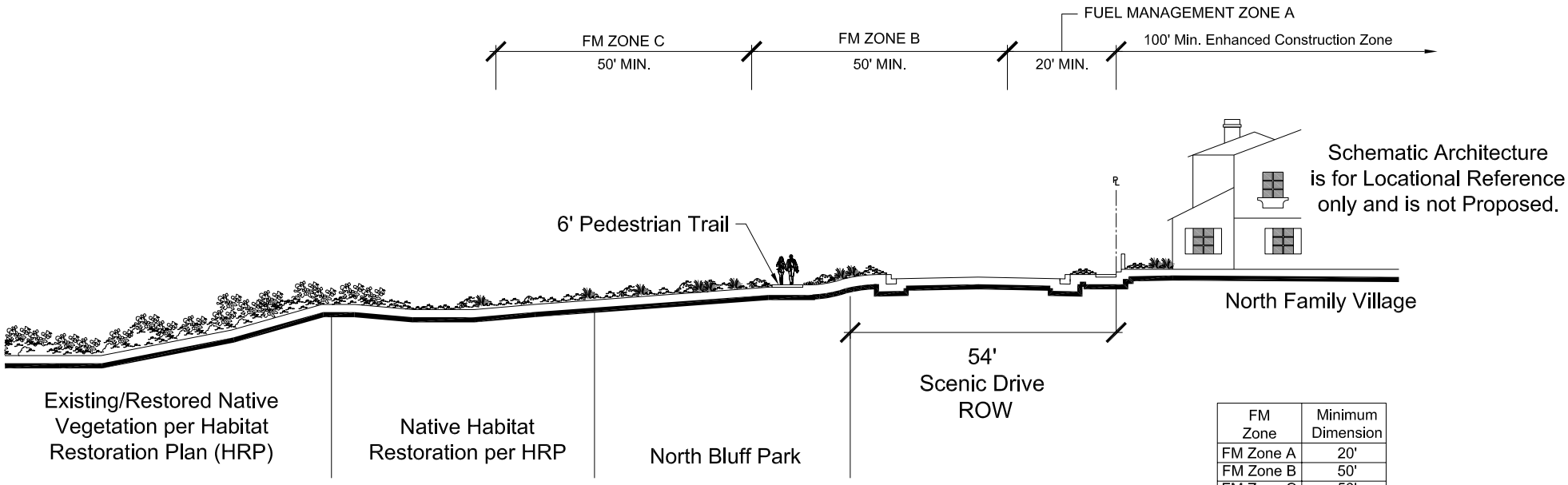


CROSS-SECTION A-A



FM Zone
FM Zone A
FM Zone B
FM Zone C

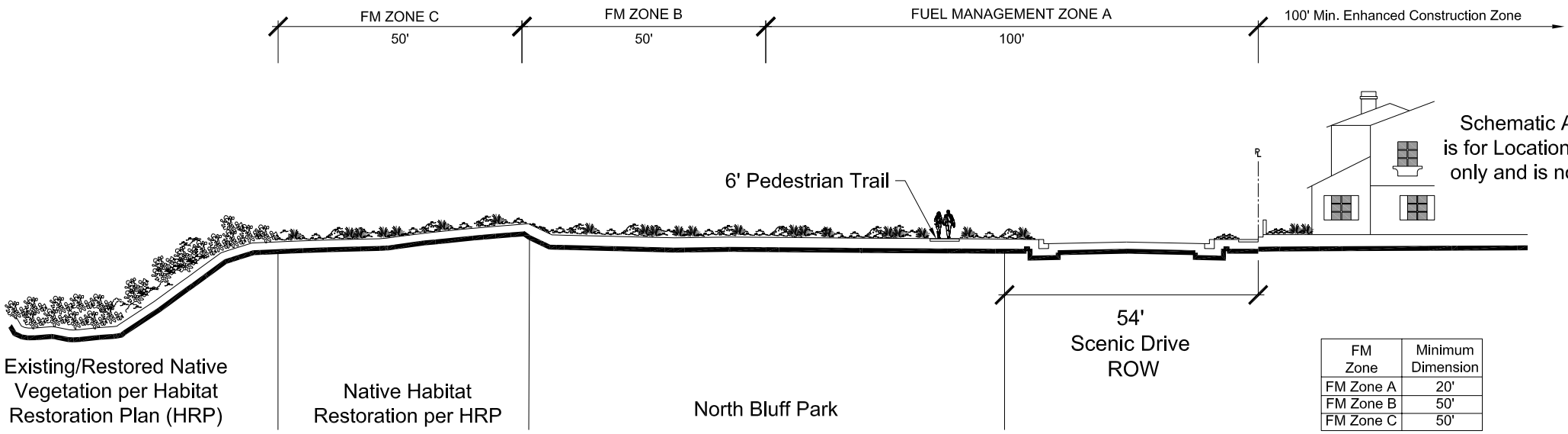
CROSS-SECTION B-B



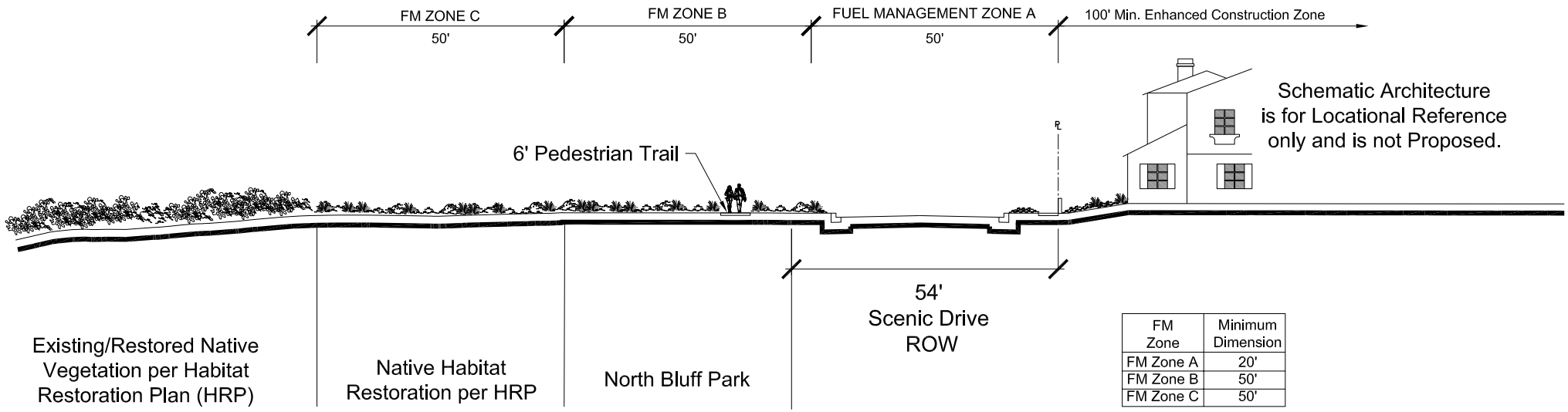
FM Zone	Minimum Dimension
FM Zone A	20'
FM Zone B	50'
FM Zone C	50'

MINIMUM DIMENSIONS FOR NORTH FAMILY VILLAGE FUEL MANAGEMENT ZONES

NOTE:
The dimensions shown above for FM Zones A, B, and C are minimums for the North Family Village adjacent to Scenic Drive and Bluff Park.
The actual dimensions for each location identified on the Fuel Management Zones Map as Cross-Section C1-C1 through C7-C7 are larger.

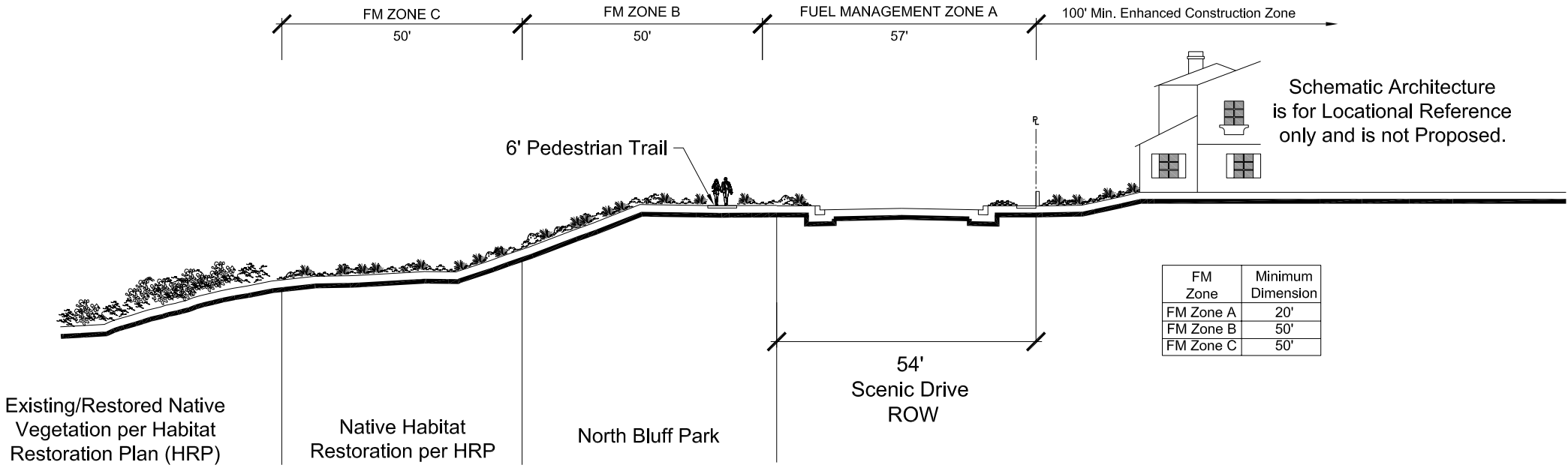


CROSS-SECTION C1-C1

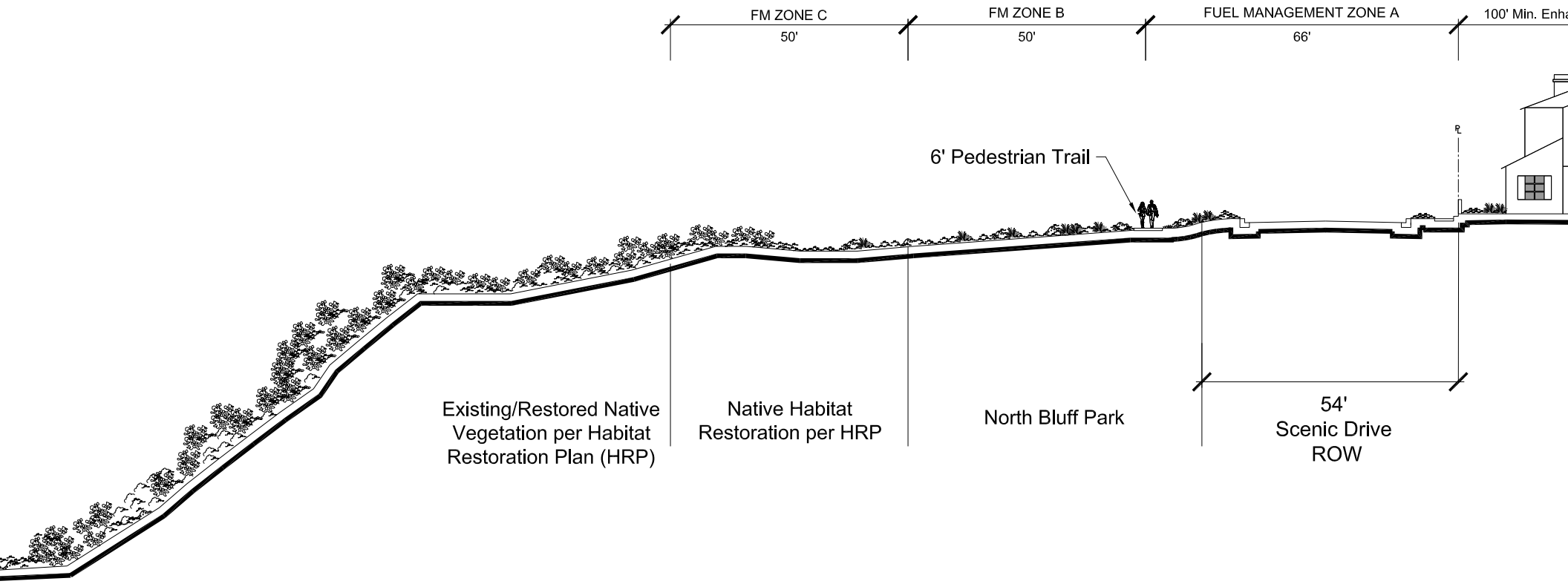


FM Zone	Minimum Dimension
FM Zone A	20'
FM Zone B	50'
FM Zone C	50'

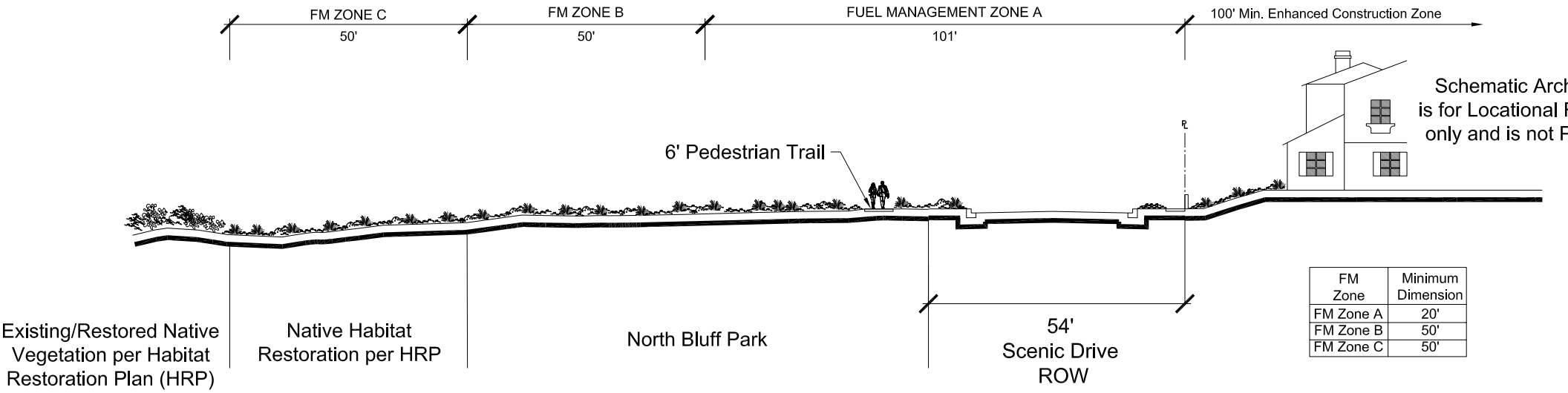
CROSS-SECTION C2-C2



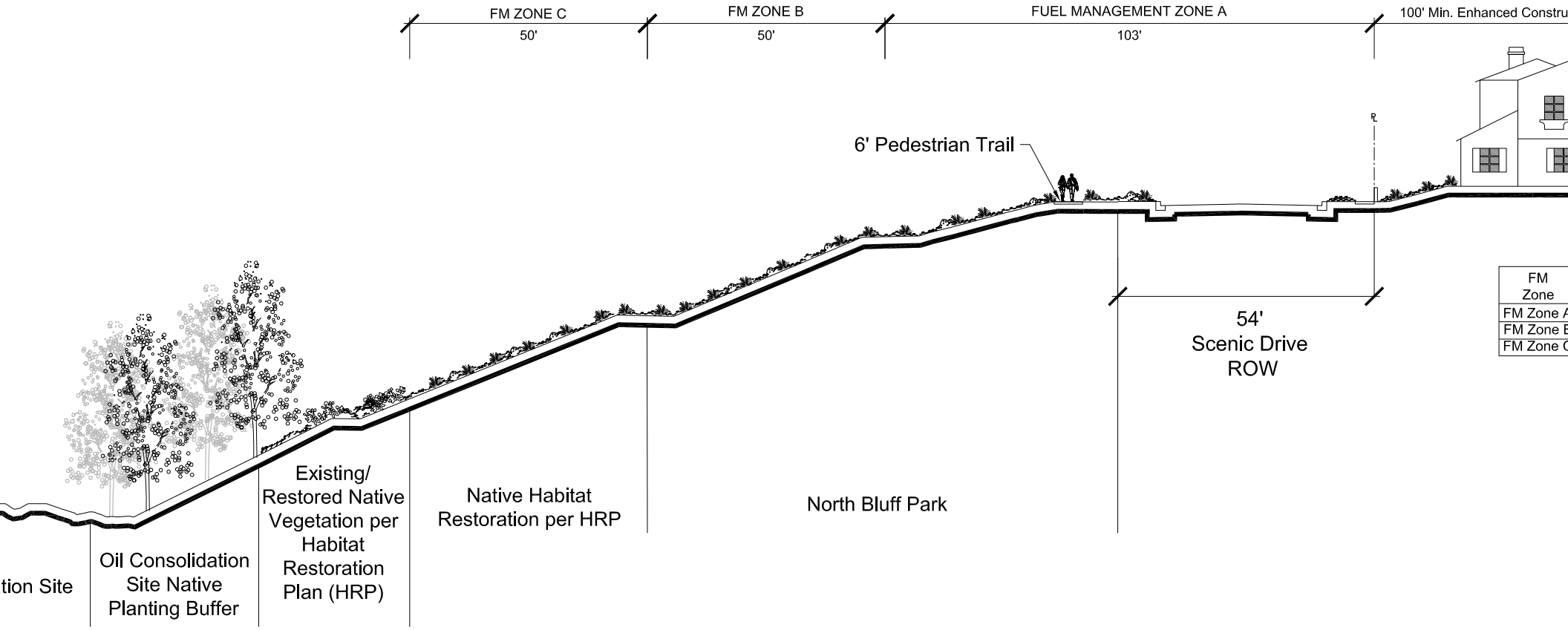
CROSS-SECTION C3-C3



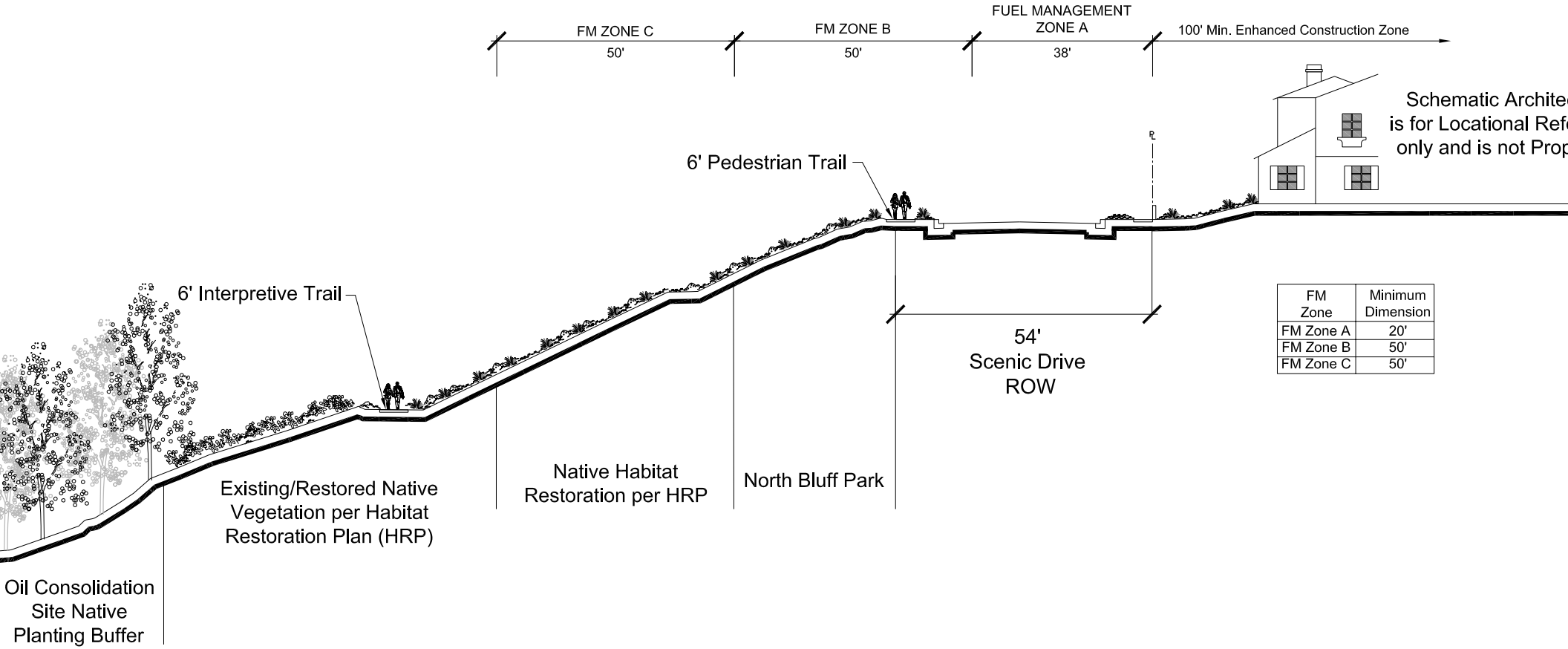
CROSS-SECTION C4-C4



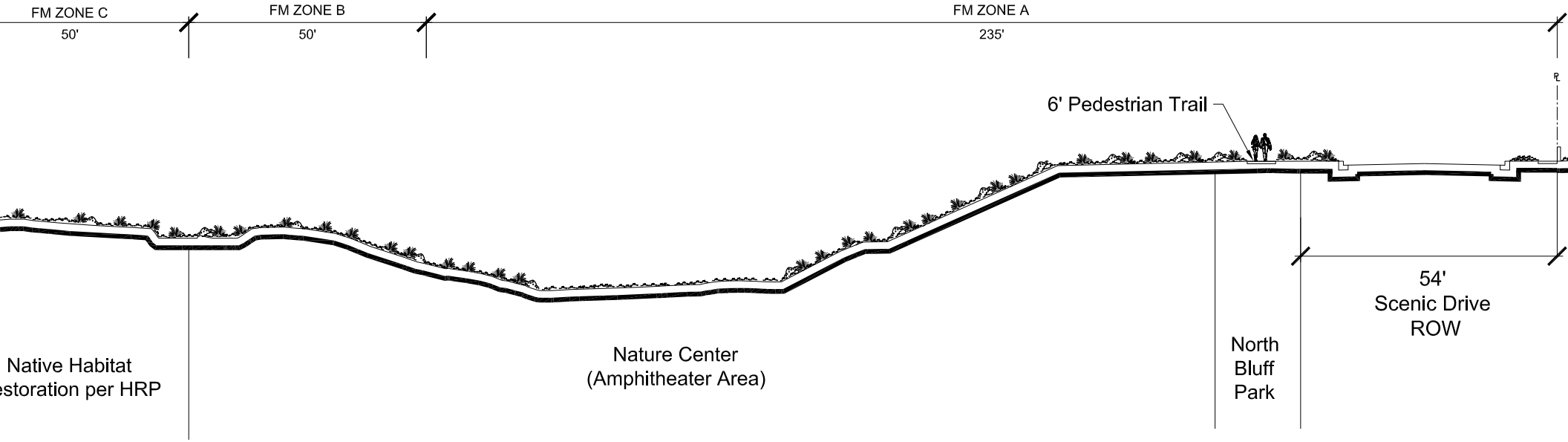
CROSS-SECTION C5-C5



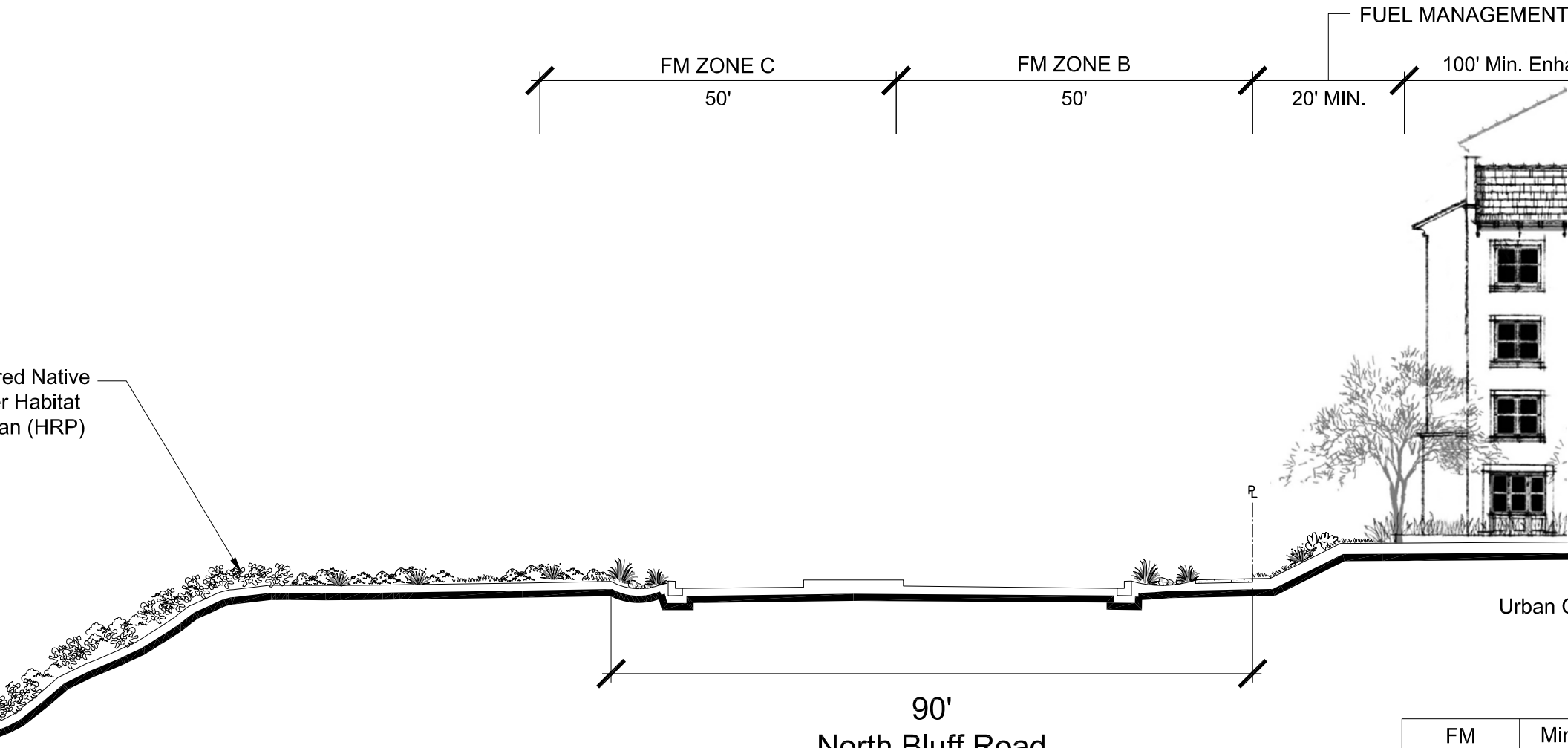
CROSS-SECTION C6-C6



CROSS-SECTION C7-C7

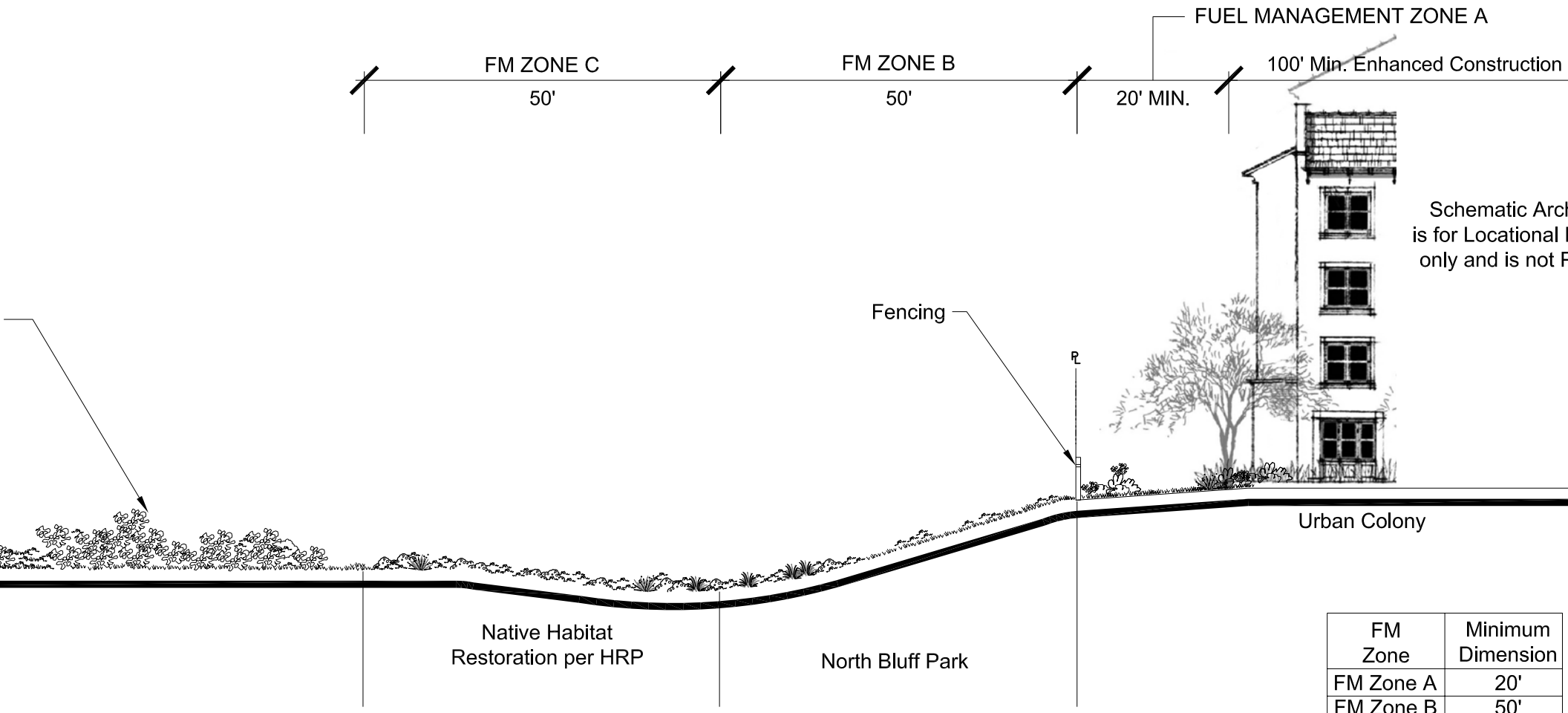


CROSS-SECTION D-D



FM Zone	Min Dim
FM Zone A	
FM Zone B	
FM Zone C	

CROSS-SECTION E-E



FM Zone	Minimum Dimension
FM Zone A	20'
FM Zone B	50'
FM Zone C	50'

CROSS-SECTION F-F

FUEL MANAGEMENT PLANT PALETTE

1. Permitted Plant Palette for Fuel Management Zone A

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Trees		
Acer macrophyllum	*Big Leaf Maple*	*C*
Arbutus unedo	*Strawberry Tree*	
Ceratonia siliqua	*Carob*	*C D*
Citrus species	*Citrus*	*C*
Eriobotrya japonica	*Loquat*	*C*
Erythrina species	*Coral Tree*	*C D*
Ginkgo biloba	*Maidenhair Tree*	*C D*
Juglans californica	*California Black Walnut*	*C D*
Lagerstroemia indica	*Crape Myrtle*	*C*
Lagunaria patersonii	*Primrose Tree*	*CD*
Liriodendron tulipfera	*Tulip Tree Fernleaf*	-
Liquidambar styraciflua	*American Sweet Gum*	*C*
Lyonthamnus flori. ssp. Asplenifolius	*Ironwood*	*C D*
Macadamia integrifolia	*Macadamia Nut*	-
Maytenus boaria	*Mayten Tree*	-
Metrosideros excelsus	*New Zealand Christmas Tree*	*C D*
Parkinsonia aculeata	*Mexican Palo Verde*	*CD*
Pistacia chinensis	*Chinese Pistache*	*C*
Pittosporum undulatum	*Victorian Box*	-
Platanus racemosa	*California Sycamore*	*C*
Populus fremontii	*Western Cottonwood*	*C*
Quercus agrifolia	*Coast Live Oak*	*C D*
Quercus engelmannii	*Engelmann Oak*	*C D*
Quercus suber	*Cork Oak*	-
Rhus lancea	*African Sumac*	*C D*
Sambucus mexicana	*Mexican Elderberry*	*C D*
Stenicarpus sinuatus	*Firewheel Tree*	*CD*

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Shrubs		
Aeonium species	*Aeonium*	*C D*
Agave species	*Century Plant*	*C D*
Agave attenuata	*Century Plant*	*C D*
Agave attenuata	*Fox Tail Agave*	*C D*
Agave filifera	*Agave Filifera*	*C D*
Agave parryi v. couesii	*Couesii Century Plant*	*C D*
Agave shawii	*Shaw's Century Plant*	*C D*
Agave species	*Century Plant*	*C D*
Agave vilmoriniana	*Octopus Agave*	*C D*
Aloe arborescens	*Tree Aloe*	*C D*
Aloe arborescens	*Candelabra Aloe*	*C D*
Aloe species	*Aloe*	*C D*
Aloe striata	*Coral Aloe*	*C D*
Aloe Vera	*Medicinal Aloe*	*C D*
Aptenia cordifolia	*Hearts And Flowers*	*C D*
Baccharis pilularis 'Twin Peaks #2'	*Dwarf Coyote Bush*	*C D*
Baccharis salicifolia	*Mulefat*	*C D*
Bromus carinatus	*California Brome*	*C*
Bulbine frutescens	*Stalked Bulbine*	*D*
Bulbine frutescens 'Hallmark'	*Dwarf Orange Bulbine*	*D*
Bulbine frutescens 'Yellow'	*Yellow bulbine*	*D*
Carissa macrocarpa	*Green Carpet Natal Plum*	-
Ceanothus g. var. hori. 'Yankee Point'	*Yankee Point Ceanothus*	*C D O*
Ceanothus gloriosus 'Point Reyes'	*Point Reyes Ceanothus*	*C D O*
Ceanothus griseus ' Louis Edmunds'	*Louis Edmunds Ceanothus*	*C D O*
Ceanothus griseus var. horizontalis	*Carmel Creeper Ceanothus*	*C D O*
Ceanothus megarcarpus	*Big Pod Ceanothus*	*C D*
Ceanothus prostrates	*Squaw Carpet Ceanothus*	*C D*
Ceanothus spinosus	*Green Bark Ceanothus*	*C D*
Ceanothus verrucosus	*Wart-Stem Ceanothus*	*C D*
Cephalocereus senilis	*Old Man Cactus*	*CD*
Cerastium tomentosum	*Snow-in-Summer*	-

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Shrubs (continued)		
Cercis occidentalis	*Western Redbud*	*C D O*
Cereus hildmannianus	*Hildmann Cactus*	*C D*
Cereus peruvianus	*Peruvian Tree Cactus*	*C D*
Chrysanthemum leucanthemum	*Oxeye Daisy*	-
Cistus hybridus	*White Rockrose*	*C D*
Cistus incanus	*NCN*	*C D*
Cistus incanus ssp. Corsicus	*NCN*	*C D*
Cistus salviifolius	*Sageleaf Rockrose*	*C D*
Cistus x purpereus	*Orchid Rockrose*	*C D*
Convolvulus cneorum	*Bush Morning Glory*	*C D*
Coprosma kirkii	*Creeping Coprosma*	-
Coprosma pumila	*Prostrate Coprosma*	-
Cotoneaster buxifolius	*NCN*	*C D*
Crassula arborescens	*Silver Jade Plant*	*C D*
Crassula ovata	*Jade Tree*	*C*
Delosperma 'Alba'	*White Trailing Ice Plant*	*C D*
Dodonaea viscosa	*Hopseed Bush*	*C D*
Doryanthes palmeri	*Spear Lily*	-
Drosanthemum hispidum	*Ice Plant*	*C D*
Dudleya brittonii	*Dudleya*	*C D*
Dudleya caespitosa	*Sea Lettuce*	*C D O*
Dudleya hassei	*Hasse's Dudleya*	*C D O*
Dudleya lanceolata	*Lance-Leaved Dudleya*	*C D O*
Dudleya pulverulenta	*Chalk Dudleya*	*C D*
Dudleya viscida	*San Juan Live Forever*	*C D O*
Echeveria species	*Hens and Chickens*	*C D*
Echinocactus grusonii	*Golden Barrel Cactus*	-
Echium species	*Echium*	*C D*
Escallonia species	*Escallonia Varieties*	*C*
Euphorbia biglandulosa	*Gopher Plant*	*C D*
Euphorbia characias	*Euphorbia*	*C D*
Euphorbia rigida	*Yellow Spurge*	*C D*
Euphorbia tirucalli 'Sticks on Fire'	*Sticks on Fire*	*C D*
Feijoa sellowiana	*Pineapple Guava*	-

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Shrubs (continued)		
Graptopetalum paraguayense	*Ghost Plant, Mother of Pearl Plant*	-
Grewia occidentalis	*Starflower*	*C*
Hardenbergia comptoniana	*Lilac Vine*	-
Hesperaloe funifera	*Giant Hesperaloe*	*C D*
Hypericum calycinum	*Aaron's Beard*	*D*
Kalanchoe beharensis	*Felt Plant*	*C D*
Kalanchoe pumila	*Flower Dust Plant*	*C D*
Kniphofia uvaria	*Red Hot Poker*	*C D*
Lamium maculatum	*Dead Nettle*	-
Lamium maculatum 'Beacon Silver'	*Beacon Silver Dead Nettle*	-
Lampranthus aurantiacus	*Ice Plant*	*C D*
Lampranthus productus	*Lampranthus*	*C D*
Lampranthus spectabilis	*Trailing Ice Plant*	*C D*
Lampranthus spectabilis 'Rose'	*Rose Trailing Ice Plant*	*C D*
Lantana camara cultivars	*Yellow Sage*	*C D*
Lantana camara montevidensis	*Trailing Lantana*	*C D*
Lavandula dentata	*French Lavender*	*C D*
Leptospermum 'laevigatum'	*Australian Tea Tree*	*C D*
Leucophyllum frutescens	*Texas Ranger*	*C D*
Ligustrum japonicum 'Texanum'	*Texas Privet*	*C D*
Limonium perezii	*Sea Lavender*	*C D*
Lonicera japonica 'Halliana'	*Hall's Japanese Honeysuckle*	-
Lonicera subspicata	*Wild Honeysuckle*	-
Mahonia 'Golden Abundance'	*Golden Abundance Mahonia*	*C D*
Mahonia nevenii	*Nevin Mahonia*	*C D*
Malephora lutea	*Rocky Point Ice Plant*	*C D*
Manfreda maculosa	*Manfreda*	-
Myoporum debile	*NCN*	-
Myoporum 'Pacificum'	*NCN*	-
Myoporum parvilfolium	*NCN*	-
Nolina cismontane	*Chapparal Nolina*	-
Nolina species	*Mexican Grasstree*	*C D*
Opuntia littoralis	*Prickly Pear*	*C D*
Opuntia oricola	*Oracle Cactus*	*C D*

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Shrubs (continued)		
Opuntia species	*Prickly Pear, Cholla*	*C D*
Osteospermum fruticosum	*Trailing African Daisy*	*C D*
Pachypodium lamieri [(1)]	*Madagascar Palm* [(1)]	-
Pedilanthus macrocarpus	*Lady's Slippers*	*D*
Photinia fraseri	*NCN*	*C D*
Pilea cadierei	*Creeping Charlie*	-
Portulacaria afra	*Elephant's Food*	*C D*
Prunus caroliniana	*Carolina Cherry Laurel*	*C D*
Prunus ilicifolia 'Ilicifolia'	*Holly Leafed Cherry*	*C D O*
Prunus lyonii	*Catalina Cherry*	*C D*
Punica granatum	*Pomegranate*	-
Pyracantha species	*Firethorn*	*C D*
Quercus berberdifolia	*California Scrub Oak*	*D*
Quercus dumosa	*Coastal Scrub Oak*	*C D*
Rhaphiolepis species	*India Hawthorn*	*C*
Rhus integrifolia	*Lemonade Berry*	*C D O*
Rhus ovata	*Sugarbush*	*C D*
Romneya coulteri	*Matilija Poppy*	*C D*
Romneya coulteri 'White Cloud'	*White Cloud Matilija Poppy*	*C D*
Rosmarinus officinalis	*Rosemary*	*C D*
Salvia greggii [(1)]	*Autumn Sage* [(1)]	*C D*
Salvia sonomensis [(1)]	*Creeping Sage* [(1)]	*C D*
Santolina chamaecyparissus	*Lavendar Cotton*	*C D*
Santolina virens	*Green Lavender Cotton*	*C D*
Sedum species	*Stonecrop*	*C D*
Solanum xantii	*Purple Nightshade*	*C D*
Tecoma capensis	*Cape Honeysuckle*	*C D*
Xylosma congestum	*Shiny Xylosma*	-
Yucca glauca	*Spanish Bayonet*	*C D*
Yucca Species [(1)]	*Yucca* [(1)]	*C D*
Yucca whipplei [(1)]	*Our Lord's Candle* [(1)]	*C D*

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE A		
Botanical Name	***Common Name***	***Suitability***
Groundcover		
Armeria maritima	*Common Thrift*	*C D*
Artemisia caucasica	*Caucasian Artesmisia*	*D*
Aptenia cordifolia x Red Apple	*Aptenia*	*D*
Cistus cripus	*NCN*	*C*
Coreopsis lancelata	*Coreopsis*	*C*
Corea pulchella	*Australian Fuscia*	*D*
Crassula lacteal	*NCN*	*D*
Crassula multicava	*NCN*	*D*
Crassula tetragona	*NCN*	*D*
Delosperma 'alba'	*White Trailing Ice Plant*	*C D*
Drosanthemum floribundum	*Rosea Ice Plant*	*C*
Drosanthemum hispidum	*NCN*	*C*
Drosanthemum speciosum	*Dewflower*	*C*
Fragaria chiloensis	*Beach Strawberry*	*D*
Iberis sempervirens	*Evergreen Candytuft*	*C D*
Iberis umbellatum	*Globe Candytuft*	*C*
Lampranthus aurantiacus	*Bush Ice Plant*	-
Lampranthus filicaulis	*Redondo Creeper*	-
Lampranthus spectabilis	*Trailing Ice Plant*	*C*
Lasthenia californica	*Dwarf Goldfields*	-
Lupinus arizonicus	*Desert Lupine*	*C D*
Lupinus benthamii	*Spider Lupine*	-
Lupinus bicolor	*Miniature Lupine*	-
Lupinus sparsiflorus	*Losely flowered Annual Lupine/Coulter's*	-
Ophiopogon japonicus	*Mondo Grass*	-
Pelargonium peltatum	*Ivy Geranium*	-
Sedum species	*Stone Crop*	-
Vines		
Bougainvillea spp.	*Bougainvillea*	*C D*
Macfadyena unguis-cati	*Cat's Claw*	*C D*
Mascagnia macroptera	*Golden Vine*	*D*
Passiflora edulis	*Passion Flower*	-
Turf		
Marathon II 'Festuca Arundinacea'	*Dwarf Tall Fescue*	
Turf	*A-G Sod Farms Inc.- Elite Plus*	*D*

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

2. Permitted Plant Palette for Fuel Management Zone B

FUEL MANAGEMENT ZONE B	
Botanical Name	***Common Name***
Shrubs From Seed	
Dichelostemma capitatum	*Wild hyacinth*
Dudleya pulverulenta	*Chalk dudleya*
Horkelia cuneata	*Mesa horkelia*
Lotus heermannii	*Woolly lotus*
Melica imperfecta	*Coast range melic*
Mirabilis californica	*Wishbone bush*
Nassella pulchra	*Purple needlegrass*
Sisyrinchium bellum	*Blue-eyed grass*
Shrubs From Container	
Aeonium species	*Aeonium*
Agave attenuata	*Fox Tail Agave*
Agave shawii	*Shaw's Century Plant*
Aloe arborescens	*Candelabra Aloe*
Aloe species	*Aloe*
Aloe striata	*Coral Aloe*
Crassula species	*Silver Jade Plant*
Dichelostemma capitatum	*Wild hyacinth*
Distictis spicata	*Saltgrass*
Dudleya lanceolata	*Lance-leaved dudleya*
Dudleya pulverulenta	*Chalk Dudleya*
Echeveria species	*Echeveria*
Horkelia cuneata	*Mesa horkelia*
Kalanchoe beharensis	*Felt Plant*
Kalanchoe pumila	*Flower Dust Plant*
Limonium perezii	*Sea Lavender*
Lycium californicum	*California boxthorn*
Nassella lepida	*Foothill needle-grass*
Opuntia littoralis	*Coast prickly-pear*
Opuntia prolifera	*Coast cholla*
Opuntia species	*Prickly Pear, Cholla*
Portulacaria afra	*Elephant's Food*
Sedum species	*Stonecrop*

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

FUEL MANAGEMENT ZONE B	
Botanical Name	***Common Name***
Sisyrinchium bellum	*Blue-eyed grass*
Tecoma capensis	*Cape Honeysuckle*
Yucca whipplei [(1)]	*Our Lord's Candle* [(1)]

(1) This plant species may not be located within 50 feet of homes.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

FUEL MANAGEMENT PLANT PALETTE

3. Permitted Plant Palette for Fuel Management Zone C / Habitat Restoration *

HABITAT RESTORATION / FUEL MANAGEMENT ZONE C	
Botanical Name	***Common Name***
Grasslands	
Bothriochloa barbinodis	Beardgrass
Distichlis spicata	Saltgrass
Lasthenia californica	California goldfields
Melica imperfecta	Coast Range Melica
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
Succulent Scrub Mosaic	
Non-Combustible/Succulent Species	
Cylindropuntia prolifera	Coastal cholla
Opuntia littoralis	Coastal prickly pear
Suaeda taxifolia	Woolly sea-blite
Fire-Resistive Shrub Species	
Encelia californica (2)	California encelia (2)
Isocoma menziesii (2)	Coastal goldenbush (2)
Isomeris arborea (2)	Bladderpod (2)
Lycium californicum (2)	California boxthorn (2)

The plants will be established in a mosaic pattern, with alternating patches of the fire-resistive shrub species and non-combustible/succulent species such that it achieves the equivalent of a 50- to 60-percent "thinning" standard with the typically "thinned" areas actually composed at NBR of succulent and cactus species. The intention is to continue to provide nesting and foraging habitat for special-status birds such as California gnatcatcher (*Polioptila californica*) and coastal cactus wren (*Campylorhynchus brunneicapillus*), with the large patches of non-combustible/succulent species intended to minimize fire risk.

* For other habitat restoration plant palettes, refer to Habitat Restoration Plan for Mitigations and Project Design Features for the Project.

(2) This plant species may not be located within 30 feet of off-Project homes along the easterly Project boundary, between 17th Street and 19th Street in the City of Costa Mesa.

C = California Friendly
D = Drought Tolerant
O = Suitable to plant under Oaks

City of Newport Beach
Urban Wildland Interface Area
Standard for Hazard Reduction

NBR • F&LSP
Attachment 1b

Fire Resistive Plant List

Botanical Name	Common Name	Plant Form	Remarks
Abelia x grandiflora	Glossy Abelia	Shrub	
Acacia redolens desert carpet (1)	Desert Carpet	Shrub	
Acer macrophyllum	Big Leaf Maple	Tree	
Achillea millefolium	Common Yarrow	Low Shrub	Prune back after flowering to remove dried fire fuel
Achillea tomentosa	Woolly Yarrow	Low Shrub	Prune back after flowering to remove dried fire fuel
Aeonium decorum	Aeonium	Ground cover	
Aeonium simsii	no common name	Ground cover	
Agave attenuata	Century Plant	Succulent	
Agave shawii	Shaw's Century Plant	Succulent	
Agave victoriae-reginae	no common name	Ground Cover	Low maintenance
Ajuga reptans	Carpet Bugle	Ground Cover	Poor on slopes
Alnus cordata	Italian Alder	Tree	
Alnus rhombifolia	White Alder	Tree	30-50 feet height
Aloe arborescens	Tree Aloe	Shrub	Highly invasive
Aloe aristata	no common name	Ground Cover	
Aloe brevifoli	no common name	Ground Cover	
Aloe Vera	Medicinal Aloe	Succulent	
Alogyne huegeii	Blue Hibiscus	Shrub	
Ambrosia chammissonis	Beach Bur-Sage	Perennial	
Amorpha fruticosa	Western False Indigobush	Shrub	Native
Anigozanthus flavidus	Kangaroo Paw	Perennial/accent	
Antirrhinum nuttalianum ssp.	no common name	Subshrub	
Aptenia cordifolia x 'Red Apple'	Red Apple Aptenia	Ground cover	High fire retardance
Arbutus unedo	Strawberry Tree	Tree	
Arctostaphylos 'Pacific Mist'	Pacific Mist Manzanita	Ground Cover	
Arctostaphylos edmundsii	Little Sur Manzanita	Ground Cover	Slow to establish
Arctostaphylos glandulosa ssp.	Eastwood Manzanita	Shrub	
Arctostaphylos hookeri 'Monterey Carpet'	Monterey Carpet Manzanita	Low Shrub	Excellent drought tolerance, semi-upright to 12 inches
Arctostaphylos pungens	no common name	Shrub	
Arctostaphylos refugioensis	Refugio Manzanita	Shrub	
Arctostaphylos uva-ursi	Bearberry	Ground Cover	Excellent drought tolerance, spreading 4-6', height to 1'
Arctostaphylos x 'Greensphere'	Greensphere Manzanita	Shrub	
Artemisia caucasica	Caucasian Artesmisia	Ground Cover	Very low maintenance; takes some foot traffic
Artemisia pycnocephala	Beach Sagewort	Perennial	
Atriplex canescens	Four-Wing Saltbush	Shrub	
Atriplex lentiformis ssp. breweri	Brewer Saltbush	Shrub	Native
Baccharis emoyi	Emory Baccharis	Shrub	
Baccharis pilularis ssp. Consanguinea	Chaparral Bloom	Shrub	Native - Drought tolerant
Baccharis pilularis var. pilularis 'Twin Peaks #2'	Twin Peaks	Ground Cover	Use only male plants
Baxtylis glomerata	Berber Orchard Grass	Grass	

Baccharis salicifolia	Mulefat	Shrub	Native - Drought tolerant

Botanical Name	**Common Name**	**Plant Form**	**Remarks**
Baileya multiradiata	Desert Marigold	Ground Cover	Drought tolerant
Beaucarnea recurvata	Bottle Palm	Shrub/Small Tree	
Bougainvillea spectabilis (2)	Bougainvillea	Shrub	
Brahea armata (3)	Mexican Blue Palm/Blue Hesper Palm	Palm	
Brahea brandegeei (4)	San Jose Hesper Palm	Palm	
Brahea edulis (5)	Guadalupe Palm	Palm	
Brickellia californica	no common name	Subshrub	
Bromus carinatus	California Brome	Grass	
Camissonia cheiranthifiloa	Beach Evening Primrose	Perennial Shrub	Native
Carissa macrocarpa	Green Carpet Natal Plum	Ground Cover/Shrub	Fair-good drought tolerance, spreads 12-18"
Carpobrotus chilensis	Sea Fig Ice Plant	Ground Cover	
Ceanothus gloriosus 'Point Reyes'	Point Reyes Ceanothus	Shrub	Excellent drought tolerance, semi-upright 12-18"
Ceanothus griseus 'Louis Edmunds'	Louis Edmunds Ceanothus	Shrub	
Ceanothus griseus horizontalis	Yankee Point	Ground Cover	
Ceanothus griseus var. horizontalis	Carmel Creeper Ceanothus	Shrub	Excellent drought tolerance.
Ceanothus griseus var. horizontalis 'Yankee Point'	Yankee Point Ceanothus	Shrub	2-3' tall
Ceanothus megarcarpus	Big Pod Ceanothus	Shrub	
Ceanothus prostratus	Squaw Carpet Ceanothus	Shrub	Excellent drought tolerance; spreads 2-6'
Ceanothus spinosus	Green Bark Ceanothus	Shrub	
Ceanothus verrucosus	Wart-Stem Ceanothus	Shrub	
Cerastium tomentosum	Snow-in-Summer	Ground cover/Shrub	White flower color
Ceratonia siliqua	Carob	Tree	
Cercis occidentalis	Western Redbud	Shrub/Tree	Drought tolerant
Chrysanthemum leucanthemum	Oxeye Daisy	Ground Cover	Ornamental, flowering
Cistus crispus	no common name	Ground Cover	
Cistus hybridus	White Rockrose	Shrub	
Cistus incanus	no common name	Shrub	
Cistus incanus ssp. Corsicus	no common name	Shrub	
Cistus salviifolius	Sageleaf Rockrose	Shrub	
Cistus x purpureus	Orchid Rockrose	Shrub	
Citrus spp.	Citrus	Tree	
Clarkia bottae	Showy Fairwell to Spring	Annual	
Cneoridium dumosum	Bushrue	Shrub	
Collinsia heterophyllia	Chinese Houses	Annual	
Comarostaphylis diversifolia	Summer Holly	Shrub	
Convolvulus cneorum	Bush Morning Glory	Shrub	White flower color
Coprosma kirkii	Creeping Coprosma	Ground Cover/Shrub	Subject to dieback after 3-4 years
Coprosma pumila	Prostrate Coprosma	Low shrub	
Coreopsis californica	Califiornia Coreopsis	Annual	
Coreopsis lanceolata	Coreopsis	Ground Cover	Ornamental flowering
Corea pulchella	Australian Fuscia	Ground Cover	12" height, 36" spread
Cotoneaster buxifolius	no common name	Shrub	
Cotoneaster congestus 'Likiang'	Likiang Cotoneaster	Ground Cover/Vine	
Cotoneaster aprneyi	no common name	Shrub	
Crassula lactea	no common name	Ground Cover	
Crassula multicava	no common name	Ground Cover	Not recommended for steep slopes

Botanical Name	Common Name	Plant Form	Remarks
Crassula ovata	Jade Tree	Shrub	
Crassula tetragona	no common name	Ground Cover	
Croton californicus	California Croton	Ground Cover	
Delosperma 'alba'	White trailing Ice Plant	Ground Cover	Not recommended for steep slopes
Dendromecon rigida	Bush Poppy	Shrub	
Dichelostemma capitatum	Blue Dicks	Herb	
Distinctis buccinatoria	Blood-Red Trumpet Vine	Vine/Climbing vine	
Dodonaea viscosa	Hopseed Bush	Shrub	Drought tolerant
Drosanthemum floribundum	Rosea Ice Plant	Ground Cover	
Drosanthemum hispidum	no common name	Ground Cover	
Drosanthemum speciosus	Dewflower	Ground Cover	
Dudleya lanceolata	Lance-leaved Dudleya	Succulent	Native
Dudleya pulverulenta	Chalk Dudleya	Succulent	Native
Elaeagnus pungens	Silverberry	Shrub	
Encelia californica	California Encelia	Small Shrub	Native
Epilobium canum [Zauschneria californica]	Hoary California Fuschia	Shrub	
Eriastrum sapphirinum	Mojave Woolly Star	Annual	
Eriobotrya japonica	Loquat	Tree	
Eriodictycon crassifolium	Thick Leaf Yerba Santa	Shrub	
Eriodictycon trichocalyx	Yerba Santa	Shrub	
Eriophyllum confertiflorum	no common name	Shrub	Native
Erythrina spp.	Coral Tree	Tree	Red/pink flower color
Escallonia spp.	Several varieties	Shrub	
Eschscholzia californica	California Poppy	Flower	
Eschscholzia mexicana	Mexican Poppy	Herb	
Euonymus fortunei	Winter Creeper Euonymus	Ground Cover	
Feijoa sellowiana	Pineapple Guava	Shrub/Tree	
Fragaria chiloensis	Wild Strawberry/Sand Strawberry	Ground Cover	
Frankenia salina	Alkali Heath	Ground Cover	Native
Fremontondendron californicum	California Flannelbush	Shrub	
Gaillardia x grandiflora	Blanketflower	Ground Cover	Ornamental flower
Galvezia speciosa	Bush Snapdragon	Shrub	Red flowers
Garrya ellipta	Silktassel	Shrub	
Gazania hybrids	South African Daisy	Ground Cover	
Gazania rigens leucolaena	Training Gazania	Ground Cover	Strongly recommended; creeping varieties
Gillia capitata	Globe Gilia	Perrenial	
Gilia leptantha	Showy Gilia	Perrenial	
Gilia tricolor	Bird's Eyes	Perrenial	
Ginkgo biloba	Maidenhair Tree	Tree	
Gnaphalium Californicum	California Everlasting	Annual	
Grewia occidentalis	Starflower	Shrub	
Grindelia stricta	Gum Plant	Ground Cover	Green foliage
Hakea suaveolens (6)	Sweet Hakea	Shrub	
Hardenbergia comptoniana	Lilac Vine	Shrub	
Heliathemum muutabile	Sunrose	Ground Cover/Shrub	Good drought tolerance, 6-12"
Helianthemum scoparium	Rush Rose	Shrub	Small leaves, drought tolerant
Heliotropium curassavicum	Salt Heliotrope	Ground Cover	Native
Helix Canariensis	English Ivy	Ground Cover	

Botanical Name	Common Name	Plant Form	Remarks
Hesperaloe parviflora	Red Yucca	Perennial	
Heteromeles arbutifolia (7)	Toyon	Shrub	Native - May be trimmed up to tree form
Hypericum calycimum	Aaron's Beard	Shrub	Good t very good drought tolerance
Iberis sempervirens	Edging Candytuft	Ground Cover	White flower color
Iberis umbellatum	Globe Candytuft	Ground Cover	Ornamental flowering
Isocoma menziesii	Coastal Goldenbush	Small Shrub	Native
Isomeris arborea	Bladderpod	Shrub	Native - Drought tolerant
Iva hayesiana	Poverty Weed	Ground Cover	Erosion control, fast growth, spreads
Juglans californica	California Black Walnut	Tree	
Juncus acutus	Spiny Rush	Perrenial	Native
Keckiella antirrhinoides	Yellow Bush Penstemon	Subshrub	
Keckiella cordifolia	Heart Leaved Penstemon	Subshrub	
Keckiella ternata	Blue Stemmed Bush Penstemon	Subshrub	
Kniphofia uvaria	Red Hot Poker	Perennial	
Lagerstroemia indica	Crape Myrtle	Tree	
Lagunaria patersonii	Primrose Tree	Tree	
Lamprathus aurantiacus	Bush Ice Plant	Ground Cover	
Lampranthus filicaulis	Redondo Creeper	Ground Cover	
Lampranthus spectabilis	Trailing Ice Plant	Ground Cover	
Lantana camara cultivars	Yellow Sage	Shrub	Water deeply, infrequently
Lantana montevidensis	Trailing Lantana	Shrub	Frost tender
Lasthenia californica	Dwarf Goldfields	Annual	
Lavandula dentata	French Lavender	Shrub	
Leptospermum laevigatum	Australian Tea Tree	Shrub	
Leucophyllum frutescens	Texas Ranger	Shrub	
Leymus condensatus	Giant Wild Rye	Large Grass	Native
Ligustrum japonicum	Texas privet	Shrub	White flower color
Limonium pectinatum	no common name	Ground Cover	Drought and salt tolerant
Limonium perezii	Sea Lavender	Shrub	Perennial
Liquidambar styraciflua (8)	American Sweet Gum	Tree	
Liriodendron tulipfera	Tulip Tree	Tree	
Lonicera japonica 'Halliana'	Hall's Japanese Honeysuckle	Vining Shrub	
Lonicera subspicata	Wild Honeysuckle	Vining Shrub	Creamy white flowers
Lotus corniculatus	Bird's Foot Trefoil	Ground Cover	Green lush look
Lotus hermannii	Northern Woolly Lotus	Perennial	
Lotus scoparius	Deerweed	Shrub	Native
Lupinus arizonicus	Desert Lupine	Annual	
Lupinus benthamii	Spider Lupine	Annual	
Lupinus bicolor	Sky Lupine	Flowering annual	
Lupinus sparsiflorus	Loosely Flowered Annual Lupine/Coulter's Lupine	Annual	
Lyonothamnus floribundus ssp. Asplenifolius	Fernleaf Ironwood	Tree	
Macadamia integrifolia	Macadamia Nut	Tree	
Mahonia aquifolium 'Golden Abundance'	Golden Abundance Oregon Grape	Shrub	Bright yellow flowers
Mahonia nevenii	Nevin Mahonia	Shrub	Yellow flowers
Malacothamnus Fasciculatus	Chapparal Mallow	Shrub	
Malephora luteola	Training Ice Plant	Ground Cover	Yellow flowers

Botanical Name	Common Name	Plant Form	Remarks
Maytenus boaria	Mayten Tree	Tree	
Melaleuca nesophila	Pink Melaleuca	Shrub	
Metrosideros excelsus	New Zealand Christmas Tree	Tree	
Mimulus spp.	Monkeyflower	Flower	
Mirabilis californica	Wishbone Bush	Perrenial	
Myoporum debile	no common name	Shrub	Excellent along seacoast
Myoporum insulare	Boobyalla	Shrub	
Myoporum parvilfolium	no common name	Ground Cover	
Myoporum 'Pacificum'	no common name	Ground Cover	
Nassella (stipa) lepidra	Foothill Needlegrass	Ground Cover	Native
Nassella (stipa) pulchra	Purple Needlegrass	Ground Cover	Native
Nemophilia menziesii	Baby Blue Eyes	Annual	
Nerium Oleander	Oleander	Shrub	Subject to leaf gall in large groupings
Nolina cismontana	Chapparal Nolina	Shrub	
Nolina spp.	Mexican Grasstree	Shrub	Drought tolerant
Oenothera belandieri	Mexican Evening Primrose	Ground Cover	
Oenothera hookeri	California Evening Primrose	Flower	Drought tolerant
Oenothera speciosa	Show Evening Primrose	Perrenial	
Ophiopogon japonicus	Mondo Grass	Ground Cover	
Opuntia littoralis	Prickly Pear	Cactus	Native
Opuntia oricola	Oracle Cactus	Cactus	Native
Opuntia prolifera	Coast Cholla	Cactus	Native
Osmanthus fragrans	Sweet Olive	Shrub	
Osteospermum fruticosum	Training African Daisy	Ground Cover	
Parkinsonia aculeata	Mexican Palo Verde	Tree	Yellow flowers
Pelargonium peltatum	Ivy Geranium	Ground Cover	
Penstemon spp.	Beard Tongue	Shrub	
Photinia fraseria	no common name	Shrub	
Pistacia chinesis	Chinese Pistache	Tree	
Pittosporum undulatum	Victorian Box	Tree	
Plantago erecta	California Plantain	Annual	
Plantago insularis	Woolly Plantain	Annual	
Plantago sempervirens	Evergreen Plantain	Ground Cover	Grey leaves; drought tolerant
Plantanus racemosa	California Sycamore	Tree	Native
Plumbago auritulata	Plumbago Cape	Shrub	
Popolus fremontii	Western Cottonwood	Tree	Native
Portulacaria Afra	Elephant's Food	Shrub	
Potentilla glandulosa	Sticky Cinquefoil	Subshrub	
Potentilla tabernaemontanii	Spring Cinquefoil	Ground Cover	
Prunus caroliniana	Carolina Cherry Laurel	Shrub/Tree	White flower color
Prunus ilicifolia ssp. Ilicifolia	Holly Leafed Cherry	Shrub	
Prunus lyonii	Catalina Cherry	Shrub/Tree	White flower color
Punica granatum	Pomegranate	Shrub/Tree	
Puya spp.	Puya	Succulent/Shrub	
Phyla nodiflora	Lippia	Ground Cover	
Pyracantha spp.	Firethorn	Shrub	
Quercus agrifolia	Coast Live Oak	Tree	Oak woodland
Quercus berberdifolia (9)	California Scrub Oak	Shrub	Valuable soil binder
Quercus dumosa (10)	Coastal Scrub Oak	Shrub	
Quercus engelmannii	Engelmann Oak	Tree	Open structure
Quercus suber	Cork Oak	Tree	

Botanical Name	Common Name	Plant Form	Remarks
Rhamnus alaternus	Italian Buckthorn	Shrub	
Rhamnus californica	California Coffee Berry	Shrub	Green leaves; drought tolerant
Rhamnus crocea	Redberry	Shrub	Native - Intricate branching
Rhamnus crocea ssp. Ilicifolia	Hollyleaf Redberry	Shrub	
Rhaphiolepis spp.	Indian Hawthorne	Shrub	
Rhus integrifolia	Lemonade Berry	Shrub	Native - May be trimmed up to tree form
Rhus lancea	African Sumac	Tree	25' height
Rhus ovata (11)	Sugarbush	Shrub	
Ribes aureum	Golden Currant	Shrub	
Ribes indecorum	White Flowering Currant	Shrub	
Ribes speciosum	Fuschia Flowering Goosebberry	Shrub	Native
Ribes viburnifolium	Evergreen currant	Shrub	
Romneya coulteri	Matilija Poppy	Shrub	Large showy white flowers
Romneya coulteri 'White Cloud'	White Cloud Matilija Poppy	Shrub	
Rosmarinus officinalis (12)	Rosemary	Shrub	
Salvia greggii (13)	Autums Sage	Shrub	
Salvia sonomensis (14)	Creeping Sage	Ground Cover	
Sambucus mexicana	Mexican Elderberry	Tree	Drought tolerant
Santolina chamaecyparissus	Lavender Cotton	Ground Cover	
Santolina virens	Green Lavender Cotton	Shrub	
Satureja chandleri	San Miguel Savory	Perennial	
Scirpis scutus	Hard Stem Bulrush	Perennial	
Scirpus californicus	California Bulrush	Perennial	Native
Sedum acre	Goldmoss Sedum	Ground Cover	Not recommended on steep slopes
Sedum album	Green Stonecrop	Ground Cover	
Sedum confusum	no common name	Ground Cover	
Sedum lineare	no common name	Ground Cover	
Sedum x rubrotinctum	Pork and Beans	Ground Cover	
Senecio serpens	no common name	Ground Cover	
Sisyrinchium bellum	Blue Eyed Grass	Ground Cover	Drought tolerant
Solanum douglasii	Douglas Nightshade	Shrub	
Solanum xantii	Purple nightshade	Perennial	Native
Stenicarpus sinuatus	Firewheel Tree	Tree	
Strelitzia nicolai	Giant Bird of Paradise	Perennial	
Strelitzia reginae	Bird of Paradise	Perennial	
Symphoricarpos mollis	Creeping Snowberry	Shrub	
Tecoma stans (Stenolobium stans)	Yellow Bells	Shrub/Small Tree	
Tecomaria capensis	Cape Honeysuckle	Ground Cover	Vine
Teucarium chamedrys	Germander	Ground Cover	
Thymus serpyllum	Lemon Thyme	Ground Cover	
Trachelospermum jasminoides	Star Jasmine	Shrub	White flower color
Trichosstems lanatum	Woolly Blue Curls	Shrub	
Trifolium hirtum 'Hyron'	Hyron Rose Clover	Ground Cover	Drought tolerant
Trifolium fragerum 'O'Connor's'	O'Connor's Legume	Ground Cover	
Umbellularia californica	California Laurel	Tree	Very spreading
Verbena lasiostachys	Western Vervain	Perennial	
Verbena peruviana	no common name	Ground Cover	
Verbena spp.	Verbena	Ground Cover	Ornamental flowering
Vinca minor	Dwarf Periwinkle	Ground Cover	Very spreading

Botanical Name	Common Name	Plant Form	Remarks
Vitis girdiana	Desert Wild Grape	Vine	
Vulpia myuros 'Zorro'	Zorro Annual Fescue	Grass	
Westringia fruticosa	no common name	Shrub	
Xannithorrhoea spp.	Grass Tree	Perennial accent/shrub	
Xylosma congestum	Shiny Xylosma	Shrub	
Yucca spp.	Yucca	Shrub	Drought tolerant
Yucca whipplei	Yucca	Shrub	

Approved Plant Palette – Qualification statements for Select Plant Species

1. **Acacia redolens desert carpet:** May be used in the upper ½ of the "B" fuel modification zone. The plants may be planted at 8' on center, maximum spacing in meandering zones not to exceed a mature width of 24' or a mature height of 24".

2. **Bougainvillea spectabilis (procumbent varieties):** Procumbent to mounding varieties may be used in the mid "B" fuel modification zone. The plants may be planted in clusters at 6' on center spacing not to exceed eight plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

3. **Brahea armata:** Additional information may be required as directed by NBFD.

4. **Brahea brandegeel:** Additional information may be required as directed by NBFD.

5. **Brahea edulis:** May be used in upper and mid "B" fuel modification zone. The plants shall be used as single specimens with mature spacing between palms of 20' minimum.

6. **Hakea Suaveolens:** May be used in the mid "B" fuel modification zone. The plants shall be used as single specimens with mature spacing between plants of 30' minimum.

7. **Heteromeles arbutifolia:** May be used in the mid to lower "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

8. **Liquidambar styraciflua:** May be used in the mid "B" fuel modification zone. The plant shall be used as single specimens with mature spacing between trees and 30' minimum.

9. **Quercus berberdifolia:** Additional information may be required as directed by NBFD.

10. **Quercus dumosa:** May be used in the mid to lower "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

11. **Rhus ovata:** May be used in the mid to lower "B" fuel modification zone of inland areas only. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

12. **Rosmarinus officinalis:** Additional information may be required as directed by NBFD.

13. **Salvia greggii:** Additional information may be required as directed by NBFD.

14. **Salvia sonomensis:** May be used in the mid to upper "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 15' minimum.

City of Newport Beach
Urban Wildland Interface Area
Standard for Hazard Reduction

NBR • F&LSP
Attachment 1c

UNDESIRABLE PLANT SPECIES

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be either physical or chemical. Physical properties that would contribute to high flammability include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amount of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Certain native plants are notorious for containing these volatile substances.

Plants with these characteristics shall not be planted in any of the fuel modification zones. Should these species already exist within these areas, they shall be removed because of the potential threat they pose to any structures. They are referred to as target species since their complete removal is a critical part of hazard reduction. These fire-prone plant species are (but not limited to):

COMBUSTIBLE PLANT LIST (MANDATORY REMOVAL)

Common Name	Botanical Name
Artichoke Thistle	Cynara cardunculus
Castor Bean plant	Ricinus commons
Wild Artichoke	Cirsium vulgare
Black Mustard	Brassica nigra
Milk Thistle	Silybum marianum
Russian Thistle/Tumbleweed	Salsola australis
Indian Tabacco	Nicotiana bigelovii
Tree Tobacco	Nicotiana glauca
Prickly Lettuce	Lactuca serriola
Horseweed	Conyza canadensis
Telegraph Plant	Heterotheca grandiflora
Mayweed	Anthemix cotula
Burning Nettle	Urtica Urens
Noary Cress, Perennial Peppergrass	Cardaria draba
Wild Turnip, Yellow Mustard, Field Mustard	Brassica rapa
Chamise	Adenostoma fasciculatum
Red Shanks	Adenostoma sparsifolium
Pampas Grass	Cartaderia selloana
California Sagebrush	Artemisia californica
Common Buckwheat	Eriogonum fasciculatum
Black Sage	Salvia mellifera
Pampas Grass	Corraders
Cypress	Cupressus sp
Eucalyptus	Eucalyptus sp
Juniper	Juniperus sp
Pine	Pinus sp

CHAPTER 47
REQUIREMENTS FOR WILDLAND-URBAN INTERFACE FIRE AREAS

SECTION 4701
GENERAL

4701.1 Scope. *The mitigation of conditions where a wildfire burning in vegetative fuels may readily transmit fire to buildings and threaten to destroy life, overwhelm fire suppression capabilities, or result in large property losses shall comply with this chapter.*

4701.2 Purpose. *The purpose of this code is to provide minimum standards to increase the ability of a building to resist the intrusion of flame or burning embers being projected by a vegetation fire and contributes to a systematic reduction in conflagration losses through the use of performance and prescriptive requirements.*

SECTION 4702
DEFINITIONS

4702.1 General. *For the purpose of this chapter, certain terms are defined as follows:*

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

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. 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 in accordance with Section 101.14 or the Department of Housing and Community Development in accordance with Section 101.15 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.*

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."

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 51189 that is not a state responsibility area and where a local agency, city, county, city and county, or district is responsible for fire protection.*

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. See Article 86B for the applicable referenced sections of the Government Code and the Public Resources Code.*

SECTION 4703
PLANS [RESERVED]

SECTION 4704
FIRE HAZARD SEVERITY ZONES

4704.1 General. *Lands in the state are classified by the CDF Director in accordance with the severity of wildfire hazard expected to prevail in those areas and the responsibility for fire protection, so that measures may be identified which will reduce the potential for losses to life, property, and resources from wildfire.*

4704.2 Classifications. *The CDF Director classifies lands into fire hazard severity zones in accordance with California Public Resources Code Sections 4201 through 4204 for State Responsibility Areas and in accordance with Government Code Sections 51175 through 51189 for areas where a local agency is responsible for fire protection.*

SECTION 4705
WILDLAND-URBAN INTERFACE FIRE AREA

4705.1 General. *Construction methods and requirements to mitigate wildfire exposure shall be applied within geographical areas where a wildfire burning in vegetative fuels may readily transmit fire to buildings and threaten to destroy life, overwhelm fire suppression capabilities, or result in large property losses.*

4705.2 Construction methods and requirements within established limits. *Within the limits established by law, construction methods intended to mitigate wildfire exposure shall comply with the California Building Code Chapter 7A, and this chapter.*

4705.3 Establishment of limits. *The establishment of limits for the Wildland-Urban Interface Fire Area's required construction methods shall be designated pursuant to the California Public Resources Code for State Responsibility areas or by a local agency following a finding supported by substantial evidence in the record that the requirements of this section are necessary for effective fire protection within the area.*

SECTION 4706
VEGETATION MANAGEMENT [RESERVED]

SECTION 4707
DEFENSIBLE SPACE [RESERVED]

SECTION 4708
MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

4708.1 Scope, purpose and application.

4708.1.1 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 this chapter.*

4708.1.2 Purpose. *The purpose of this chapter is to establish minimum standards for the protection of life and property 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.*

4708.1.3 Application. *New buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area designated by the enforcing agency for which an application for a building permit is submitted on or after December 1, 2005, shall comply with the following Sections:*

1. *4710.1 Roofing*
2. *4710.2 Attic Ventilation*

4708.2 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 the California Building Code Appendix Chapter 1, Section 104.10. When required by the enforcing agency for the purposes of granting modifications, a fire protection plan shall be submitted in accordance with the Chapter 47.*

SECTION 4709
STANDARDS OF QUALITY [RESERVED]

SECTION 4710
MATERIALS, SYSTEMS AND METHODS OF CONSTRUCTION

4710.1 Roofing.

4710.1.1 General. *Roofs shall comply with the requirements of this chapter and the California Building Code, Chapter 15. Roofs shall have a roofing assembly installed in accordance with its listing and the manufacturer's installation instructions.*

4710.1.2 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 No. 72 ASTM cap sheet installed over the combustible decking.*

4710.1.3 Roof valleys. *When provided, valley flashings shall be not less 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal installed over a minimum 36-inch-wide (914 mm) underlayment consisting of one layer of No. 72 ASTM cap sheet running the full length of the valley.*

4710.1.4 Roof gutters. *Roof gutters shall be provided with the means to prevent the accumulation of leaves and debris in the gutter.*

4710.2 Attic ventilation.

4710.2.1 General. *When required by the California Building Code, Chapter 15, roof and attic vents shall resist the intrusion of flame and embers into the attic area of the structure, or shall be protected by corrosion-resistant, noncombustible wire mesh with ¼-inch (6 mm) openings or its equivalent.*

4710.2.2 Eave or cornice vents. *Vents shall not be installed in eaves and cornices.*

Exception: *Eave and cornice vents may be used provided they resist the intrusion of flame and burning embers into the attic area of the structure.*

SECTION 4711
EXTERIOR WALLS [RESERVED]

SECTION 4712
DECKING, FLOORS AND UNDERFLOOR PROTECTION [RESERVED]

SECTION 4713
ANCILLARY BUILDINGS AND STRUCTURES [RESERVED]

CHAPTER 7A [SFM]

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

SECTION 701A
SCOPE, PURPOSE AND APPLICATION

701A.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 702A.*

701A.2 Purpose. *The purpose of this chapter is to establish minimum standards for the protection of life and property 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 flames or burning embers projected by a vegetation fire and contributes to a systematic reduction in conflagration losses.*

701A.3 Application. *New buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area designated by the enforcing agency for which an application for a building permit is submitted on or after December 1, 2005, shall comply with the following sections:*

1. ***704A.1—Roofing***
2. ***704A.2—Attic Ventilation***

701A.3.1 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 Appendix Chapter 1, Section 104.10. 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 47.*

701A.3.2 New buildings located in any fire hazard severity zone. *New buildings located in any Fire Hazard Severity Zone, or any Wildland-Urban Interface Fire Area designated by the enforcing agency for which an application for a building permit is submitted on or after January 1, 2008, shall comply with all sections of this chapter.*

701A.3.2.1 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:*

701A.3.2.2 *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.*

701A.3.2.3 *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 wildlife exposure as described in this chapter.*

701A.3.2.4 *Prior to building permit final approval the property shall be in compliance with the vegetation clearance requirements prescribed in California Public Resources Code 4291 California Government Code Section 51182.*

SECTION 702A
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.*

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 47. 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 101.8 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."

IGNITION-RESISTANT MATERIAL *is any product which, when tested in accordance with ASTM E 84 for a period of 30 minutes, shall have a flame spread of not over 25 and show no evidence of progressive combustion. In addition, the flame front shall not progress more than 10½ feet (3200 mm) beyond the centerline of the burner at any time during the test.*

Materials shall pass the accelerated weathering test and be identified as exterior type, in accordance with ASTM D 2898 and ASTM D 3201. All materials shall bear identification showing the fire performance rating thereof. That identification shall be issued by ICC-ES or a testing facility recognized

by the State Fire Marshal having a service for inspection of materials at the factory.

Fire-Retardant-Treated Wood or noncombustible materials as defined in Section 202 shall satisfy the intent of this section.

The enforcing agency may use other definitions of ignition-resistant material that reflect wildfire exposure to building materials and/or their materials, performance in resisting ignition.

***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.*

***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. See Section 706A for the applicable referenced sections of the Government Code and the Public Resources Code.*

SECTION 703A
STANDARDS OF QUALITY

***703A.1 General.** Material, systems, and methods of construction used shall be in accordance with this Chapter.*

***703A.2 Qualification by testing.** Material and material assemblies tested in accordance with the requirements of Section 703A shall be accepted for use when the results and conditions of those tests are met. Testing shall be performed by a testing agency approved by the State Fire Marshal or identified by an ICC-ES report.*

***703A.3 Standards of quality.** The State Fire Marshal standards listed below and as referenced in this chapter are located in the California Referenced Standards Code, Part 12 and Chapter 35 of this code.*

***SFM 12-7A-1,** Exterior Wall Siding and Sheathing.*

***SFM 12-7A-2,** Exterior Window.*

***SFM 12-7A-3,** Under Eave.*

***SFM 12-7A-4,** Decking.*

SECTION 704A
MATERIALS, SYSTEMS AND METHODS OF CONSTRUCTION

704A.1 Roofing.

***704A.1.1 General.** Roofs shall comply with the requirements of Chapter 7A and Chapter 15. Roofs shall have a roofing assembly installed in accordance with its listing and the manufacturer's installation instructions.*

***704A.1.2 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 No. 72 ASTM cap sheet installed over the combustible decking.*

***704A.1.3 Roof valleys.** When provided, valley flashings shall be not less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal installed over a minimum 36-inch-wide (914 mm) underlayment consisting of one layer of No. 72 ASTM cap sheet running the full length of the valley.*

***704A.1.4** Reserved.*

***704A.1.5 Roof gutters.** Roof gutters shall be provided with the means to prevent the accumulation of leaves and debris in the gutter.*

704A.2 Attic ventilation.

***704A.2.1 General.** When required by Chapter 15, roof and attic vents shall resist the intrusion of flame and embers into the attic area of the structure, or shall be protected by corrosion-resistant, noncombustible wire mesh with $^1/_4$-inch (6 mm) openings or its equivalent.*

***704A.2.2 Eave or cornice vents.** Vents shall not be installed in eaves and cornices.*

***Exception:** Eave and cornice vents may be used provided they resist the intrusion of flame and burning embers into the attic area of the structure.*

***704A.2.3 Eave protection.** Eaves and soffits shall meet the requirements of SFM 12-7A-3 or shall be protected by ignition-resistant materials or noncombustible construction on the exposed underside.*

704A.3 Exterior walls.

***704A.3.1 General.** Exterior walls shall be approved noncombustible or ignition-resistant material, heavy timber, or log wall construction or shall provide protection from the intrusion of flames and embers in accordance with standard SFM 12-7A-1.*

***704A.3.1.1 Exterior wall coverings.** 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.*

***704A.3.2 Exterior wall openings.** Exterior wall openings shall be in accordance with this section.*

***704A.3.2.1 Exterior wall vents.** Unless otherwise prohibited by other provisions of this code, vent openings in*

exterior walls shall resist the intrusion of flame and embers into the structure or vents shall be screened with a corrosion-resistant, noncombustible wire mesh with $^1/_4$- inch (6 mm) openings or its equivalent.

704A.3.2.2 Exterior glazing and window walls. *Exterior windows, window walls, glazed doors, and glazed openings within exterior doors shall be insulating-glass units with a minimum of one tempered pane, or glass block units, or have a fire-resistance rating of not less than 20 minutes, when tested according to ASTM E 2010, or conform to the performance requirements of SFM 12-7A-2.*

704A.3.2.3 Exterior door assemblies. *Exterior door assemblies shall conform to the performance requirements of standard SFM 12-7A-1 or shall be of approved noncombustible construction, or solid core wood having stiles and rails not less than $1^3/_8$ inches thick with interior field panel thickness no less than $1^1/_4$ inches thick, or shall have a fire-resistance rating of not less than 20 minutes when tested according to ASTM E 2074.*

Exception: *Noncombustible or exterior fire-retardant treated wood vehicle access doors are not required to comply with this chapter.*

704A.4 Decking, floors and underfloor protection.

704A.4.1 Decking.

704A.4.1.1 Decking surfaces. *Decking, surfaces, stair treads, risers, and landings of decks, porches, and balconies where any portion of such surface is within 10 feet (3048 mm) of the primary structure shall comply with one of the following methods:*

1. *Shall be constructed of ignition-resistant materials and pass the performance requirements of SFM 12-7A-4, Parts A and B.*
2. *Shall be constructed with heavy timber, exterior fire-retardant-treated wood or approved noncombustible materials.*
3. *Shall pass the performance requirements of SFM 12-7A-4, Part A, 12-7A-4.7.5.1 only with a net peak heat release rate of 25kW/sq-ft for a 40-minute observation period and:*
    a. *Decking surface material shall pass the accelerated weathering test and be identified as exterior type, in accordance with ASTM E 84 and;*
    b. *The exterior wall covering to which it the deck is attached and within 10 (3048 mm) feet of the deck shall be constructed of approved noncombustible or ignition resistant material.*

    Exception: *Walls are not required to comply with this subsection if the decking surface material conforms to ASTM E-84 Class B flame spread.*

The use of paints, coatings, stains, or other surface treatments are not an approved method of protection as required in this chapter.

704A.4.2 Underfloor and appendages protection.

704A.4.2.1 Underside of appendages and floor projections. *The underside of cantilevered and overhanging appendages and floor projections shall maintain the ignition-resistant integrity of exterior walls, or the projection shall be enclosed to the grade.*

704A.4.2.2 Unenclosed underfloor protection. *Buildings shall have all underfloor areas enclosed to the grade with exterior walls in accordance with Section 704A.3.*

Exception: *The complete enclosure of under floor areas may be omitted where the underside of all exposed floors, exposed structural columns, beams and supporting walls are protected as required with exterior ignition-resistant material construction or be heavy timber.*

704A.5 Ancillary buildings and structures.

704A.5.1 Ancillary buildings and structures. *When required by the enforcing agency, ancillary buildings and structures and detached accessory structures shall comply with the provisions of this chapter.*

NBR F&LSP Attachment 3

Fuel Management and Maintenance Program Analysis

Newport Banning Ranch

Newport Beach, California

June 2010

Prepared by:

firesafe ::PLANNING SOLUTIONS

Table of Contents

1 Purpose of Report

Firesafe Planning Solutions performed an assessment of how the fuel management and maintenance program (FMMP) will reduce the intensity of a wildfire approaching The Newport Banning Ranch residential community. This fire analysis report provides the results of the assessment and shows support of the fuel management installation and maintenance program. The study takes into consideration existing vegetative interface fuels, future re-vegetated interface areas, topography, and weather conditions during a fire. The study includes expected fire behavior burning within off-site and on-site vegetation. Additionally exterior and interior located perimeter vegetation treatment and maintenance plan are addressed. The fire intensity from worst case scenario examples has been calculated and the results of fire behavior calculations were are simulated against the fire protection design built into the Newport Banning Ranch (NBR) development.

2 Geographic Description

The NBR site is not located within an existing Special Fire Protection Area. Once developed, the site will be designated as a Special Fire Protection Area as it is within the sphere of the city of Newport Beach Fire Department's guidelines and City staff has indicated it will require such designation.

The future community will be mostly attached to existing development on the southwest, south, and east. The NBR planned community is located west of the city of Costa Mesa. The entire east side of NBR is bordered by existing commercial, light industrial, and residential development. For the sake of wildland interface, the new tracts will fill-in the area between two existing built-out developments, similar to bridge connecting the developments together except for the Oxbow Loop (Semeniuk Slough) located to the west. The northwest side of NBR will have a moderate wildland interface from vegetation within the existing adjacent oil fields situated 50-75 feet below the future community. The south side of the community is bordered by West (Pacific) Coast Highway and small moderate-hazard vegetative areas near the coastal bluffs along the highway.

(Figure 1) Most of the development perimeter in yellow does not have a wildland interface due to existing surrounding developments on the south-west, south, and east.

3 Site Fire Hazard Assessment

Most of the future homes will border the Bluff Park edges, which itself will adjoin upland areas of the Open Space Preserve, including an interior located drainage arroyo that separates the north and south development areas. This "Large Arroyo" will continue to support a healthy coastal sage scrub plant community or be restored to coastal sage scrub vegetation or upland grassland. Droughts have had an impact on existing coastal sage scrub plant communities. The recent rains have caused the shrub type vegetation on the site to support much greener and denser vegetation presently, and non-native grasses and weeds are more prevalent too. During droughts, coastal sage scrub plant communities can have a large percentage of dead material. This is due to the Mediterranean climate where long wet winters promote lots of new growth and long dry summer seasons can cause parts of the plants to die back. The shrubs on the interior arroyos are primarily dominated by Encelia Californica, which grows between 1-3 feet in height and is on the approved Fire Department plant list. Other types of vegetation in and adjacent to the interior located drainage arroyos are:

3.1 Oil Lease and Interior Arroyo Vegetation:

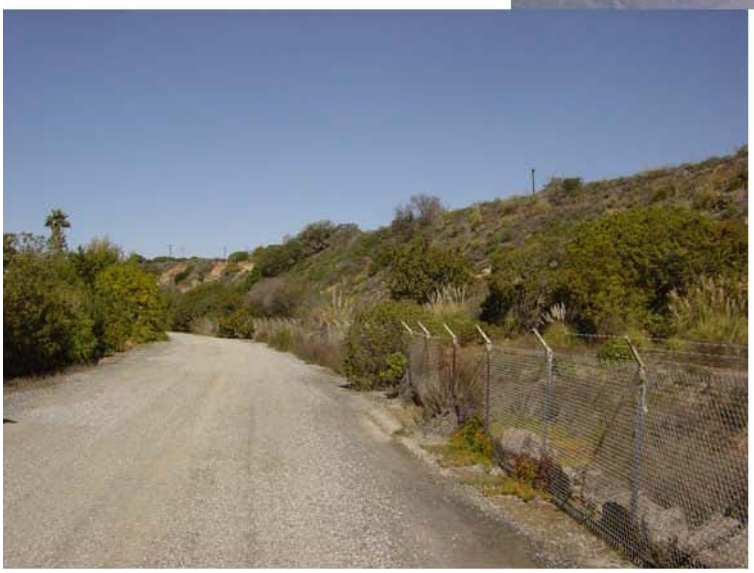
Type	Approximate Height Ft.	Approximate Width Ft.
• Baccharis	5	3
• Saltbush	3	8
• Lemonadeberry	7	7
• Toyon	7	7
• Bladder Pod	3	3
• Mulefat	7	3
• Willow	15	12
• Cactus		

Other species found on-site that are determined by The City of Newport Beach Fire Department as being highly combustible are required to be continuously removed from the fuel management zone: Pampas Grass, Buckwheat, Artemisia, Black Sage, Thistles, Mustard, and Castor Bean.

(Figure 2) Photo of the interior arroyo vegetation. Notice the vegetation on the slopes of the arroyos is mostly only as tall as the cactus is except for the willows in the drainage.

3.2 62nd Street Oxbow Loop Development Perimeter Vegetation: (Not a direct Interface)

Type	Approximate Height Ft.	Approximate Width Ft.
• Pine	15	10
• Pepper	15	12
• Chinese Elm	15	7
• Juniper	9	7
• Ice Plant / Covers	1	20
• Eucalyptus	20	12
• Willow	15	12
• Palm	25	10-20
• Ornamental shrubs	8	6



(Figure 3) These species are located along the banks of the Oxbow Loop and are not a fire hazard to the proposed structures. The road between the bank vegetation and the slope leading up near the future development helps as a fire break. The types of vegetation on the slopes on the opposite side of the Oxbow Loop and road are the same as within the oil lease and interior arroyos.

Specific plant palettes are identified in this document for the various zones within the fuel management areas. These palettes have been reviewed and approved by the Newport Beach Fire Department and landscape architects.

In addition to areas currently vegetated with the coastal sage scrub, the Project will establish new plantings within the Project as a habitat area for raptors. This area will be designed as an upland grasslands area. It will be maintained with specific plant species and will not be allowed to transition into a shrub or chaparral plant community. It will be maintained by "hand plucking" any plant materials not on the approved list on an annual basis to maintain its value as a raptor habitat.

3.3 Upland Native Grassland Mosaic Restoration Areas

Upland Grassland Mosaic Restoration Areas will be established within the center of the Project area and adjacent to the developed areas. Most of these will be in the intermediate Zone "B" between the wildland and the irrigated fuel management zones. These areas will be vegetated with a suite of native bunchgrasses, succulents, cactus, and other low height/fuel volume native plants suitable for raptor foraging and as gnatcatcher and cactus wren habitat as summarized below.

UPLAND NATIVE GRASSLAND MOSAIC PLANT PALETTE

HABITAT RESTORATION / FUEL MANAGEMENT ZONE "C"	
Botanical Name	***Common Name***
Grasslands	
Bothriochloa barbinodis	Beardgrass
Distichlis spicata	Saltgrass
Lasthenia californica	California goldfields
Melica imperfecta	Coast Range Melica
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
Succulent Scrub Mosaic	
Non-Combustible/Succulent Species	
Cylindropuntia prolifera	Coastal cholla
Opuntia littoralis	Coastal prickly pear
Suaeda taxifolia	Woolly sea-blite
Fire-Resistive Shrub Species	
Encelia californica (1)	California encelia (1)
Isocoma menziesii (1)	Coastal goldenbush (1)
Isomeris arborea (1)	Bladderpod (1)
Lycium californicum (1)	California boxthorn (1)

(1) *This plant species may not be located within 50 feet of homes.*

3.4 Vernal Pool Restoration and Edges

An existing vernal pool southwest of the intersection of Bluff Road and 17th Street restoration will be restored as part of Project's Habitat Restoration Plan (HRP). The HRP will protect and restore the degraded habitat within the pool boundary and provide an open space buffer around the pool.

As shown below, the plant palettes for the Vernal Pool Restoration Area and for the Vernal Pool Watershed Area (surrounding the Pool) have both been designed as low-growing suites of native plant species that will provide appropriate habitat consistent with the habitat mitigation objectives for the Project.

The Vernal Pool Restoration and Watershed Areas are adjoined by the vernal pool interpretive park and adjacent public streets, including Bluff Road and Scenic Drive. One edge of the Vernal Pool Watershed Area will be developed with homes. A six-foot-high radiant heat wall shall be constructed along this

residential edge.[1] This wall, in conjunction with plant heights of 12 inches or less, will provide protection for the homes from a fire originating in that area. The precise design and location of the radiant heat wall will be shown in the final Fire Master Plan (see Section 10).

PLANT PALETTE – VERNAL POOL RESTORATION AREA

Botanic Name	***Common Name***	***Plant Height***
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Frankenia salina	Alkali heath	4 to 8 inches
Heliotropum curassivicum	Seaside heliotrope	4 to 8 inches
Lasthenia californica	California goldfields	4 to 8 inches
Lupinus bicolor	Miniature lupine	4 to 8 inches
Malvella leprosa	Alkali side	2 to 6 in
Plantago erecta	Western plantain	3 to 6 inches
Spergularia marina	Saltmarsh sand spurrey	1 to 4 inches

PLANT PALETTE – VERNAL POOL WATERSHED AREA

Botanic Name	***Common Name***	***Plant Height***
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Dudleya lanceolata (succulent)	Lance-leaved dudleya	12 inches
Dudleya pulverulenta (succulent)	Chalk dudleya	12 inches
Frankenia salina	Alkali seaheath	4 to 8 inches
Lasthenia californica	Dwarf goldfields	4 to 8 inches
Lupinus bicolor	Miniature lupine	4 to 8 inches
Malvella leprosa	Alkali side	2 to 6 inches
Melica imperfecta	Coast range melic	16 inches
Nassella pulchra	Purple needlegrass	18 inches
Opuntia littoralis (succulent)	Coast prickly-pear	36 inches
Opuntia prolifera (succulent)	Coast cholla	48 inches
Plantago erecta	Western plantain	3 to 6 inches
Suaeda taxifolia (succulent)	Wooly sea-blite	12 inches

Both the upland native grassland mosaic and vernal pool areas are depicted on the Fuel Management Plan graphic attached to this report.

[1] A radiant heat wall is typically a six-foot-high solid masonry wall. Certain types of insulated glass products may be incorporated into radiant heat walls to provide a "view wall." For example, Superlite II-XL, Pyrostop, Pyrobel, Contraflam, and Swissflam are glazing products rated 60-minute plus to ASTME119, limit temperature rise to 250F degrees, and reduce radiant heat flux to 0 kilowatts per square meter.

4 Fuel Management

Fuel management is land that is designated for the installation of plant species and land with selectively removed native vegetation. A fuel management program starts when the local governmental planning department places development construction conditions requiring a fuel management program. Any new development occurring within lands containing highly combustible native vegetation needs management of the vegetation at the urban interface in order to protect structures. High-fuel and volatile native plants are generally replaced with drought-tolerant, fire-resistant species in order to slow the speed and intensity of an approaching wildfire.

Fuel management programs vary in complexity and designs. They are dependent upon the type and spacing of vegetation as well as topography, weather conditions, and the placement of structure within the development Project. Irrigated fuel management zones help to reduce the impacts of wildfire before they spread to structures. The reduction of available native fuels , which have been replaced by fire resistive plant types, will cause a reduction in the intensity of a fire when approaching homes/structures.

Fuel management is as an on-going maintenance program because the program requires zones to be maintained indefinitely. Installing new plants works great initially and maintenance is easy, but proper long-term maintenance can be difficult if not done correctly. Experienced techniques can assist in extending the longest possible life span for the plants. Funds for fuel management maintenance need to be anticipated in the annual budget of association dues. Proper and consistent maintenance can save on the total long-term cost of maintenance over long periods of time or the failure of the protection system with wide spread consequences to the building owners and the city.

5 The Fuel Management Program

The Fuel Management Program designed for the NBR is very similar to fuel management programs approved in the County of Orange within the last 5 years. The design of NBR is very similar to the Marblehead coastal development in the City of San Clemente, the Brighwater coastal development in Huntington Beach, and the Dana Point Headlands Reserve development. The Marblehead development was approved with fuel management zones less in total width than what is proposed for NBR and additionally there is a greater-sized coastal sage scrub habitat preserved within these developments. Marblehead Coastal and Dana Headlands Preserve are similar in proximity to the ocean, topography, and plant species. All three developments were regulated by the California Coastal Commission which created the requirement to preserve specific plant species both on- and off-site.

The Fuel Management and Maintenance Program (FMMP) requires regular maintenance activities to be done routinely on an indefinite basis generally by the future Homeowners Association (HOA). The fuel management zones will be originally installed and maintained by the master developer until the ongoing maintenance responsibility is turned over to the ultimate maintenance entity. Where fuel management areas include road right-of-way, they may be maintained by the City. Where fuel management areas are FMZ Zone “C”, they will be maintained by the Banning Ranch Conservancy Group (to be determined). The maintenance requirements are clearly shown on the fuel management plans. The developer will distribute the approved plans with maintenance requirements directly to the Homeowners Association at

a required maintenance turnover meeting. The program requires The City of Newport Beach Fire Department to be present at the maintenance turnover.

The following fuel management zones are safe designs based on results the size of the wildland areas, type of vegetation, and amount of vegetation, the fuel/structure wind alignments, and the BehavePlus Calculation Results Analysis in this report.

The fuel management Area is a minimum of 120 feet in total width and divided into three (3) zones:

5.1 Zone "A"

- Zone "A" is generally a minimum 20-foot-wide flat or level-grade defensible space consisting of irrigated landscape and/or hardscape. Zone "A" will be located on private lots, within the Bluff Park, and/or within road rights-of-way.
- Combustible structures are prohibited within Zone "A". Vegetation shall be consistent with the permitted plant palette and densities for Zone "A" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1b for "undesirable" plant list).
- Depending upon the land use, Zone "A" shall be maintained by individual property owners, a Homeowners Association or similar community entity, or (for public roadways) by the City.
- There are no sensitive habitats within or adjacent to Zone "A", and thinning and/or removal of non-approved landscape shall be permitted throughout the year.

5.2 Zone "B"

- Zone "B" is generally a minimum 50-foot-wide space adjacent to Zone "A" and closer to the native vegetation areas. It consists of trails, hardscape, and/or irrigated low-fuel volume landscape within the portion of the Bluff Park adjacent to the Open Space Site Planning Areas. The irrigation system shall be designed to mimic normal/average rainfall and to provide the necessary moisture to the plants during dry periods or seasons.
- As in Zone A, combustible structures are prohibited within Zone "B". Vegetation within Zone "B" shall be consistent with the permitted plant palette and densities for Zone "B" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1b for the "undesirable" plant list).
- Zone "B" shall be maintained by a Homeowners Association or similar community entity.
- There are no sensitive habitats within Zone "B", and thinning and/or removal of non-approved landscape will be permitted throughout the year.
- Fire Department highly combustible (not part of the HRP) plants will be removed during the regular maintenance.
- Meet all Fire Department Zone "B" maintenance requirements.

5.3 Zone "C"

- Zone "C" is a minimum 50-foot-wide space between Zone "B" and existing or proposed native habitat. Zone "C" is itself part of the native habitat restoration area proposed by the Newport Banning Ranch Habitat Restoration Plan (HRP).

- As in Zones "A" and "B", combustible structures and construction are not permitted within Zone "C". Zone "C" will be composed of a mosaic pattern of non-irrigated low grasses, succulents, cactus, and other low height/fuel volume native plants, as described for the Zone "C" plant palette in Attachment 1a. Existing non-native plants and species not approved by the HRP for this area, including those on the Fire Department's "undesirable" plant list contained in Attachment 1b, will be removed prior to restoration planting.

- In the Upland Open Space Area north of the Urban Colony and west of the City of Costa Mesa, a 100-foot-wide Zone "C" will be created adjacent to existing neighborhoods, including California Seabreeze. Unmanaged vegetation currently comes up to the rear yards of the off-Project homes in this area. Newport Banning Ranch will provide an especially wide Fuel Management Zone "C" in this area as a component of the Habitat Restoration Plan. The Zone "C" plant palette for the 30 feet of this Zone "C" closest to the homes will be more limited than usual to specified grasses, cacti, succulents, and open rock areas as noted in the Zone "C" plant palette.

- It is anticipated that Zone "C" will be maintained by the Newport Banning Ranch Conservation Group, yet to be determined. Maintenance by a Homeowners Association or similar community entity may be proposed in certain locations.

- Maintenance within Zone "C" will include removal of non-native/invasive species, removal of dead plant material, and removal of species inconsistent with the HRP, including those on the Fire Department's "undesirable" plant list. Maintenance within Zone "C" will not include the pruning, thinning, or removing of living HRP-approved native vegetation.

5.4 Maintenance Requirements for All Management Zones:

- No highly combustible plant species shall be allowed per City Fire Department's Requirements/ Guidelines.

- Horizontal and vertical plant spacing specifications are required and shall be shown on the final Fire Master Plan and maintained.

- Dead and dying material shall be removed regularly in Zones "A" and "B".

- Dead material removed from Zone "C" consistent with City-approved HRP.

6 Calculating Fire Behavior

This report uses a scientific approach to describe a wildland fire hazard assessment and expected wildland fire behavior within and outside of the fuel management zones. Computer projections simulate a fire burning within the native vegetative fuels directly outside the boundaries of the management zones. This report will demonstrate why fuel management zones will help protect structures in the community.

Firesafe Planning Solutions used a computer software program titled "BehavePlus Fire Modeling System 3.0.2" to predict the level of wildfire intensity for a fire approaching NBR. 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. The Fire Behavior and Fuel Modeling System, developed by research scientists from USDA-Forest Service (Andrews & Bevens, 2003; Burgan & Rothermel, 1984) will be used to evaluate both wildfire risk as well as the proposed vegetation management recommendations.

The BehavePlus system provides an indication of how vegetative fuels will burn under specific fuel, weather, and topography conditions. The BehavePlus system is a set of computer programs based upon energy release from specific fuels during a fire and is employed by wildfire professionals both nationally and internationally to predict wildfire behavior. Fuel models used in BEHAVE have been classified into specific groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. The differences in fire behavior among these models are basically related to fuel and their distribution among fuel particle size classes. Observation of the location and positioning of fuels in the field determines which fuel groups are presented. 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.

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 FMMP is the best fire defense system for NBR. 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 will input 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.*

7 Wildland Interface Fuel Types

These fuels are considered highly combustible in the native setting and can be analyzed for their fire performance based on many factors. The type and amount of fuels in the wildland area located immediately outside of the fuel management zone are generally:

7.1 20 % Native Grasses from 1-2' in Height

These fuels present the potential for a fast-spreading, wind-driven fire. Fire intensity is low but the rate of spread is high. With structures setbacks and enhanced construction requirements in place, they do not present a significant hazard. This type of fire is generally in a localized small area.

7.2 60% Coastal Sage Shrubs 3- 4' in Height

The shrubs present the potential for a fast-spreading, wind-driven fire. Fire intensity and ember production has the potential to be high at the wildland interface area because the shrubs are covering 2/3 of the land outside of the zone limits. The shrubs will not present a fire hazard to the homes after the fuel management zone is installed, structures are setback, and construction requirements are in place.

7.3 20% Remaining Vegetation Types

Chaparral-type, tree-form shrubs and trees outside of the zone limits will not be a fire hazard to the homes because the homes will be far enough away so heat travel will not cause direct flame impingement or radiant heat ignition of the homes. Ember intrusion will be deflected by the construction features of the homes.

(Figure 4) This type of vegetation will fit into a BehavePlus fuel model type SCAL 18. The site vegetation is not as dense as the vegetation described within the model, so fire behavior will be even lower than predicted.

8 Wind Patterns and Structure Alignment

The result of wild fire intensity is determined by wind speed, wind direction, the age of fuels, and the amount of moisture in the air. Wind direction determines how dry or moist the relative humidity in the air is. Fire intensity and rate of fire spread are usually determined by the speed of the winds. We entered the two most extreme wind patterns and speeds relating to wildfires into the BehavePlus model. All other lesser wind patterns and wind speeds normally produce less fire intensity based on a fire in wildland fuels. The two most extreme wind patterns/structure location alignments are:

- 50 mph northeast Santa Ana wind. (Generally occurring in the late fall, during low fuel moisture times). A review of RAWS data for the area could not find any recorded wind gusts above this level for the past 10 years; and
- A rare 30 mph dry southwest on-shore, normally prevailing wind. (Generating from over the ocean, after dry air is pushed out to sea by a Santa Ana condition).

A 50 mph north-east wind scenario would mostly affect homes on the interior arroyo because a fire affecting the north-west perimeter will be moving laterally or away from the homes located on the north-west perimeter

North -West Development Interface Photos

(Figure 5) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the north-west perimeter of the development. The oil lease has many roads (future trails), which serve as continuity breaks in the scattered fuels.

(Figure 6) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the North-West perimeter of the development. The fuels in the oil lease area are not even as severe as the SCAL 18 model we used in many areas. Fire behavior will be less than the worst-case scenario we calculated in those areas.

(Figure 7) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the North-West perimeter of the development. The fuels in the oil lease area are not as severe as the SCAL 18 model we used. Fire behavior will be less than the worst case scenario we calculated.

(Figure 8) This is a photo of the most extreme north side of the future development which is directly adjacent to existing development.

(Figure 9) Photo of the west-facing slope below the future development located on the west side of the development. A south-west wind-directed fire coming from the vegetation within the oil lease could affect the North-West perimeter of the development.

Interior Development Arroyo Interface Photos

(Figure 10) We used BehavePlus to calculate and predict south-west wind and north-east wind directed fires coming from native vegetation within interior open space arroyos. Unless the wind happens to change in the middle of a fire event, the fire will continue to move only one direction of the two directions shown. Homes located on the perimeter of the interior arroyos shown will have all of the CBC Chapter 7A construction requirements in place even though they are not required by code in moderate or high fire hazard areas.

(Figure 11) We used BehavePlus to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. On the right is a lower arroyo drainage with Willow species. The fuels on the right are not in the fuel management zones and have a fairly high-fuel moisture content. On the left is the coastal sage scrub vegetation Fuel Model SCAL 18

(Figure 12) We used BehavePlus to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. In the background is a lower arroyo drainage with Willow species. The fuels in the forefront are the coastal sage scrub vegetation Fuel Model SCAL 18. The Pampas Grass will be removed and the Encelia would remain and be horizontally spaced not to create a fuel mass exceeding 40% of the total area.

(Figure 13) We used BEHAVE to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. The fuels in the forefront are the coastal sage scrub vegetation Fuel Model SCAL 18. The Encelia would remain and be horizontally spaced. Areas in between shrub groups will have low grasses, succulents, cactus, and other low-fuel-volume species.

(Figure 14) We used BEHAVE to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. The fuels in the forefront are Encelia. In the distance you can see the upslope vegetation which will be leading up to homes. Homes located on the perimeter of the interior arroyos shown will have all of the CBC Chapter 7A construction requirements in place even though they are not required by code in moderate or high fire hazard areas.

9 BehavePlus Fire Behavior Inputs and Results

9.1 Fuel Moistures:

The fuel moistures used in the modeling for the BehavePlus calculation are the worst case scenario. Relative humidity, temperature, slope aspect, time of day, and month of the year all have an impact on the determination of the actual percentage of dead fuel moisture. The values listed below are at or below the lowest recorded levels for the area being analyzed.

Fuel moisture changes over time. In general, the dead fuel moisture will move about 2/3 of the difference between its current moisture level in the fuel and that of the air around in varying increments based on the size (amount of surface area to total mass) of the fuel. Fuels are grouped by the time it takes to move the 2/3 distance. "One hour" fuel is less than ½ inch thick. It is the most volatile of the fuels. "Ten hour" fuel is between ½ inch and 1 inch thick. "Hundred hour" fuel is between 1 inch and 3 inches and "Thousand hour" fuel is above 3 inches in thickness. Thousand hour fuels are relatively stable and are not used in this model

Live fuel moisture is the moisture found in the leaf and woody portion of a shrub. Live fuel moisture is calculated by cutting a small branch and weighing it, placing it in a low temperature oven for 12 hours, removing the branch and weighing it again. The difference in weight is the loss of moisture in the leaves and woody portion of the branch. For this reason, live moisture may exceed 100% of the dry weight of the plant. Live fuel moisture is the highest in the spring and early summer, and the lowest in late summer, fall and early winter. Los Angeles County Fire Department samples live fuel moistures from sites throughout Los Angeles County each month.

Fuel moisture recorded from the sites still apply to Orange County area and serve as an indicator of moisture content. We are using worst case moistures to indicate the results of worst case wild fire. All other fires when there are greater fuel moistures within the shrubs, will result in less fire intensity than we are predicting.

South, Southwest and West Wind Condition Fuel Moisture Inputs: Late fire season 30-MPH southwest wind pattern.

- 1-Hour Fine Fuel Moisture 3%
- 10-Hour Fuel Moisture 5%
- 100-Hour Fuel Moisture 7%
- Live Herbaceous Fuel Moisture 30%
- Live Woody Fuel Moisture 60%

North, Northeast and East Wind Condition Fuel Moisture Inputs: Santa Ana Winds

- 1-Hour Fine Fuel Moisture 2%
- 10-Hour Fuel Moisture 3%
- 100-Hour Fuel Moisture 5%

- Live Herbaceous Fuel Moisture 30%
- Live Woody Fuel Moisture 50%

BehavePlus Fire Behavior Inputs and Results are as follows:

9.2 The North-West Development Perimeter Side / South -West Wind Driven Fire

The North-West side of the development is mostly subject to south-west normal prevailing wind direction fire weather:

(Figure 15) BehavePlus fuel model type SCAL 18 on the slope leading up to the future development.

9.2.1. BehavePlus Inputs:

Wind Direction: South-west wind moving to a north-east direction
Wind Speed: 30 mph wind speed, upslope, unsheltered
Slope: 15% degree slope

9.2.2. BehavePlus Outputs:

Fuel Model	SCAL18	Grass 4	Grass Scrub 2
Max Rate of Spread (feet/min)	194	908	266
Fire Line Intensity (Btu/ft/s)	13,141	7,643	2,476
Flame Length (feet)	**35.3**	27.5	16

9.3 Interior Arroyo North-East Wind Driven Fire

(Figure 16) BehavePlus fuel model type SCAL 18 in the interior arroyo leading up to the future development. Encelia shrubs are present in the foreground.

9.3.1. BehavePlus Inputs:

Wind Direction: North-East wind moving to a south-west direction
Wind Speed: 50 mph wind speed, upslope, unsheltered
Slope: 60% degree slope.

9.3.2. BehavePlus Outputs:

Fuel Model	SCAL18	Grass 4	Grass Scrub 2
Max Rate of Spread (feet/min)	384	1,945	676
Fire Line Intensity (Btu/ft/s)	27,885	18,339	6,924
Flame Length (feet)	**49.9**	41.1	26.3

10 BehavePlus Calculation Results Analysis

The modeling for this Project used the extreme conditions in every case. Winds were modeled at or above the strongest gusts recorded over the past 10 years. Fuel moistures were estimated at or below those recorded in existing databases. Slopes were used that created the greatest impact for rate of spread (this is not always the steepest slope as the slope itself begins to shelter the fuel from the extreme aspects of the wind when it becomes a barrier).

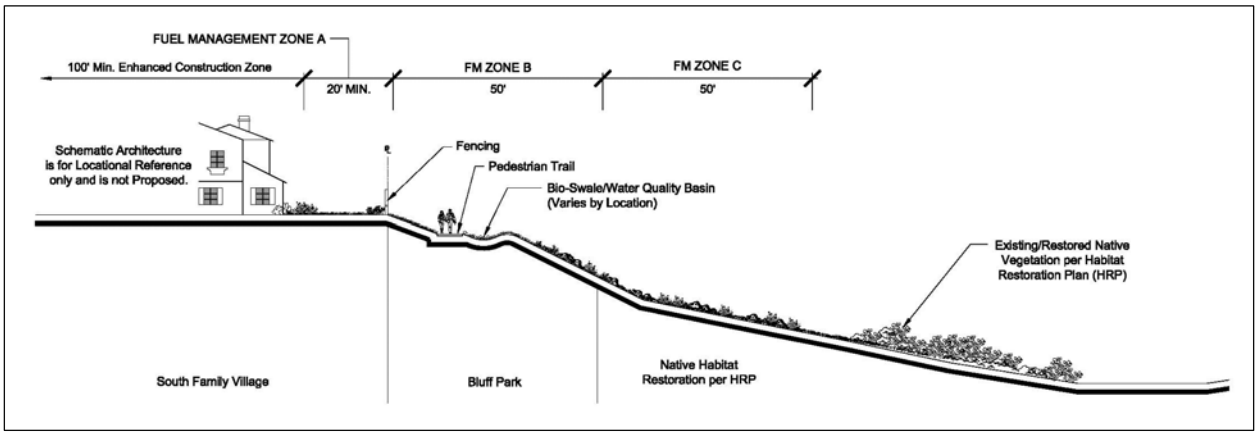
Three separate fuel models were used to project the maximum fire behavior for this Project. Southern California Model 18 (Sage/Buckwheat) was used for the interior pristine areas that will be allowed to continue in their natural state. Both grass (GR4 moderate grass, dry climate) and grass/shrub mix (GS2 moderate load, dry climate) models were used to insure that fire behavior was correctly modeled as the upland grassland interface matures.

It should be noted that while the GR4 model is more volatile in terms of rate of spread and flame length, the SCAL18 model has the greatest threat in terms of total volume of fire/heat and impact on the adjacent structures. Under the existing plan, the SCAL18 fuel will always be separated from the structures by the grassland mosaic (Zone "C") and the modified management fuel zones (Zone "A" and Zone "B"). The fuel management system has been designed so that SCAL18 fuel is no closer than 120 feet from the structures. The maximum flame length in the SCAL18 zone is 49.9 feet. For this reason, the Zone "C"/habitat area is never less than 50 feet in width and in many cases is two times the minimum.

The grass/shrub mosaic interface (Zone "C") will produce a maximum flame length of 41 feet in the worst case scenario. This would be a wind-driven fire, traveling upslope, in extreme weather (low humidity and high temperature), unsheltered and with a continuous fuel bed. This zone will double as a raptor habitat. It will not be thinned or modified for fire management but it will be maintained by "hand plucking" materials which are not on the approved palette. It will start out as primary grassland mosaic and may eventually become a grass/shrub mixture. It was modeled in both configurations. The Zone "C" is not irrigated. The maximum flame length that can be achieved at the Zone "B"/Zone "C" juncture is 41 feet. For this reason, the Zone "B" minimum width is 50 feet.

Zone "B" is irrigated and will provide the necessary buffer for a defensible space. The heat sink properties of Zone "B" will result in a 75% flame length reduction in this zone. This is due to the Zone "B" being cleared, replanted, and permanently irrigated with only plants listed on the approved plans. Plants are originally installed and maintained conforming to code-required horizontal spacing arrangements. Due to the fact that the Zone "C" has a low fuel loading in term of duration of flame front, the actual flames from the Zone "C" will be significantly reduced prior to reaching the Zone "B". The duration of the flaming front should not be long enough to remove enough moisture from the Zone "B" plants to have them ignite. As long at the dead and duff components of the Zone "A" and Zone "B" maintenance plans have been followed, no fire will move past Zone "B". Zone "A" is the buffer that provides for the defensible space. While no direct flame is intended at the Zone "A" juncture with Zone "B", an additional area of 20 feet is provided that will allow fire crews to safely position themselves into that interface between the wildland and the structures for suppression efforts.

The arrangement of the zones is shown in an example below:



Structure ignition from wild vegetation fires comes mostly from two sources, firebrands and radiant and convective heat. Ignition of a structure by convective heat transfer requires direct flame impingement. If the flame lengths are less than the measured distance to non-managed combustible vegetation from a structure, there is a probability of structure ignition. This is not the case with this Project. The future structures will not ignite from the direct effects of fire as they are never within a distance which provides for a possibility of ignition. Fires in fuels measured directly outside the fuel management zones do not have sufficient flame lengths to contact the homes.

During strong and dry winds, convective firebrands have the capability of being carried by drafts and strong winds for long distances. The chance of firebrands igniting a structure will depend on the size of the firebrand and the type of receptive construction materials on the structure. Firebrands landing on combustible roofing and decks are common sources for structure ignition. Firebrands can also enter a structure through broken windows, unscreened vents, decks and chimneys, and any small opening.

The chance of a structure fire caused by firebrands is not a concern for the NBR as **all homes** will be constructed with Class A roofing and roofing assemblies and attic venting requirements from Chapter 7A from the 2007 California Building Code (CBC). In addition, **all structures adjacent to a fuel management zone** will further be constructed to meet the minimum requirements of Chapter 7A for exterior wall and eave surface, window and door requirements, appendages and underfloor protection. Therefore, due to the fact that mostly non-combustible building materials will be used in the construction of structures, the radiant heat issue needs to be addressed.

Wildland fires could cause ignition to existing developments by radiating heat to a structure. Radiation exposure depends on the intensity and the duration of the fire. Radiant heat decreases as the distance between the fire and the structure increases. Single-pane windows are subject to breaking from radiant heat and provide an opening for embers to enter a structure. Structure windows adjacent to fuel management zones will be dual pane with one pane tempered in case of an ember hitting a heated window. Radiant heat has a short lifetime in a concentrated area because the fire passes by structures that have been constructed to the latest codes and continues to move onward.

Radiant and convective heat transfer energy is not enough to reach the future structures to the point of ignition because the fuels measured are more than 100 feet away from the homes when you total the distance of the management zone and the structure setbacks. See the following information regarding a valid structure assessment model used by the Forest Service and professionals throughout the nation titled “SIAM”.

Flames and fire intensity are significantly reduced within the fuel management zone. The fuel management zone also reduces the amount of embers projected into the air because the area is replanted with plants with greater fire-resistive characteristics and the plants are spaced and thinned.

11 Structure Ignition Assessment Model (SIAM).

A USDA Forest Service research study and report titled “Structure Ignition Assessment Model (SIAM)” by Jack D. Cohen, Intermountain Fire Science Laboratory, Missoula, Montana, has helped to validate how much distance is required to keep structures from igniting due to wildland fire radiant heat.

SIAM research further suggests that for reducing structure ignitions from radiant and convective heat sources, vegetation management (fuel treatment) beyond some relatively short (100 feet) distance from a structure built of non-combustible materials has little significant benefit for reducing flame generated ignitions. Vegetation management cannot be practically extensive enough to significantly reduce airborne firebrand ignitions landing on combustible roofs or other fuel beds on privately controlled land around a home. In lighter fuels such as grass and short grass, fuel treatment can be reduced to 50 feet and still protect a structure that is built of non-combustible materials.

Project structures will be set back even further from the intensity of a fire burning outside the limits of the fuel management zone. Back and side yards incorporate ornamental plants and trees in a turf or planter type setting. Fire suppression efforts combined with the fuel management zone protection and the latest building construction practices will ensure the best possible outcome for a safe development.

12 Report Summary

This development is designed and protected by the most recently developed codes. BehavePlus was used estimate the maximum intensity of fire moving towards this development, and flame lengths and fire intensity will be ultimately be reduced by the installation and maintenance of the FMMP.

Using a systematic approach, the threats presented by the vegetation that will remain after the completion of this Project have been mitigated to a point where they do not present a risk to the structure or occupants of this Project once completed. The use of fuel management, enhanced construction features, and ongoing maintenance will insure that this community remains protected from the threat of wildfires as long as the conditions required by this program are in compliance.

NBR F&LSP Attachment 3

Fuel Management and Maintenance Program Analysis

Newport Banning Ranch

Newport Beach, California

May 2010

Prepared by:

firesafe ::PLANNING SOLUTIONS

Table of Contents

1 Purpose of Report

Firesafe Planning Solutions performed an assessment of how the fuel management and maintenance program (FMMP) will reduce the intensity of a wildfire approaching The Newport Banning Ranch residential community. This fire analysis report provides the results of the assessment and shows support of the fuel management installation and maintenance program. The study takes into consideration existing vegetative interface fuels, future re-vegetated interface areas, topography, and weather conditions during a fire. The study includes expected fire behavior burning within off-site and on-site vegetation. Additionally exterior and interior located perimeter vegetation treatment and maintenance plan are addressed. The fire intensity from worst case scenario examples has been calculated and the results of fire behavior calculations were are simulated against the fire protection design built into the Newport Banning Ranch (NBR) development.

2 Geographic Description

The NBR site is not located within an existing Special Fire Protection Area. Once developed, the site will be designated as a Special Fire Protection Area as it is within the sphere of the city of Newport Beach Fire Department's guidelines and City staff has indicated it will require such designation.

The future community will be mostly attached to existing development on the southwest, south, and east. The NBR planned community is located west of the city of Costa Mesa. The entire east side of NBR is bordered by existing commercial, light industrial, and residential development. For the sake of wildland interface, the new tracts will fill-in the area between two existing built-out developments, similar to bridge connecting the developments together except for the Oxbow Loop (Semeniuk Slough) located to the west. The northwest side of NBR will have a moderate wildland interface from vegetation within the existing adjacent oil fields situated 50-75 feet below the future community. The south side of the community is bordered by West (Pacific) Coast Highway and small moderate-hazard vegetative areas near the coastal bluffs along the highway.

(Figure 1) Most of the development perimeter in yellow does not have a wildland interface due to existing surrounding developments on the south-west, south, and east.

3 Site Fire Hazard Assessment

Most of the future homes will border the Bluff Park edges, which itself will adjoin upland areas of the Open Space Preserve, including an interior located drainage arroyo that separates the north and south development areas. This "Large Arroyo" will continue to support a healthy coastal sage scrub plant community or be restored to coastal sage scrub vegetation or upland grassland. Droughts have had an impact on existing coastal sage scrub plant communities. The recent rains have caused the shrub type vegetation on the site to support much greener and denser vegetation presently, and non-native grasses and weeds are more prevalent too. During droughts, coastal sage scrub plant communities can have a large percentage of dead material. This is due to the Mediterranean climate where long wet winters promote lots of new growth and long dry summer seasons can cause parts of the plants to die back. The shrubs on the interior arroyos are primarily dominated by Encelia Californica, which grows between 1-3 feet in height and is on the approved Fire Department plant list. Other types of vegetation in and adjacent to the interior located drainage arroyos are:

3.1 Oil Lease and Interior Arroyo Vegetation:

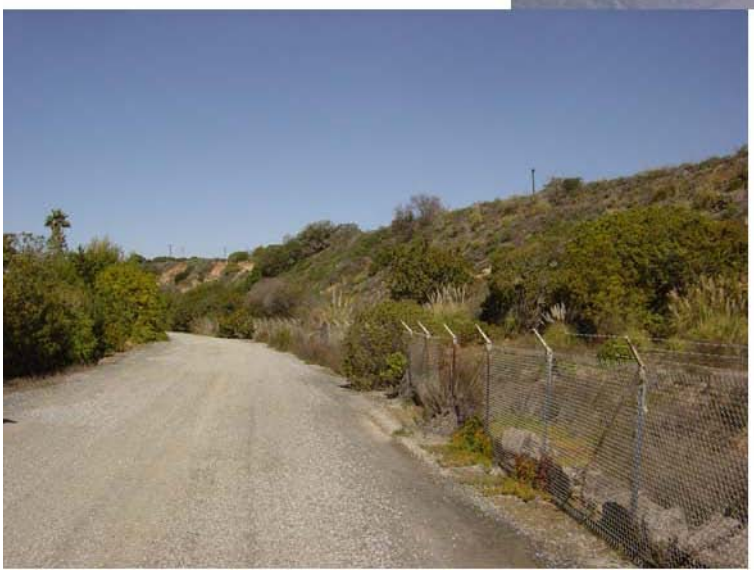
Type	Approximate Height Ft.	Approximate Width Ft.
• Baccharis	5	3
• Saltbush	3	8
• Lemonadeberry	7	7
• Toyon	7	7
• Bladder Pod	3	3
• Mulefat	7	3
• Willow	15	12
• Cactus		

Other species found on-site that are determined by The City of Newport Beach Fire Department as being highly combustible are required to be continuously removed from the fuel management zone: Pampas Grass, Buckwheat, Artemisia, Black Sage, Thistles, Mustard, and Castor Bean.

(Figure 2) Photo of the interior arroyo vegetation. Notice the vegetation on the slopes of the arroyos is mostly only as tall as the cactus is except for the willows in the drainage.

3.2 62nd Street Oxbow Loop Development Perimeter Vegetation: (Not a direct Interface)

Type	Approximate Height Ft.	Approximate Width Ft.
• Pine	15	10
• Pepper	15	12
• Chinese Elm	15	7
• Juniper	9	7
• Ice Plant / Covers	1	20
• Eucalyptus	20	12
• Willow	15	12
• Palm	25	10-20
• Ornamental shrubs	8	6



(Figure 3) These species are located along the banks of the Oxbow Loop and are not a fire hazard to the proposed structures. The road between the bank vegetation and the slope leading up near the future development helps as a fire break. The types of vegetation on the slopes on the opposite side of the Oxbow Loop and road are the same as within the oil lease and interior arroyos.

Specific plant palettes are identified in this document for the various zones within the fuel management areas. These palettes have been reviewed and approved by the Newport Beach Fire Department and landscape architects.

In addition to areas currently vegetated with the coastal sage scrub, the Project will establish new plantings within the Project as a habitat area for raptors. This area will be designed as an upland grasslands area. It will be maintained with specific plant species and will not be allowed to transition into a shrub or chaparral plant community. It will be maintained by "hand plucking" any plant materials not on the approved list on an annual basis to maintain its value as a raptor habitat.

3.3 Upland Native Grassland Mosaic Restoration Areas

Upland Grassland Mosaic Restoration Areas will be established within the center of the Project area and adjacent to the developed areas. Most of these will be in the intermediate Zone "B" between the wildland and the irrigated fuel management zones. These areas will be vegetated with a suite of native bunchgrasses, succulents, cactus, and other low height/fuel volume native plants suitable for raptor foraging and as gnatcatcher and cactus wren habitat as summarized below.

UPLAND NATIVE GRASSLAND MOSAIC PLANT PALETTE

HABITAT RESTORATION / FUEL MANAGEMENT ZONE "C"	
Botanical Name	***Common Name***
Grasslands	
Bothriochloa barbinodis	Beardgrass
Distichlis spicata	Saltgrass
Lasthenia californica	California goldfields
Melica imperfecta	Coast Range Melica
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
Succulent Scrub Mosaic	
Non-Combustible/Succulent Species	
Cylindropuntia prolifera	Coastal cholla
Opuntia littoralis	Coastal prickly pear
Suaeda taxifolia	Woolly sea-blite
Fire-Resistive Shrub Species	
Encelia californica (1)	California encelia (1)
Isocoma menziesii (1)	Coastal goldenbush (1)
Isomeris arborea (1)	Bladderpod (1)
Lycium californicum (1)	California boxthorn (1)

(1) *This plant species may not be located within 50 feet of homes.*

3.4 Vernal Pool Restoration Area

A vernal pool on the Project site southwest of Bluff Road and 17th Street will be preserved and enhanced as part of the HRP. The plant palette for the Vernal Pool Restoration Area (Planning Area 2e) has been designed as a low-growing suite of appropriate native species that will provide appropriate habitat consistent with habitat mitigation objectives for the Project.

PLANT PALETTE – VERNAL POOL RESTORATION AREA

Botanic Name	**Common Name**	**Plant Height**
Cressa truxillensis	Alkali weed	2 to 6 inches
Distichlis spicata	Saltgrass	4 to 8 inches
Frankenia salina	Alkali heath	4 to 8 inches
Heliotropum curassivicum	Seaside heliotrope	4 to 8 inches

Lasthenia californica	California goldfields	4 to 8 inches
Lupinus bicolor	Miniature lupine	4 to 8 inches
Malvella leprosa	Alkali sida ches	2 to 6 in
Plantago erecta	Western plantain	3 to 6 inches
Spergularia marina	Saltmarsh sand spurrey	1 to 4 inches

Both the upland native grassland mosaic and vernal pool areas are depicted on the Fuel Management Plan graphic attached to this report.

4 Fuel Management

Fuel management is land that is designated for the installation of plant species and land with selectively removed native vegetation. A fuel management program starts when the local governmental planning department places development construction conditions requiring a fuel management program. Any new development occurring within lands containing highly combustible native vegetation needs management of the vegetation at the urban interface in order to protect structures. High-fuel and volatile native plants are generally replaced with drought-tolerant, fire-resistant species in order to slow the speed and intensity of an approaching wildfire.

Fuel management programs vary in complexity and designs. They are dependent upon the type and spacing of vegetation as well as topography, weather conditions, and the placement of structure within the development Project. Irrigated fuel management zones help to reduce the impacts of wildfire before they spread to structures. The reduction of available native fuels , which have been replaced by fire resistive plant types, will cause a reduction in the intensity of a fire when approaching homes/structures.

Fuel management is as an on-going maintenance program because the program requires zones to be maintained indefinitely. Installing new plants works great initially and maintenance is easy, but proper long-term maintenance can be difficult if not done correctly. Experienced techniques can assist in extending the longest possible life span for the plants. Funds for fuel management maintenance need to be anticipated in the annual budget of association dues. Proper and consistent maintenance can save on the total long-term cost of maintenance over long periods of time or the failure of the protection system with wide spread consequences to the building owners and the city.

5 The Fuel Management Program

The Fuel Management Program designed for the NBR is very similar to fuel management programs approved in the County of Orange within the last 5 years. The design of NBR is very similar to the Marblehead coastal development in the City of San Clemente, the Brighwater coastal development in Huntington Beach, and the Dana Point Headlands Reserve development. The Marblehead development was approved with fuel management zones less in total width than what is proposed for NBR and additionally there is a greater-sized coastal sage scrub habitat preserved within these developments. Marblehead Coastal and Dana Headlands Preserve are similar in proximity to the ocean, topography, and plant species. All three developments were regulated by the California Coastal Commission which created the requirement to preserve specific plant species both on- and off-site.

The Fuel Management and Maintenance Program (FMMP) requires regular maintenance activities to be done routinely on an indefinite basis generally by the future Homeowners Association (HOA). The fuel management zones will be originally installed and maintained by the master developer until the ongoing maintenance responsibility is turned over to the ultimate maintenance entity. Where fuel management areas include road right-of-way, they may be maintained by the City. Where fuel management areas are FMZ Zone "C", they will be maintained by the Banning Ranch Conservancy Group (to be determined). The maintenance requirements are clearly shown on the fuel management plans. The developer will distribute the approved plans with maintenance requirements directly to the Homeowners Association at a required maintenance turnover meeting. The program requires The City of Newport Beach Fire Department to be present at the maintenance turnover.

The following fuel management zones are safe designs based on results the size of the wildland areas, type of vegetation, and amount of vegetation, the fuel/structure wind alignments, and the BehavePlus Calculation Results Analysis in this report.

The fuel management Area is a minimum of 120 feet in total width and divided into three (3) zones:

5.1 Zone "A"

- Zone "A" is generally a minimum 20-foot-wide flat or level-grade defensible space consisting of irrigated landscape and/or hardscape. Zone "A" will be located on private lots, within the Bluff Park, and/or within road rights-of-way.

- Combustible structures are prohibited within Zone "A". Vegetation shall be consistent with the permitted plant palette and densities for Zone "A" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1b for "undesirable" plant list).

- Depending upon the land use, Zone "A" shall be maintained by individual property owners, a Homeowners Association or similar community entity, or (for public roadways) by the City.

- There are no sensitive habitats within or adjacent to Zone "A", and thinning and/or removal of non-approved landscape shall be permitted throughout the year.

5.2 Zone "B"

- Zone "B" is generally a minimum 50-foot-wide space adjacent to Zone "A" and closer to the native vegetation areas. It consists of trails, hardscape, and/or irrigated low-fuel volume landscape within the portion of the Bluff Park adjacent to the Open Space Site Planning Areas. The irrigation system shall be designed to mimic normal/average rainfall and to provide the necessary moisture to the plants during dry periods or seasons.

- As in Zone A, combustible structures are prohibited within Zone "B". Vegetation within Zone "B" shall be consistent with the permitted plant palette and densities for Zone "B" shown in Attachment 1a. Plants determined by the Fire Department to be highly combustible or otherwise undesirable shall be removed during regular maintenance (see Attachment 1b for the "undesirable" plant list).

- Zone "B" shall be maintained by a Homeowners Association or similar community entity.

- There are no sensitive habitats within Zone "B", and thinning and/or removal of non-approved landscape will be permitted throughout the year.
- Fire Department highly combustible (not part of the HRP) plants will be removed during the regular maintenance.
- Meet all Fire Department Zone "B" maintenance requirements.

5.3 Zone "C"

- Zone "C" is a minimum 50-foot-wide space between Zone "B" and existing or proposed native habitat. Zone "C" is itself part of the native habitat restoration area proposed by the Newport Banning Ranch Habitat Restoration Plan (HRP).
- As in Zones "A" and "B", combustible structures and construction are not permitted within Zone "C". Zone "C" will be composed of a mosaic pattern of non-irrigated low grasses, succulents, cactus, and other low height/fuel volume native plants, as described for the Zone "C" plant palette in Attachment 1a. Existing non-native plants and species not approved by the HRP for this area, including those on the Fire Department's "undesirable" plant list contained in Attachment 1b, will be removed prior to restoration planting.
- In the Upland Open Space Area north of the Urban Colony and west of the City of Costa Mesa, a 100-foot-wide Zone "C" will be created adjacent to existing neighborhoods, including California Seabreeze. Unmanaged vegetation currently comes up to the rear yards of the off-Project homes in this area. Newport Banning Ranch will provide an especially wide Fuel Management Zone "C" in this area as a component of the Habitat Restoration Plan. The Zone "C" plant palette for the 30 feet of this Zone "C" closest to the homes will be more limited than usual to specified grasses, cacti, succulents, and open rock areas as noted in the Zone "C" plant palette.
- It is anticipated that Zone "C" will be maintained by the Newport Banning Ranch Conservation Group, yet to be determined. Maintenance by a Homeowners Association or similar community entity may be proposed in certain locations.
- Maintenance within Zone "C" will include removal of non-native/invasive species, removal of dead plant material, and removal of species inconsistent with the HRP, including those on the Fire Department's "undesirable" plant list. Maintenance within Zone "C" will not include the pruning, thinning, or removing of living HRP-approved native vegetation.

5.4 Maintenance Requirements for All Management Zones:

- No highly combustible plant species shall be allowed per City Fire Department's Requirements/ Guidelines.
- Horizontal and vertical plant spacing specifications are required and shall be shown on the final Fire Master Plan and maintained.
- Dead and dying material shall be removed regularly in Zones "A" and "B".
- Dead material removed from Zone "C" consistent with City-approved HRP.

6 Calculating Fire Behavior

This report uses a scientific approach to describe a wildland fire hazard assessment and expected wildland fire behavior within and outside of the fuel management zones. Computer projections simulate a fire burning within the native vegetative fuels directly outside the boundaries of the management zones. This report will demonstrate why fuel management zones will help protect structures in the community.

Firesafe Planning Solutions used a computer software program titled "BehavePlus Fire Modeling System 3.0.2" to predict the level of wildfire intensity for a fire approaching NBR. 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. The Fire Behavior and Fuel Modeling System, developed by research scientists from USDA-Forest Service (Andrews & Bevens, 2003; Burgan & Rothermel, 1984) will be used to evaluate both wildfire risk as well as the proposed vegetation management recommendations.

The BehavePlus system provides an indication of how vegetative fuels will burn under specific fuel, weather, and topography conditions. The BehavePlus system is a set of computer programs based upon energy release from specific fuels during a fire and is employed by wildfire professionals both nationally and internationally to predict wildfire behavior. Fuel models used in BEHAVE have been classified into specific groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. The differences in fire behavior among these models are basically related to fuel and their distribution among fuel particle size classes. Observation of the location and positioning of fuels in the field determines which fuel groups are presented. 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.

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 FMMP is the best fire defense system for NBR. 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 will input 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.*

7 Wildland Interface Fuel Types

These fuels are considered highly combustible in the native setting and can be analyzed for their fire performance based on many factors. The type and amount of fuels in the wildland area located immediately outside of the fuel management zone are generally:

7.1 20 % Native Grasses from 1-2' in Height

These fuels present the potential for a fast-spreading, wind-driven fire. Fire intensity is low but the rate of spread is high. With structures setbacks and enhanced construction requirements in place, they do not present a significant hazard. This type of fire is generally in a localized small area.

7.2 60% Coastal Sage Shrubs 3- 4' in Height

The shrubs present the potential for a fast-spreading, wind-driven fire. Fire intensity and ember production has the potential to be high at the wildland interface area because the shrubs are covering 2/3 of the land outside of the zone limits. The shrubs will not present a fire hazard to the homes after the fuel management zone is installed, structures are setback, and construction requirements are in place.

7.3 20% Remaining Vegetation Types

Chaparral-type, tree-form shrubs and trees outside of the zone limits will not be a fire hazard to the homes because the homes will be far enough away so heat travel will not cause direct flame impingement or radiant heat ignition of the homes. Ember intrusion will be deflected by the construction features of the homes.

(Figure 4) This type of vegetation will fit into a BehavePlus fuel model type SCAL 18. The site vegetation is not as dense as the vegetation described within the model, so fire behavior will be even lower than predicted.

8 Wind Patterns and Structure Alignment

The result of wild fire intensity is determined by wind speed, wind direction, the age of fuels, and the amount of moisture in the air. Wind direction determines how dry or moist the relative humidity in the air is. Fire intensity and rate of fire spread are usually determined by the speed of the winds. We entered the two most extreme wind patterns and speeds relating to wildfires into the BehavePlus model. All other lesser wind patterns and wind speeds normally produce less fire intensity based on a fire in wildland fuels. The two most extreme wind patterns/structure location alignments are:

- 50 mph northeast Santa Ana wind. (Generally occurring in the late fall, during low fuel moisture times). A review of RAWS data for the area could not find any recorded wind gusts above this level for the past 10 years; and
- A rare 30 mph dry southwest on-shore, normally prevailing wind. (Generating from over the ocean, after dry air is pushed out to sea by a Santa Ana condition).

A 50 mph north-east wind scenario would mostly affect homes on the interior arroyo because a fire affecting the north-west perimeter will be moving laterally or away from the homes located on the north-west perimeter

North -West Development Interface Photos

(Figure 5) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the north-west perimeter of the development. The oil lease has many roads (future trails), which serve as continuity breaks in the scattered fuels.

(Figure 6) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the North-West perimeter of the development. The fuels in the oil lease area are not even as severe as the SCAL 18 model we used in many areas. Fire behavior will be less than the worst-case scenario we calculated in those areas.

(Figure 7) We used BehavePlus to calculate and predict a south-west wind-directed fire coming from the vegetation within the oil lease that could affect the North-West perimeter of the development. The fuels in the oil lease area are not as severe as the SCAL 18 model we used. Fire behavior will be less than the worst case scenario we calculated.

(Figure 8) This is a photo of the most extreme north side of the future development which is directly adjacent to existing development.

(Figure 9) Photo of the west-facing slope below the future development located on the west side of the development. A south-west wind-directed fire coming from the vegetation within the oil lease could affect the North-West perimeter of the development.

Interior Development Arroyo Interface Photos

(Figure 10) We used BehavePlus to calculate and predict south-west wind and north-east wind directed fires coming from native vegetation within interior open space arroyos. Unless the wind happens to change in the middle of a fire event, the fire will continue to move only one direction of the two directions shown. Homes located on the perimeter of the interior arroyos shown will have all of the CBC Chapter 7A construction requirements in place even though they are not required by code in moderate or high fire hazard areas.

(Figure 11) We used BehavePlus to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. On the right is a lower arroyo drainage with Willow species. The fuels on the right are not in the fuel management zones and have a fairly high-fuel moisture content. On the left is the coastal sage scrub vegetation Fuel Model SCAL 18

(Figure 12) We used BehavePlus to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. In the background is a lower arroyo drainage with Willow species. The fuels in the forefront are the coastal sage scrub vegetation Fuel Model SCAL 18. The Pampas Grass will be removed and the Encelia would remain and be horizontally spaced not to create a fuel mass exceeding 40% of the total area.

(Figure 13) We used BEHAVE to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. The fuels in the forefront are the coastal sage scrub vegetation Fuel Model SCAL 18. The Encelia would remain and be horizontally spaced. Areas in between shrub groups will have low grasses, succulents, cactus, and other low-fuel-volume species.

(Figure 14) We used BEHAVE to calculate and predict south-west wind-directed and north-east wind-directed fires coming from native vegetation within interior open space arroyos. The fuels in the forefront are Encelia. In the distance you can see the upslope vegetation which will be leading up to homes. Homes located on the perimeter of the interior arroyos shown will have all of the CBC Chapter 7A construction requirements in place even though they are not required by code in moderate or high fire hazard areas.

9 BehavePlus Fire Behavior Inputs and Results

9.1 Fuel Moistures:

The fuel moistures used in the modeling for the BehavePlus calculation are the worst case scenario. Relative humidity, temperature, slope aspect, time of day, and month of the year all have an impact on the determination of the actual percentage of dead fuel moisture. The values listed below are at or below the lowest recorded levels for the area being analyzed.

Fuel moisture changes over time. In general, the dead fuel moisture will move about 2/3 of the difference between its current moisture level in the fuel and that of the air around in varying increments based on the size (amount of surface area to total mass) of the fuel. Fuels are grouped by the time it takes to move the 2/3 distance. "One hour" fuel is less than ½ inch thick. It is the most volatile of the fuels. "Ten hour" fuel is between ½ inch and 1 inch thick. "Hundred hour" fuel is between 1 inch and 3 inches and "Thousand hour" fuel is above 3 inches in thickness. Thousand hour fuels are relatively stable and are not used in this model

Live fuel moisture is the moisture found in the leaf and woody portion of a shrub. Live fuel moisture is calculated by cutting a small branch and weighing it, placing it in a low temperature oven for 12 hours, removing the branch and weighing it again. The difference in weight is the loss of moisture in the leaves and woody portion of the branch. For this reason, live moisture may exceed 100% of the dry weight of the plant. Live fuel moisture is the highest in the spring and early summer, and the lowest in late summer, fall and early winter. Los Angeles County Fire Department samples live fuel moistures from sites throughout Los Angeles County each month.

Fuel moisture recorded from the sites still apply to Orange County area and serve as an indicator of moisture content. We are using worst case moistures to indicate the results of worst case wild fire. All other fires when there are greater fuel moistures within the shrubs, will result in less fire intensity than we are predicting.

South, Southwest and West Wind Condition Fuel Moisture Inputs: Late fire season 30-MPH southwest wind pattern.

- 1-Hour Fine Fuel Moisture 3%
- 10-Hour Fuel Moisture 5%
- 100-Hour Fuel Moisture 7%
- Live Herbaceous Fuel Moisture 30%
- Live Woody Fuel Moisture 60%

North, Northeast and East Wind Condition Fuel Moisture Inputs: Santa Ana Winds

- 1-Hour Fine Fuel Moisture 2%
- 10-Hour Fuel Moisture 3%
- 100-Hour Fuel Moisture 5%

- Live Herbaceous Fuel Moisture 30%
- Live Woody Fuel Moisture 50%

BehavePlus Fire Behavior Inputs and Results are as follows:

9.2 The North-West Development Perimeter Side / South -West Wind Driven Fire

The North-West side of the development is mostly subject to south-west normal prevailing wind direction fire weather:

(Figure 15) BehavePlus fuel model type SCAL 18 on the slope leading up to the future development.

9.2.1. BehavePlus Inputs:

Wind Direction: South-west wind moving to a north-east direction
Wind Speed: 30 mph wind speed, upslope, unsheltered
Slope: 15% degree slope

9.2.2. BehavePlus Outputs:

Fuel Model	SCAL18	Grass 4	Grass Scrub 2
Max Rate of Spread (feet/min)	194	908	266
Fire Line Intensity (Btu/ft/s)	13,141	7,643	2,476
Flame Length (feet)	**35.3**	27.5	16

9.3 Interior Arroyo North-East Wind Driven Fire

(Figure 16) BehavePlus fuel model type SCAL 18 in the interior arroyo leading up to the future development. Encelia shrubs are present in the foreground.

9.3.1. BehavePlus Inputs:

Wind Direction: North-East wind moving to a south-west direction
Wind Speed: 50 mph wind speed, upslope, unsheltered
Slope: 60% degree slope.

9.3.2. BehavePlus Outputs:

Fuel Model	SCAL18	Grass 4	Grass Scrub 2
Max Rate of Spread (feet/min)	384	1,945	676
Fire Line Intensity (Btu/ft/s)	27,885	18,339	6,924
Flame Length (feet)	**49.9**	41.1	26.3

10 BehavePlus Calculation Results Analysis

The modeling for this Project used the extreme conditions in every case. Winds were modeled at or above the strongest gusts recorded over the past 10 years. Fuel moistures were estimated at or below those recorded in existing databases. Slopes were used that created the greatest impact for rate of spread (this is not always the steepest slope as the slope itself begins to shelter the fuel from the extreme aspects of the wind when it becomes a barrier).

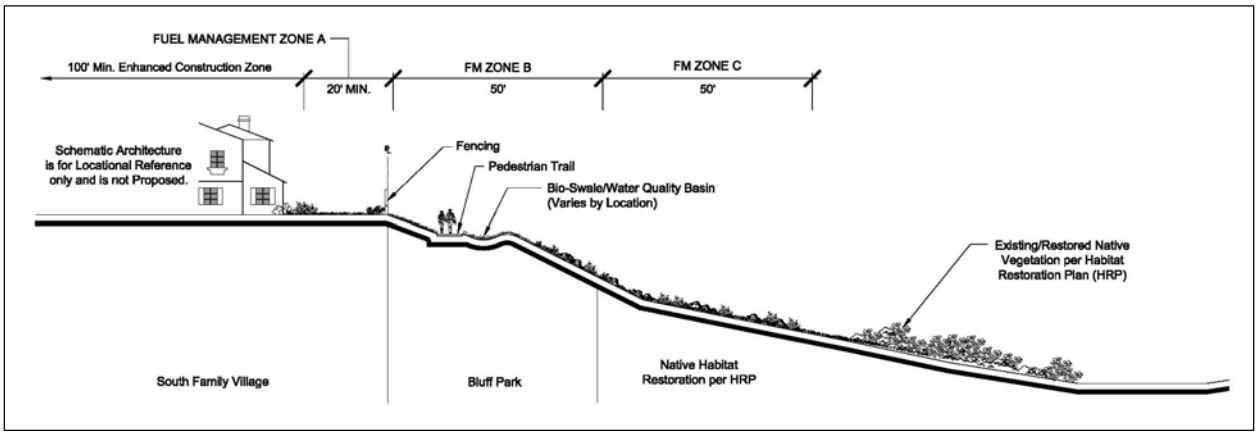
Three separate fuel models were used to project the maximum fire behavior for this Project. Southern California Model 18 (Sage/Buckwheat) was used for the interior pristine areas that will be allowed to continue in their natural state. Both grass (GR4 moderate grass, dry climate) and grass/shrub mix (GS2 moderate load, dry climate) models were used to insure that fire behavior was correctly modeled as the upland grassland interface matures.

It should be noted that while the GR4 model is more volatile in terms of rate of spread and flame length, the SCAL18 model has the greatest threat in terms of total volume of fire/heat and impact on the adjacent structures. Under the existing plan, the SCAL18 fuel will always be separated from the structures by the grassland mosaic (Zone "C") and the modified management fuel zones (Zone "A" and Zone "B"). The fuel management system has been designed so that SCAL18 fuel is no closer than 120 feet from the structures. The maximum flame length in the SCAL18 zone is 49.9 feet. For this reason, the Zone "C"/habitat area is never less than 50 feet in width and in many cases is two times the minimum.

The grass/shrub mosaic interface (Zone "C") will produce a maximum flame length of 41 feet in the worst case scenario. This would be a wind-driven fire, traveling upslope, in extreme weather (low humidity and high temperature), unsheltered and with a continuous fuel bed. This zone will double as a raptor habitat. It will not be thinned or modified for fire management but it will be maintained by "hand plucking" materials which are not on the approved palette. It will start out as primary grassland mosaic and may eventually become a grass/shrub mixture. It was modeled in both configurations. The Zone "C" is not irrigated. The maximum flame length that can be achieved at the Zone "B"/Zone "C" juncture is 41 feet. For this reason, the Zone "B" minimum width is 50 feet.

Zone "B" is irrigated and will provide the necessary buffer for a defensible space. The heat sink properties of Zone "B" will result in a 75% flame length reduction in this zone. This is due to the Zone "B" being cleared, replanted, and permanently irrigated with only plants listed on the approved plans. Plants are originally installed and maintained conforming to code-required horizontal spacing arrangements. Due to the fact that the Zone "C" has a low fuel loading in term of duration of flame front, the actual flames from the Zone "C" will be significantly reduced prior to reaching the Zone "B". The duration of the flaming front should not be long enough to remove enough moisture from the Zone "B" plants to have them ignite. As long at the dead and duff components of the Zone "A" and Zone "B" maintenance plans have been followed, no fire will move past Zone "B". Zone "A" is the buffer that provides for the defensible space. While no direct flame is intended at the Zone "A" juncture with Zone "B", an additional area of 20 feet is provided that will allow fire crews to safely position themselves into that interface between the wildland and the structures for suppression efforts.

The arrangement of the zones is shown in an example below:



Structure ignition from wild vegetation fires comes mostly from two sources, firebrands and radiant and convective heat. Ignition of a structure by convective heat transfer requires direct flame impingement. If the flame lengths are less than the measured distance to non-managed combustible vegetation from a structure, there is a probability of structure ignition. This is not the case with this Project. The future structures will not ignite from the direct effects of fire as they are never within a distance which provides for a possibility of ignition. Fires in fuels measured directly outside the fuel management zones do not have sufficient flame lengths to contact the homes.

During strong and dry winds, convective firebrands have the capability of being carried by drafts and strong winds for long distances. The chance of firebrands igniting a structure will depend on the size of the firebrand and the type of receptive construction materials on the structure. Firebrands landing on combustible roofing and decks are common sources for structure ignition. Firebrands can also enter a structure through broken windows, unscreened vents, decks and chimneys, and any small opening.

The chance of a structure fire caused by firebrands is not a concern for the NBR as **all homes** will be constructed with Class A roofing and roofing assemblies and attic venting requirements from Chapter 7A from the 2007 California Building Code (CBC). In addition, **all structures adjacent to a fuel management zone** will further be constructed to meet the minimum requirements of Chapter 7A for exterior wall and eave surface, window and door requirements, appendages and underfloor protection. Therefore, due to the fact that mostly non-combustible building materials will be used in the construction of structures, the radiant heat issue needs to be addressed.

Wildland fires could cause ignition to existing developments by radiating heat to a structure. Radiation exposure depends on the intensity and the duration of the fire. Radiant heat decreases as the distance between the fire and the structure increases. Single-pane windows are subject to breaking from radiant heat and provide an opening for embers to enter a structure. Structure windows adjacent to fuel management zones will be dual pane with one pane tempered in case of an ember hitting a heated window. Radiant heat has a short lifetime in a concentrated area because the fire passes by structures that have been constructed to the latest codes and continues to move onward.

Radiant and convective heat transfer energy is not enough to reach the future structures to the point of ignition because the fuels measured are more than 100 feet away from the homes when you total the distance of the management zone and the structure setbacks. See the following information regarding a valid structure assessment model used by the Forest Service and professionals throughout the nation titled “SIAM”.

Flames and fire intensity are significantly reduced within the fuel management zone. The fuel management zone also reduces the amount of embers projected into the air because the area is replanted with plants with greater fire-resistive characteristics and the plants are spaced and thinned.

11 Structure Ignition Assessment Model (SIAM).

A USDA Forest Service research study and report titled “Structure Ignition Assessment Model (SIAM)” by Jack D. Cohen, Intermountain Fire Science Laboratory, Missoula, Montana, has helped to validate how much distance is required to keep structures from igniting due to wildland fire radiant heat.

SIAM research further suggests that for reducing structure ignitions from radiant and convective heat sources, vegetation management (fuel treatment) beyond some relatively short (100 feet) distance from a structure built of non-combustible materials has little significant benefit for reducing flame generated ignitions. Vegetation management cannot be practically extensive enough to significantly reduce airborne firebrand ignitions landing on combustible roofs or other fuel beds on privately controlled land around a home. In lighter fuels such as grass and short grass, fuel treatment can be reduced to 50 feet and still protect a structure that is built of non-combustible materials.

Project structures will be set back even further from the intensity of a fire burning outside the limits of the fuel management zone. Back and side yards incorporate ornamental plants and trees in a turf or planter type setting. Fire suppression efforts combined with the fuel management zone protection and the latest building construction practices will ensure the best possible outcome for a safe development.

12 Report Summary

This development is designed and protected by the most recently developed codes. BehavePlus was used estimate the maximum intensity of fire moving towards this development, and flame lengths and fire intensity will be ultimately be reduced by the installation and maintenance of the FMMP.

Using a systematic approach, the threats presented by the vegetation that will remain after the completion of this Project have been mitigated to a point where they do not present a risk to the structure or occupants of this Project once completed. The use of fuel management, enhanced construction features, and ongoing maintenance will insure that this community remains protected from the threat of wildfires as long as the conditions required by this program are in compliance.

NBR F&LSP Attachment 4

May 12, 2010

Mr. Steve Bunting
Fire Marshall/Chief Fire Prevention Division
Newport Beach Fire Department
3300 Newport Boulevard
Newport Beach, CA 92658-8915

SUBJECT: **Alternate Means and Methods for Fuel Management**
Newport Banning Ranch Planned Community
Newport Beach, CA

On behalf of Newport Banning Ranch LLC, we hereby submit a request for use of Alternate Means and Methods (AM&M) per the 2007 California Fire Code. Our request relates to our proposal to provide a total fuel management width of 120 feet, which is less than the standard 170 feet.

The following information is being provided to assist in your evaluation of this proposed AM&M.

A. Project information:

- Project name: Newport Banning Ranch Planned Community
- Contact person: David Oatis, Firesafe Planning Solutions, (949) 240-5911
  302 N. El Camino Real, Suite 202, San Clemente, CA 92672
- Current landowner: Newport Banning Ranch, LLC
- Development type: Residential, resort, and commercial planned community

B. Code Sections for which the modification is requested:

- 2007 California Fire Code (CFC) Section 317 and local amendments.

C. General Description:

The Newport Banning Ranch Project is an approximately 401-acre master planned community in the City of Newport Beach. Consistent with the City's General Plan, the community will be composed of compact development with up to 1,375 single-family and multi-family residential dwelling units, a maximum 75-room resort, and up to 75,000 square feet of commercial uses. Pursuant to the General Plan, at least 50 percent of the site must be

retained in open space. Therefore, significant uses include approximately 231 acres of upland and lowland open space, and a 20-acre oil facilities consolidation site that will ultimately revert to open space. The General Plan also calls for a 20- to 30-acre community park. The plan proposes a 28-acre community park, a 21-acre bluff park, and approximately 4 acres of interpretive parks.

Newport Banning Ranch property is located north of West (Pacific Coast Highway), south of 19th Street, and east of the Santa Ana River.

The property has been a producing oil field since the early 1940s. It contains over 470 producing/potentially producing and abandoned oil well sites and related oil facility infrastructure, including but not limited to pipelines, storage tanks, power poles, machinery, improved and unimproved roadways, buildings, and oil processing facilities.

Today, and in addition to oil, the majority of the property contains non-native vegetation and invasive species. However, there is intact native vegetation on the Project site. Slopes along the southern and southwestern site boundary support maritime succulent scrub and disturbed coastal bluff scrub. The property supports several special status plants and protected wildlife species. The federally-listed threatened coastal California gnatcatcher and the coastal cactus wren (a California Department of Fish and Game [CDFG] Species of Special Concern) are present on the Project site.

The Project site is generally bound on the north by Talbert Nature Preserve/Regional Park in the City of Costa Mesa and residential development in the City of Newport Beach; on the south by West Coast Highway and residential development in the City of Newport Beach; on the east by residential, light industrial, and office development in the Cities of Costa Mesa and Newport Beach; and on the west by the USACE wetlands restoration area and the Santa Ana River. The City of Huntington Beach is west of the Santa Ana River. At its nearest point, the Project site is less than 0.25 mile inland from the Pacific Ocean.

There is currently no public access to the Project site.

D. Hardship:

Our hardship is: The inability to achieve a standard 170 feet of Fuel Modification width because of the simultaneous need to preserve open space and protect native habitat areas, consistent with the City's General Plan and California Coastal Commission policies.

E. Proposed alternative fire protection measures:

The Project proposes a minimum 120-foot-wide Fuel Management area that would be comprised of a minimum 20-foot-wide Zone A, a minimum 50-foot-wide Zone B, and a minimum 50-foot-wide Zone C. In many areas of the Project, Zone A is considerably wider than the minimum 20 feet, and the total width is considerably wider than the minimum120-foot-wide width, as shown on the Fuel Management Plan and cross-sections submitted with this letter.

Alternative fire protection measures are proposed as follows:

a. Enhanced Construction Zone – All structures on lots within 100' of the interior Fuel Management edge (i.e., FMZ "A") shall receive enhanced construction on all four (4) sides per 2007 California Building Code Chapter 7A and the 2007 California Fire Code Chapter 47 as locally amended by the City of Newport Beach. (CBC Chapter 7A and CFC Chapter 47 are provided as Attachments 2a and 2b, respectively, to this Fire and Life Safety Program.)

b. Ember Intrusion Zone – Structures outside the Enhanced Construction Zone as defined above will be treated as being within an Ember Intrusion Zone. These structures, which comprise all structures in the community exclusive of the Enhance Construction Zone structures, are subject to new CBC Chapter 7A requirements to mitigate ember intrusion, including:

1) 704A.1.2.....Roof Coverings
2) 704A.1.3.....Roof Valley Coverings
3) 704A.1.5.....Roof Gutters
4) 704A.2.....Attic Vents
5) 704A.2.2.....Eave and Cornice Vents
6) 704A.3.2.1.....Exterior Wall Vents
7) 704A.4.1.1.....Decking Surfaces
8) 704A.4.2.1.....Underside of Appendages and Floor Protection
9) 704A.4.2.2.....Unenclosed Underfloor Protection

c. Sprinkler Systems – All single-family and multi-family homes shall be constructed with an approved modified NFPA 13 Automatic Fire Sprinkler System installed by a licensed fire sprinkler contractor. All commercial use buildings shall be constructed with an approved full NFPA 13 Automatic Fire Sprinkler System installed by a licensed fire sprinkler contractor. Separate plans shall be submitted to the Fire Department for approval prior to installation.

Thank you in advance for your consideration of this proposed AM&M request. Please feel free to call me with any questions or requests for additional information.

Sincerely,

David Oatis, President
Firesafe Planning Solutions for Newport Banning Ranch LLC