Appendix 5.11-1 Alternate Methods and Materials, Fire Apparatus Access Roads

Appendices

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Alternate Methods and Materials
Fire Apparatus Access Roads

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June 1, 2016

Project:
Residential Care Facility
959 Genevieve Street
Solana Beach, CA 92027

Prepared For:
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1 Introduction

The California Fire Code (CFC) Section 503.1.1 requires that fire apparatus access roads be provided for buildings that extend to within 150 feet of all portions new buildings and all portions of the exterior walls of the first story of new buildings. This distance is based on the standard pre-connected hose lengths carried on fire apparatus.

Exception 1 to this code provision allows the fire official authorization to increase the dimension of 150 feet where the building is equipped throughout with an approved automatic sprinkler system installed in accordance with CFC Section 903.3.1.1 or 903.3.1.2. Exception 2 to this code provision allows an increase in the 150-feet dimension where fire apparatus access roads cannot be installed because topography and location on property prevents compliance and an alternative means of fire protection is provided.

This report provides a fire protection engineering design to support an increase in the 150-feet dimension based on the use of automatic fire sprinklers for compliance with CFC 503.1.1 Exception 1 and additional building and fire suppression enhancements that meet the intent of CFC Section 503.1 for Compliance with Exception 2 as an Alternate Method per CFC Section 104.9.

2 Codes and Standards

The following codes and standards were used for the preparation of this report:

- California Building Code (CBC) – 2013 Edition.
- California Fire Code (CBC) – 2013 Edition.
- Nation Fire Protection Association (NFPA) Standard 1, Fire Code 2012 Edition.
- Nation Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems, 2013 Edition.
- Nation Fire Protection Association Research Division, U.S. Experience with Sprinklers, J. Hall, 2012

The authority having jurisdiction (AHJ) is the Solana Beach Building and Fire Departments.

3 Project Description

The proposed building will be located at 959 Genevieve Street in Solana Beach, California. The building occupancy is R-2.1 on Floors (story) 1 and 2 with a gross combined floor area of 69,743 square feet; and occupancy S-1 parking on basement Floor B1 with a gross floor area of 20,198 square feet. Basement parking construction is Type I-A and residential construction above is Type V-A. A perspective view of the building is provided in Figure 1 and an overall site plan and individual floor plans are provided in Figures 2 and 3, respectively.

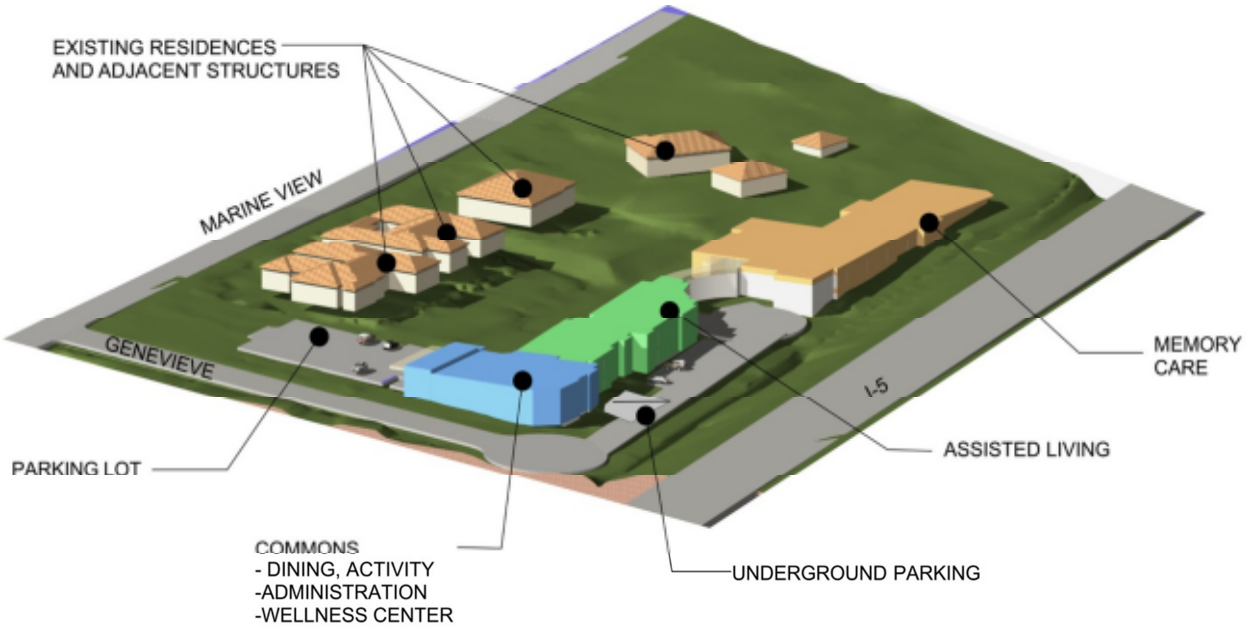

Figure 1 –Exterior perspective view of building.

Fire apparatus access roads are provided along the building frontage at Genevieve Street and the private roadway on the site. The grade level parking lot accessed from Genevieve Street can also be used to access the buildings.

The building is divided into north Buildings D & E and south Buildings A & B which are connected with a circulation hall, Building C. Fire walls constructed in accordance with CBC Section 706 separate each Building A through D. The long narrow shape of the building site prevents compliance with the prescriptive code requirement to provide access within 150 feet of all portions of the building exterior.

Figure 2 –Building site plan.

Figure 3 –Building floor plans.

4 Code Requirements & Intent

CFC Section 503.1.1 establishes a requirement for fire apparatus access roads and the maximum distance from buildings or facilities to fire apparatus access roads. The provisions intend to limit the maximum length of fire hose needed to reach any point along the exterior of a building or facility from a fire department vehicle. An access road is required to extend to within 150 feet of all portions along the exterior wall of the grade level story of each new building. The 150 foot distance is based on the standard length of pre-connected hoses carried on fire apparatus and is not intended to be measured to any point within the building.

A sample layout of a prescriptive code compliant fire apparatus access road configuration is provided in Figure 4. A compliant layout can be achieved where all exterior walls are 150 feet in distance from the access road.

Pre-connected hose lines on pumping fire apparatus are normally 200 feet to 250 feet in length. The 150 foot requirement allows fire fighters to stretch hose lines to a building access point on any exterior wall with a normal fire-fighting crew and have sufficient hose for fire-fighting operations inside the building.

Fire hydrant-to-building proximity and location along the fire apparatus access road also affect the hose length needed for firefighting efforts. Pumping fire apparatus require a suction line from a fire hydrant. Therefore, strategically locating fire hydrants along the access road aids in fire apparatus positioning to minimizing the distance fire fighters need to stretch fire hose.

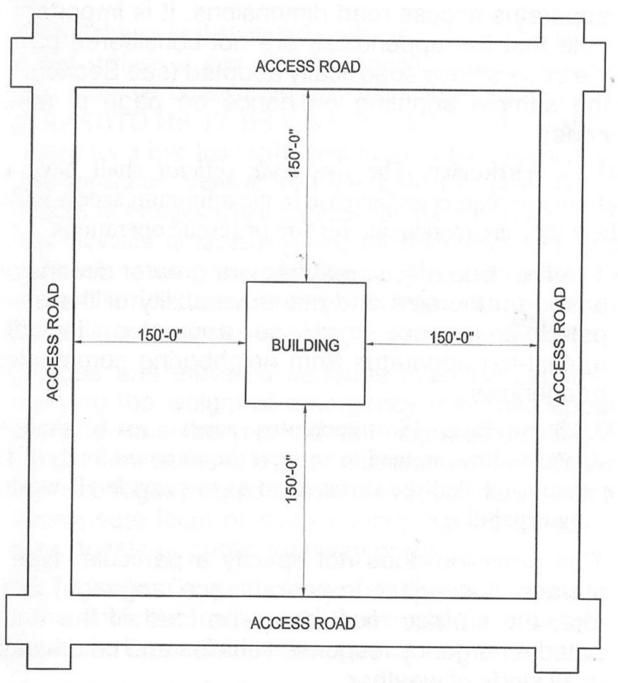

Figure 4 –Sample fire apparatus access road layout.

In determining the application of CFC Section 503.1.1, it should be considered that in order for the fire department access to be effective, an exterior wall would need to have openings through which access to the interior of the building could be achieved by hose streams or personnel. Therefore, buildings locations which allow openings in the exterior walls and where openings are provided benefit firefighting efforts.

Exception 1 to CFC 503.1.1 allows the fire code official authorization to increase the dimension beyond 150 feet where the building is equipped throughout with an approved automatic sprinkler system installed in accordance with CFC Section 903.3.1.1 or 903.3.1.2.

This exception acknowledges that automatic sprinklers are highly effective and a reliable element of total system design for fire protection in buildings.

The large number of sprinklered buildings which have been constructed provided sufficient loss history data on sprinkler performance; it is now possible to understand the value of automatic sprinkler protection. The sprinkler systems provide building fire protection, lessening the fire department suppression burden and the water supply need on the fire department. Also, the record of automatic sprinkler system performance is significant. NFPA records show that 96 percent of all fires in sprinklered buildings are controlled or extinguished by the sprinkler system, with a large percentage of these fires controlled by no more than two or three sprinkler heads.

The CFC does not provide the fire code official guidance on how much increase over 150 feet is reasonable and each case must be evaluated individually. However, NFPA Fire Code 1, 2012 Edition does provide a code reference which allows an increase in fire department access roads length to 450 feet for buildings protected throughout with an automatic fire sprinkler system.

Exception 2 allows an increase in the 150-feet dimension, where fire apparatus access roads cannot be installed because topography and location on property prevents compliance and an alternative means of fire protection is provided. Alternate means generally will include additional building and fire suppression components to minimize fire size and fire spread and to aid in firefighting operations. These “alternate means” provide an equivalent level of protection to that of 150 foot fire apparatus access roads.

5 Proposed Fire Protection Engineering Design

Automatic fire sprinklers will be provided as detailed for compliance with CFC 503.1.1 Exception 1; and additional alternate building features and fire protection enhancements that meet or exceed the intent of CFC Section 503.1.1 for compliance with Exception 2 as an Alternate Means. The following fire protection engineering design will be provided to meet the intent of CBC Section 503.1:

1. Provide an automatic fire sprinkler system throughout all buildings for compliance with CFC 903.3.1.1, NFPA 13 sprinkler systems. Although a full NFPA 13 system will be provided, increases for building height per CBC 504.2 or increases for building area per CBC 506.3 are not applied.

2. Provide a combined Class I manual standpipe system within the stair enclosures in accordance with CBC Section 905. Standpipes are not required in buildings three stories or less where the highest occupied floor level is 30 feet or less above or below vehicle access.

3. Provide two stair enclosures (Building A and Building D) that extend to the roof and provide standpipes described in Item 2 above at roof level adjacent to the stairs. All stair enclosures will be 2-hour where only 1-hour is required.

4. Provide exterior horizontal Class I manual standpipes around the perimeter of the buildings. These standpipe connections eliminate the need for long hose pulls where the code specified 150 foot access road dimension is exceeded.

5. Use fire walls (CBC 706) to create five separate Buildings (A, B, C, D & E) each separated with 2-hour rated wall construction. Building areas are well below allowable area/height and increases for yards or automatic sprinklers are not applied.

6. Provide a total coverage smoke detection system throughout all building areas. Smoke detection is required in areas utilizing timed delayed egress devices, however, detection will be provided throughout all building areas to provide early activation of the fire alarm system.

7. Design Building C, which functions as a circulation hallway between the buildings, to facilitate access through this building for firefighting operations behind the buildings. This includes non-combustible construction, fire walls at each end of the hallway, perimeter glazing to allow clear visual view through the building to the accessible route behind the buildings, minimal building size, low fuel loading, and doors that unlock during alarm conditions.

8. Provide a water supply for fire firefighting that exceeds the minimum required fire flow and locate new fire hydrants (both private and public) for ideal fire pumper location relative to building access points to minimize hose length for firefighting.

5.1 Automatic Fire Sprinklers

Automatic sprinklers are highly effective elements of total system designs for fire protection in buildings. They save lives and property, producing large reductions in the number of deaths during a fire, reduce the direct property damage during a fire, and especially in the likelihood of a fire with large loss of life or large property loss. When they operate, they are effective 96% of the time, resulting in a combined performance of operating effectively in 88% of reported fires where sprinklers were present in the fire area and fire was large enough to activate sprinklers.

Sprinkler systems are carefully designed to activate early in a real fire but not to activate in a non-fire situation. Each sprinkler reacts only to the fire conditions in its area. Water release in a fire is generally much less than would occur if the fire department had to suppress the fire, because later action means a larger fire, which means more water is needed.

The benefit provided to property and life through the installation of sprinkler system is indisputable. A sprinkler system properly designed for the hazards it protects will control or extinguish the fire, will confine the fire to the room of origin and typically do so with the operation of only a few sprinklers.

The advantage of automatic sprinklers tends to come in the following three scenarios:

1. A fire that would otherwise have spread beyond the room of fire origin will be confined to the room of origin, resulting in a smaller fire-damaged area and less property damage.

2. A fire that would otherwise have grown larger than the design fire area in a room larger than that area will be confined to the design fire area, resulting in a smaller fire-damaged area and less property damage.

3. A fire will be confined to an area smaller than the room or the design fire area, even though that degree of success goes beyond the performance assured by the design, resulting in a smaller fire-damaged area and less property damage.

The positive impact and value of sprinklers can be quantified through the following:

1. Reduction in life loss per fire or property loss per fire;

2. Reduction in the likelihood of large fire size or severity, such as fire spread beyond room of origin, multiple deaths, or large property loss; and

3. Qualitative performance as “effective” or “satisfactory” by fire investigators or incident reporters.

The validity of the high success rate of automatic sprinklers in the United States has been corroborated by two studies conducted in New York City (98.4 percent and 98.5 percent), two studies in Australia and New Zealand (99.8 percent and 99.5 percent), and a study completed by the United States Department of Energy (98.3 percent). Other conclusions of these studies are as follows:

1. Properly installed and maintained, automatic sprinklers are a highly effective safeguard against the loss of life and property from fire. Fire fatalities in sprinklered buildings have been reported only for persons closely involved with the fire ignition or exposed in an explosion or flash fire.

2. A significantly high percentage of fires are controlled by relatively few sprinklers. NFPA statistics indicated 85 percent of all fires are controlled by ten or less sprinklers and 70.1 percent of all fires are controlled by four or less sprinklers. Thus, firefighting in sprinklered buildings relies less on manual firefighting efforts when compared to non-sprinklered buildings.

3. A high level of reliable sprinkler performance is directly related to electrical supervision of the conditions which may impair sprinkler operation, such as system control values. The sprinkler control valves on this project will be electrically supervised.

A close examination of the various studies indicates that performance of automatic sprinklers can be expected to achieve a better level of performance than the statistics indicate. Sprinkler performance statistics are typically biased toward large fires. Major fires or fires which open many sprinklers are almost always reported, while there is not always a reason or incentive to report small fires opening one or a few sprinklers. The statistics thus become skewed toward large loss fires and portray sprinkler performance in a less favorable light than is really the case.

Primary reasons for automatic sprinkler failure as reported by the NFPA includes closed control valves, partial sprinkler protection, inadequate water supplies, combustible concealed spaces lacking sprinkler protection, sprinkler systems not designed for the hazard, and obstructions to sprinkler distribution.

The performance of automatic sprinkler systems can be significantly increased if the potential for failure can be reduced or eliminated by proper design considerations. Such considerations will be addressed for this project. Proper criteria for water supply and sprinkler densities and placement will meet the requirements of NFPA 13. Design and installation in accordance with these criteria will alleviate problems attributed to three of the primary failure modes – inadequate water supplies, sprinklers inadequate for the hazard, and obstructions to sprinkler distribution. Combustible concealed spaces, which are noted as a failure mechanism, will be properly protected in accordance with their construction type. Partial sprinkler protection is also not contemplated as a failure mode, since the building is fully sprinklered. Other reasons for failure, such as antiquated systems or frozen systems, will not be factors in these buildings.

Impairment of the automatic sprinkler systems (i.e., closed control valves) is responsible for the majority of sprinkler system failures. All valves controlling the water supply for automatic sprinkler systems will be electrically monitored. This function provides the means by which impairments of a sprinkler system will be immediately identified in time to allow correction before sprinklers are needed. With the potential for failure eliminated or greatly reduced by supervision of the sprinkler system and inherently removed by other design features, satisfactory performance can be expected to approach or exceed 99 percent.

The benefits provided by automatic sprinklers support an increase in fire apparatus access roads beyond 150 feet from the exterior building walls. Firefighters responding to a fire incident within a sprinklered building require less firefighting efforts when compared to firefighting in a non-sprinklered building. The NFPA Standard 1 recognizes this benefit and allow an access road length to 450 feet for sprinklered

buildings, and the code also allows the fire official the authority to increase the dimension of 150 feet when the building is equipped throughout with an automatic sprinkler system.

The proposed automatic sprinkler system will provide adequate sprinkler protection to control or extinguish a fire, limit fire growth, the production of smoke and other products of combustion and significantly limit required manual firefighting efforts.

Due to the excellent performance of automatic sprinkler systems, the use of CFC 503.1.1 Exception 1 provides an equivalent level of protection to that prescribed by the code. Sprinklered light-hazard occupancies have an excellent loss history record and this alternate method meets the standard of safety compliant with the intent of the code and substantiates an increase in the fire apparatus access roadway dimension beyond the code specified 150 feet as detailed herein.

CBC 903.2.8 specifics that a NFPA 13R system may be used in R-2.1 occupancies when the sprinkler system is not used in accordance with CBC Section 504.2 or 506.3 for building height or building area increases. In other words, when building height and building area increases are applied, a full NFPA 13 automatic sprinkler system is required per CBC 903.3.1.1.

The proposed building does not apply increase to the basic allowable height and area in CBC Table 503, and therefore, a NFPA 13R automatic sprinkler could be used. The proposed design uses a NFPA 13 system in compliance with CBC 903.3.1.1 to provide complete sprinkler coverage throughout the buildings and additional sprinkler density/area for extinguishment or control of fire.

5.2 Standpipes, Stairs to the Roof & Exterior Horizontal Standpipes

The standard operating procedures (SOPs) of most fire departments require one of the first-response pumpers to pump into the fire department connection (FDC) of the sprinkler system. In this way, water pressure and volume to the system can be increased, making the sprinklers more effective and providing required pressure to hose line nozzles through the standpipe system.

The building/fire code or city code amendments do not prescriptively require standpipes for this project.

The proposed combined manual Class I standpipe system will allow standpipes in the stair enclosures, exterior horizontal standpipes and the automatic sprinkler system to be charged through the FDC connection.

Exterior horizontal standpipes allow firefighting operations around the perimeter of the buildings without excessive hose lengths. These standpipe connections will be located at building exits which allow for both firefighting efforts within the buildings or from the exterior.

Standpipes within all stair enclosures will be added to provide interior firefighting without long hose lengths. Standpipes are only mandated by the code for buildings four or more stories in height and more than 30 feet above vehicle access.

The buildings includes four stair enclosure and standpipes within each enclosure providing more flexibility in firefighting tactics as firefighters carrying single hose packs can quickly connect to the standpipe system and avoid long hose pulls from the building exterior.

Roof access via two stair enclosures with adjacent standpipe connections provides similar benefits and quick roof access, a roof accessible water supply for hose connections and a strategic advantage during firefighting.

Stair enclosure fire resistance rating will be increased from the code required 1-hour to 2-hour, providing both occupants and firefighters additional protection from fire exposure.

5.3 Fire Walls

Confining fire is one of the most important principles to be followed when planning fire control for a building[1]. The basic area and fire resistive limitations in the CBC have been based upon a consideration of building use and type of construction. These two parameters are used to limit building size, define the maximum size of the fire compartment, and specify fire resistance.

For this project, the building areas provided do not exceed basic allowable area of 10,500 square feet per Table 5-B without considering increases. For sprinklered buildings using a NFPA 13 system, area increases may be used to allow a maximum building area of 31,500 square feet per building floor. This would allow the proposed building to be constructed with one fire wall.

None of the building areas approach the 31,500 square foot allowable limit for a sprinklered building. The maximum single floor area of the largest building (Building E) is 9,891 square feet and the minimum single floor area of the smallest building (Building A) is 5,472 square feet, excluding Building C which is 1,050 square feet per floor and serves as a circulation between the buildings.

The use of multiple fire walls creates building compartments significantly less in area than that allowed by code. In addition, each building area created with the fire walls is further compartmented with fire partitions at each residential unit. The residential perimeter wall construction and corridors in each building uses fire partitions constructed of one-hour fire resistive materials. This creates a building with a small number of living units per story within a compartment created by the fire wall construction, and additional compartmentation created by the individual living units.

The degree of compartmentation within this residential building limits the size and severity of a fire that may potentially develop, and prevents fire and smoke migration beyond the fire origin. This provides building fire safety through passive construction materials that reduces the potential for a large fire scenario, therefore reducing necessary manual firefighting efforts.

[1] Shorter, G.W., *The Fire Protection Engineer and Modern Building*, Fire Technology.

5.4 Total Coverage Smoke Detection System

The buildings will be provided with an automatic fire alarm system in accordance with CBC Section 907.2.9 A code compliant system would consist of notification devices (audio and visual) activated by waterflow from the sprinkler systems, a manual fire alarm system and local single or multiple station smoke detectors within the individual residential unit.

Smoke detection is required and provided above the doors (spot detections) at the Level 2 exits of Buildings A & B. This includes four door locations: one exit to memory garden, one exit to Building C and one exit at each exit-enclosure (two locations) which uses delayed egress locks. Smoke detection is per CBC Section 1008.1.9.7.

However, the system will be upgraded to include a full coverage smoke detection system throughout all buildings. This provides early fire department notification of a fire event and early occupant egress from the buildings. The proposed design includes smoke detectors in the corridors and common areas of the building. These detectors, in addition to waterflow from the sprinkler systems, will initiate notification devices within the building and simultaneously automatically transmit a fire alarm to an approved central station and a constantly attended location within the building.

Occupant and fire department notification of a fire event will be improved, thus occupants will begin the egress and evacuation process sooner and firefighting efforts will begin sooner, when building conditions are more favorable.

5.5 Building C Design

Building C provides facility ingress/egress and occupant circulation between the main Buildings A & B to the south and Buildings D & E to the north. The Alternate Means includes fire apparatus access road distance to the exterior of the buildings as measured through Building C to provide exterior access on both the east and west sides of the buildings. Figure 5 shows the location of Building C relative to the buildings to the north and south and the benefit provided by site access through the building.

Access through a building is not considered as an approved route around the exterior of the building. However, in lieu of providing an open breezeway between the main buildings, the Alternate Means includes Building C design and construction to facilitate firefighting operations that pass through this building to gain exterior building access. This is done to supplement fire department access around the exterior of the building, improve access and reduce the length of hose needed.

The Building C is limited in size (1,050 square feet per floor), has a width of approximately 11.5 feet and is separated from Building B and D with 2-hour rated fire walls at each end of the hallway. Construction materials are non-combustible and construction is Type V-A.

The perimeter construction is storefront glazing and six pair of double doors (three per side) provides a clear visible view of the interior Lobby and allows visibility through the Lobby into the exterior access path around the building exterior.

Because of the nature of its use as occupant circulation, fire loading will be low and furnishings will not be utilized. The building will remain clear for occupant movement which will allow for fire department access through the building at all times.

Activation of the building fire alarm system (manual or automatic) will automatically unlock the exterior doors that serve Building C.

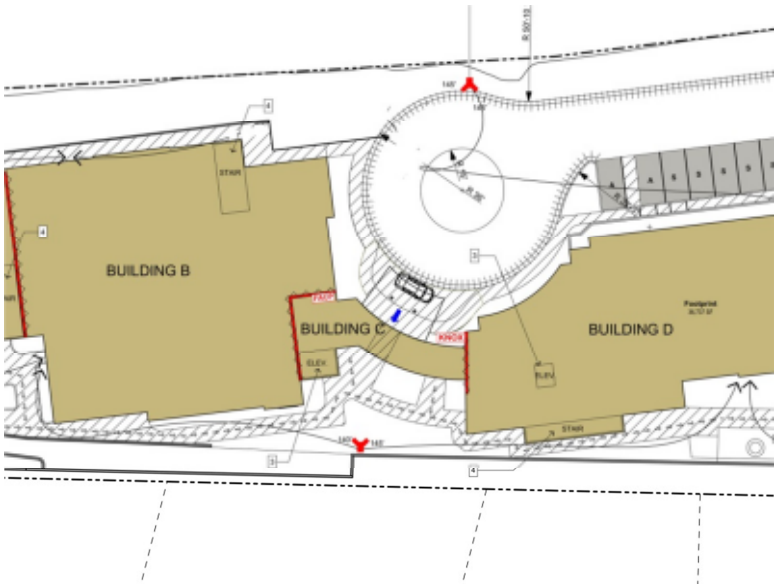

Figure 5 –Building C .

5.6 Water Supply and Fire Hydrant Layout

The required fire flow (water required for fighting fire) is determined according to CFC Appendix B, *Fire Flow Requirements for Buildings*. The fire flow requirement is intended to provide sufficient water supply to limit fire spread within the building and prevent fire spread to adjacent buildings.

Total Building Area:

69,743 square feet (Type V-A) + 20,198 square feet (Type IA) = 89,941 square feet

Base Fire Flow Per Construction Type:

Type V-A at 69,743 square feet = 4,750 gpm
Type I-A at 20,198 square feet = 1,500 gpm

Percent of Building Area:

V-A = 69,743/89,941 x 100 = 78%
I-A = 20,198/89,941 x 100 = 22%

Base Fire Flow:

0.78 (4,750 gpm) + 1,500 gpm (min. allowed) = 5,205 gpm

Adjusted Reduction For Fire Sprinklers:

50% applied, up to 75% reduction allowed as permitted by AHJ.
0.50 (5,205 gpm) = 2,600 gpm for a duration of 2-hours

The following flow test information was provided by Dexter Wilson Engineering, Inc. on behalf of the Santa Fe Irrigation District. The water supply analysis is provided in a letter dated June 21, 2016 and is attached to this report:

Simulation:	No. 1A FH1	No. 1A FH2
Date:	06/21/16	06/21/16
Location:	959 Genevieve St.	959 Genevieve St.
Static Pressure:	99 psi	93 psi
Residual Pressure:	76 psi	71 psi
Flow:	1250 gpm	1250 gpm

Simulation No. 1A was run with fire hydrant FH1 and FH2 flowing simultaneously for a combined flow of 2500 gpm.

Simulation:	No. 1B FH1	No. 1B FH2
Date:	06/21/16	06/21/16
Location:	959 Genevieve St.	959 Genevieve St.
Static Pressure:	99 psi	93 psi
Residual Pressure:	20 psi	20 psi
Flow:	2300 gpm	2300 gpm

Simulation No. 1B was run with fire hydrant FH1 and FH2 flowing simultaneously for a combined flow of 4600 gpm.

The available water supply at 20 psi can be calculated utilizing the following equation for water at about 60°F:

$$Q = Q_F \left(\frac{P_S - P}{P_S - P_R} \right)^{0.54}$$

Where:

P = Specified pressure
P_S = Static Pressure, flow test
P_R = Residual pressure, flow test
Q_F = Flow in flow test
Q = Flow at specified pressure

This calculation was performed for flow test No. 1A and the flow calculated as 2433 gpm for FH1 and 2388 gpm for FH2. This is a combined flow of 4822 gpm at 20-psi which correlated well with the simulated calculation No. 1B of 4600 gpm.

The Public Works Department is capable of supplying water through the supply grid for a duration of 2-hours.

Therefore, the fire flow is adequate for the project as proposed and provides almost double the code specified flow based on building area and construction type.

6 Discussion

In lieu of providing fire apparatus access roads within 150-feet of all portions of the building exterior, the code provisions of CFC 503.1.1 Exception 1 and 2 are used and include an Alternate Means. Exception 1 allows the fire code official authorization to increase the dimension of 150-feet where the building is equipped throughout with an approved automatic sprinkler system; and Exception 2 allows an increase in the 150-feet dimension, where fire apparatus access roads cannot be installed because topography and location on property prevents compliance and an Alternative Means of fire protection is provided.

The long narrow shape of the building site and site topography prevents compliance with the prescriptive code requirement of access within 150-feet of all portions of the building exterior.

Building features provided as an Alternate Means engineering design in lieu of 150-foot access include: automatic sprinkler protection; Class I standpipes within stair enclosures, Class I standpipes at roof level and Class I horizontal standpipes around the building exterior; building separation and compartmentation using multiple fire walls; a total coverage smoke detection system; Building C design to facilitate access through the building, thus further reducing access length around the building; and fire hydrants located to minimize access length and adequate fire flow needed for firefighting.

The provisions of the code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by the code. However, CFC 503.1.1 is different in that the Exceptions call out specific provisions where the code official may allow an increase in access road dimension, namely sprinklers and site specific conditions.

The CBC assumes a fundamental difference in required firefighting effort when fire sprinklers are provided. The 150-foot access road dimension has existed in the code for decades and referenced standards, code commentary and engineering opinion (supported by fire loss history and automatic sprinkler performance) support an increase in access road length beyond 150-feet for sprinklered buildings.

The ability of automatic fire sprinklers to control and/or extinguish fire has been recognized in many studies.

The primary requirement for these code provisions is to limit the maximum length of fire hose needed to reach any point along the exterior of a building or facility from a fire department vehicle. However, the CFC specifically allows for an Alternate Means when conditions exist that prevent compliance with this provision.

The proposed design includes multiple building features to support and increase in access road length. These are detailed in Section 5 of this report and each provide direct mitigation to the increase in access road length and the code intent of limiting fire hose length needed to reach any point along the building exterior and to minimize required firefighting efforts.

7 Summary

The proposed Engineering Design addresses the code intent that fire apparatus access roads be provided for buildings that extend to within 150 feet of all portions of the building and all portions of the exterior walls of the first story of the building.

Exceptions to this code provision allow an increase in the dimension of 150 feet where the building is equipped with an approved automatic sprinkler system and where fire apparatus access roads cannot be installed because topography and location on property prevents compliance.

This report provides and Alternate Means technical analysis to increase the dimension of the access roads.

Building features provided as an Alternate Means engineering design in lieu of 150-foot access include: automatic sprinkler protection; Class I standpipes within stair enclosures, Class I standpipes at roof level and Class I standpipes around the building exterior; building separation and compartmentation using multiple fire walls; a total coverage smoke detection system; Building C design to facilitate access through the building, thus further reducing access length around the building; and fire hydrants located to minimize access length and adequate fire flow needed for firefighting.

This engineering design meets the intent of the code and provides a suitable, effective and a safe Alternate Means utilizing exceptions to the code provision that allow an increase in the dimension of 150 feet.

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Appendix A – Water Supply Analysis

DEXTER WILSON ENGINEERING, INC.

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June 21, 2016

Santa Fe Irrigation District
5920 Linea Del Cielo
Rancho Santa Fe, CA 92067
Phone: 858-756-2424

Re: **Preliminary** Fire Flow Analysis for 959 Genevieve Street

A preliminary fire flow analysis was requested from SFID by the owners of the subject property. The analysis was conducted based on the ability to deliver a residual pressure of 20 PSI in the surrounding area which is typical for the City of Solana Beach Fire Department. The project however has yet to receive official fire flow requirements from the city. Upon receiving the official requirements, this analysis may have to be updated/revised. Use of the enclosed information is intended for background knowledge for the project and its future use as demonstration of meeting official requirements will be subject to approval by both the City of Solana Beach Fire Department and the SFID.

Fire Analysis Location

- Address: 959 Genevieve Street
- City: Solana Beach
- State: CA, 92075
- APN: 298-390-51
- Map Grid: 298-1689 D3
- Description: One hydraulic model runs were conducted for this analysis.

2234 FARADAY AVENUE • CARLSBAD, CA 92008 • PH (760) 438-4422 • FAX (760) 438-0173

Model Run 1:

At two proposed public fire hydrants. A proposed public fire hydrant (FH1) is located northwest of the property and a proposed public fire hydrant (FH2) is located northeast of the property connected to the 8-inch pipeline (340 Zone) located in Genevieve Street. (Exhibit A).

Model Run 1 Data:

Assumed Proposed Public Fire Hydrant (FH1) Data:

Pressure Zone:	340 Zone (HGL = 340 feet)
Hydrant Elevation:	111.5 feet
Static Pressure:	99 psi

Assumed Proposed Public Fire Hydrant (FH2) Data:

Pressure Zone:	340 Zone (HGL=340 feet)
Hydrant Elevation:	125 feet
Static Pressure:	93 psi

Model Run 1A

2,500 gpm During Maximum Day Demands at Fire Flow Analysis Location:

The existing system is capable of delivering 2,500 gpm, with 1,250 gpm through FH1 and 1,250 gpm through FH2. The residual pressure at this flow rate was 76 psi at the proposed hydrant FH1 and 71 psi at the proposed hydrant FH2.

Model Run 1B

Fire Flow Analysis to Determine Flow at 20 psi Residual:

The existing system is capable of theoretically delivering 4,600 gpm combined through the proposed fire hydrants (2,300 gpm through FH1 & FH2) with a residual pressure of 20 psi in the surrounding area.

LEGEND

PRESSURE (psi)

- Less than 20
- Greater than 20

N

ACADEMY DR
MOLA VISTA WY
PRS202-1
GENEVIEVE ST
JUANITA ST
VERA ST
FRESCA CT
STEVENS AV
HERNANDEZ ST
VALLEY AV
IDA AV
SINARDO AV
CASTRO ST
VIVA CT
I-5 NB
I-5 SB
PRIVATE RD
PRS340-3
SOLANA DR
LOS CABALLITOS ST
GENEVIEVE ST
FH1
FH2
HYDRAULIC ANALYSIS LOCATIONS
959 GENEVIEVE STREET
MARINE VIEW AV
HIGHLAND DR
RAMONA PL
PRS340-4
AVOCADO PL
W AVOCADO PL
E AVOCADO PL
CLIPPER CT
AMERICA WY
FREEDOM CT
SAN JULIO DR
TIERRA ALTA
SAN ANDRES DR
LADERA LINDA

0 150 300 600 Feet

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

EXHIBIT A

MAXIMUM DAY DEMAND WITH
2,500 GPM FIRE FLOW SPLIT
BETWEEN TWO FIRE HYDRANTS

Date Saved: 6/21/2016 9:37:33 AM
Document Path: \\artic\gis\134001-6\InfoWater Data\WORKING GIS MODEL\Fireflow\2016-06-21_959GenevieveStreet\959GenevieveStreet_Exhibit-A.mxd

From:	Natalie Fraschetti
To:	Donald Ward
Subject:	FW: Fire Flow analysis
Date:	Wednesday, June 15, 2016 11:52:49 AM
Attachments:	image001.png HYDRANTS.pdf

Don,

This is a preliminary SFID fire flow request. Please prepare a fire flow analysis assuming 2,500 gpm split between the two proposed hydrants. The report should be prepared in our typical format; however, I'll have some modifications to the text. We need to complete this by the end of day Tuesday.

Thank you.

Natalie Fraschetti, P.E.
Dexter Wilson Engineering, Inc.
Office: (760) 438-4422, ext. 106
Cell: (858) 539-9081

From: Will Mack [mailto:wmack@plsaengineering.com]
Sent: Wednesday, June 15, 2016 11:47 AM
To: Natalie Fraschetti <Natalie@dwilsoneng.com>
Subject: RE: Fire Flow analysis

Hi Natalie,
I did any overlay of the new hydrant locations and noted the elevations in red on the prelim grading plan. The hydrants will be located approximately 13 ft over from the main. Let me know if you require any further information.

Thanks,
Will

Will Mack, P.E. | Associate Principal
PASCO LARET SUITER & ASSOCIATES
ph 858.259.8212 Ext. 112
fx 858.259.4812
535 North Highway 101, Ste A Solana Beach, CA 92075 | www.plsaengineering.com
Please visit us at our new website! www.plsaengineering.com

From: Natalie Fraschetti [mailto:Natalie@dwilsoneng.com]
Sent: Wednesday, June 15, 2016 8:27 AM

To: Will Mack
Cc: Marissa Potter
Subject: RE: Fire Flow analysis

Hi Will,

At the approval of SFID, we can provide a preliminary fire flow analysis to you. The District's fee for the analysis is $750. Once we receive notification from the District that the fee has been paid, I'll coordinate directly with you on running the scenario and providing the results. Note that once you have your official requirements from the Fire Department, you will likely have to go through this process again.

Marissa – Could you please provide Will with direction on how to make the $750 payment for this preliminary analysis?

Feel free to call with any questions.

Thank you.

Natalie Fraschetti, P.E.
Dexter Wilson Engineering, Inc.
Office: (760) 438-4422, ext. 106
Cell: (858) 539-9081

From: Will Mack [mailto:wmack@plsaengineering.com]
Sent: Tuesday, June 14, 2016 10:14 AM
To: Natalie Fraschetti <Natalie@dwilsoneng.com>
Subject: Fire Flow analysis

Hi Natalie,
I have a project located at 959 Genevieve St in Solana Beach and I need a preliminary fire flow analysis for planning purposes. We are looking to potentially add 2 hydrants on Genevieve at the locations shown. Typically the fire department will require at least 2,500 gpm at 20 psi residual. Andrew Oven suggested I contact you directly since this is just for preliminary design. Please let me know what need to happen in order to run the analysis.

Thanks,
Will

Will Mack, P.E. | Associate Principal
PASCO LARET SUITER & ASSOCIATES
ph 858.259.8212 Ext. 112
fx 858.259.4812
535 North Highway 101, Ste A Solana Beach, CA 92075 | www.plsaengineering.com
Please visit us at our new website! www.plsaengineering.com

copies of documents conveyed by Pasco Laret Suiter & Associates, Inc. may be relied upon. Any use of the information obtained or derived from these electronic files will be at the receiving party's sole risk.

PRELIMINARY GRADING PLAN FOR RESIDENTIAL CARE FACILITY 959 GENEVIEVE STREET

PREPARED FOR

PACIFIC SOUND INVESTORS, LLC

SITE ADDRESS

959 GENEVIEVE STREET
SOLANA BEACH, CA 92075

APN'S

298-390-51

LEGAL DESCRIPTION

PORTION OF LOTS 1 & 2 IN BLOCK 3 OF KENNEY'S MARINE VIEW GARDENS IN THE CITY OF SOLANA BEACH, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 1774 REC 12-31-1923 IN THE OFFICE OF THE COUNTY RECORDER OF SAID SAN DIEGO COUNTY. BEING PARCEL A OF CERTIFICATE OF COMPLIANCE RECORDED APRIL 28, 2003 AS DOC. NO. 2003-487729 OF OFFICIAL RECORDS OF SAID SAN DIEGO COUNTY.

BENCHMARK

ELEVATIONS SHOWN ON THIS MAP ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). THE BENCHMARK USED TO ESTABLISH SAID ELEVATIONS IS THE CITY OF SOLANA BEACH, CONTROL POINT NUMBER 2004, PER RECORD OF SURVEY 18971.

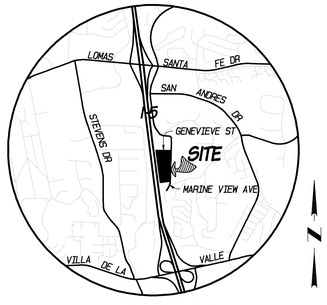
THE PUBLISHED NAVD88 ELEVATION OF SAID BENCHMARK IS 315.148 FEET. EPOC 2004.0

PROPOSED DISTURBED AREA

2.57 AC

LEGEND

DESCRIPTION	SYMBOL
SITE BOUNDARY	
RIGHT-OF-WAY CENTERLINE	
OFFSITE PROPERTY LINE	
EXISTING EASEMENT	
EXISTING CONTOUR LINE	134
EXISTING FENCE	X X
EXISTING WATER LINE	W
EXISTING SEWER LINE	S
EXISTING OVERHEAD UTILITIES	E
PROPOSED CONTOUR LINE	134
PROPOSED LIMIT OF GRADING	
PROPOSED BUILDING FOOTPRINT	
PROPOSED LOWER BUILDING LEVEL	
PROPOSED RETAINING WALL	
PROPOSED CUT SLOPE	
PROPOSED BROW DITCH	
PROPOSED DRAINAGE DIRECTION	
PROPOSED PERMANENT BMP AREA	
PROPOSED PVC STORMDRAIN	
PROPOSED DRAIN INLET	
PROPOSED RIP-RAP ENERGY DISSIPATOR	
PROPOSED CONCRETE DROP INLET	
PROPOSED BOX CULVERT	
PROPOSED CONCRETE WING HEADWALL	
TYPE G CATCH BASIN	
PROPOSED SAWCUT LINE	
PROPOSED G-2 CURB, GUTTER & G-7 SIDEWALK	
PROPOSED ROLLED CURB & DG SIDEWALK	
PROPOSED AC PAVING	
PROPOSED ENHANCED PAVING PER LANDSCAPE PLAN	



VICINITY MAP

NOT TO SCALE

PROJECT AREA TABULATION:

GROSS AREA: 126,875 SF (2.91 AC)
AREA OF DEDICATION: -347 SF
AREA OF STREET VACATION: +603 SF
NET AREA: 127,131 SF (2.91 AC)

ESTIMATED EARTHWORK QUANTITIES

27,200 CY CUT
1,200 CY FILL
26,000 CY NET EXPORT

NOTE:
GRADING QUANTITIES HEREON REPRESENT COMPACTED SOIL VOLUMES AND DO NOT ACCOUNT FOR SPOILS GENERATED FROM FOOTINGS OR UTILITY TRENCHES OR FOR REMEDIAL GRADING THAT MAY BE REQUIRED PER THE PROJECT GEOTECHNICAL RECOMMENDATIONS

TYPICAL SECTION GENEVIEVE ST.

NOT TO SCALE

TYPICAL SECTION MARINE VIEW AVE.

NOT TO SCALE

GRAPHIC SCALE 1"=30'

0 30 60 90

DATE PREPARED: 6/15/2016

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
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