CITYGATE ASSOCIATES, LLC
PUBLIC SAFETY SERVICES

STANDARDS OF COVERAGE AND MANAGEMENT/ADMINISTRATIVE ASSESSMENT

VOLUME 1 OF 2: TECHNICAL REPORT

CENTRAL FIRE PROTECTION DISTRICT OF SANTA CRUZ COUNTY

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EXECUTIVE SUMMARY

The Central Fire Protection District of Santa Cruz County (District) retained Citygate Associates, LLC (Citygate) to conduct a comprehensive Standards of Coverage (SOC) and Management/Administrative Assessment to provide a foundation for future District planning. The goal of this assessment is to identify both the current service level and services desired, and then to assess the District's ability to provide them. After understanding gaps in operations and resources, Citygate has provided recommendations to maximize and improve District operations and resources over time.

This assessment is presented in several parts, including this Executive Summary outlining the most significant findings and recommendations; the fire station/crew deployment analysis supported by maps and response statistics; assessment of the District's management/administrative organization and staffing; and future service demand and alternative service models. Section 4, beginning on page 77, integrates all the findings and recommendations presented throughout the report. A separate Map Atlas (**Volume 2**) contains all the maps referenced throughout this study. Overall, there are 33 findings and nine specific action recommendations.

POLICY CHOICES FRAMEWORK

There are no mandatory federal or state regulations directing the level of fire service staffing, response times, or outcomes. Thus, the level of fire protection services provided are a *local policy decision*, and communities have the level of fire services they can afford, which is not always the level they may desire. However, the body of regulations on fire services provides that if services are provided at all, they must be done so with the safety of the firefighters and citizens in mind.

OVERALL SUMMARY OF DISTRICT SERVICES

Citygate finds that the District is well organized to accomplish its mission to serve a mixed residential and non-residential land use pattern with a geographically challenging road network and daily traffic congestion that make it difficult to serve some areas of the District quickly. Overall, the challenges facing the District can be summarized in two themes: (1) first-due response performance and (2) management/administrative capacity.

Challenge #1: Initial Unit (First-Due) Response Performance

Fire service deployment, simply stated, is about the *speed* and *weight* of the response. *Speed* refers to initial response (first-due) of all-risk intervention resources (engines, trucks, and/or rescue ambulances) strategically deployed across a jurisdiction for response to emergencies

within a time interval to achieve desired outcomes. *Weight* refers to multiple-unit responses (Effective Response Force or ERF) for more serious emergencies, such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents. In these situations, a sufficient number of firefighters must be assembled within a reasonable time interval to safely control the emergency and prevent it from escalating into a more serious event.

If desired outcomes include limiting building fire damage to only part of the inside of an affected building and/or minimizing permanent physiological/neurological deficit resulting from medical emergencies, then first-due units should arrive within 7:30 minutes from 9-1-1 notification, and ERF resources should arrive within 11:30 minutes of 9-1-1 notification, all at 90 percent or better reliability. District-wide call to first arrival response performance over the preceding three years is *significantly slower* than this goal by 33 percent (2:31 minutes), as shown in Table 1.

Table 1—90th Percentile Call to First Arrival Response Performance

Zone	Response Time
District-Wide	10:01
Station 1	9:43
Station 2	9:58
Station 3	11:47
Station 4	9:40

Numerous factors influence the District's first-due response performance, including large fire station first-due response areas, longer-than-expected dispatch center call processing and crew turnout time performance, and slower travel times due to the District's topography, road network, and daily traffic congestion.

Citygate recommends the following to improve first-due response performance:

- Collaborate with Santa Cruz Regional 9-1-1 to improve call processing performance to achieve better alignment with industry-recognized best practice standards while maintaining dispatch accuracy.
- Work to improve 90th percentile turnout time performance to meet a recommended goal of 2:00 minutes or less.

- As long-term fiscal and strategic planning and funding permit, consider adaptive deployment of one or more "rapid response"[1] Peak Activity Units during traffic congestion and/or periods of high service demand.
- As capital planning and funding permit, consider relocating Fire Stations 3 and 4 to sites outside of a designated flood zone that, to the extent possible, enhance first-due travel time coverage for their higher population and building density response areas.

Challenge #2: Management/Administrative Capacity

While the District has a highly qualified, capable, and dedicated management/administrative organization, it is *understaffed* to meet short-term and ongoing workload demand, as summarized in Table 2.

Table 2—Management/Administrative Workload Gap Summary

Division	Estimated Workload Capacity Gap			
	Temporary/Transitional[1]		Ongoing	
	Annual Hours	FTE[2]	Annual Hours	FTE[2]
Operations	0	0	980–1,960	0.5–1.0
Fire Prevention	0	0	944–1,888	0.5–1.0
Finance	640–1,040	0.33–0.5	500–990	0.25–0.5
Human Resources	980–1,570	0.5–0.8	980–1,960	0.5–1.0
Fleet Services	0	0	2,940–5,880	1.5–3.0
Total	**1,620–2,610**	**.83–1.3**	**6,344–12,678**	**3.25–6.5**

[1] Estimated duration of need: 12–18 months
[2] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Citygate recommends that the District consider supplemental management/administrative program needs as prioritized in Table 3 as fiscal/strategic planning and funding permit.

[1] Smaller (1- to 1/2-ton) apparatus with EMS and fire suppression capabilities

Table 3—Recommended Management/Administrative Program Priorities

Program Priority		Description	FTE[1]
1	Fleet Services	Additional heavy equipment mechanic capacity	0.5–1.0
2	Operations	Technical administrative support	0.5–1.0
3	Fleet Services	Additional administrative support capacity	0.25–1.0
4	Human Resources	Additional support capacity	0.5–1.0
5	Fire Prevention	Additional technical support capacity	0.5–1.0
6	Finance	Additional support capacity	0.25–0.5
7	Fleet Services	Program management	0.5–1.0

[1] Full-Time Equivalent assuming 1 FTE = 1,960 hours annually

SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC's Standards of Coverage (SOC) and Management/Administrative Assessment for the District is presented in this volume. Citygate's scope of work and corresponding Work Plan was developed consistent with Citygate's Project Team members' experience in fire administration and deployment. Citygate utilizes various National Fire Protection Association (NFPA) and Insurance Services Office (ISO) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI).

1.1 REPORT ORGANIZATION

This report is organized into the following sections. **Volume 2** (Map Atlas) is separately bound.

Executive Summary: Summary of current District services and significant future challenges.

Section 1 Introduction and Background: An introduction to the study and background facts about Santa Cruz County and the Fire District.

Section 2 Standards of Coverage Assessment: An overview of the SOC process and detailed analysis of existing deployment policies, outcome expectations, community risk, critical tasks, distribution and concentration effectiveness, reliability and historical response effectiveness, overall deployment evaluation, and viable service delivery alternatives.

Section 3 Management/Administrative Assessment: A comprehensive assessment of the District's management and administrative functions, including staffing and workload analysis.

Section 4 Findings and Recommendations: A list of all the findings and recommendations from this study grouped by deployment, management/administrative, staffing, and alternative service models.

Appendix A Risk Assessment

Appendix B Incident Statistical Analysis

1.1.1 Goals of the Report

This report cites findings and makes recommendations related to each finding as appropriate. Findings and recommendations throughout Sections 1–3 and Appendices A–B of this report are sequentially numbered. To provide a comprehensive summary, a complete list of all these same findings and recommendations, by theme, is included in Section 4.

This document provides technical information about how fire services are provided and legally regulated and how the District currently operates. This information is presented in the form of recommendations and policy choices for consideration by the District and the communities it serves.

The result is a solid technical foundation upon which to understand the advantages and disadvantages of the choices facing District leadership and the communities it serves regarding how best to provide fire services and, more specifically, at what level of desired outcome and expense.

1.1.2 Limitations of Report

In the United States, there are no federal or state regulations requiring a specific minimum level of fire services. Each community, through the public policy process, is expected to understand the local fire and non-fire risks and its ability to pay, and then choose its level of fire services. **If** fire services are provided at all, federal and state regulations specify how to do it safely for the public and for the personnel providing the services.

While this report and technical explanation can provide a framework for the discussion of District services, neither this report nor the Citygate team can make the final decisions, nor can every possible alternative be analyzed for cost in detail. Once final strategic choices receive policy approval, District staff can conduct any final costing and fiscal analysis as is typically completed in its normal operating and capital budget preparation cycle.

1.2 Project Approach and Scope of Work

1.2.1 Project Approach and Research Methods

Citygate utilized multiple sources to gather, understand, and model information about the District for this study. Citygate began by requesting a large amount of background data and information to better understand current costs, service levels, history of service level decisions, and what other prior studies, if any, had to say.

In subsequent site visits, Citygate followed up with focused interviews of the District's project team members and other District stakeholders. Citygate reviewed demographic information about the District and the potential for future growth and development. While collecting information and garnering an understanding about the District and its operations, Citygate obtained map and response data from which to model current and projected future fire service deployment, with the goal to identify the location(s) of stations and crew quantities required to best serve the District as it currently exists and to facilitate future deployment planning.

Once Citygate gained an understanding of the District's service area and its fire and non-fire risks, the Citygate team then developed a model of fire services that was tested against the travel

time mapping and prior response data to ensure an appropriate fit. Citygate also evaluated future District growth and service demand by risk type and identified and evaluated potential alternative emergency and non-emergency service delivery models. This resulted in Citygate being able to propose an approach to address both current needs with effective and efficient use of existing resources and long-range needs as the District continues to evolve. The result is a framework for enhancing District services while meeting reasonable community expectations and fiscal realities.

Following the deployment analysis, Citygate reviewed the District's management and administrative organization, specifically examining responsibilities, capabilities, and workload of the District's five divisions.

1.2.2 Project Scope of Work

Citygate's approach to this Standards of Coverage and Management/Administrative Assessment involved:

- Reviewing agency-provided data and information and conducting listening sessions with project stakeholders.
- Utilizing a geographic mapping software program called FireView™ to model fire station travel time coverage.
- Using an incident response time analysis program called StatsFD™ to review the statistics of prior incident performance; results were plotted not only on graphs and charts, but also over Google Earth images using 3D tools.
- Identifying and evaluating future District population and related development growth.
- Projecting future service demand by risk type.
- Identifying and evaluating potential alternate service delivery models.
- Recommending appropriate risk-specific response performance goals.
- Identifying a long-term strategy, including incremental short- and mid-term goals to achieve desired response performance objectives.
- Utilizing the Commission on Fire Accreditation International self-assessment criteria and National Fire Protection Association Standard 1201—Standard for Providing Emergency Services to the Public—and other NFPA standards as the basis for evaluating support services, including administration, dispatch, fire prevention, safety, training, and facility and equipment maintenance.

- Reviewing and evaluating the responsibilities, capabilities, staffing levels, and workload of the District's Operations, Fire Prevention, Finance, Human Resources, and Fleet Divisions.

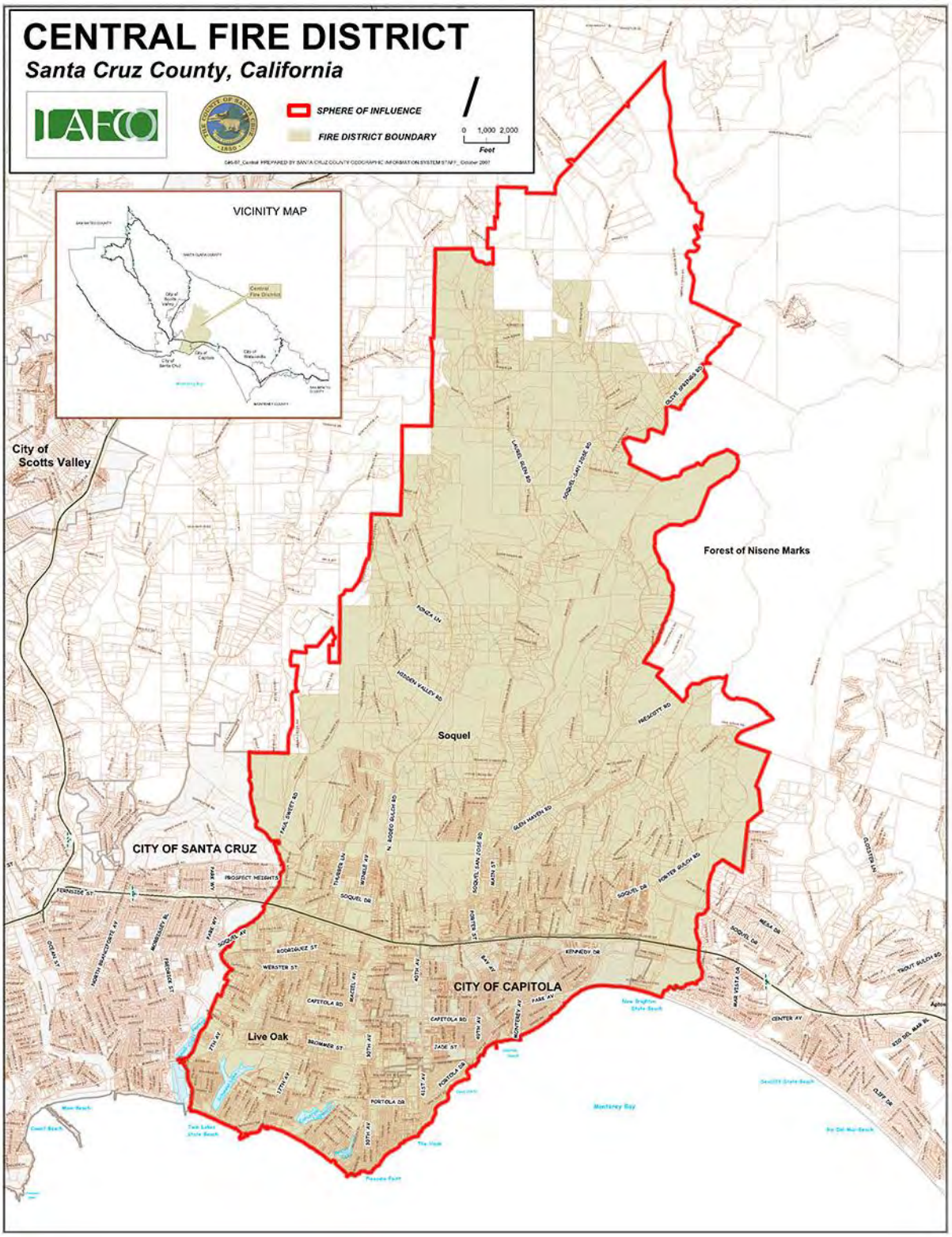
1.3 FIRE DISTRICT OVERVIEW

Located in central Santa Cruz County, California, between the City of Santa Cruz and the Aptos/La Selva Fire Protection District, the Central Fire Protection District of Santa Cruz County encompasses 28 square miles and an estimated population of 55,000, including the City of Capitola and the unincorporated communities of Live Oak and Soquel, as shown in Figure 1.

With elevation ranging from sea level to approximately 1,000 feet, the climate is typical of the central California coast with comfortable weather all year. Summer temperatures average in the 70s, with winter temperatures averaging in the 60s. Annual rainfall averages approximately 23 inches, occurring generally from November through March. Winds are generally onshore from the northwest.

Created in 1987 through consolidation of the Capitola, Live Oak, and Soquel Fire Districts, the District operates under the authority of California Health and Safety Code Section 13800 et seq. (Fire Protection District Law of 1987), and provides fire suppression, Advanced Life Support (ALS) pre-hospital emergency medical, urban search and rescue, water rescue, initial hazardous material spill/release, fire prevention, and community education services from four fire stations with 56 full-time and 18 part-time employees, including 15 Paid-Call Firefighters. The District responds to more than 5,700 calls for service annually, with dispatch services provided by Santa Cruz Regional 9-1-1 in Santa Cruz, a Joint Powers Authority providing 9-1-1 and dispatch services for multiple public agencies in the Counties of Santa Cruz and San Benito. The District received an ISO Public Protection Class 2/10 Rating in December 2012.

Figure 1—Central Fire Protection District of Santa Cruz County



1.3.1 District Organization

The District is governed by a seven-member Board of Directors elected to staggered four-year terms. The Board appoints the Fire Chief, who administers all District services. The District is further organized into five divisions with 63.5 budgeted positions, one of which is currently vacant, as shown in Table 4 and Figure 2.

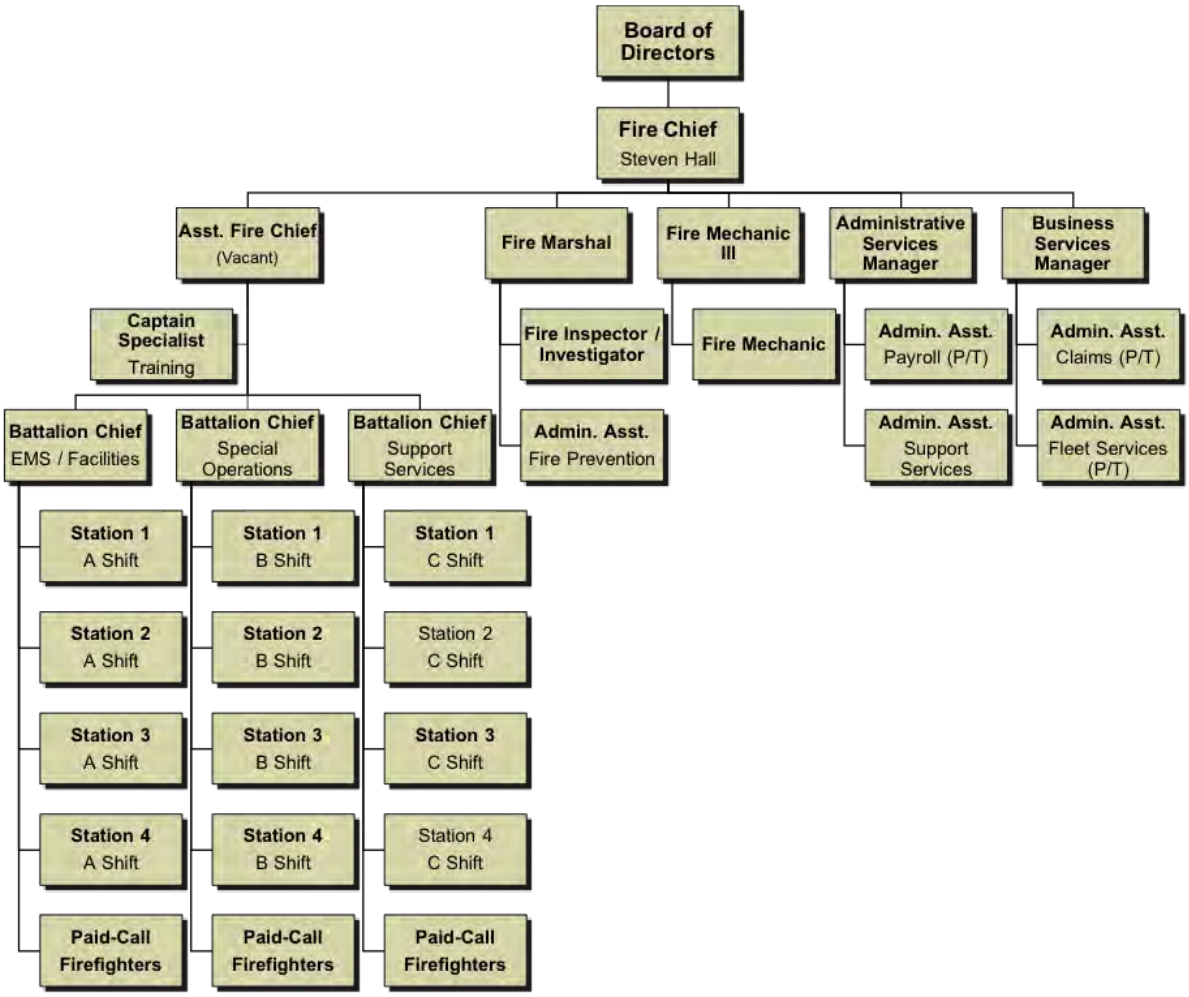
Table 4—Fire District Organization

Division	Budgeted Positions
Fire Chief	1
Operations	53[1]
Fire Prevention	3
Finance	2
Human Resources	2.5
Fleet Services	2
Total	**63.5**

[1] Plus 15 Paid-Call Firefighters
Source: Central FPD

Figure 2 shows the organizational structure of the District.

Figure 2—Central FPD Organizational Chart



1.3.2 Facilities and Resources

The District provides services from four fire stations, as shown in Table 5.

Table 5—Central FPD Facilities and Assigned Resources

Station	Location	Assigned Resources	Staffing
1	930 17th Street, Santa Cruz	**Engine 3411** Rescue 3460 Engine 3415 **Battalion Chief**	**3** **1**
2	3445 Thurber Lane, Santa Cruz	**Engine 3412** Truck 3472 Water Tender 3450	**4**
3	4747 Soquel Drive, Soquel	**Engine 3413** Engine 3437 Engine 3417 Squad 3493	**3**
4	405 Capitola Avenue, Capitola	**Engine 3414** Engine 3438	**3**
		Total	**14**

Source: Central FPD

Response personnel work a 48/96-hour shift schedule of two consecutive 24-hour days on duty followed by four days off duty. The District provides services with four Type-I structural fire engines, one Type-1 100-foot Quint, two Type-3 wildland fire engines, one 2,000-gallon water tender, one rescue unit, and one squad.

SECTION 2—STANDARDS OF COVERAGE ANALYSIS

This section provides a detailed analysis of the District's current ability to deploy and mitigate emergency risks within its service area. The response analysis uses prior response statistics and geographic mapping to help the District and the community to visualize what the current response system can and cannot deliver.

2.1 STANDARDS OF COVERAGE PROCESS OVERVIEW

The core methodology used by Citygate in the scope of its deployment analysis work is "Standards of Response Coverage" (SOC) 5th and 6th Editions, which is a systems-based approach to fire department deployment published by the CFAI. This approach uses local risk and demographics to determine the level of protection best fitting a community's needs.

The Standards of Coverage method evaluates deployment as part of a fire agency's self-assessment process. This approach uses risk and community expectations on outcomes to help elected officials make informed decisions on fire and emergency medical services deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire and emergency medical service levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than using only a singular component. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss over-worked companies. If a risk assessment for deployment is not considered, and deployment is based only on travel time, a community could under-deploy to incidents.

Table 6 describes the eight elements of the Standards of Coverage process.

Table 6—Standards of Cover Process Elements

SOC Element		Description
1	Existing Deployment Policies	Reviewing the deployment goals the agency has in place today.
2	Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies.
3	Community Risk Assessment	Reviewing the assets at risk in the community. (For this study, see *Appendix A—Risk Assessment*.)
4	Critical Task Analysis	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force.
5	Distribution Analysis	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies.
6	Concentration Analysis	Reviewing the spacing of fire stations so that building fires can receive sufficient resources in a timely manner (First Alarm Assignment or the Effective Response Force).
7	Reliability and Historical Response Effectiveness Analysis	Using prior response statistics to determine the percent of compliance the existing system delivers.
8	Overall Evaluation	Proposing Standard of Coverage statements by risk type as necessary.

Source: CFAI *Standards of Cover*, 5th Edition

Fire service deployment, simply summarized, is about the *speed* and *weight* of the response. *Speed* refers to initial response (first-due), all-risk intervention resources (engines, trucks, and/or rescue ambulances) strategically deployed across a jurisdiction for response to emergencies within a specified time interval to control routine to moderate emergencies without the incident escalating to greater size or complexity. *Weight* refers to multiple-unit responses for more serious emergencies, such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents. In these situations, a sufficient number of firefighters must be assembled within a reasonable time interval to safely control the emergency and prevent it from escalating into a more serious event. Table 7 illustrates this deployment paradigm.

Table 7—Fire Service Deployment Paradigm

Element	Description	Purpose
Speed of Response	Travel time of initial response all-risk intervention units strategically located across a jurisdiction.	Controlling routine to moderate emergencies without the incident escalating in size or complexity.
Weight of Response	Number of firefighters in a multiple-unit response for serious emergencies.	Assembling enough firefighters within a reasonable timeframe to safely control the emergency without escalation.

Thus, smaller fires and less complex emergencies require a single-unit or two-unit response (engine and/or specialty resource) within a relatively short response time. Larger or more complex incidents require more units and personnel to control. In either case, if the crews arrive too late or the total number of personnel is too few for the emergency, they are drawn into an escalating and more dangerous situation. The science of fire crew deployment is to spread crews out across a community or jurisdiction for quick response to keep emergencies small with positive outcomes without spreading resources so far apart that they cannot assemble quickly enough to effectively control more serious emergencies.

2.2 CURRENT DEPLOYMENT

SOC ELEMENT 1 OF 8
EXISTING DEPLOYMENT POLICIES

Nationally recognized standards and best practices suggest using a time line with several incremental measurements to define response time. Ideally the clock start time is when the dispatcher receives the emergency call in the local 9-1-1 center. In some cases, the call must then be transferred to a separate fire dispatch center. In this setting, the response time clock starts when the fire dispatcher receives the 9-1-1 call into the computer-aided dispatch (CAD) system. Response time increments include dispatch center call processing, crew alerting and response unit boarding (commonly called turnout time), and actual driving (travel) time.

In reviewing documentation provided for this study, it appears that the District has *not* adopted formal response time policies by risk type as recommended by the CFAI. The District does, however, have an informal response performance goal of crew turnout time of 60 seconds or less, first-due travel time of 4:00 minutes or less, and multiple-unit Effective Response Force (ERF or first-alarm) travel time of 8:00 minutes or less, all at 90 percent or better reliability. The District also has a service level history that can be documented in response times, number of response companies, and minimum staffing. Thus, although the District has not adopted a formal deployment policy, it has been budgeting for and providing a level of service that can be well documented.

Finding #1: The District has not adopted response time policy statements by risk type consistent with the best practice recommendations of the Commission on Fire Accreditation International.

Another source for deployment policy is the local/regional emergency medical services (EMS) system. Santa Cruz County, like many other California counties, has established an Exclusive Operating Area (EOA) for the provision of Advanced Life Support (ALS) emergency ambulance transportation services. Since 1990, American Medical Response, West (AMRW) has been the County's ambulance transportation provider under a contract administered by the Santa Cruz County Health Services Agency. This is a performance-based contract requiring ALS ambulance response performance, as shown in Table 8.

Table 8—ALS Ambulance Response Performance Requirements

Population Density[1]	ALS Ambulance Response Standard[2]
Urban	8:00 minutes or less @ 90% reliability
Suburban	12:00 minutes or less @ 90% reliability
Rural	20:00 minutes or less @ 90% reliability

[1] Urban density: 101–500 per square mile; suburban density: 51–100 per square mile; rural density: 5–50 per square mile

[2] From time of dispatch to time of arrival

Source: Santa Cruz County Emergency Ambulance Agreement

To ensure contract response performance compliance, AMRW has partnered with the Emergency Medical Services Integration Authority (EMSIA), a Joint Powers Authority consisting of 11 Santa Cruz County fire agencies providing ALS first-responder services pursuant to a Prehospital Emergency Medical Services Agreement with AMRW. Under this agreement, the fire agencies provide certain ALS services within their respective service areas, thus enabling AMRW to provide emergency medical and transport services under the County contract with modified (longer) response time requirements, as shown in Table 9. The District is one of the EMSIA member agencies and provides ALS emergency medical services every day of the year from each of its four fire stations.

Table 9—Santa Cruz County EMS Response Standards

Population Density[1]	ALS First Responder	ALS Ambulance
Urban	8:00 minutes or less @ 90%	12:00 minutes or less @ 90%
Suburban	12:00 minutes or less @ 90%	18:00 minutes or less @ 90%
Rural	20:00 minutes or less @ 90%	30:00 minutes or less @ 90%

[1] Urban density: 101–500 per square mile; suburban density: 51–100 per square mile; rural density: 5–50 per square mile

Source: Santa Cruz County Emergency Ambulance Agreement

A third potential source for deployment policy is the Safety Element of the County General Plan. The only reference to response time standards in the Santa Cruz County General Plan is in reference to the general prohibition of subdivisions more than 20 minutes' response time from the nearest fire station.[2]

National Fire Protection Association (NFPA) Standard 1710,[3] a recommended deployment standard for career fire departments in urban/suburban areas, calls for arrival of the initial (first-due) intervention unit within 6:50 minutes from the time of call receipt in fire dispatch and arrival of all the resources comprising the Effective Response Force (ERF or first alarm) within 10:50 minutes, at 90 percent or better reliability. The standard further identifies a minimum initial ERF of 14–15 personnel for a fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement or other exposed buildings.

In Citygate's experience, very few fire agencies can meet this response performance standard, primarily due to existing resource distribution and the costs associated with relocating those resources. Citygate therefore recommends that its *urban/suburban* client agencies consider a first-due performance measure of 7:30 minutes or less from fire dispatch notification, 90 percent of the time, and a performance measure of 11:30 minutes or less for arrival of the last ERF resource. For *rural* response zones, Citygate recommends a first-due performance measure of 11:30 minutes or less.

2.2.1 Current Deployment Model

Resources and Staffing

The District's current deployment model includes four ALS engines staffed with a minimum of 3–4 personnel each, including at least one EMT-Paramedic and one Battalion Chief for a total daily staffing of 14 personnel, as summarized in Table 10.

[2] Santa Cruz County General Plan, Public Safety and Noise Element, Section 6.5.4(c)

[3] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016 Edition)

Table 10—Central FPD Deployment Model

Station		Minimum Daily Staffing
1	Live Oak	3
2	Santa Cruz	4
3	Soquel	3
4	Capitola	3
	Battalion Chief	1
	Total	**14**

Source: Central FPD

As Table 10 shows, the District's current deployment model meets the minimum staffing standards for building fires as recommended by NFPA 1710 or, as the critical tasking section of this report will review, provides minimally sufficient personnel for moderate-size building or wildland fire incidents. The District does have informal automatic mutual aid agreements with the Aptos/La Selva Fire Protection District and County Service Area #48 and is a signatory to the Santa Cruz County and State of California Mutual Aid Agreements. In addition, the District has immediate access to all CAL FIRE resources for wildland fires occurring in the State Responsibility Area of the District north of Highway 1.

Response Plan

The District is an "all-risk" fire agency providing the people it protects with services that include fire suppression, pre-hospital ALS EMS, hazardous material and technical rescue response, and other non-emergency services, including fire prevention, community safety education, and related services.

Given these risks, the District utilizes a tiered response plan calling for different types and numbers of resources depending on incident/risk type. Santa Cruz Regional 9-1-1's computer-aided dispatch (CAD) system selects and dispatches the closest and most appropriate resource types pursuant to the District's response plan, as shown in Table 11.

Table 11—Response Plan by Incident Type

Incident Type	Minimum Resources Dispatched	Total Personnel
Single-Patient EMS	1 ALS Engine, AMR Ambulance	5–6
Vehicle Fire	1 Engine	3–4
Building Fire[1]	4 Engines[2], 1 Truck/Quint, PCFs, Battalion Chief	17+
Wildland Fire[1]	4 Engines, 1 Water Tender, PCFs, Battalion Chief	15+
Rescue	1 Engine, Rescue	6
Hazardous Material	1 Engine, Battalion Chief	4–5

[1] Depending on number of available Paid-Call Firefighters
[2] One engine provided by mutual aid agency
Source: Central FPD

Finding #2: The District has a standard response plan that considers risk and establishes an appropriate initial response for each incident type. Each type of call for service receives the combination of engine companies, trucks, ambulances, specialty units, and command officers customarily needed to effectively control that type of incident as based on District experience.

2.3 Outcome Expectations

SOC Element 2 of 8
Community Outcome Expectations

The Standards of Coverage process begins by reviewing existing emergency services outcome expectations. This includes determining for what purpose the response system exists and whether the governing body has adopted any response performance measures. If so, the time measures used must be understood and good data must be available.

Current national best practice is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically this is called a "fractile" measure.[4] This is because the measure of average only identifies the central or middle point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were way above the average, or just above.

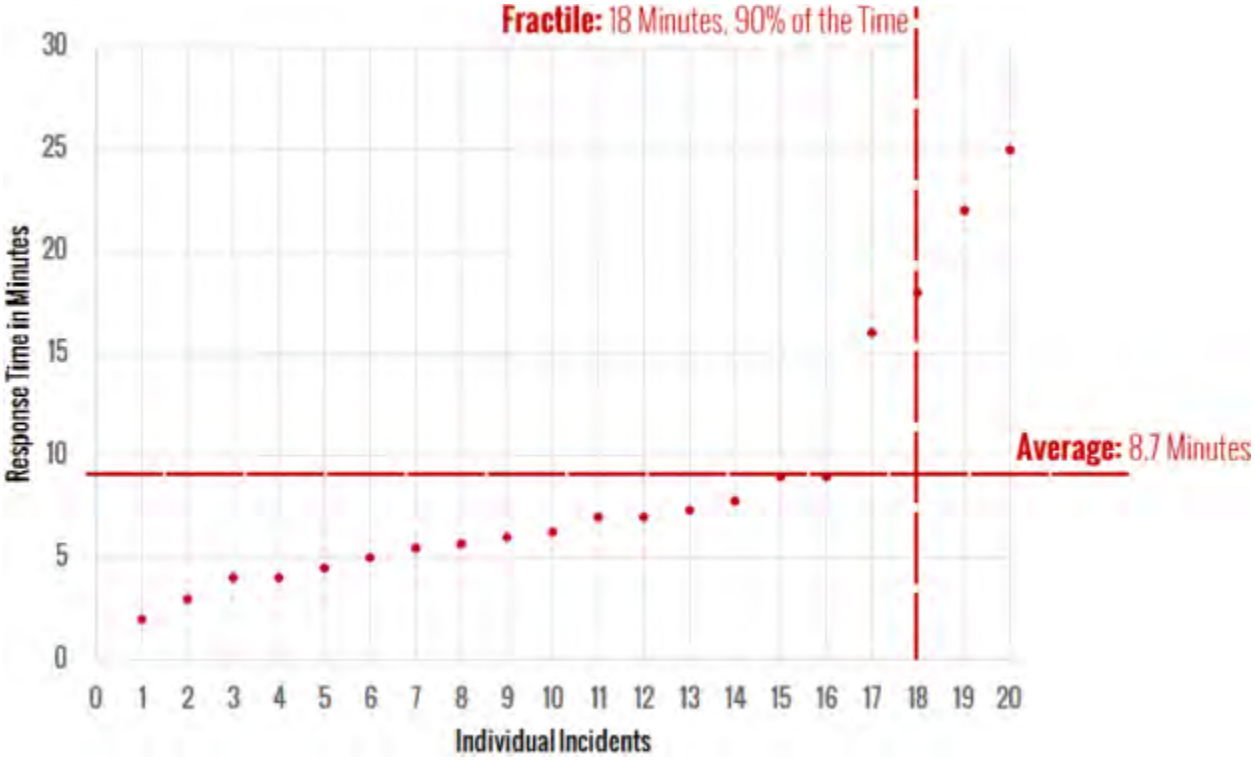
[4] A *fractile* is that point below which a stated fraction of the values lie. The fraction is often given in percent; the term percentile may then be used.

For example, Figure 3 shows response times for a fictitious fire department. This agency is small and receives 20 calls for service each month. Each response time has been plotted on the following graph from shortest response time to longest response time.

Figure 3 shows that the average response time is 8.7 minutes. However, the average response time fails to properly account for four calls for service with response times far exceeding a threshold in which positive outcomes could be expected. In fact, it is evident in Figure 3 that 20 percent of responses are far too slow and that this jurisdiction has a potential life-threatening service delivery problem. Average response time as a measurement tool for fire services is simply not sufficient. This is a significant issue in larger cities if hundreds or thousands of calls are answered far beyond the average point.

By using the fractile measurement with 90 percent of responses in mind, this small jurisdiction has a response time of 18:00 minutes, 90 percent of the time. This fractile measurement is far more accurate at reflecting the service delivery situation in this small agency.

Figure 3—Fractile versus Average Response Time Measurements



More importantly, within the Standards of Coverage process, positive outcomes are the goal, and from that, crew size and response time can be calculated to allow appropriate fire station spacing (distribution and concentration). Emergency medical incidents have situations with the most severe time constraints. The brain can only survive 4:00 to 6:00 minutes without oxygen. Heart

attacks and other events can cause oxygen deprivation to the brain. Heart attacks make up a small percentage; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in a 6:00- to 8:00-minute timeframe. If fire service response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, *all* responding crews must arrive, assess the situation, and deploy effective measures before brain death occurs or the fire spreads beyond the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is *beginning* to manage the problem within a 7:00- to 8:00-minute total response time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point of leaving the room of origin and becoming very serious. Thus, the District needs a first-due response goal that is within a range to give the situation hope for a positive outcome. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine starts to drive the response route. Ideally, the emergency is noticed immediately and the 9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, 1:00 minute. Then crew notification and travel time take additional minutes. Upon arrival, the crew must approach the patient or emergency, assess the situation, and deploy its skills and tools appropriately. Even in easy-to-access situations, this step can take 2:00 minutes or more. This timeframe may be increased considerably due to long driveways, apartment buildings with limited access, multi-story apartments or office complexes, or shopping center buildings.

Unfortunately, there are times when the emergency has become too severe, even before the 9-1-1 notification and/or fire department response, for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed deployment system, then only anomalies like bad weather, poor traffic conditions, or multiple emergencies slow the response system down. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

For this report, "total" response time is the sum of the alarm processing, dispatch, crew turnout, and road travel time steps. This is consistent with CFAI best practice recommendations.

2.4 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

A community risk assessment is the third element of the SOC process. Within the context of an SOC study, the objectives of a community risk assessment are to:

1. Identify the values at risk to be protected within the community or service area

2. Identify the specific hazards with the potential to adversely impact the community or service area
3. Quantify the overall risk associated with each hazard
4. Establish a foundation for current/future deployment decisions and risk-reduction/hazard-mitigation planning and evaluation.

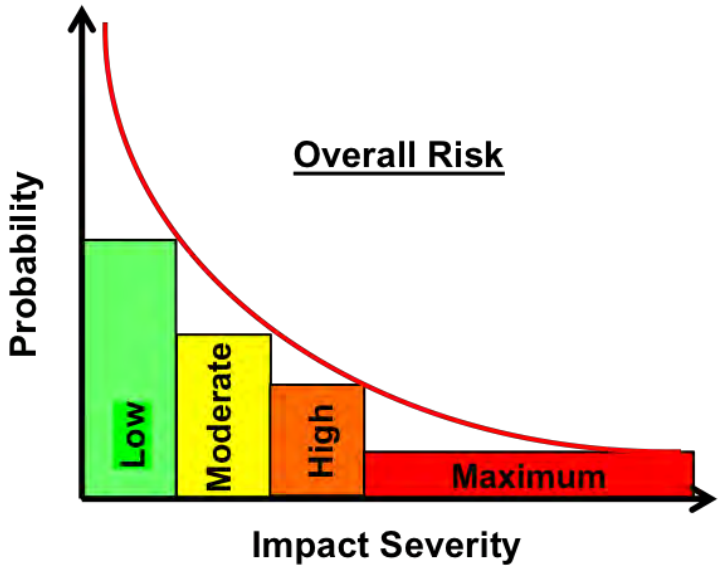
A *hazard* is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. *Risk* is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community as a whole.

2.4.1 Risk Assessment Methodology

The methodology employed by Citygate to assess community risks as an integral element of an SOC study incorporates the following elements:

- Identification of geographic planning sub-zones (risk zones) appropriate to the community or jurisdiction
- Identification and quantification (to the extent data is available) of the specific values at risk to various hazards within the community or service area
- Identification of the fire and non-fire hazards to be evaluated
- Determination of the probability of occurrence for each hazard
- Identification and evaluation of multiple relevant impact severity factors for each hazard by planning zone using agency/jurisdiction-specific data and information
- Quantification of overall risk for each hazard based on probability of occurrence in combination with probable impact severity, as shown in Figure 4.

Figure 4—Overall Risk



Source: Commission on Fire Accreditation International (CFAI): *Community Risk Assessment: Standards of Cover (6th Edition)*

2.4.2 Values at Risk to Be Protected

Broadly defined, **values at risk** are those tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people; critical facilities/infrastructure; buildings; and key economic, cultural, historic, and/or natural resources.

People

Residents, employees, visitors, and travelers through a community or jurisdiction are vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency. At-risk populations typically include children less than 10 years of age, the elderly, and people housed in institutional settings. Key demographic data for the District includes the following:

- Slightly more than 25 percent of the population is under 10 or over 64 years of age.
- The District's population is predominantly White (63 percent), followed by Hispanic/Latino (26 percent), and other ethnicities (11 percent).

- Of the population over 24 years of age, 40 percent has completed high school or equivalency.
- Of the population over 24 years of age, 24 percent has an undergraduate, graduate, or professional degree.
- Slightly more than 65 percent of the population 16 years of age or older is in the workforce; of those, 7.8 percent is unemployed.
- The population below the federal poverty level is 12.3 percent.
- Nearly 13 percent of the population has no health insurance coverage.

In addition, the District's service area includes more than 22,000 housing units, as well as office, professional services, retail sales, restaurants/bars, motels, churches, schools, government facilities, healthcare facilities, and other non-residential building occupancies.

There are economic, cultural, and natural resources to be protected within the District, as well as multiple critical facilities, where a hazard occurrence with significant impact severity would likely affect critical public or community services.

The higher population density areas of the District are essentially built out, with zoning regulations limiting new development to existing town centers and concentrated urban areas.

2.4.3 Hazard Identification

Citygate utilized prior risk studies where available, fire and non-fire hazards as identified by the Commission on Fire Accreditation International (CFAI), and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study.

Following review and evaluation of the hazards identified in the 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, and the fire and non-fire hazards as identified by the CFAI as they relate to services provided by the District, Citygate evaluated the following five hazards for this risk assessment:

1. Building Fire
2. Wildland Fire
3. Medical Emergency
4. Hazardous Materials Release/Spill
5. Technical Rescue

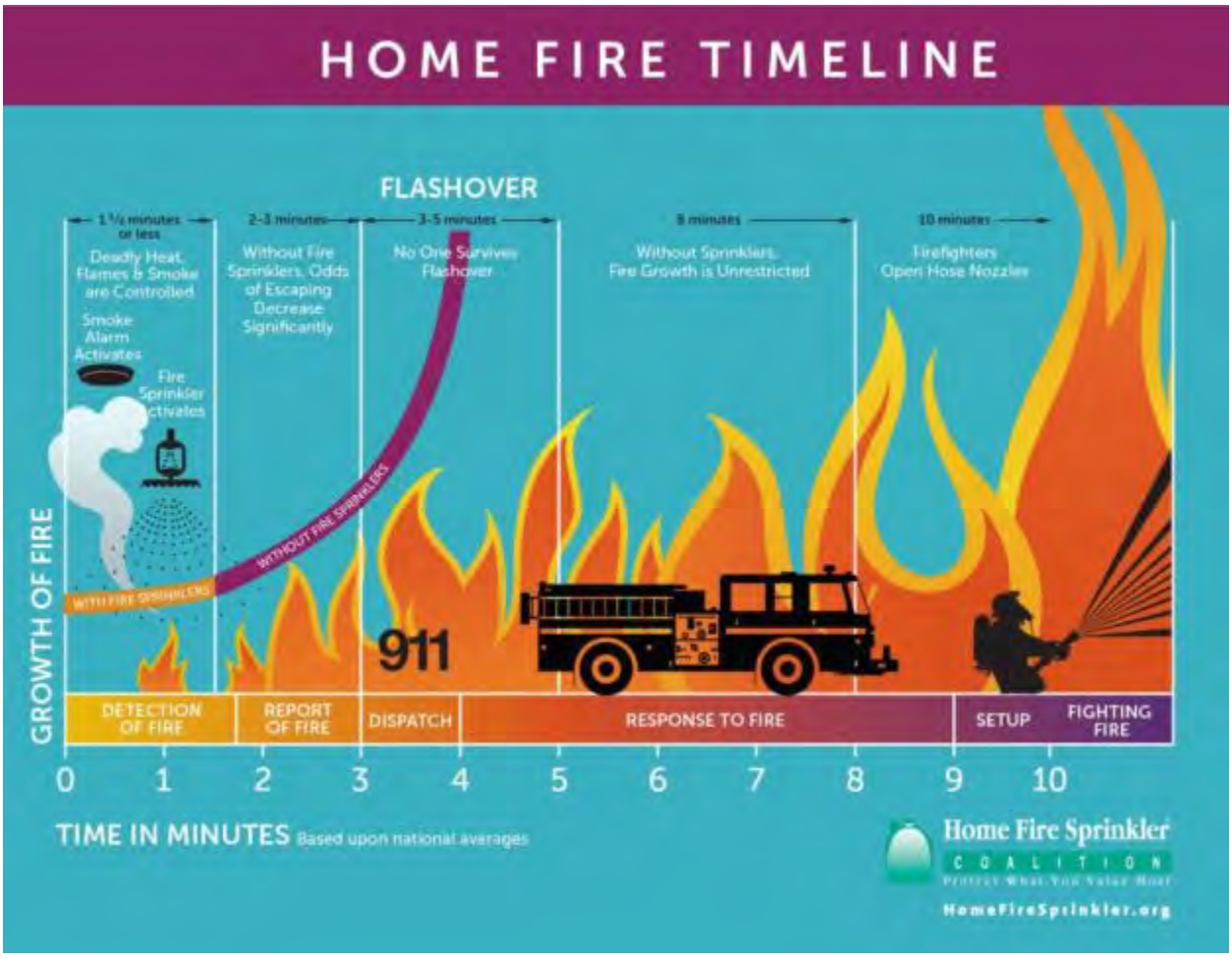
Because building fires and medical emergencies have the most severe time constraints if positive outcomes are to be achieved, what follows is a brief overview of building fire and medical emergency risk. **Appendix A** contains the full risk assessment for all five hazards.

Building Fire Risk

One of the primary hazards in any community is building fire. Building fire risk factors include building density, size, age, occupancy, and construction materials and methods, as well as the number of stories, the required fire flow, the proximity to other buildings, built-in fire protection/alarm systems, an available fire suppression water supply, building fire service capacity, fire suppression resource deployment (distribution/concentration), staffing, and response time.

Figure 5 illustrates the building fire progression timeline and shows that flashover, which is the point at which the entire room erupts into fire after all the combustible objects in that room reach their ignition temperature, can occur as early as 3:00 to 5:00 minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

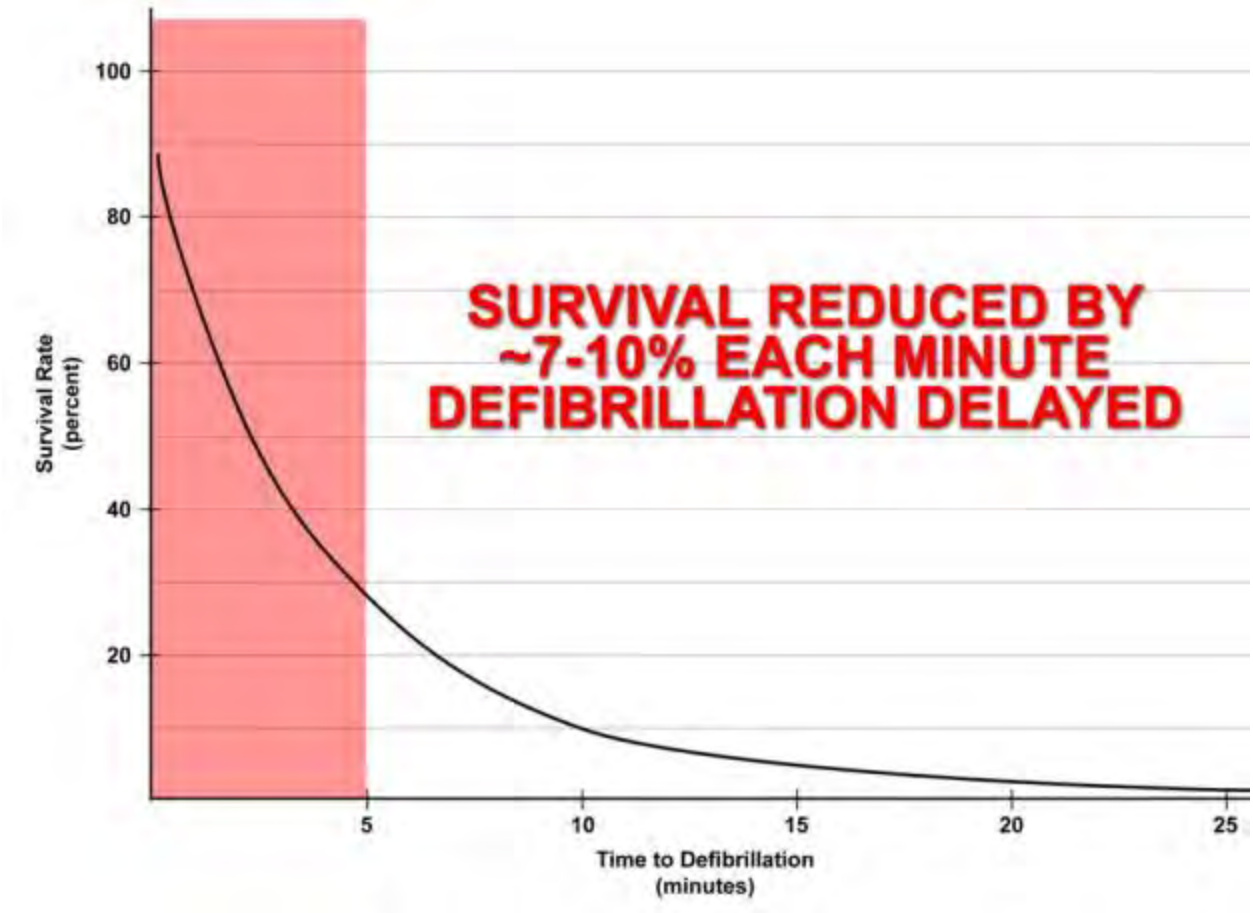
Figure 5—Building Fire Progression Timeline



Medical Emergency Risk

Fire agency service demand is most jurisdictions today is predominantly for medical emergencies. Figure 6 illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases.

Figure 6—Survival Rate Versus Time to Defibrillation



Source: www.suddencardiacarrest.com

2.4.4 Risk Assessment Summary

Citygate's evaluation of the values at risk and hazards likely to impact the District yields the following:

1. The District's service area includes urban population densities in the City of Capitola and the rural communities of Live Oak and Soquel and rural population densities in most of the other areas.
2. The District's population is stable and is projected to grow less than one percent annually over the next 18 years into 2035.
3. The District includes a mix of residential, commercial, office, educational, and other non-residential uses typical of other central coast communities of similar size and demographics.

4. The District has economic, cultural, historic, and natural resource values to be protected, as identified in this assessment.

5. The District's overall risk for five hazards related to emergency services provided range from **LOW** to **HIGH**, as shown in Table 12.

Table 12—Overall Risk by Hazard

Hazard		Planning Zone					
		Station 1	Station 2		Station 3		Station 4
		Suburban	Suburban	Rural	Suburban	Rural	Suburban
1	Building Fire	HIGH	MODERATE	LOW	HIGH	MODERATE	HIGH
2	Wildland Fire	MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE
3	Medical Emergency	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
4	Hazardous Material	HIGH	HIGH	LOW	HIGH	LOW	HIGH
5	Technical Rescue	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	HIGH

Appendix A contains a more in-depth discussion of the risk factors evaluated and resultant risk assessment scoring.

2.5 Critical Task Time Measures—What Must Be Done over What Timeframe to Achieve the Stated Outcome Expectation?

SOC Element 4 of 8
Critical Task Time Study

Standards of Coverage (SOC) studies use task time information to determine the number of firefighters needed within a timeframe to accomplish the desired fire control objective on moderate residential fires and modest emergency medical incidents. The time it takes to complete one specific task is called an "evolution." These task time evolutions are shown on Table 13 and Table 14 to demonstrate the amount of time these operations require. These tables start with the time of fire dispatch notification and finish with the outcome achieved. These tables are composite tables from Citygate clients in suburban/rural departments similar to Central FPD, with units staffed with 3–4 personnel per engine or ladder truck. These tasks and times are also consistent with national published studies.[5]

[5] National Institute of Standards and Technology Technical Note 1661, *Report on Residential Fireground Field Experiments* (April 2010). NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression*

The evolution test results were obtained at training sites under best-case conditions: clear weather with moderate temperatures. The structure fire response times are from actual events, showing how units arrive at staggered intervals.

It takes a considerable amount of time after a task is ordered by command to accomplish it and arrive at the desired outcome. Some tasks must be completed sequentially, while other tasks can be completed concurrently if sufficient personnel are available. Task completion time is usually a function of how many personnel are *simultaneously* available. Logically, the fewer number of firefighters available, the longer some tasks will take to complete. Some tasks must be conducted by a minimum of two firefighters to comply with safety regulations. For example, two firefighters are required to search a smoke-filled room for a victim. *Critical steps* are highlighted in gray in the tables.

2.5.1 Critical Firefighting Tasks

Table 13 shows company and individual tasks required to control a typical single-family dwelling fire with four response units (engines/trucks) and one Chief Officer for a total *Effective Response Force* of 17 personnel. These tasks are taken from fire departments' operational procedures, which are consistent with the customary findings of other agencies using the Standards of Coverage process. No conditions existed to override the Occupational Safety and Health Administration (OSHA) 2-in/2-out safety policy, which requires that firefighters enter serious building fires in teams of two while two more firefighters are outside and immediately ready to rescue them should trouble arise.

Scenario: *Simulated fire in an approximately 2,000 square-foot, two-story residence with unknown rescue situation. Responding companies receive dispatch information typical for a witnessed fire. Upon arrival, they find approximately 50 percent of the second floor involved in fire.*

Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, 2016 Edition.

Table 13—First Alarm Residential Structure Fire Critical Tasks – 17 Personnel

Critical Task Description	Time from Arrival of First-Due Engine	Total Elapsed Time
First-due engine response (dispatch, turnout, and travel time)		07:30
First-due engine on-scene	00:00	
Conditions report	02:37	
Supply line established and charged	03:00	
Charged fire attack hose line to second floor	03:48	
Rapid Intervention Team arrived and established	04:40	12:10
Forcible building entry	06:09	
First Battalion Chief and second engine arrival	03:38	
Third engine arrival	05:45	
Back-up charged fire attack hose line at door	06:15	
Water applied to fire	07:04	14:34
Fourth engine and ladder truck arrival	07:56	
Primary victim search completed	08:10	15:40
Ladders positioned	11:05	
Utilities secured	12:45	
Positive pressure ventilation established	12:32	
Secondary search completed	15:53	23:23
Check for fire extension in hidden spaces	15:58	
Fire controlled	**17:15**	**24:45**

The duties in Table 13, grouped together, form an *Effective Response Force* or *First Alarm Assignment*. These distinct tasks must be performed to effectively achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish these tasks, the incident progression clock keeps running, as it has since the onset of the emergency.

Fire in a building can double in size during its *free-burn* period before fire suppression is initiated. Many studies have shown that a small fire can spread to engulf an entire room in less than 4:00 to 5:00 minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire suppression and search/rescue operations commence before the flashover point occurs if the outcome goal is to

keep the fire damage in or near the room of origin. In addition, flashover presents a serious danger to both firefighters and any occupants of the building.

A 2010 National Institute of Standards (NIST) study[6] tested multiple crew staffing and arrival timing scenarios relative to the completion of 22 critical tasks for a low-hazard residential building fire using four fire companies (three engines and one truck). The study found that the three-person crews completed all 22 critical tasks nearly seven percent faster (on average) than the two-person crews, and the four-person crews completed the same tasks nearly 25 percent faster than the three-person crews. These findings support the CFAI critical time task element of the SOC analysis process and the critical task times reflected in Table 13 and Table 14.

2.5.2 Critical Medical Emergency Tasks

The District responds to nearly 3,000 EMS incidents annually, including vehicle accidents, strokes, heart attacks, difficulty breathing, falls, childbirths, and other medical emergencies. For comparison, Table 14 summarizes the critical tasks required for a cardiac arrest patient.

Scenario: *Simulated single-patient full cardiac arrest inside a residence. A standard response of one ALS engine and one ALS ambulance respond with a total of 5–6 personnel.*

[6] NIST Technical Note 1661, Report on Residential Fireground Field Experiments (April 2010)

Table 14—Cardiac Arrest Critical Tasks – 4 Personnel[7] + ALS Ambulance

Critical Task Description	Time from Arrival of First-Due Engine	Total Elapsed Time
First-due engine response (dispatch, turnout, and travel time)		7:30
First-due engine on scene	00:00	
Engine crew determine full arrest and start CPR	00:55	8:25
Ambulance on-scene	01:35	
Cardiac monitor attached to patient	02:10	
Auto pulse CPR unit attached	03:18	
Intravenous line placed	03:24	10:54
Bag valve mask ventilation started	03:42	
Epinephrine administered	05:32	13:02
Intubation completed	06:10	13:40
Defibrillate, positive change in patient rhythm	06:53	14:23
Patient on gurney	07:28	
Patient in ambulance	**10:45**	**18:15**

2.5.3 Critical Technical Rescue Tasks

Table 15 summarizes the critical tasks required for a typical single-vehicle collision with technical rescue required.

Scenario: *Simulated single-car collision with one patient. The driver required moderate extrication with power tools, and the vehicle was upright with no fuel hazards. One engine, one technical rescue unit, and one ALS transport ambulance respond with a total of eight personnel.*

[7] Minimum of one paramedic

Table 15—Single-Patient Traffic Collision – 8 Personnel

Critical Task Description	Time from Arrival of First-Due Engine	Total Elapsed Time
First-due engine response (dispatch, turnout, and travel time)		07:30
First-due engine on scene	00:00	
Assess and upgrade to rescue response	00:15	
Initial report	02:00	
Vehicle stabilization initiated	02:00	09:30
Protection firefighting line in place	02:25	
Technical rescue unit arrival	02:00	
Patient assessed, vital signs obtained	03:48	11:18
Door forcibly opened and secured	04:48	
Patient on backboard and removed	05:40	13:10
Patient on gurney	06:00	
Patient under ambulance crew care and departs scene	**07:30**	**15:00**

2.5.4 Critical Task Analysis and Effective Response Force Size

What does a deployment study derive from a critical task analysis? The total task times (as shown in Table 13 through Table 15) to stop the escalation of an emergency must be compared to outcomes. Nationally published fire service "time vs. temperature" tables illustrate that after approximately 4:00 to 5:00 minutes of free burning, fire in an enclosed room will escalate to the point of flashover. At this point, the entire room is engulfed in fire, the entire building becomes threatened, and human survival near or in the room of fire origin becomes impossible. Additionally, brain death begins to occur within 4:00 to 6:00 minutes of the heart stopping. Thus, the Effective Response Force must arrive in time to prevent these emergency events from becoming worse.

The District's daily staffing level, combined with automatic/mutual aid resources, is sufficient to deliver a single Effective Response Force of 17+ firefighters to a building fire—if they can arrive in time, which the mapping and statistics sections of this study will show is not always possible. Mitigating an emergency event is a team effort once the units have arrived. This refers to the *weight* of response analogy; if too few personnel arrive too slowly, then the emergency will escalate instead of improving. The outcome times, of course, will be longer and yield less desirable results if the arriving force is later or smaller.

The quantity of staffing and the arrival timeframe can be critical in a serious fire. Fires in older and/or multi-story buildings could well require the initial firefighters needing to rescue trapped or immobile occupants. If the Effective Response Force is too small, rescue and firefighting operations *cannot* be conducted simultaneously.

Fires and complex medical incidents require that additional units arrive in time to complete an effective intervention. Time is one factor that comes from *proper station siting*. Good performance also comes from *adequate staffing* and training. But where fire stations are spaced too far apart, and one unit must cover another unit's response area or multiple units are needed, these units can be too far away and the emergency will escalate and/or result in a less than desirable outcome.

Previous critical task studies conducted by Citygate and NFPA Standard 1710 find that all units need to arrive with 15+ firefighters within 11:30 minutes (from the time of receipt of 9-1-1 call) at a room and contents structure fire to be able to *simultaneously and effectively* perform the critical rescue, fire suppression, and ventilation tasks.

A question one might ask is, "If fewer firefighters arrive, *what* from the list of critical tasks would not be completed?" Most likely, the search team would be delayed, as would ventilation. The attack lines would only consist of two firefighters, which does not allow for rapid movement of the hose line above the first-floor in a multi-story building. Rescue is conducted with at least two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Effective deployment is about the **speed** *(travel time)* and the **weight** *(number of firefighters)* of the response.

Seventeen initial firefighters could handle a moderate-risk, confined residential fire; however, even an Effective Response Force (ERF) of 17 personnel will be seriously slowed if the fire is above the first floor in a low-rise apartment building or commercial/industrial building. This is where the capability to add additional personnel and resources to the standard response becomes critical.

Given that the District's First Alarm plan (ERF) delivers 17+ personnel (including mutual aid units) to a moderate risk building fire, it reflects the District's goal to confine serious building fires to or near the room of origin and to prevent the spread of fire to adjoining buildings. This is a typical desired outcome in urban/suburban areas and requires more firefighters more quickly than the typical rural outcome of keeping the fire contained to the building, not room, of origin.

The District's current physical response to building fires is, in effect, its de-facto deployment measure to more densely populated urban areas—*if those areas are within a reasonable travel time from a fire station*. Thus, this becomes the baseline policy for the deployment of firefighters.

2.6 Distribution and Concentration Studies—How the Location of First-Due and First Alarm Resources Affects Emergency Incident Outcomes

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

The District is served today by four fire stations deploying four engine companies, one cross-staffed aerial ladder truck, and one Battalion Chief as the duty Incident Commander. It is appropriate to understand using geographic mapping tools what the existing stations do and do not cover within travel time goals, if there are any coverage gaps needing one or more stations, and what, if anything, to do about them.

In brief, there are two geographic perspectives to fire station deployment:

- **Distribution** – the spacing of first-due fire units to control routine emergencies before they escalate and require additional resources.
- **Concentration** – the spacing of fire stations sufficiently close to each other so that more complex emergency incidents can receive sufficient resources from multiple fire stations quickly. As indicated, this is known as the **Effective Response Force**, or, more commonly, the "First Alarm Assignment"—the collection of a sufficient number of firefighters on scene, delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due fire unit travel time coverage, Citygate used a geographic mapping tool called FireView™ that can measure theoretical travel time over a street network. For this time calculation, Citygate used the base map and street travel speeds calibrated to actual fire apparatus travel times from previous responses to simulate real-world travel time coverage. Using these tools, Citygate ran several deployment tests and measured their impact on various parts of the District. A 4:00-minute first-due and 8:00-minute ERF travel time was used consistent with the NFPA 1710's performance goal. When 3:30 minutes are added for dispatch processing and crew turnout time, then the maps effectively show the area covered within 7:30 minutes of Santa Cruz Regional 9-1-1 receiving the request for the first-due unit and 11:30 minutes for an Effective Response Force (First Alarm) response.

2.6.1 Traffic Congestion Impacts

Citygate's team members personally observed daily traffic congestion in many parts of the District's service area, as Citygate has done in many other jurisdictions in recent years. The legacy approach to predicting travel times *does not* provide accurate results during traffic congestion periods because the traditional data set is insufficient.

Citygate is now able to obtain traffic throughput travel speed data from the company that provides real-time traffic data to internet-based traffic mapping applications. That company, HERE, is a multi-national firm that provides the data that drives internet-based map views of traffic congestion with red, yellow, and green segments to indicate flow impedance. HERE obtains traffic speed samples from a variety of public and private sources and measures traffic speeds in 15:00-minute increments, between intersections (segments), on a 24/7/365 basis for a rolling 36-month period.

To build the *traffic congestion* time-over-distance maps for this analysis, Citygate's model first uses actual fire apparatus travel times averaged over a 24-hour period for one year. Then traffic speed data is used to build a congested traffic model. Overall, the congestion impacts can be measured in the road miles covered at peak and off-peak traffic periods, as shown in Table 16.

Table 16—Road Mile Coverage for First-Due and ERF Units

Travel Time Measure	Total Road Miles	Road Miles Covered				Difference	
		Non-Congested		Congested		Congested vs. Non-Congested	
		Miles	Percent	Miles	Percent	Miles	Percent
4:00-Minute First Due	215	109	50.70%	51	23.72%	**-58**	-53.21%
8:00-Minute ERF	215	121	56.28%	2	0.93%	**-119**	-98.35%

As Table 16 shows, nearly **51 percent** of the District's public road miles are within 4:00 minutes travel time of a fire station *during non-congested traffic conditions*. That same 4:00-minute travel time coverage is *reduced* to **24 percent** of total road miles *during traffic congestion periods*. More importantly, 8:00-minute multiple-unit ERF travel time coverage is much more severely impacted from **56 percent** during non-congested conditions to **less than one percent** of the road miles, as multiple units must travel across large areas of the District. The following maps (see **Volume 2**) will show where this normal and reduced coverage occurs.

2.6.2 Deployment Baselines

Map #1 – General Geography, Station Locations, and Response Resource Types

Map #1 shows the District boundary and fire station locations, including adjacent agency mutual aid stations. This is a reference map for other maps that follow. Station symbols denote the type of staffed fire apparatus at each station. It is important to remember that all District stations are staffed with a minimum of three personnel, including at least one paramedic.

Map #2a – Planning Zones

This map shows the initial response (first-due) polygon for each station, as well as the District's urban services boundary, resulting in the six planning zones used for this study.

Map #2b – Risk Assessment: Critical Facilities

Map #2b shows the locations of the District's critical facilities as described in Appendix A.1.4.

Map #2c – Risk Assessment: High Needed Fire Flow Locations

This map displays the locations of buildings within the District with needed fire flow greater than 1,000 gallons per minute as determined by the Insurance Services Office. As the map illustrates, these buildings are located in the commercial zoning areas of the District.

Map #2d – Risk Assessment: Population Density

Map #2d shows the District's population density, aggregated by census block group, ranging from less than 100 to more than 18,000 per square mile. The higher population density areas are also the areas where the calls for service and building densities are higher, as shown in Map #8. These are also the areas where the District's Effective Response Force (First Alarm) response times need will need to be shorter to facilitate desired outcomes.

Map #2e – Risk Assessment: SRA Fire Hazard Severity Zones

This map shows the location of **Moderate**, **High**, and **Very High** Wildland Fire Hazard Severity Zones within the State Responsibility Areas (SRA) of the District as determined by the California Department of Forestry and Fire Protection (CAL FIRE).

Map #2f – Risk Assessment: LRA Fire Hazard Severity Zones

This map shows the location of **Moderate**, **High**, and **Very High** Wildland Fire Hazard Severity Zones within the Local Responsibility Areas (LRA) of the District as determined by the California Department of Forestry and Fire Protection (CAL FIRE).

Map #2g – Risk Assessment: Hazardous Materials Sites

Map #2g shows the location of businesses requiring a state or county hazardous material operating permit or Hazardous Materials Business Plan (HMBP).

Map #3 – First-Due Unit Distribution: 4:00-Minute Urban First-Due Travel Time Coverage

Map #3 shows the current distribution of fire stations using the District's first-due travel time goal of 4:00 minutes or less, with green indicating the street segments that a fire engine could be expected to reach within this time, assuming it is in its station and encounters no traffic congestion. The modeling tool uses actual fire apparatus speed by roadway type.

The purpose of response time modeling is to determine response time coverage across a jurisdiction's geography and station locations. This geo-mapping design is then validated against dispatch time data to reflect actual response times. There should be some overlap between station areas so that a second-due unit can have a chance of an acceptable response time when it responds to a call in another station's first-due response area.

> **Finding #3:** Most of the urban population density areas of the District are within 4:00-minute first-due travel time of an existing fire station *without traffic congestion*.

As discussed in Appendix B.1.5, District-wide first-due *travel time* to 90 percent of all incidents ranges, by station area, from 5:19 to 7:46 minutes.

Map #3a – First-Due Unit Distribution: 4:00-Minute Urban First-Due Travel Time Coverage WITH TRAFFIC CONGESTION

This map shows 4:00-minute first-due travel time coverage during daily traffic congestion periods. Note that 4:00-minute travel time coverage is *reduced 53 percent*, to only 24 percent of total public road miles, from non-traffic congestion periods.

> **Finding #4:** First-due 4:00-minute travel time coverage is *reduced by 53 percent* during traffic congestion periods, leaving *significant coverage gaps* in the high urban population and building density areas of the District.

Map #3b – First-Due Unit Distribution: 8:00-Minute Rural First-Due Travel Time Coverage

Map #3b shows 8:00-minute first-due travel time coverage, which is Citygate's recommended distribution goal for rural areas. Note that this first-due travel time goal covers approximately 75 percent of the District's rural planning zones.

Map #3c – First-Due Unit Distribution: 8:00-Minute Rural First-Due Travel Time Coverage WITH TRAFFIC CONGESTION

Map #3c shows 8:00-minute first-due travel time coverage during daily traffic congestion periods. Note that this first-due travel time coverage is approximately 75 percent less than non-congestion periods.

Map #4 - ISO 1.5-Mile Coverage Areas

This map displays the Insurance Service Office (ISO) recommendation that urban stations cover a 1.5-mile *distance* response area and, in rural areas, that stations be less than five miles apart.

Depending on a jurisdiction's road network, the 1.5-mile measure usually equates to a 3:30- to 4:30-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As can be seen, the 1.5-mile ISO coverage is very good in the urban planning zones, and five-mile coverage is also very good in all but approximately the very northern 15 to 20 percent of the District.

Map #5 – Concentration: Effective Response Force (ERF) 8:00-Minute Travel Time Coverage

Map #5 shows in green where the District's current response plan should deliver the initial Effective Response Force of four engines, one ladder truck, and one Battalion Chief, including mutual aid, within an 8:00-minute travel time without traffic congestion.

> **Finding #5:** Nearly all the urban population density areas of the District are within 8:00 minutes travel time of a multiple-unit Effective Response Force *without traffic congestion*.

Map #5a – Concentration: Effective Response Force (ERF) 8:00-Minute Travel Time Coverage WITH TRAFFIC CONGESTION

This map shows in green where the District's current response plan should deliver the initial Effective Response Force of four engines, one ladder truck, and one Battalion Chief, including mutual aid, within an 8:00-minute travel time *with* traffic congestion. As can be seen, 8:00-minute ERF travel time coverage under these conditions is *reduced more than 98 percent*, to less than one percent of total road miles, from non-traffic congestion conditions.

> **Finding #6:** Effective Response Force travel time coverage of 8:00 minutes is *reduced by 98 percent* during traffic congestion periods, covering *less than one percent* of the total District service area.

Map #5b – Concentration: Effective Response Force (ERF) 12:00-Minute Rural Travel Time Coverage

Map #5b shows in green where the District's current response plan should deliver the initial Effective Response Force of four engines, one ladder truck, and one Battalion Chief, including mutual aid, within 12:00 minutes travel time without traffic congestion, which is Citygate's recommended concentration goal for rural areas. As can be seen, approximately 66 percent of the rural planning zones are covered, except for the northernmost section.

Map #5c – Concentration: Effective Response Force (ERF) 12:00-Minute Rural Travel Time Coverage WITH TRAFFIC CONGESTION

This map shows in green where the District's current response plan should deliver the initial Effective Response Force of four engines, one ladder truck, and one Battalion Chief, including mutual aid, within 12:00 minutes travel time *with* traffic congestion. As can be seen, only a very small segment of the rural planning zones are covered during traffic congestion conditions.

Map #6 – 8:00-Minute Ladder Truck Travel Time Coverage

Map #6 shows 8:00-minute travel time coverage for Central FPD Truck 3472. As can be seen, this specialized resource can reach nearly all the urban population density areas of the District, and the southern half of the rural areas, within 8:00 minutes travel time without traffic congestion.

Map #6a – 8:00-Minute Ladder Truck Travel Time Coverage WITH TRAFFIC CONGESTION

This map shows 8:00-minute travel time coverage for Central FPD Truck 3472 during traffic congestion conditions. As can be seen, coverage for this this specialized resource is *reduced by approximately 50 percent* during traffic congestion conditions.

Finding #7:	The District's aerial ladder truck can only be expected to reach approximately *35 percent* of the urban service area from Station 2 within an 8:00-minute travel time during traffic congestion periods.

Recommendation #1:	As capital planning and funding permit, consider re-locating the aerial ladder truck closer to the center of the District's urban service area.

Map #7 – Battalion Chief 8:00-Minute Travel Time Coverage

Map #7 displays 8:00-minute travel time coverage for a Battalion Chief from Station 1 without traffic congestion. This travel time coverage includes nearly all the urban population density areas of the District and a small portion of the rural areas as well.

Map #7a – Battalion Chief 8:00-Minute Travel Time Coverage WITH TRAFFIC CONGESTION

This map displays 8:00-minute travel time coverage for a Battalion Chief from Station 1 *with* traffic congestion. As can be seen, 8:00-minute travel time coverage is *reduced by approximately 35 percent* during traffic congestion periods.

Map #8 – All Incident Locations

Map #8 shows the location of all incidents from January 2014 through December 2016. It is apparent that incidents occur on almost every road segment within the District.

Map #8a – Emergency Medical Services and Rescue Incident Locations

Map #8a further illustrates only the emergency medical and rescue incident locations. With the majority of the calls for service being medical emergencies, virtually all areas of the District require pre-hospital emergency medical services.

Map #8b – All Fire Locations

This map identifies the location of all fires within the District over the three years study period. All fires include any type of fire call, from vehicle to dumpster to building. There are obviously fewer fires than medical or rescue calls. Even given this, it is evident that fires occur in all planning zones, and fires are more concentrated where populations, buildings, and traffic are more densely spaced due to zoning and historic growth over the decades.

Map #8c – Structure Fire Locations

Map #8c displays the location of all structure fires over the past three years. While the number of structure fires is a smaller subset of total fires, there are two meaningful findings from this map. First, there are structure fires in every District planning zone except Station 2 – Rural, and second, there are few building fires in the District overall.

The location of many of the building fires parallels the older and higher risk building types in the District in which more significant risk, and the ISO-evaluated buildings, are more common. These areas and buildings pose a significant fire and life loss risk. Additionally, fires in the more complicated building types must be controlled quickly or the losses could be more significant.

Map #9 – Emergency Medical Services and Rescue Incident Location Densities

Map #9 examines, by mathematical density, where clusters of emergency medical services incident activity occurred. In this set, the darker density color plots the highest concentration of EMS/rescue incidents. This type of map makes the location of frequent workload more meaningful than just mapping the locations of all EMS incidents, as was done for Map #8a.

This perspective is important because the deployment system needs an overlap of units to ensure the delivery of multiple units when needed for more serious incidents or to handle simultaneous calls for service, as is evident in the higher concentration areas of the District.

Map #9a – All Fire Location Densities

This map is similar to Map 9, but shows the hot spots of activity for all types of fires. Again, fire density is greater in the higher population density areas of the District.

2.7 STATISTICAL ANALYSIS

SOC ELEMENT 7 OF 8
RELIABILITY AND HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The map sets described in Section 2.6 and presented in **Volume 2** show the ideal situation for response times and the response effectiveness given perfect conditions with no competing calls, traffic congestion, units out of place, or simultaneous calls for service. Examination of the actual response time data provides a picture of actual response performance with simultaneous calls, rush hour traffic congestion, units out of position, and delayed travel time for events such as periods of severe weather.

2.7.1 Service Demand

For 2016, the District responded to 5,185 calls for service (incidents) for an average daily service demand of 14.16 incidents. Of those, 1.91 percent were fire incidents, 58.40 percent were EMS incidents, and 39.69 percent were other incidents (e.g., alarm activation with no fire, false alarm, no incident found, public assist, smoke scare, assist other agency, smoke or odor removal, electrical problem, water leak, rescue, hazardous material incident, animal problem, etc.).

Annual service demand is trending upward an average of nearly 4.5 percent over the most recent three-year period, as shown in Table 17 and Figure 7.

Table 17—Annual Service Demand

Year	Incidents
2014	4,752
2015	5,098
2016	5,184
Total	**15,034**

Source: Central FPD incident records

Figure 7—Annual Service Demand by Year

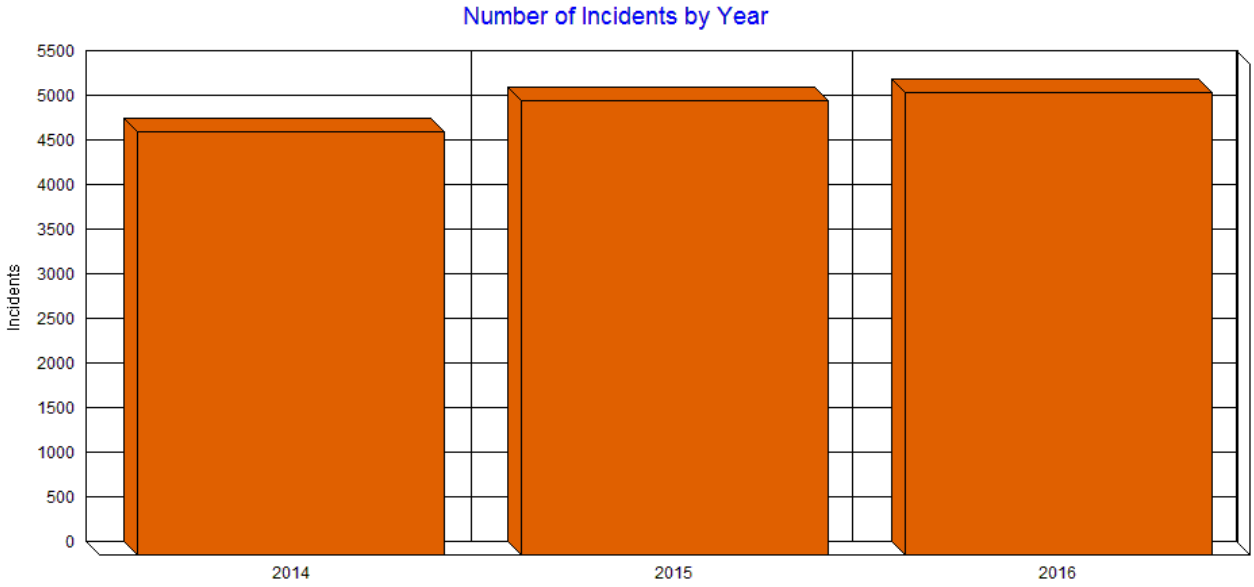
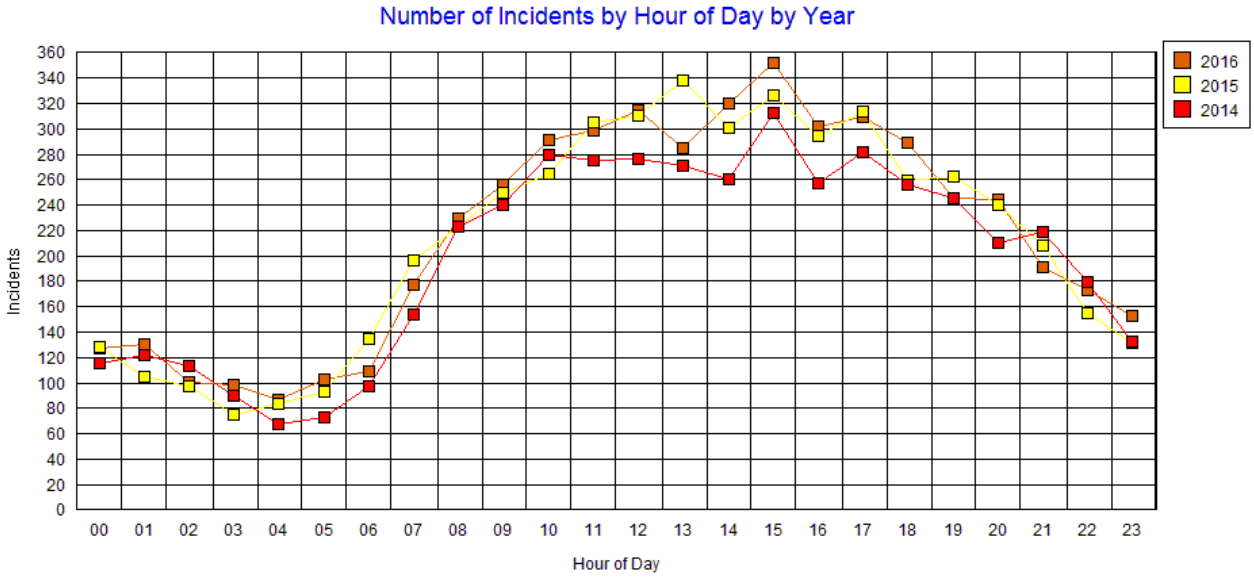


Figure 8—Service Demand by Hour of Day and Year



2.7.2 Operational Performance

Once incident types are quantified, the analysis shifts to the time required to respond to those emergencies. Fractile analyses track the percentage (and count the number) of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments. Based on national best practice recommendations and Citygate's experience, this study's response time test measurement is for the 90 percent call to arrival to be *7:30 minutes or less* for

urban/suburban planning (demand) zones. This is comprised of three component elements: call processing time, turnout time, and travel time.

Call to First Arrival Performance

A person needing help in an emergency measures the speed of the fire department response from the time assistance is first requested until the help arrives. This measure is referred to as "call to first arrival." As Table 18 shows, District-wide call to arrival performance is 34 percent (2:31) *slower* than the recommended goal of 7:30 minutes or less for positive outcomes in urban areas, predominantly due to slower-than-expected call processing, turnout, and travel times.

Table 18—90th Percentile Call to First Arrival Performance

Incident Location	Overall	2014	2015	2016
District-Wide	10:01	9:47	9:49	10:32

Source: Central FPD incident records; SCR911 CAD records

Call Processing Time

Call processing time is the time it takes to answer the 9-1-1 call, determine the nature of the emergency, enter information into the computer-aided dispatch system, and dispatch the appropriate resource(s). Best practice[8] is for 90 percent of calls to be processed and dispatched within 90 seconds where no language barriers exist or medical self-help instructions are not needed. Table 19 shows, 90th percentile District-wide call processing performance for 2016 was *more than double* the 90-second best practice goal (3:04).

Table 19—90th Percentile Call Processing Performance

Incident Location	Overall	2014	2015	2016
District-Wide	2:56	2:52	2:54	3:04

Source: Central FPD incident records and SCR911 CAD data

Although the District has no direct control over 9-1-1 call processing performance, it is a significant element of the District's overall response performance and associated customer service. Citygate suggests that the District collaborate with SCR911 staff to identify ways to improve this performance to a level more in alignment with industry-recognized best practice standards.

[8] NFPA Standard 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (2016)

Turnout Time

Turnout time is the time it takes for the crew(s) to hear the dispatch message, confirm the response travel route, don appropriate safety clothing, and board the apparatus for response. While turnout time best practice standard is 60 to 80 seconds,[9] it has long been recognized as a standard rarely met in practical experience. Citygate has long recommended that, due to this and the floor plan design of some fire stations, most agencies should be able to reasonably achieve a 2:00-minute crew turnout time at 90 percent compliance. As Table 20 shows, District-wide 90th percentile turnout time performance is 45 seconds *slower* (37 percent) than the recommended 2:00-minute target.

Table 20—90th Percentile Turnout Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	2:45	2:40	2:44	2:48

Source: Central FPD incident records; SCR911 CAD records

Travel Time

Travel time is defined as the time segment that begins with the start of apparatus movement and ends when that apparatus stops moving on arrival at the emergency. It is important to understand that this time segment *does not include* the time required to exit the apparatus and walk to an EMS patient or to deploy a hose line on a fire.

First-Due Travel Time

Best practice standards for first-due travel time is 4:00 minutes or less for urban demand zones,[10] and 8:00 minutes or less for rural demand zones.[11] As Table 21 shows, District-wide 90th percentile first-due travel time performance is 1:50 *slower* (46 percent) than the recommended 4:00-minute target; however, this is not unexpected due to large first-due response areas, topography, a predominantly curvilinear road network, and morning/afternoon traffic congestion on Highway 1 and surface streets.

[9] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

[10] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

[11] Citygate-recommended first-due travel time goal based on NFPA 1720 standard for rural areas: arrival of six or more personnel within 14:00 minutes of receipt of dispatch

Table 21—90th Percentile First-Due Travel Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	5:50	5:42	5:41	6:08

Source: Central FPD incident records; SCR911 CAD records

Effective Response Force Travel Time

The District's Effective Response Force (ERF or First Alarm) for building fires is four engines, one ladder truck, and one Battalion Chief. Over the three-year study period, there was only one incident with that ERF deployment arrival at the incident, which is statistically insignificant. A more practical ERF travel time performance analysis would be to evaluate those incidents where four apparatus plus a Chief Officer were dispatched and arrived at the incident. There were 45 incidents meeting this ERF definition, 15 of which were building fires.

Best practice standards for ERF travel time is 8:00 minutes or less for urban/suburban areas[12] and 12:00 minutes or less for rural areas.[13] As Table 22 shows, District-wide 90th percentile ERF travel time performance for four apparatus and one Chief Officer *nearly meets* or *is faster* than the 8:00-minute target for two of the three years studied. It is also important to note that this travel time analysis only involved 15 incidents over a three-year period, and the results should be considered with caution as these sample sizes are very small and can readily change significantly from year-to-year depending on the number and locations of the fires. For example, the ERF travel time performance for 2015 is abnormally skewed by a single incident out of the five total ERF incidents for that year.

Table 22—90th Percentile ERF Travel Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	13:21	6:27	37:50	8:57

Source: Central FPD incident records; SCR911 CAD records

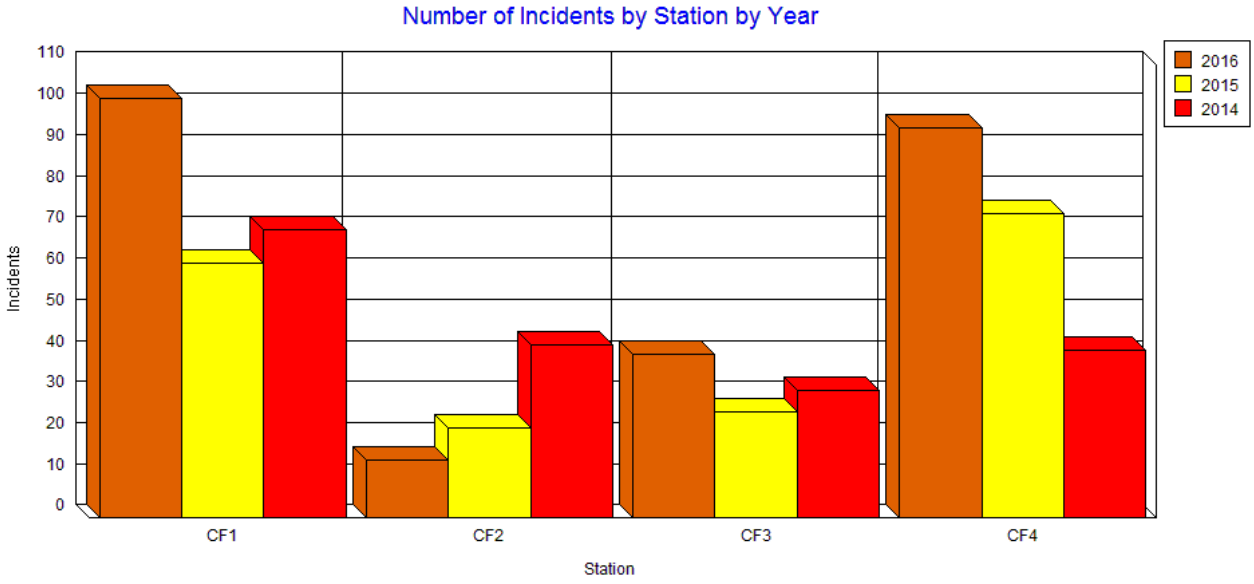
[12] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

[13] NFPA 1720 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments (2014). A response time of 14:00 minutes or less from receipt of dispatch notification minus Citygate-recommended 2:00-minute turnout time goal.

2.7.3 Simultaneous Incident Activity

Simultaneous incident activity measures the percentage of concurrent or overlapping incidents. For multiple-station departments, simultaneous incident activity in different station areas may have very little operational impact. However, simultaneous incidents within a single station response area can result in significantly longer response times because the second or successive concurrent call must be handled by an engine/resource from a more distant station. As Figure 9 shows, with nearly 100 simultaneous calls for Station 1 and Station 4 in 2016, and the sharp rise from prior years, simultaneous incident activity within these two station response areas can be expected to impact District first-due response performance somewhat.

Figure 9—Simultaneous Incident Activity within Same Station Response Area



2.7.4 Statistical Analysis Summary

Citygate's analysis of the most recent three calendar years of incident data yields the following conclusions. See **Appendix B** for the full statistical analysis.

- There were approximately 5,100 calls for service annually, or about 14 calls per day
- Annual service demand is trending up about 4.5 percent annually
- Fire incidents made up 1.9 percent of the calls
- EMS incidents made up 58.4 percent
- Other incidents made up 39.7 percent (e.g., alarm activation with no fire, false alarm, no incident found, public assist, smoke scare, assist other agency, smoke or

odor removal, electrical problem, water leak, rescue, hazardous material incident, animal problem, etc.)

- Station 1 and Station 4 had the highest service demand; Station 2 and Station 3 had significantly fewer calls for service
- Slightly more than three percent of calls were aid to other jurisdictions
- Simultaneous incidents had minimal impact on first-due response times
- Overall, District hourly station service demand and unit-hour utilization percentages were well below recommended maximum saturation rates
- For 2016, 9-1-1 call processing and dispatch performance was 94 seconds (104 percent) *slower* than a 90-second best practice standard
- Fire crew turnout time for 2016 was 48 seconds (40 percent) *slower* than a Citygate-recommended goal of 2:00 minutes or less
- First-due travel time performance was 1:50 *slower* (46 percent) than a 4:00-minute best practice goal for positive outcomes
- Effective Response Force (multiple-unit First Alarm) travel time performance for four apparatus and one Chief Officer *nearly met* or *was faster* than an 8:00-minute best practice goal; the number of incidents annually where all ERF resources arrive at the emergency was very small
- Call to first arrival performance was 2:31 (34 percent) *slower* than the recommended 7:30 minutes or less goal for positive outcomes in urban areas, predominantly due to slower than expected call processing, turnout, and travel times.

2.8 Overall Evaluation

SOC Element 8 of 8
Overall Evaluation

The District serves a predominantly residential and associated retail/service land use pattern, with a geographically challenging road network and daily traffic congestion that make it difficult to serve some areas of the District quickly. The District's overall size, topography, large geographic fire station response areas, predominantly curvilinear road network, daily traffic congestion, and 9-1-1 call processing and fire crew turnout times significantly slower than best practice recommendations also challenge the District's ability to respond to emergencies in sufficient time to achieve desired outcomes.

While the state Fire Code requires fire sprinklers even in residential dwellings, it will be many more decades before enough homes are replaced or remodeled with automatic fire sprinklers. If desired outcomes include limiting building fire damage to only part of the inside of an affected building and/or minimizing permanent physiological/neurological deficit resulting from medical emergencies, then the District will need both first-due and ERF coverage in all demand/planning zones consistent with Citygate's response performance recommendations of first-due arrival within 7:30 minutes from 9-1-1 notification and ERF arrival within 11:30 minutes of 9-1-1 notification, all at 90 percent or better reliability.

The District is not meeting its current distribution (first-due) turnout time goal of 60 seconds or less, or its first-due travel time goal of 4:00 minutes or less, by significant margins. Dispatch center call processing performance is also significantly below best practice standards. Overall, first-due call-to-arrival response performance is 34 percent (2:31) *slower* than the recommended 7:30 minutes or less goal for positive outcomes in urban areas, predominantly due to slower-than-expected call processing, turnout, and travel times.

If the District could save 76 seconds in call processing and 75 seconds in crew turnout time, the resultant 2:31 minutes, when subtracted from the actual call to arrival time of 10:01 minutes, reduces overall call to first arrival time to 7:30 minutes, meeting best practices *without additional fire stations.*

The District's concentration (ERF) travel time performance, on the other hand, is effectively meeting its goal of 8:00 minutes or less for the relatively few incidents each year where the entire ERF arrives at the emergency incident. This ERF travel time performance is, however, limited primarily to the higher urban population density areas of the District. ERF response performance to the more rural areas should be expected to be significantly slower, resulting in more serious outcomes.

2.8.1 Response Performance Gap Analysis

The next step in this analysis is to look at the size, location, and risks in the gap areas beyond the 7:30-minute first-due response time goal for positive outcomes. Assuming call processing and turnout times within a recommended total of 3:00 to 3:30 minutes, that leaves 4:00 to 4:30 minutes for travel time. As shown in Map #3, areas of the District *not covered* in a 4:00-minute travel time, *without traffic congestion,* include:

Gap Area #1: Twin Lakes area, generally bound by Eaton Street, 9th Avenue, East Cliff Drive, 5th Avenue, and Lake Avenue.

Gap Area #2: Area south of Highway 1, generally bound by Mattison Lane, Maciel Avenue, Capitola Road, Soquel Avenue, and Highway 1.

Gap Area #3: Pleasure Point Park area, generally bound by 30th Avenue, Portola Drive, 41st Avenue, and East Cliff Drive.

Gap Area #4: Southeastern corner of the District, generally bound by Park Avenue, Soquel Drive, and the eastern and southern District boundaries.

With traffic congestion impacts, those gap areas expand significantly:

Gap Area #5: Station 1 response area, generally west of Schwan Lagoon, north of Capitola Road, and most of the area west of Corcoran Lagoon to 41st Avenue.

Gap Area #6: Station 3 response area, generally west of Soquel San Jose Road north to the urban services boundary; the gap area shown to the east of Fairway Drive south of the urban services boundary is within 4:00 minutes travel time from Aptos/La Selva FPD Station 1.

Gap Area #7: Station 4 response area, generally west of Wharf Road and northeast of Bay Avenue.

Another factor to evaluate is the values at risk to be protected within these gap coverage areas, the two most significant of which are people and buildings. As Map #2d shows, these gap areas include the highest population densities within the District, ranging from a low of 2,500 per square mile to more than 18,000 per square mile. These gap areas also include the preponderance of the District's higher-density residential and non-residential building occupancies.

Considering daily traffic congestion impacts, a significant concern is Gap Area #7, which includes the core high-density commercial and residential areas of Capitola. Given that Station 3 and Station 4 are located within a designated flood zone, Citygate suggests that the District consider relocating these stations in its long-term capital plan.

Recommendation #2:	As capital planning and funding allow, consider relocating Fire Station 3 outside of the designated flood zone.
Recommendation #3:	As capital planning and funding allow, consider relocating Fire Station 4 outside of the designated flood zone and downtown Capitola.

As Map #6a illustrates, 8:00-minute travel time coverage for the District's aerial ladder truck from Station 2 leaves significant coverage gaps throughout most of the higher population and building density areas south of Highway 1, as well as in the eastern area of the District east of Porter Avenue. In addition to its aerial and ground ladder capabilities, this apparatus carries other specialized firefighting and rescue tools not available on other District apparatus. Because of

these specialized capabilities, this resource should ideally be located closer to the center of the District's service area, if possible, to provide the greatest first-due and ERF travel time coverage.

Recommendation #4:	As capital/strategic planning allows, consider relocating the aerial ladder truck closer to the center of the District's service area to maximize first-due and Effective Response Force travel time coverage for this specialized resource.

Absent reduced call processing and crew turnout times as discussed in Appendix B.1.5, and/or alternative deployment strategy(s) as further discussed in Section 2.9, longer-than-desired first-due and ERF response times will adversely affect outcomes in the less populated, rural areas of the District.

2.8.2 Recommended Response Performance Goals

It is apparent from the GIS element of this study that the District's service area includes diverse population densities and topography. In such districts, Citygate recommends agencies adopt tiered service level measures reflective of the lighter risks and populations to be protected in the more rural areas. Doing so provides the shortest response times for the higher intensity risks in the urban/suburban areas while still providing a reasonable service level for the lower risk rural areas. Given the differential population density and risks within the District's service area, consideration could be given to a tiered response time policy, as shown in Table 23.

Table 23—Recommended Total Response Time Goals by Population Density

Population Density (Per Square Mile)	First-Due		Effective Response Force[1]	
	Travel Time	Total Response Time	Travel Time	Total Response Time
>1,000	4:00	7:30	8:00	11:30
≤1,000	8:00	11:30	16:00	19:30

[1] Minimum of 16 personnel, including at least 1 Chief Officer

Based on the technical analysis and findings contained in this Standards of Coverage assessment, Citygate offers the following deployment recommendations:

Recommendation #5: **Adopt Updated Deployment Policies:** The District's Board of Directors should adopt updated, complete performance measures to aid deployment planning and to monitor performance. The measures of time should be designed to deliver outcomes that will save patients medically salvageable upon arrival and to keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures for the District's planning zones:

5.1 Distribution of Fire Stations: To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive, 90 percent of the time, within 7:30 minutes from the receipt of the 9-1-1 call in urban planning zones and within 11:30 minutes in rural planning zones. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 4:00-minute (urban zones) or 8:00-minute (rural zones) travel time.

5.2 Multiple-Unit Effective Response Force for Serious Emergencies: In the urban planning zones, to confine building fires near the room of origin, keep wildland fires under three acres in size, and treat multiple medical patients at a single incident, a multiple-unit Effective Response Force of at least 16 personnel, including at least one Chief Officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt in fire dispatch, 90 percent of the time. For the rural planning zones, the ERF should arrive within 19:30 minutes. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute (urban zones) or 16:00-minute (rural zones) travel time.

5.3 Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the District response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. This can be achieved with a first-due total response time of 7:30 minutes (urban zones) or 11:30 minutes (rural zones) to provide initial hazard evaluation and/or mitigation actions. After the initial evaluation is completed, a determination can be made whether to request additional resources from the regional hazardous materials response team.

5.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue with a first-due total response time of 7:30 minutes (urban zones) or 11:30 minutes (rural zones) to evaluate the situation and/or initiate rescue actions. Following the initial evaluation, assemble additional resources as needed within a total response time of 11:30 minutes (urban zones) or 19:30 minutes (rural zones) to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

2.9 POTENTIAL SERVICE DELIVERY ALTERNATIVES

2.9.1 Projected Growth

Table 24 summarizes projected population and housing unit growth within the District to the year 2035.

Table 24—Projected Population and Housing Growth

Area	Growth Factor							
	Population				Housing Units			
	2015[1]	2035[2]	Projected Growth (Units)	Projected Growth (Percent)	2015[1]	2035[2]	Projected Growth (Units)	Projected Growth (Percent)
City of Capitola[1]	10,077	10,088	11	**0.11%**	5,112	5,553	441	**8.63%**
Live Oak CDP[3]	18,038	19,402	1,364	**7.56%**	6,780	7,293	513	**7.56%**
Soquel CDP	10,827	11,646	819	**7.56%**	4,171	4,486	315	**7.56%**
Remainder of District[3]	16,058	17,272	1,214	**7.56%**	6,186	6,654	468	**7.56%**
Total	**55,000**	**58,407**	**3,407**	**6.19%**	**22,249**	**23,986**	**1,737**	**7.81%**

[1] U.S. Census Bureau (2015) data
[2] Association of Monterey Bay Governments (AMBAG) 2014 Regional Growth Forecast
[3] Estimated using AMBAG growth projection rate for unincorporated Santa Cruz County

As Table 24 shows, population and housing units within the District are projected to grow a very modest 6.19 percent and 7.81 percent respectively over the next 18 years to 2035. Although no data was available relative to current or projected non-residential development, Citygate anticipates a relatively equivalent growth rate for non-residential development.

2.9.2 Projected Future Service Demand

Service demand (calls for service) for fire agencies is generally a function of population and demographics: higher population densities and lower socio-economic demographics drive service demand up.

As Figure 17 in Appendix A.1.11 illustrates, the District's population density ranges from less than 100 to more than 18,000 people per square mile, with the higher densities occurring in the Capitola, Soquel, and Live Oak areas. The remainder of the District's service area is predominantly rural, with lower population density. Also, as Table 33 in Appendix A.1.4 shows, the District's population is generally well educated, employed, and covered by health insurance. In addition, most of the housing units are owner-occupied. Although more than 14 percent of the District's population is 65 years of age or older, violent crime and poverty rates within the

District are low. These factors, in aggregate, tend to result in lower service demand than other communities of similar population density with lower socio-economic demographics.

As discussed previously, population and related housing units are projected to increase by a very modest 6.19 percent and 7.81 percent respectively over the next 18 years to 2035, with zoning regulations limiting new development to existing town centers and concentrated urban areas.

Although incident data prior to 2014 was not reviewed for this assessment, service demand over the past three years has increased an average of less than five percent annually, as shown in Table 62 in Appendix B.1.4. Medical emergencies, the single largest service demand category, have increased an average of only 3.8 percent annually over the past two years. While building fire service demand has trended upward slightly, the number of building fire incidents remains low.

Given the District's demographics, zoning regulations, and service demand history, Citygate projects a continued annual service demand increase, averaging approximately five percent, over the next 10 years to 2027. In terms of calls per day, the current quantity of approximately 14 on an annualized basis only rises in 10 years to 23 per day.

Finding #8: Annual service demand is projected to annually increase by approximately five percent over the next 10 years into 2027. This increase can be absorbed within the District's current service capacity.

2.9.3 Service Delivery Alternatives

Operational Deployment Alternatives

As discussed in Section 2.8, current fire station locations, topography, predominantly curvilinear road network, and daily traffic congestion prevent response times from facilitating desired outcomes in many areas of the District. If desired outcomes include minimizing permanent physiological/neurological deficit resulting from medical emergencies and/or limiting building fire damage to only part of the inside of an affected building, then the District will need first-due response coverage within a recommended 7:30 minutes from 9-1-1 notification, and ERF response coverage within 11:30 minutes of 9-1-1 notification, in all demand/planning zones.

It is apparent from the GIS element of this study that, given the existing fire station locations within the District and the adjoining fire agencies, there are no opportunities to consolidate fire station locations to enhance service delivery within the District. The next most proximal fire station, Aptos/La Selva FPD Fire Station 1, is located 2.3 miles east of Fire Station 3 on Soquel Drive and provides appropriate station distribution spacing for both first-due and ERF travel time coverage.

As discussed in Section 2.8, there are currently four sections of the District's urban service area beyond the recommended 4:00-minute first-due travel time goal *without traffic congestion*, and three additional areas *with traffic congestion*, most of which have a population density greater than 2,500 per square mile. As suggested, first-due response performance in those gap areas could potentially be improved by relocating Station 3 west/northwest and by relocating Station 4 northeast closer to Highway 1. Improving first-due response performance in the other gap areas is impractical given the District's current station locations and the cost associated with providing additional stations/resources to serve these generally lower population density and service demand areas.

Given the daily traffic congestion impacts throughout most of the District's urban service area, first-due response performance could also potentially be improved with dynamic deployment of one or more "rapid response"[14] Peak Activity Units (PAU) during these or other high service demand periods. These PAUs could be staffed with two personnel, including at least one paramedic, to provide faster Advanced Life Support EMS and initial fire suppression response to areas difficult to reach within the preferred 7:30-minute first-due response time. This adaptive deployment model could be implemented and evaluated at the least cost by down-staffing two engines to 2–3 personnel to staff one PAU. Other PAU staffing alternatives include:

- Down-staff one engine; additional person on overtime
- Both personnel on overtime
- Add one additional permanent Firefighter; staff PAU when two engines are staffed with four personnel.

This adaptive deployment model would provide five or more staffed response units during peak traffic congestion and/or service demand periods, depending on the number of PAUs deployed, and provide additional available ERF staffing during these periods.

Operational Support Systems Alternatives

While the District already utilizes shared dispatch and fleet maintenance services, as well as shared EMS and training administration, other opportunities may exist to share or consolidate other District administrative/support programs/functions. For example, the District could collaborate with the Aptos-La Selva FPD to restart the Cooperative Prevention Project (CPP). Although this shared fire prevention services program was implemented in June 2014 and terminated by the Central FPD Board of Directors in September 2015, it served as a viable program meeting the fire prevention needs of both districts. With essentially identical California Fire Code amendments, similar data management systems, and similar program goals and

[14] Smaller Type-6 apparatus with EMS and fire suppression capability

objectives, this alternative may be worth consideration in lieu of the District hiring additional personnel to support the fire prevention program.

Another potential opportunity to share/consolidate services with the Aptos-La Selva FPD involves sharing mid-management staff, including the Aptos/La Selva Division Chiefs and the Central FPD Battalion Chiefs. As discussed in Section 1.3.1 and Section 3, the District currently utilizes three Battalion Chiefs working a 48/96-hour shift schedule to provide emergency incident command, shift personnel supervision, and management/oversight of assigned operational programs. Citygate's assessment of the District's Operations Division, however, as discussed in Section 3, finds that there is currently insufficient capacity in this staffing model to adequately meet all operational, supervisory, and assigned program responsibilities. While some of this capacity gap could be alleviated with the filling of the vacant Assistant Fire Chief position, many of the identified Operations Division workload gaps need additional lower-level technical administrative support.

Under this concept, the Battalion Chiefs would be responsible for shift administration and emergency incident management and the Division Chiefs would be responsible for administration of both agencies' operations, EMS, prevention/risk reduction, training, safety, and fleet maintenance programs. While this alternative would not provide any fiscal savings, it could provide enhanced program continuity and efficiencies for both Districts. This model could also be another incremental step toward a functional or full consolidation. While this alternative would involve legal, operational, and labor relations issues, it may well be worth consideration by both Districts to enhance operational and administrative efficacy.

Along that same theme, a third alternative could involve the sharing of some or all administrative support services, such as accounting, payroll, human resources, risk management, technology management, and website/social media administration. This alternative could also provide enhanced administrative backup/surge capacity to ensure continuity of essential business services/systems in the event of a prolonged or unanticipated administrative absence for both Districts.

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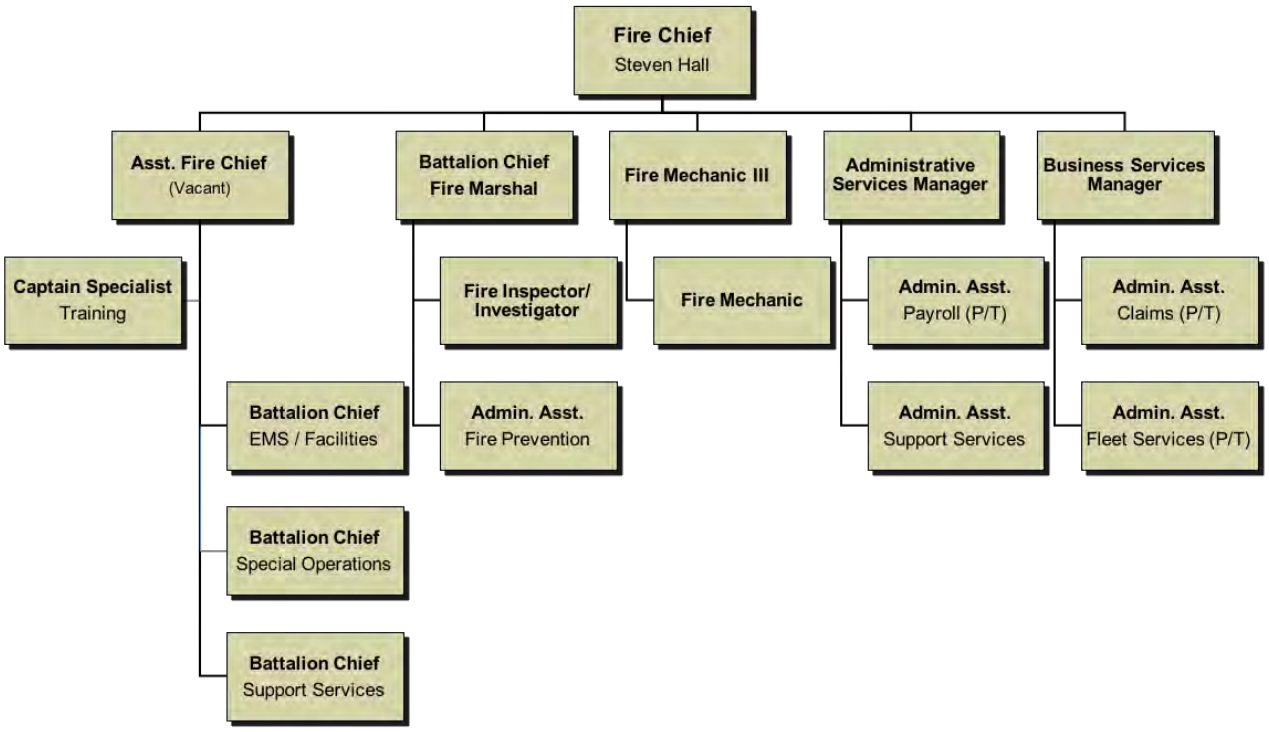
SECTION 3—MANAGEMENT/ADMINISTRATIVE ASSESSMENT

This section provides a detailed assessment of the District's management and administrative organization, including key responsibilities, capabilities, staffing level, workload analysis, and analysis of any resultant capacity or skill gaps.

3.1 MANAGEMENT/ADMINISTRATIVE ORGANIZATION

The District's management and administrative organization includes the Fire Chief, Assistant Fire Chief (currently vacant), three Battalion Chiefs, one Fire Marshal, one Fire Captain Specialist, one Fire Inspector/Investigator, one Fire Mechanic III, one Fire Mechanic, an Administrative Services Manager, a Business Services Manager, and five Administrative Assistants, three of whom are part-time employees, for a total of 15.5 budgeted positions, as shown in Figure 10.

Figure 10—Administrative/Management Organization



This staff is responsible for administering and managing all District functions and services, including overall administration, operations, training, safety, EMS, human resources, accounting, budgeting, risk management, policies/procedures, information technology, fire prevention, community education and information, fire investigation, coordination with other local/regional

service providers/stakeholders, fleet maintenance, and other related administrative and management responsibilities.

3.2 MANAGEMENT/ADMINISTRATIVE ASSESSMENT METHODOLOGY

Citygate's assessment of the District's management and administrative organization involves the following elements:

1. Identification of budgeted staffing by division and job title
2. Identification of any current position vacancies
3. Identification of key primary and secondary responsibilities
4. Identification of percentage of work time currently required for each responsibility
5. Administration of a Strengths/Weaknesses/Opportunities/Threats (SWOT) questionnaire
6. Follow-up interview with each management/administrative employee to validate SWOT questionnaire and workload assessment
7. Identification of specific current and/or anticipated near-term future workload gaps by division:
    a. What is not being performed
    b. What is not being performed to desired/expected levels
8. Estimation of additional workload capacity and required skills needed to relieve identified workload gaps.

3.3 OPERATIONS DIVISION

The Operations Division administrative staff consists of an Assistant Fire Chief (currently vacant), three Battalion Chiefs, and one Fire Captain Specialist. Key administrative responsibilities include:

- Training
- Safety
- Communications
- Self-Contained Breathing Apparatus (SCBA)

- Designated Infectious Control Officer
- EMS
- Firefighting and rescue equipment
- Incident reports and records
- Facilities maintenance
- Paid-Call Firefighter program
- Fire hydrant testing.

Citygate's review of the Operations Division administrative responsibilities yielded the following comments:

- Strengths:
  - Very qualified and committed staff
  - Inter-agency cooperation, training, and interoperability
  - Paid-Call Firefighter program
  - In-house fleet maintenance
- Weaknesses/Concerns:
  - Battalion Chief's workload and associated limited available capacity/time for assigned administrative program responsibilities
  - Reduced quality of program management/staff work due to limited capacity
  - Limited available District EMS support capacity from the EMSIA Battalion Chief
  - Challenges associated with the District's current inventory management program; solution is in process
  - Advanced Urban Search and Rescue (USAR) skills training needs
  - Lack of a dedicated training facility
  - Some position task books outdated
  - Company performance standards not validated (currently in process)
  - Insufficient staff capacity to effectively manage the training program

- Lack of appropriate oversight of training records
- Lack of supervisor training
- Outdated Emergency Operations Guidelines and Standard Operating Procedures
- Lack of career/professional development opportunities
- Very outdated career development program
- Limited opportunities to serve in higher position on an "acting" basis
- Poor succession planning
- District's Health and Safety Manual needs updating.
- Outdated Illness and Injury Prevention Plan (IIPP)
- Low funding support of some operational programs

◆ Opportunities:

- Additional/expanded shared services with other local/regional agencies
- Establishment of a regional training center
- Participation in National Fire Academy classes
- Accredited regional fire training program through Cabrillo College
- Stronger vision and support from District leadership
- Additional administrative staff capacity
- Remodel/replacement of older facilities
- Additional fire station facility(s)

◆ Threats:

- Funding reductions
- Low operational staff participation in administrative programs
- Economic downturns and related revenue impacts
- Diminishing grant opportunities
- Any potential staffing reductions.

Citygate's Operations Division workload review found that while most administrative responsibilities are being met to a minimally satisfactory degree, all three Battalion Chiefs and the Fire Captain Specialist are challenged to meet their assigned program responsibilities in a timely manner and/or to an expected or desired level of proficiency, quality, and thoroughness. Each Battalion Chief reported regularly working 12–15 hours on assigned duty days, as well as frequently performing District work on off-duty days. They also reported their challenges of attempting to maintain the status quo with little or no capacity to address program improvements, to encourage career/professional development for themselves or subordinates, or to substantively contribute to other organizational programs or initiatives.

While the current Assistant Fire Chief vacancy, if filled, would alleviate some of the current Operations Division workload gap, Citygate finds that additional technical administrative support capacity beyond that management/supervisory level is needed to relieve current and ongoing workload gaps for the operational Battalion Chiefs and Fire Captain Specialist. Although no formal forensic workload analysis was included in the scope of work for this project, Citygate's assessment estimates 0.5–1.0 FTE[15] of ongoing additional technical administrative support is needed to relieve those workload gaps, as summarized in Table 25. This additional capacity could also potentially provide supplemental administrative support capacity and/or redundant critical business systems capability for other District divisions.

Table 25—Workload Gap Summary – Operations Division

Workload Gap	Estimated Workload Capacity Gap			
	Temporary/Transitional		Ongoing	
	Annual Hours	FTE[1]	Annual Hours	FTE[1]
Administrative support of operational programs	0	0	980–1,960	0.5–1.0
Total	**0**	**0**	**980–1,960**	**0.5–1.0**

[1] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Finding #9: The Operations Division has current and ongoing administrative workload gaps needing an estimated 0.5–1.0 FTE of additional technical administrative support capacity to close. This additional capacity could also potentially provide supplemental administrative support/redundant critical business systems capability for other District divisions.

[15] FTE = Full-time equivalent

3.4 FIRE PREVENTION DIVISION

The District's Fire Prevention Division consists of one Battalion Chief / Fire Marshal who reports directly to the Fire Chief, one Fire Inspector/Investigator, and one full-time Administrative Assistant. As an extension of current staff, a specialized, contract private-sector firm conducts construction plan reviews. Key Fire Prevention Division responsibilities include:

- Fire code adoption and enforcement
- Mandated occupancy inspections
- Other occupancy inspections
- New development/construction plan review and related inspections
- Burn permit administration
- Weed abatement program administration
- Community outreach and life safety education programs
- Public information
- Fire investigations.

Citygate's review of the Fire Prevention Division yielded the following:

- Strengths:
  - Committed, well-qualified staff
  - Ancillary benefits of the engine company inspection program, specifically response area familiarization and pre-fire planning of inspected occupancies
  - Centralized plan review, fire inspection, weed abatement, and public education programs that provide good customer service
  - Quality of provided fire prevention services
- Weaknesses/Concerns:
  - Poor internal communication, coordination, and consistency
  - Lack of enforcement mechanism for non-compliance or failure to pay fees
  - Centralized scheduling of inspections is less efficient than individual inspectors scheduling their own inspections

- Lack of fire inspection training for both Operations and Prevention Division staff, resulting in a lack of consistency in priority and quality
- Fire prevention files organized by occupancy classification and inspection status rather than by address/location
- Handwritten documents/files rather than electronic
- Less than optimum organization of wildland defensible space inspection program
- Multiple record management systems used for prevention records
- Division succession planning is not occurring

◆ Opportunities:

- Enhanced fire prevention-specific training and career development
- Improved consistency of company inspections with new fire prevention software program and focused training
- Ability to synchronize Outlook calendar with personal smartphone
- Capacity to improve number/percentage of fire inspections completed annually
- Establishment of an enforcement mechanism for non-compliance or failure to pay required fees
- Better organization of processes and records
- Cooperative Prevention Program with Aptos/La Selva Fire District
- Division-specific succession planning

◆ Threats:

- Excessive workload during peak activity periods
- Lack of internal communication, coordination, and consistency
- Potential wildland-urban interface (WUI) fire damage
- Specialized hazards related to legal cannabis growing/processing facilities.

Citygate's Prevention Division workload review finds that most key responsibilities, including plan reviews, fire protection system inspections, mandated occupancy inspections, burn permit administration, and annual weed abatement program management, are being satisfactorily met.

The current gaps related to the frequency and consistency of fire inspections conducted by both Division staff and station personnel can be resolved through training and better internal communications, coordination, and business systems. This includes use of the recently implemented inspection software program.

At the time of this report, the Division had already added program responsibilities to include:

- Management/oversight of engine company inspections and related inspection records
- Management of the business self-inspection program and related inspection records.

As summarized in Table 26, this additional workload, along with additional capacity needed to effectively support the Division's records management system and develop and implement a desired internal succession development program, will require additionally estimated ongoing capacity.

Table 26—Workload Gap Summary – Fire Prevention Division

Workload Gap	Estimated Workload Capacity Gap			
	Temporary/Transitional		Ongoing	
	Annual Hours	FTE[1]	Annual Hours	FTE[1]
Engine company inspection program management/support	0	0	416–832	0.20–0.40
Business self-inspection program management/support[2]	0	0	208–416	0.10–0.20
Record management system support	0	0	260–520	0.13–0.26
Training / succession development	0	0	60–120	0.03–0.06
Total	**0**	**0**	**944–1,888**	**0.5–1.0**

[1] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

[2] Newly added program responsibilities

Finding #10: While most Fire Prevention Division responsibilities are being satisfactorily met, recently added program responsibilities and other ongoing workloads gaps identified will require an estimated 0.5–1.0 FTE additional ongoing technical support capacity.

3.5 FINANCE DIVISION

Finance Division staff includes a Business Services Manager and two part-time Administrative Assistants. Key responsibilities include:

- Budget development and management
- Accounts payable
- Accounts receivable
- Fiscal planning
- Investments
- Fiscal audits
- Claims
- Technology systems
- Fleet services management.

Citygate's review of the Finance Division yielded the following:

- Strengths:
  - Well-qualified and committed staff
  - Technical knowledge and related support services provided
  - Strong working relationship with other divisions
- Weaknesses/Concerns:
  - Lack of a Comprehensive Annual Financial Report (CAFR)
  - Lack of a comprehensive budget document
  - Outdated financial policies
  - Cumbersome financial business processes
  - Capital asset policy, plan, and inventory system needs to be updated
  - Lack of a strategy to address unfunded fiscal liabilities
  - Lack of high-speed network connectivity to fire stations and fleet services facilities

- Lack of available capacity/time to keep current with records management/filing
- Lack of available capacity/time to properly reconcile financial accounts
- Outdated job descriptions that do not accurately reflect current responsibilities

◆ Opportunities:

- Fully integrated business software systems
- Expanded mobile software applications
- Integrated accounting software solution
- Expanded/updated fleet services business processes

◆ Threats:

- None identified.

Citygate's Finance Division workload review finds that while most key responsibilities are being satisfactorily met, the Division is understaffed to effectively meet all its responsibilities. Table 27 summarizes Citygate estimates for the additional temporary and ongoing technical support capacity needed to relieve those gaps.

Table 27—Workload Gap Summary – Finance Division

Workload Gap	Estimated Workload Capacity Gap			
	Temporary/Transitional[1]		Ongoing	
	Annual Hours	FTE[2]	Annual Hours	FTE[2]
Comprehensive Annual Financial Report	0	0	80–160	0.04–0.08
Comprehensive budget document	0	0	80–160	0.04–0.08
Update/maintain financial policies	160–240	0.08–0.12	40–80	0.02–0.04
Long-term fiscal planning	0	0	40–80	0.02–0.04
Capital asset program support	80–160	0.04–0.08	40–80	0.02–0.04
Record management system support	160–240	0.08–0.12	220–430	0.11–0.22
IT technical support	240–400	0.13–0.20	0	0
Total	**640–1,040**	**0.33–0.5**	**500–990**	**0.25–0.50**

[1] Estimated duration of need: 12–18 months

[2] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Finding #11: While most Finance Division responsibilities are being satisfactorily met, an estimated 0.33–0.50 FTE temporary and 0.25–0.50 FTE ongoing technical support capacity is needed to effectively meet all program responsibilities.

3.6 HUMAN RESOURCES DIVISION

Human Resources Division staff includes an Administrative Services Manager and one full-time and one part-time Administrative Assistant. Key responsibilities include:

- Personnel management
- Payroll
- Employee benefits management
- Risk management
- Incoming telephone calls
- Public/vendor contacts
- Emergency record system administration
- Records retention program administration
- Special projects
- Board of Directors support
- Fire Chief / Chief Officer administrative support.

Citygate's review of the Human Resources Division yielded the following:

- Strengths:
  - Well-qualified staff
  - Strong technical knowledge and related support services provided
  - Conformance with federal and state regulations
  - Good working relationship with other divisions
- Weaknesses/Concerns:
  - Cross-training to ensure redundant critical business systems capability and succession planning needed

- Increasing complexity of payroll
- Extra workload during the budget development process supersedes other responsibilities which prevents Division staff from completing some of their other responsibilities during this period
- Necessity of clear, updated policies
- Inadequate capacity to implement new integrated payroll system
- Inadequate capacity to implement Lexipol policy system
- Inadequate capacity to scan older documents into digital records management system
- Inadequate capacity to complete ongoing projects
- Inadequate capacity to meet all assigned and expected responsibilities
- Outdated job descriptions

◆ Opportunities:

- Updated integrated payroll system
- Lexipol policy system

◆ Threats:

- Labor-management relationship.

Citygate's Human Resources Division workload review finds that while most key responsibilities are being satisfactorily met, the Division is understaffed to effectively meet all its responsibilities. As summarized in Table 28, Citygate estimates that additional temporary and ongoing technical support capacity is needed to relieve those gaps.

Table 28—Workload Gap Summary – Human Resources Division

Workload Gap	Estimated Workload Capacity Gap			
	Temporary/Transitional[1]		Ongoing	
	Annual Hours	FTE[2]	Annual Hours	FTE[2]
Redundant payroll and benefits system capability	0	0	160–320	0.08–0.16
Lexipol policy system implementation	880–1,430	0.45–0.73	80–160	0.04–0.08
Update/maintain HR policies	0	0	80–160	0.04–0.08
Update/maintain job descriptions	100–140	0.05–0.07	60–120	0.03–0.04
Telephone system/public contact coverage	0	0	480–960	0.25–0.50
Special projects capacity	0	0	80–160	0.04–0.08
Training/succession development	0	0	40–80	0.02–0.04
Total	**980–1,570**	**0.50–0.80**	**980–1,960**	**0.50–1.00**

[1] Estimated duration of need: 12–18 months

[2] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Finding #12: The Human Resources Division has current and ongoing workload gaps that require an estimated 0.5–0.8 FTE temporary and 0.5–1.0 FTE ongoing additional capacity to close.

3.7 Fleet Services Division

The Fleet Services Division consists of a Fire Mechanic III who reports directly to the Fire Chief and one Fire Mechanic. A part-time Administrative Assistant supervised by the Business Services Manager provides technical support services. Key responsibilities of the Fleet Services Division include:

- Maintaining operational readiness of all District apparatus and support vehicles including safety inspections, preventive maintenance, repairs, and equipment installation
- Fire pump and exhaust opacity testing
- Annual rescue tool and ground ladder maintenance
- Contract fleet maintenance services for other local fire agencies
- Fleet services contract administration

- Parts and shop supplies procurement, inventory, and invoicing to appropriate job
- Fleet maintenance/repair scheduling
- Maintenance/repair invoicing to appropriate vehicle/agency
- District fuel purchasing and use records
- Administration of all shop and fire station facility use permits
- Procurement, inventory, and distribution of fire station supplies
- Management of Division budget
- Maintenance of pump test records
- Conformance with all applicable county, state, and federal laws and regulations.

Citygate's review of the Fleet Services Division yielded the following comments:

- Strengths:
  - Efficiency and cost savings of District fleet maintenance facility
  - Contract fleet maintenance services to other local fire agencies
  - Certified Fire Mechanic
  - Quality of fleet services provided
  - Overall fleet safety record
  - Detailed inventory of commonly used parts and shop supplies
- Weaknesses/Concerns:
  - Continually unable to keep up with demand for services
    - Fire Mechanic III regularly works 48–50 hours per week
  - External contract customers getting priority over District needs
  - Parts availability / lag time
  - Safety inspections not getting done within required timeframe
  - Overall shop capacity too low for size of fleet with current staffing allocation
  - Inaccurate job description(s)
  - Liability for use/loss of employee-owned tools

- Lack of ongoing technical skills / career development training
- Lack of succession planning for Division
- Lack of long-range planning
- Lack of integration of software/databases across all divisions
- Less than optimal organizational communication (all divisions)

◆ Opportunities:

- Utilization of electronic records in lieu of current paper records (currently in process)
- Electronic inventory management system
- Amendment of contract fees to more closely align with standard shop rates
- Utilization of available training opportunities to maintain/improve technical skills
- Additional staff to keep up with workload
- Better organization of shop facility and procedures

◆ Threats:

- Funding reductions
- Lack of training / opportunities for advancement.

Citygate's Fleet Services Division workload review found that with the current staff of two mechanics and one part-time Administrative Assistant, the Division is challenged to meet District and contract agency expectations for timely preventive maintenance and repairs and management of the District's parts and facility supplies programs. As estimated in Table 29, the Division requires additional ongoing workload capacity to close the gaps.

Table 29—Workload Gap Summary – Fleet Services Division

Workload Gap	Estimated Workload Capacity Gap			
	Temporary/Transitional		Ongoing	
	Annual Hours	FTE[1]	Annual Hours	FTE[1]
Program administration and management	0	0	980–1,960	0.50–1.00
Heavy equipment automotive mechanic capacity	0	0	980–1,960	0.50–1.00
Records system management	0	0	260–520	0.10–0.25
Cal/OSHA required postings and record-keeping	0	0	60–120	0.03–0.06
Data management system capacity	0	0	260–520	0.10–0.25
Parts/station supplies inventory management	0	0	400–800	0.20–0.40
Total	**0**	**0**	**2,940–5,880**	**1.50–03.00**

[1] FTE = Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Finding #13: The Fleet Services Division has current and ongoing workload gaps requiring an estimated additional 0.5–1.0 FTE management capacity, 0.5–1.0 FTE automotive/heavy equipment mechanic capacity, and 0.5–1.0 FTE administrative support capacity to close.

3.8 MANAGEMENT/ADMINISTRATIVE ASSESSMENT SUMMARY

Overall, Citygate's assessment of the District's management/administrative organization finds that, while it has highly qualified and capable staff, it is understaffed to meet current and near-term future workload, as summarized in Table 30. Citygate further finds that near-term future management/administrative workload, without the District adding fire station(s) and/or taking on substantial additional service responsibilities, is unlikely to significantly change.

Table 30—Management/Administrative Workload Gap Summary

Division	Estimated Workload Capacity Gap			
	Temporary/Transitional[1]		Ongoing	
	Annual Hours	FTE[2]	Annual Hours	FTE[2]
Operations	0	0	980–1,960	0.50–1.00
Fire Prevention	0	0	944–1,888	0.50–1.00
Finance	640–1,040	0.33–0.50	500–990	0.25–0.50
Human Resources	980–1,570	0.50–0.80	980–1,960	0.50–1.00
Fleet Services	0	0	2,940–5,880	1.50–3.00
Total	**1,620–2,610**	**0.83–1.3**	**6,344–12,678**	**3.25–6.50**

[1] Estimated duration of need: 12–18 months
[2] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Finding #14: The District's five divisions have current, near-term, and/or ongoing management and administrative workload gaps that need an estimated additional 0.83–1.30 temporary and 03.25–6.50 ongoing FTE capacity to close.

Finding #15: The District's current management and administrative workload is not expected to substantively change in the near-term future without additional fire station(s) and/or the District assuming additional services or responsibilities.

Recommendation #6: As fiscal/strategic planning and funding permit, the District should consider adding supplemental management and administrative capacity, as identified and prioritized in this report, to resolve workload capacity gaps.

3.8.1 Recommended Management/Administrative Program Priorities

Pursuant to review of the management and administrative responsibilities of the District's five divisions and identification and estimated quantification of current and ongoing workload

capacity gaps, Citygate recommends program priorities for consideration by the District, as summarized in Table 31, as fiscal/strategic planning and funding permit.

Table 31—Recommended Management/Administrative Program Priorities

Program Priority		Description	FTE [1]
1	**Fleet Services**	Additional heavy equipment mechanic capacity	0.50–1.00
2	**Operations**	Technical administrative support	0.50–1.00
3	**Fleet Services**	Additional administrative support capacity	0.25–1.00
4	**Human Resources**	Additional support capacity	0.50–1.00
5	**Fire Prevention**	Additional technical support capacity	0.50–1.00
6	**Finance**	Additional support capacity	0.25–0.50
7	**Fleet Services**	Program management	0.50–1.00

[1] FTE: Full-Time Equivalent assuming 1 FTE = 1,960 annual hours

Citygate further recommends that the District consider conducting an internal audit to identify critical business systems and processes and any existing or potential single points of failure related to those systems/processes. The next step would be to then prioritize and eliminate them as needed funding permits. Single points of failure can include software/hardware systems, internal business processes, and/or staff capability/expertise. Elimination typically involves at least one level of redundancy, although additional redundancy may be desirable for some systems/processes such as storage of critical records.

SECTION 4—FINDINGS AND RECOMMENDATIONS

The following is a complete list of the findings and recommendations contained in this report. Beginning with deployment, findings and recommendations are grouped and presented by subject area.

4.1 DEPLOYMENT FINDINGS AND RECOMMENDATIONS

Finding #1: The District has not adopted response time policy statements by risk type consistent with the best practice recommendations of the Commission on Fire Accreditation International.

Finding #2: The District has a standard response plan that considers risk and establishes an appropriate initial response for each incident type. Each type of call for service receives the combination of engine companies, trucks, ambulances, specialty units, and command officers customarily needed to effectively control that type of incident as based on District experience.

Finding #3: Most of the urban population density areas of the District are within 4:00-minute first-due travel time of an existing fire station *without traffic congestion*.

Finding #4: First-due 4:00-minute travel time coverage is *reduced by 53 percent* during traffic congestion periods, leaving *significant coverage gaps* in the high urban population and building density areas of the District.

Finding #5: Nearly all the urban population density areas of the District are within 8:00 minutes travel time of a multiple-unit Effective Response Force *without traffic congestion*.

Finding #6: Effective Response Force travel time coverage of 8:00 minutes is *reduced by 98 percent* during traffic congestion periods, covering *less than one percent* of the total District service area.

Finding #7: The District's aerial ladder truck can only be expected to reach approximately *35 percent* of the urban service area from Station 2 within an 8:00-minute travel time during traffic congestion periods.

Finding #8: Annual service demand is projected to annually increase by approximately five percent over the next 10 years into 2027. This increase can be absorbed within the District's current service capacity.

Finding #16: The District's population is projected to grow less than one percent annually over the next 18 years into 2035.

Finding #17: The District's core populated areas are essentially built out, with zoning regulations limiting new development to existing town centers and concentrated urban areas.

Finding #18: The District has an open-ocean rescue capability; however, this service is not always available.

Finding #19: Most of the District's service area north of Highway 1 is within a **Moderate** or **High** wildland Fire Hazard Severity Zone (FHSZ), as identified by CAL FIRE.

Finding #20: Portions of the District's service area south of Highway 1 lie within a **Moderate** or **High** wildland FHSZ, as recommended by CAL FIRE.

Finding #21: The District has established a goal to inspect every parcel north of Highway 1 within the State Responsibility Area at least every two years to ensure that required defensible space is appropriately established and maintained.

Finding #22: The San Mateo / Santa Cruz County Community Wildfire Protection Plan identifies several high-priority wildland fire mitigation project areas within the District.

Finding #23: The County has established appropriate emergency evacuation protocols, procedures, and resources in its Emergency Operations Plan.

Finding #24: The County has established a mass emergency telephone notification system to effectively communicate emergency information to the public in a timely manner.

Finding #25: The County regularly utilizes, validates, and evaluates its emergency evacuation protocols, procedures, and resources to ensure ongoing emergency evacuation readiness and effectiveness.

Finding #26: The District's day-of-week and month-of-year service demands are fairly consistent, indicating the need for a consistent 24-hour-per-day, seven-days-per-week fire and EMS emergency response system.

Finding #27: Out of all incident activity in 2016, slightly more than 28 percent involved two or more simultaneous (concurrent) incidents.

Finding #28: Simultaneous incident activity **within the same station response area** somewhat impacted District's first-due response time, involving 4.8 percent of all calls for service in 2016.

Finding #29: Overall District hourly station service demand and unit-hour utilization percentages are well below recommended maximum saturation rates.

Finding #30: Call processing times for 90 percent of the District's incidents fail to meet recommended best practices by a significant margin (89 seconds), and a significantly low percentage of dispatch records have a call processing time stamp within expected parameters.

Finding #31: Turnout time performance appears to consistently fail by a significant margin to meet a recommended target of 2:00 minutes or less.

Finding #32: Effective Response Force travel times in many District areas are significantly slower than the 8:00 minutes or less recommended for desired outcomes.

Finding #33: Overall District call to first arrival performance of 10:01 minutes is 34 percent (2:31 minutes) slower than the recommended 7:30-minutes-or-less goal for positive outcomes in urban areas. This is predominantly due to slower than expected call processing, crew turnout, and travel times. However, this performance does meet Citygate's recommended 12:00-minutes-or-less call to first arrival performance goal for rural areas.

If the District could save 76 seconds in call processing and 75 seconds in crew turnout time, the resultant 2:31 minutes, when subtracted from the actual call to arrival time of 10:01 minutes, would lower call to arrival to 7:30 minutes, meeting best practices and without additional fire stations.

Recommendation #1: As capital planning and funding allow, consider re-locating the aerial ladder truck closer to the center of the District's urban service area.

Recommendation #2: As capital planning and funding allow, consider relocating Fire Station 3 outside of the designated flood zone.

Recommendation #3: As capital planning and funding allow, consider relocating Fire Station 4 outside of the designated flood zone and downtown Capitola.

Recommendation #4: As capital/strategic planning allows, consider relocating the aerial ladder truck closer to the center of the District's service area to maximize first-due and Effective Response Force (ERF) travel time coverage for this specialized resource.

Recommendation #5: **Adopt Updated Deployment Policies:** The District's Board of Directors should adopt updated, complete performance measures to aid deployment planning and to monitor performance. The measures of time should be designed to deliver outcomes that will save medically salvageable patients upon arrival and to keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures for the District's planning zones:

5.1 Distribution of Fire Stations: To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 7:30 minutes, 90 percent of the time from the receipt of the 9-1-1 call in urban planning zones and within 11:30 minutes in rural planning zones. This equates to a 90-second dispatch time, 2:00-minute company turnout time and 4:00-minute (urban zones) or 8:00-minute (rural zones) travel time.

5.2 Multiple-Unit Effective Response Force for Serious Emergencies: In the urban planning zones, to confine building fires near the room of origin, keep wildland fires under three acres in size, and treat multiple medical patients at a single incident, a multiple-unit ERF of at least 16 personnel, including at least one Chief Officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt in fire dispatch 90 percent of the time. For the rural planning zones, the ERF should arrive within 19:30 minutes. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute (urban zones) or 16:00-minute (rural zones) travel time fire station spacing.

5.3 Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the District response is to minimize or halt the release of a hazardous substance, so it has minimal impact on the community. This can be achieved

with a first-due total response time of 7:30 minutes (urban zones) or 11:30 minutes (rural zones) to provide initial hazard evaluation and/or mitigation actions. After the initial evaluation is completed, the District can determine whether to request additional resources from the regional Hazardous Materials Response team.

5.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue with a first-due total response time of 7:30 minutes (urban zones) or 11:30 minutes (rural zones) to evaluate the situation and/or initiate rescue actions. Following the initial evaluation, assemble additional resources as needed within a total response time of 11:30 minutes (urban zones) or 19:30 minutes (rural zones) to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #7: The District should consider making open-ocean rescue capability available daily from at least one station.

Recommendation #8: Collaborate with Santa Cruz Regional 9-1-1 to improve call processing performance more in alignment with industry-recognized best practice standards while maintaining dispatch accuracy.

Recommendation #9: Work to improve 90th percentile turnout time performance to meet a recommended target of 2:00 minutes or less.

4.2 MANAGEMENT/ADMINISTRATIVE FINDINGS AND RECOMMENDATIONS

Finding #9: The Operations Division has current and ongoing administrative workload gaps needing an estimated 0.5–1.0 FTE of additional technical administrative support capacity to close. This additional capacity could also potentially provide supplemental administrative support/redundant critical business systems capability for other District divisions.

Finding #10: While most Fire Prevention Division responsibilities are being satisfactorily met, recently added program responsibilities and other ongoing workloads gaps identified will require an estimated 0.5–1.0 FTE additional ongoing technical support capacity.

Finding #11: While most Finance Division responsibilities are being satisfactorily met, an estimated 0.33–0.50 FTE temporary and 0.25–0.50 FTE ongoing technical support capacity is needed to effectively meet all program responsibilities.

Finding #12: The Human Resources Division has current and ongoing workload gaps that require an estimated 0.5–0.8 FTE temporary and 0.5–1.0 FTE ongoing additional capacity to close.

Finding #13: The Fleet Services Division has current and ongoing workload gaps requiring an estimated additional 0.5–1.0 FTE management capacity, 0.5–1.0 FTE automotive/heavy equipment mechanic capacity, and 0.5–1.0 FTE administrative support capacity to close.

Finding #14: The District's five divisions have current, near-term, and/or ongoing management and administrative workload gaps that need an estimated additional 0.83–1.30 temporary and 03.25–6.50 ongoing FTE capacity to close.

Finding #15: The District's current management and administrative workload is not expected to substantively change in the near-term future without additional fire station(s) and/or the District assuming additional services or responsibilities.

Recommendation #6: As fiscal/strategic planning and funding permit, the District should consider adding supplemental management and administrative capacity, as identified and prioritized in this report, to resolve workload capacity gaps.

APPENDIX A—RISK ASSESSMENT

A.1 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

A community risk assessment is the third element of the SOC process. Within the context of an SOC study, the objectives of a community risk assessment are to:

1. Identify the values at risk to be protected within the community or service area
2. Identify the specific hazards with the potential to adversely impact the community or service area
3. Quantify the overall risk associated with each hazard
4. Establish a foundation for current/future deployment decisions and risk-reduction/hazard-mitigation planning and evaluation.

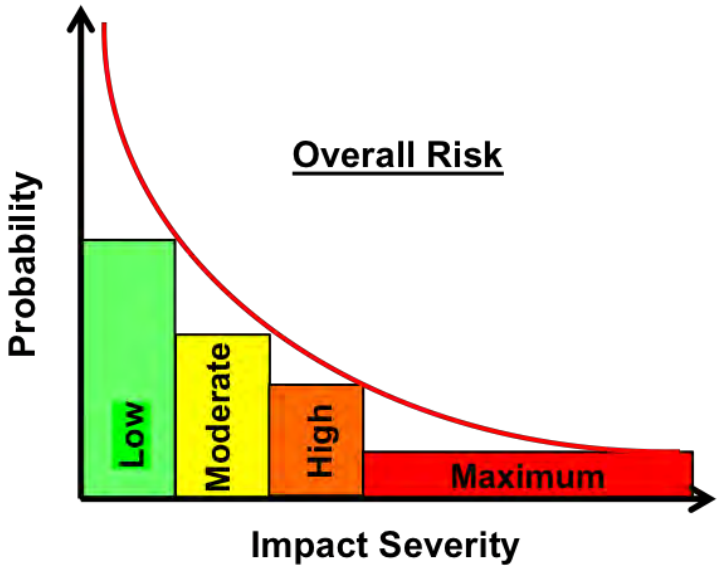
A **hazard** is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. **Risk** is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community as a whole.

A.1.1 Risk Assessment Methodology

The methodology employed by Citygate to assess community risks as an integral element of an SOC study incorporates the following elements:

- Identification of geographic planning sub-zones (risk zones) appropriate to the community or jurisdiction
- Identification and quantification (to the extent data is available) of the specific values at risk to various hazards within the community or service area
- Identification of the fire and non-fire hazards to be evaluated
- Determination of the probability of occurrence for each hazard
- Identification and evaluation of multiple relevant impact severity factors for each hazard by planning zone using agency/jurisdiction-specific data and information
- Quantification of overall risk for each hazard based on probability of occurrence in combination with probable impact severity, as shown in Figure 11.

Figure 11—Overall Risk



Source: Commission on Fire Accreditation International (CFAI): *Community Risk Assessment: Standards of Cover (6th Edition)*

Citygate used multiple data sources for this study to understand the hazards and values to be protected in the District as follows:

- U.S. Census Bureau population and demographic data
- Insurance Services Office (ISO) building fire flow and construction data
- Santa Cruz County geographical information systems (GIS) data
- Santa Cruz County General Plan and zoning information
- Santa Cruz County Local Hazard Mitigation Plan 2015–2020
- Fire District data and information

A.1.2 Risk Assessment Summary

Citygate's evaluation of the values at risk and hazards likely to impact the District's service area yields the following conclusions:

1. The District's service area includes urban population densities in the City of Capitola and the rural communities of Live Oak and Soquel and rural population densities in most of the other areas.

2. The District's population is stable and is projected to grow less than one percent annually over the next 18 years into 2035.

3. The District includes a mix of residential, commercial, office, educational, and other non-residential uses typical of other central coast communities of similar size and demographics.

4. The District has economic, cultural, historic, and natural resource values to be protected, as identified in this assessment.

5. The District's overall risk for five hazards related to emergency services provided range from **LOW** to **HIGH**, as shown in Table 32.

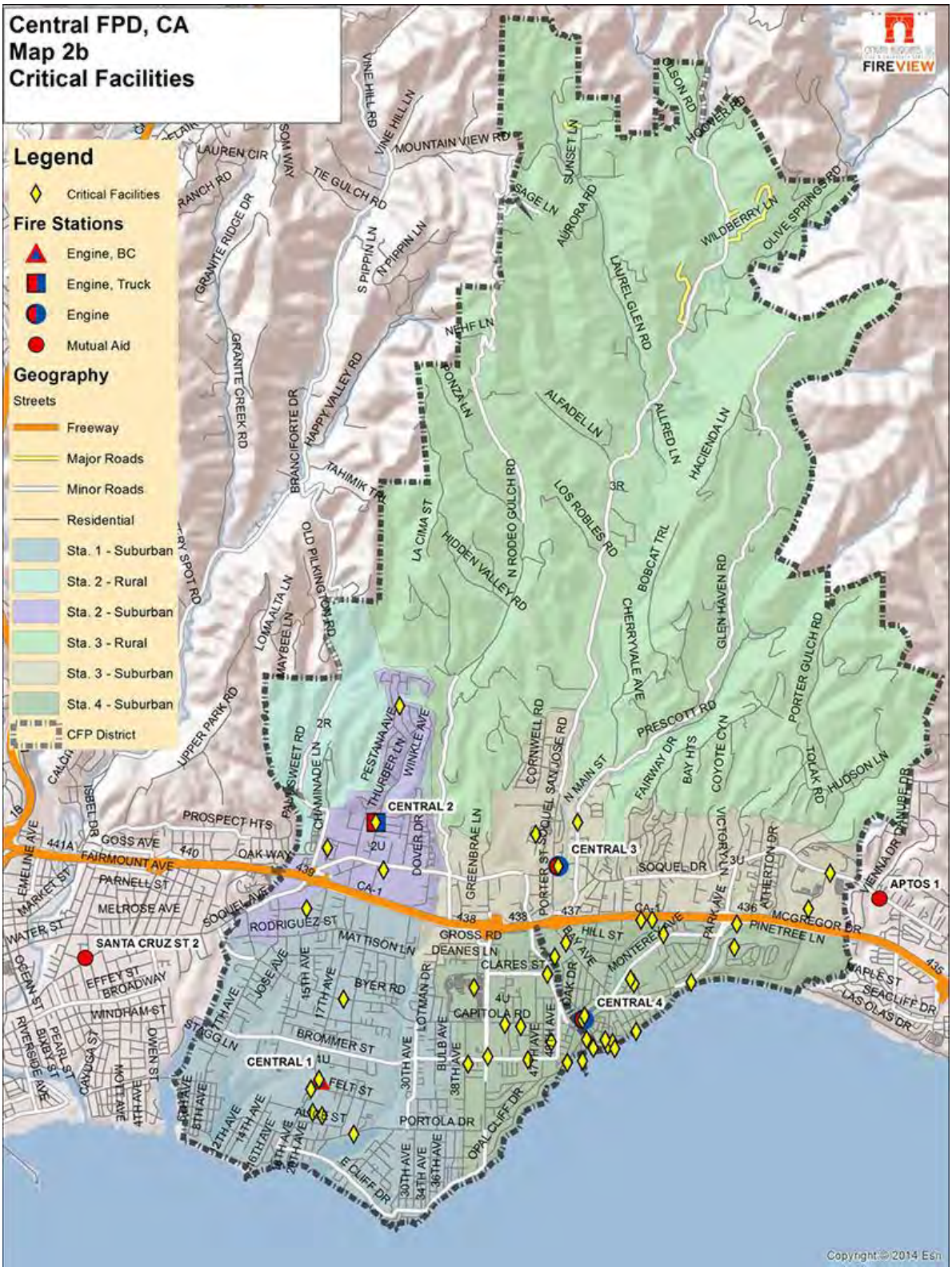
Table 32—Overall Risk by Hazard

Hazard		Planning Zone					
		Station 1	Station 2		Station 3		Station 4
		Suburban	Suburban	Rural	Suburban	Rural	Suburban
1	Building Fire	HIGH	MODERATE	LOW	HIGH	MODERATE	HIGH
2	Wildland Fire	MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE
3	Medical Emergency	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
4	Hazardous Material	HIGH	HIGH	LOW	HIGH	LOW	HIGH
5	Technical Rescue	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	HIGH

A.1.3 Planning Zones

The Commission on Fire Accreditation International (CFAI) recommends that jurisdictions establish geographic planning zones to better understand risk at a sub-jurisdictional level. For example, portions of a jurisdiction may contain predominantly moderate-risk building occupancies, such as detached single-family residences, while other areas contain high- or maximum-risk occupancies, such as commercial and industrial buildings with a high-hazard fire load. If risk were to be evaluated on a jurisdiction-wide basis, the predominant moderate risk could outweigh the high or maximum risk and may not be a significant factor in an overall risk assessment. If, however, those high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then it becomes a more significant risk factor. Another consideration in establishing planning zones is that the jurisdiction's record management system must also track the specific zone for each incident to be able to appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized six planning zones incorporating each fire station's first-due response areas divided by the District's urban services boundary as applicable, as shown in Figure 12.

Figure 12—Risk Planning Zones



A.1.4 Values at Risk

This section identifies, describes, and quantifies, as data is available, the values at risk to be protected within the District's service area. Broadly defined, **values at risk** are those tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people; critical facilities/infrastructure; buildings; and key economic, cultural, historic, and/or natural resources.

People

Residents, employees, visitors, and travelers through a community or jurisdiction are vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency. At-risk populations typically include children less than 10 years of age, the elderly, and people housed in institutional settings. Table 33 summarizes key District demographic data.

Table 33—Key District Demographic Data

Demographic	2015	Percentage
Population	**54,999**	
Under 10 years	6,239	11.34%
10–19 years	6,821	12.40%
20–64 years	34,187	62.16%
65–74 years	4,099	7.45%
75 years and older	3,653	6.64%
Median age	39.9	N/A
Housing Units	**22,687**	
Owner-occupied	12,007	52.93%
Renter-occupied	8,993	39.64%
Median household size	2.57	N/A
Ethnicity	**54,999**	
White	34,853	63.37%
Hispanic/Latino	14,437	26.25%
Black/African American	731	1.33%
Asian	3,021	5.49%
Other	1,957	3.56%
Education (population over 24 yrs. of age)	**37,680**	**68.51%**
High School graduate	15,217	40.38%
Undergraduate degree	8,920	23.67%
Graduate/Professional degree	5,306	14.08%
Employment (population over 15 yrs. of age)	**44,861**	**81.57%**
In labor force	29,179	65.04%
Unemployed	2,266	7.77%
Population below poverty level	6,764	12.30%
Population with health insurance coverage	6,908	12.56%

Source: U.S. Census Bureau; Citygate estimates

Of note from Table 33 are the following:

- Slightly more than 25 percent of the population is under 10 or over 64 years of age.

- The District's population is predominantly White (63 percent), followed by Hispanic/Latino (26 percent), and other ethnicities (11 percent).
- Of the population over 24 years of age, 40 percent has completed high school or equivalency.
- Of the population over 24 years of age, 24 percent has an undergraduate, graduate, or professional degree.
- Slightly more than 65 percent of the population 16 years of age or older is in the workforce; of those, 7.8 percent is unemployed.
- The population below the federal poverty level is 12.3 percent.
- Nearly 13 percent of the population has no health insurance coverage.

Buildings

The District's service area includes more than 22,600 housing units, as well as a large inventory of office, commercial, professional services, retail sales, restaurants/bars, motels, churches, schools, government facilities, healthcare facilities, and other non-residential occupancies. No data was available to determine District building inventory by occupancy classification.

Building Occupancy Risk Categories

The CFAI identifies four risk categories that relate to building occupancy as follows:

Low Risk – includes detached garages, storage sheds, outbuildings, and similar building occupancies that pose a relatively low risk of harm to humans or the community if damaged or destroyed by fire.

Moderate Risk – includes detached single-family or two-family dwellings, mobile homes, commercial and industrial buildings less than 10,000 square feet without a high-hazard fire load, aircraft, railroad facilities, and similar building occupancies where loss of life or property damage is limited to the single building.

High Risk – includes apartment/condominium buildings, commercial and industrial buildings more than 10,000 square feet without a high-hazard fire load, low-occupant load buildings with high fuel loading or hazardous materials, and similar occupancies with potential for substantial loss of life or unusual property damage or financial impact.

Maximum Risk – includes buildings or facilities with unusually high risk requiring an ERF involving a significant augmentation of resources and personnel and where a fire would pose the potential for a catastrophic event involving large loss of life and/or significant economic impact to the community.

Critical Facilities/Infrastructure

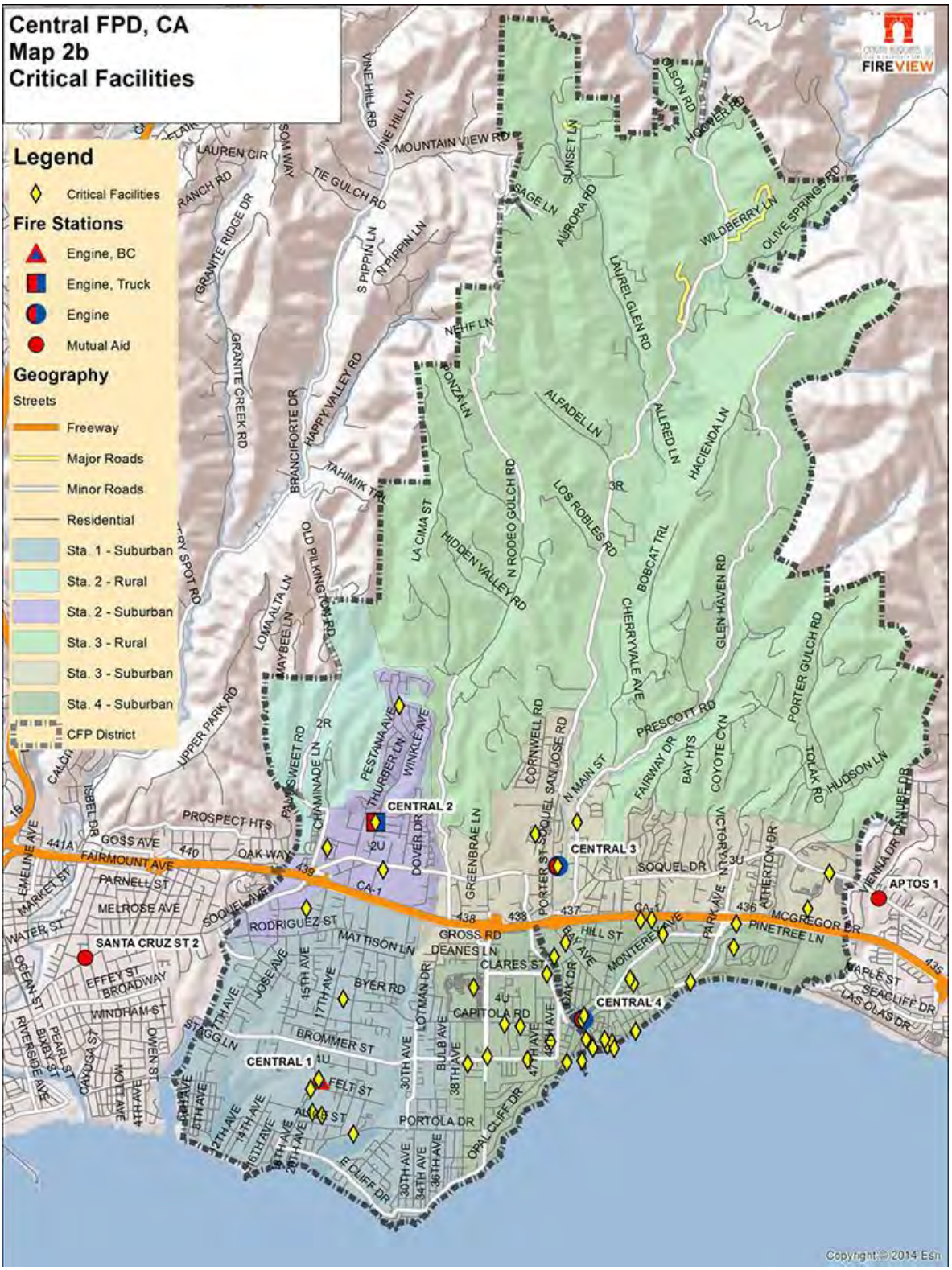
The U.S. Department of Homeland Security defines Critical Facilities / Key Resources (CIKR) as those physical assets essential to the public health and safety, economic vitality, and resilience of a community. For this assessment, the District and Citygate identified 51 critical facilities, as summarized in Table 34 and Figure 13. A hazard occurrence with significant impact severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Table 34—Critical Facilities

	Facility Name/Description	Facility Category
1	Jade Street Community Center	Community
2	New Brighton School	Community
3	Shoreline Middle School	Education
4	Del Mar Elementary	Education
5	Cabrillo College	Education
6	Twin Lakes Christian School	Education
7	New Brighton Middle School	Education
8	Soquel Elementary School District	Education
9	Cypress High School	Education
10	Live Oak School District	Education
11	Green Acres Elementary	Education
12	Santa Cruz Gardens Elementary	Education
13	Main Street Elementary	Education
14	Santa Cruz City Schools	Education
15	Soquel High School	Education
16	Soquel Elementary	Education
17	New Brighton School Gym	Evacuation Center
18	U.S. Post Office	Government
19	Live Oak Branch Library	Government
20	Department of Motor Vehicles	Government
21	Capitola Library	Government
22	Capitola Corporation Yard	Government
23	New Brighton State Park	Government
24	Police Communications Antenna	Government
25	Police Communications Antenna	Government

	Facility Name/Description	Facility Category
26	Dominican Santa Cruz Hospital	Healthcare
27	Sutter Maternity and Surgery Center	Healthcare
28	VA Capitola Clinic	Healthcare
29	Stockton Avenue Bridge	Infrastructure
30	Capitola Wharf	Infrastructure
31	Capitola Beach Sea Wall	Infrastructure
32	Cliff Drive Sea Wall	Infrastructure
33	Park Avenue Sea Wall	Infrastructure
34	Capitola Beach Flume	Infrastructure
35	Capitola Beach Jetty	Infrastructure
36	Grand Avenue Cliffs	Infrastructure
37	Central FPD Station 1	Public Safety
38	Central FPD Station 2	Public Safety
39	Central FPD Station 3	Public Safety
40	Central FPD Station 4	Public Safety
41	Central FPD Fleet Maintenance Facility	Public Safety
42	City Hall / Emergency Operations Center	Public Safety
43	Capitola Police Station	Public Safety
44	Noble Gulch Storm Pipe	Public Utility
45	38th Avenue Drainage Facility	Public Utility
46	Capitola Pump Station	Public Utility
47	Soquel Pump Station	Public Utility
48	Lawn Way Storm Drain Pump Station	Public Utility
49	Soquel Creek Water District Treatment Plant	Public Utility
50	Soquel Creek Water District Treatment Plant	Public Utility
51	Soquel Creek Water District Booster Pumping Station	Public Utility

Figure 13—Critical Facilities



Economic Resources

Key economic resources within the District's service area include the Capitola Mall with more than 85 tenant businesses, Dominican Hospital, Cabrillo Community College, and businesses along the District's waterfront that contribute to the area's tourism economy.

Natural Resources

The District's service area includes several miles of Pacific Ocean coastline, which is also part of the Monterey Bay National Marine Sanctuary, a federally protected area. Other natural resources include DeLaveaga Park, New Brighton State Beach, Capitola Beach, and numerous creeks and watershed drainages.

Cultural/Historic Resources

The National Register of Historic Places lists five sites within the District's service area, including the Hihn Building, Rispin Mansion, Old Riverview Historic District, Six Sisters-Lawn Way Historic District, and Venetian Court Apartments.

A.1.5 Future Growth and Development

Land Use

The Santa Cruz County General Plan establishes seven land-use goals as follows:

1. To provide an organized and functional balance of urban, rural, and agricultural land use that maintains environmental quality; enhances economic vitality; protects the public health, safety, and welfare; and preserves the quality of life in the unincorporated areas of the County

2. To achieve patterns of rural residential development that are compatible with the physical limitations of the land, the natural and cultural resources of the County, the availability of public services, and protection of the natural environment

3. To provide urban residential areas within the Urban Services Line, which are protected from noise, traffic congestion, natural hazards, and other objectionable influences of nonresidential land use; and to establish a variety of residential land use categories and dwelling unit densities offering a diverse choice of housing opportunities

4. To provide adequate facilities to meet the shopping, service, and employment needs of County residents and area visitors in a manner compatible with adjacent residential development, availability of public facilities, protection of natural resources, and maintenance of environmental quality and high standards of urban design

5. To ensure adequate present and future availability of land for both public and quasi-public facility uses, including schools, hospitals, cemeteries, sanitary landfills, and water supply and sewage treatment facilities

6. To develop an efficient land-use pattern that improves the area's jobs/housing balance and thereby reduces the total amount of vehicle miles traveled and reduces polluting emissions

7. To continue using village, town, community, and specific plans to provide a planning framework to guide future public and private improvements in town centers and other concentrated urban and rural areas; to provide a higher level of planning detail and public involvement; and to promote economic vitality and coherent community design within the unique town center areas, which are community focal points for living, working, shopping, and visiting.

The Soquel Village Plan[16] further identifies five goals including flood management, residential and pedestrian-oriented village environment, design guidelines for village core uses, land use compatibility, and economic development.

In addition, the City of Capitola General Plan[17] identifies nine specific land-use goals as follows:

1. Maintain and enhance Capitola's distinctive identity and unique sense of place

2. Preserve historic and cultural resources

3. Promote sustainable land-use patterns that encourage transportation alternatives and reduce greenhouse gas emissions

4. Protect and enhance the special character of residential neighborhoods

5. Ensure that new residential development respects the existing scale, density, and character of neighborhoods

6. Strengthen Capitola Village as the heart of the community

7. Ensure a high-quality and distinctive design environment in Capitola Village

8. Support the long-term transformation of Capitola Mall into a more pedestrian-friendly commercial district with high-quality architecture and outdoor amenities attractive to shoppers and families

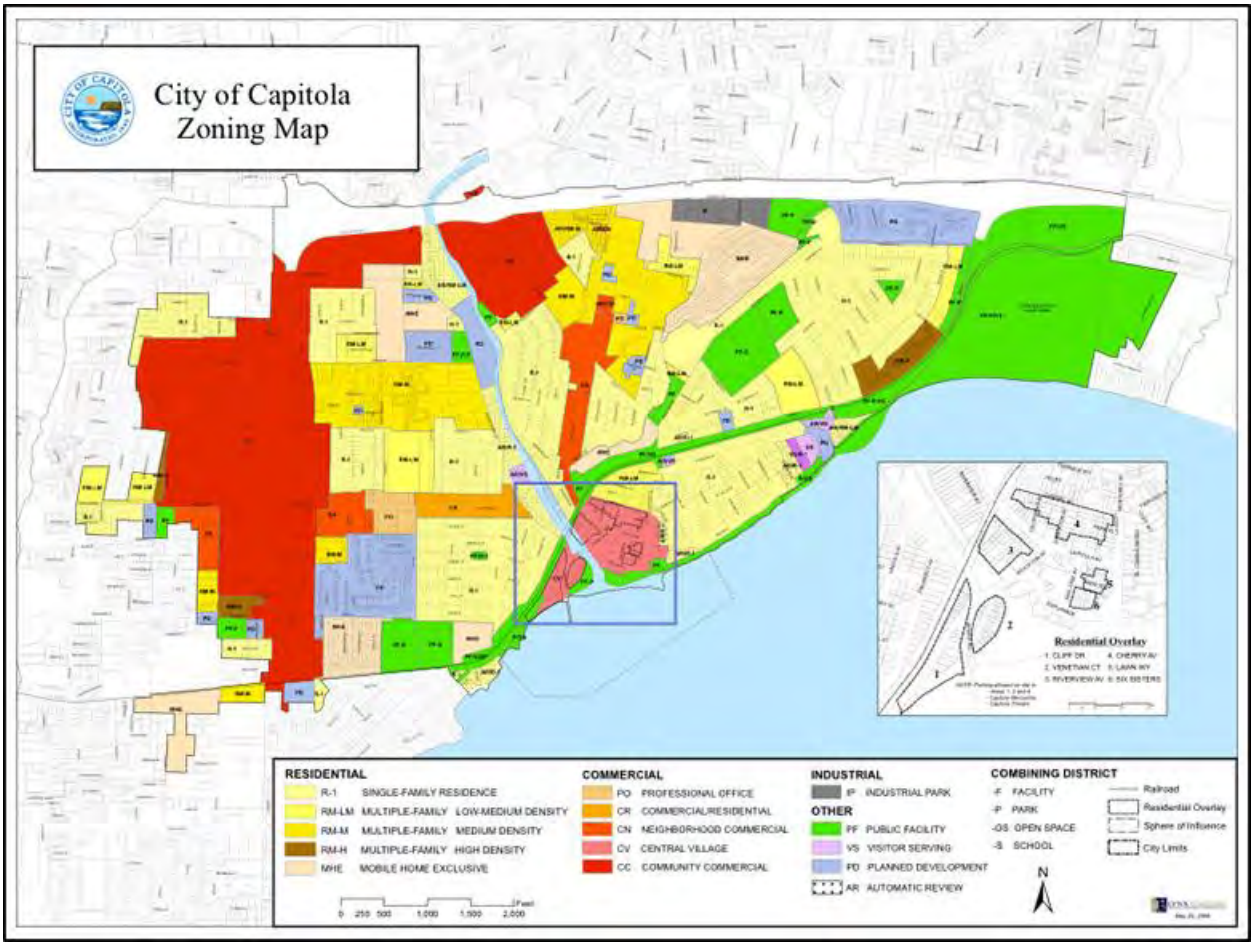
[16] Soquel Village Plan, Santa Cruz County (May 1990)

[17] Capitola General Plan (June 2014) – Land Use Element

9. Encourage high-quality development within the 41st Avenue corridor that creates an active and inviting public realm.

Figure 14 illustrates the various land use designations for the City of Capitola.

Figure 14—Capitola Land Use Map



Future Growth

Table 35 summarizes an 18-year projected population and housing unit growth within the District into the year 2035.

Table 35—Projected Population and Housing Growth

Area	Growth Factor							
	Population				Housing Units			
	2015[1]	2035[2]	Projected Growth (Units)	Projected Growth (Percent)	2015[1]	2035[2]	Projected Growth (Units)	Projected Growth (Percent)
City of Capitola[1]	10,077	10,088	11	**0.11%**	5,112	5,553	441	**8.63%**
Live Oak CDP[3]	18,038	19,402	1,364	**7.56%**	6,780	7,293	513	**7.56%**
Soquel CDP	10,827	11,646	819	**7.56%**	4,171	4,486	315	**7.56%**
Remainder of District[3]	16,058	17,272	1,214	**7.56%**	6,186	6,654	468	**7.56%**
Total	**55,000**	**58,407**	**3,407**	**6.19%**	**22,249**	**23,986**	**1,737**	**7.81%**

[1] U.S. Census Bureau (2015) data
[2] Association of Monterey Bay Governments (AMBAG) 2014 Regional Growth Forecast
[3] Estimated using AMBAG growth projection rate for unincorporated Santa Cruz County

As Table 35 shows, population and housing units within the District are projected to grow by a very modest 6.19 and 7.81 percent respectively over the next 18 years into 2035. Although no data was available relative to current or projected non-residential development, it is reasonable to also anticipate very modest non-residential development within the District's service area.

Finding #16: The District's population is projected to grow less than one percent annually over the next 18 years into 2035.

Finding #17: The District's core populated areas are essentially built out, with zoning regulations limiting new development to existing town centers and concentrated urban areas.

A.1.6 Hazard Identification

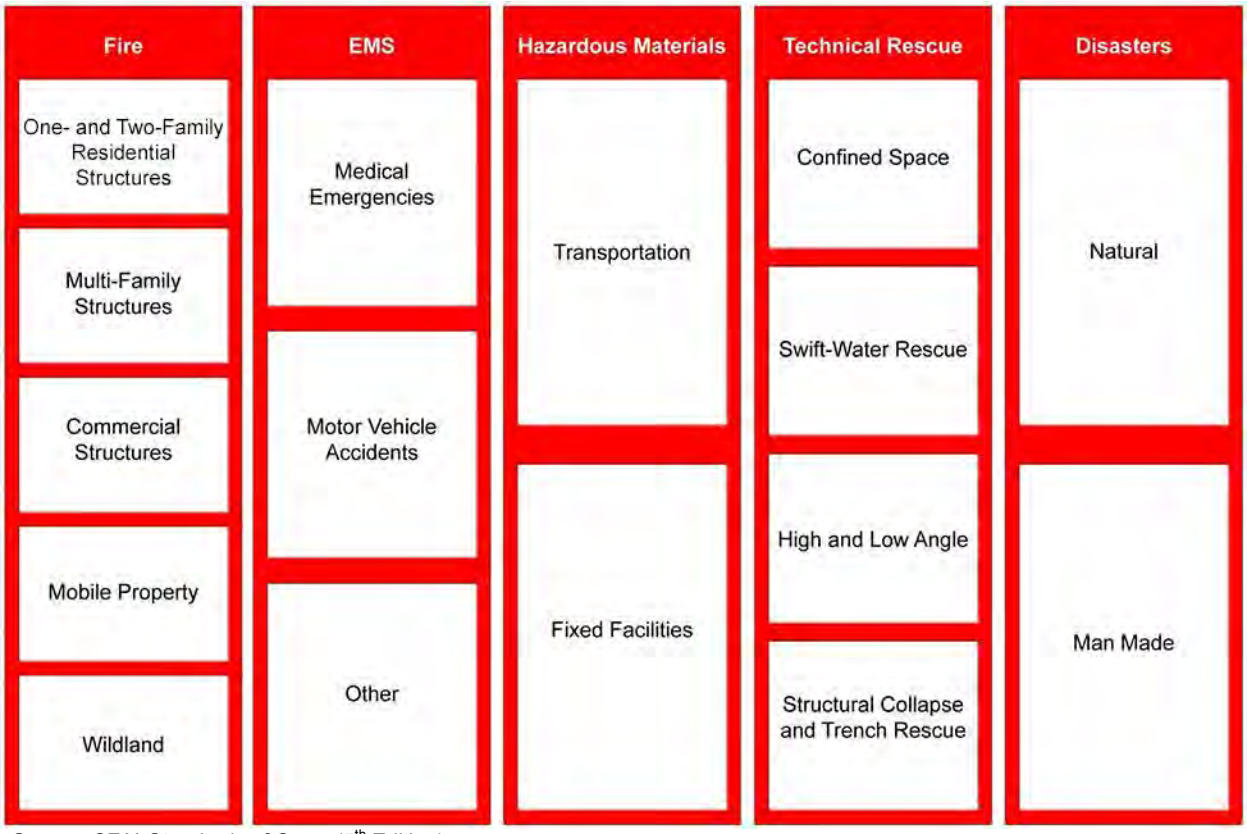
Citygate utilized prior risk studies where available, fire and non-fire hazards as identified by the Commission on Fire Accreditation International (CFAI), and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study.

The 2015–2020 Santa Cruz Local Hazard Mitigation Plan (LHMP) identifies five hazards relating to services provided by the District, including earthquake/liquefaction, wildfire, flood,

tsunami, and landslide. Although the District has no legal authority or responsibility to mitigate earthquake/liquefaction, flood, tsunami, or landslide risk other than for District-owned facilities, it does provide services related to these hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

The CFAI groups hazards into fire and non-fire categories, as shown in Figure 15. Identification, qualification, and quantification of the various fire and non-fire hazards are important factors in evaluating how resources are or can be deployed to mitigate those risks.

Figure 15—CFAI Hazard Categories



Source: CFAI *Standards of Cover* (5th Edition)

Following review and evaluation of the hazards identified in the 2015–2020 Santa Cruz County LHMP and the fire and non-fire hazards as identified by the CFAI as they relate to services provided by the District, Citygate evaluated the following five hazards for this risk assessment:

1. Building Fire
2. Wildland Fire
3. Medical Emergency

4. Hazardous Materials Release/Spill

5. Technical Rescue

A.1.7 Service Capacity

Service capacity refers to the District's available response force; the size, types, and condition of its response fleet and any specialized equipment; core and specialized performance capabilities and competencies; resource distribution and concentration; availability of automatic and/or mutual aid; and any other agency-specific factors influencing its ability to meet current and prospective future service demand relative to the risks to be protected.

The District's service capacity for building fire risk consists of an ERF of 17[18] personnel staffing four Type-1 fire engines,[19] one Type-1 100-foot Quint, and one Chief Officer from the District's four stations and one adjacent automatic aid station.[20] The District's wildland fire service capacity consists of an ERF of 15 personnel staffing four engines, one water tender, and a Chief Officer.

The District's medical emergency service capacity consists of a daily, on-duty response force of 14 personnel staffing four fire engines, each staffed with a minimum of one EMT-Paramedic capable of providing Advanced Life Support (ALS) pre-hospital emergency medical care. ALS ground ambulance transportation is provided by American Medical Response West under an exclusive operating area performance-based contract with the Santa Cruz County Health Services Agency. Air ambulance services, when needed, are provided by CalStar from Gilroy or Lifeflight from Stanford Hospital in Palo Alto. There are two hospitals with emergency services in Santa Cruz County: Dominican Hospital in Santa Cruz and Watsonville Community Hospital. Trauma Centers include:

- Santa Clara Valley Medical Center – San Jose (Level 1)
- Regional Medical Center – San Jose (Level 2)
- Stanford Medical Center – Palo Alto (Level 1)
- Natividad Medical Center – Salinas (Level 2)

All District response personnel are trained to the U.S. Department of Transportation Hazardous Material First Responder Operational level to provide initial hazardous material incident assessment, hazard isolation, and support for a hazardous material response team. In addition, Scotts Valley Fire District hosts the Santa Cruz County Hazardous Materials Team in partnership

[18] Plus Paid-Call Firefighters as available

[19] One engine provided by a mutual aid agency

[20] City of Santa Cruz, Aptos/La Selva Fire Protection District, or Santa Cruz County Service Area #48

with Central and Aptos/La Selva Fire Districts, the Cities of Santa Cruz and Watsonville, and University of California at Santa Cruz. This resource (HAZMAT 1) is cross-staffed as needed with partner agency personnel trained to the Hazardous Material Specialist or Technician level.

All District response personnel are trained to the Low Angle Rope Rescue Operational (LARRO) level and are also internally trained for high-angle rope rescue. Approximately 30–50 percent of the response force is also trained to the Rescue Systems 1 level; however, although emphasized, this certification is not mandatory. The District operates a cross-staffed medium rescue unit from Station 1 that includes air bags, hydraulic tools, concrete breaching tools, cribbing/shoring, and other technical rescue equipment.

The District also has an Open-Ocean Rescue Team consisting of 12 response personnel certified as rescue swimmers and assigned to either Station 1 or Station 4 through the station bid process. Although this capability is not required to be available as part of the daily minimum staffing, it is generally available from at least one District station.

Finding #18: The District has an open-ocean rescue capability; however, this service is not always available.

Recommendation #7: The District should consider making open-ocean rescue capability available daily from at least one station.

A.1.8 Probability of Occurrence

Probability of occurrence refers to the probability of a future hazard occurrence during a specific period. Because the CFAI Agency Accreditation process requires annual review of an agency's risk assessment and baseline performance measures, Citygate recommends using the 12 months following completion of an SOC study as an appropriate period for the probability of occurrence evaluation. Table 36 summarizes the five probability of occurrence categories and related scoring criteria used for this analysis.

Table 36—Probability of Occurrence Scoring Criteria

Score	Probability of Occurrence	Description	General Criteria
0	***Very Low***	Improbable	Hazard occurrence is *unlikely*
1	***Low***	Rare	Hazard *could occur* Historical occurrence less than once every 5 years
2	***Moderate***	Infrequent	Hazard *should occur* infrequently Historical occurrence once every 3–5 years
3	***High***	Likely	Hazard *likely to occur* regularly Historical occurrence once every 1–3 years
4	***Very High***	Frequent	Hazard is *expected to occur* frequently Historical occurrence multiple times per year

Citygate's SOC assessments use recent multiple-year hazard response data to determine the probability of hazard occurrence for the ensuing 12-month period.

A.1.9 Impact Severity

Impact severity refers to the extent of a hazard occurrence's impacts on people, buildings, lifeline services, the environment, and the community as a whole. Table 37 summarizes the five impact severity categories and related scoring criteria used for this analysis.

Table 37—Impact Severity Scoring Criteria

Score	Impact Severity	General Criteria
1	Insignificant	No serious injuries or fatalities expected Few persons displaced for only a short duration Inconsequential or no damage Very minimal or no disruption to community No measurable environmental impacts Little or no financial loss
2	Minor	Some minor injuries; no fatalities expected Some persons displaced for less than 24 hours Some minor damage Minor community disruption; no loss of lifeline services Minimal environmental impacts with no lasting effects Minor financial loss
3	Moderate	Some hospitalizations; some fatalities expected Localized displacement of persons for up to 24 hours Localized damage Normal community functioning with some inconvenience; minor loss of lifeline services Some environmental impacts with no lasting effects, or small environmental impact with long-term effect Moderate financial loss
4	Major	Many serious injuries and hospitalizations Many fatalities expected Significant displacement of many people for more than 24 hours Significant damage requiring external resources Community services disrupted; some lifeline services potentially unavailable Some environmental impacts with long-term effects Major financial loss
5	Catastrophic	Extensive severe injuries and fatalities expected Local/regional hospital capacity impacted Large number of persons displaced for an extended duration Extensive damage Community unable to function without significant support; widespread loss of lifeline services Significant environmental impacts and/or permanent damage Catastrophic financial loss; inability to function without significant financial support

A.1.10 Overall Risk

Overall hazard risk is determined by multiplying the *probability of occurrence score* by the *impact severity score*. The resultant total determines the overall *risk ranking*, as described in Table 38.

Table 38—Overall Risk Score and Rating

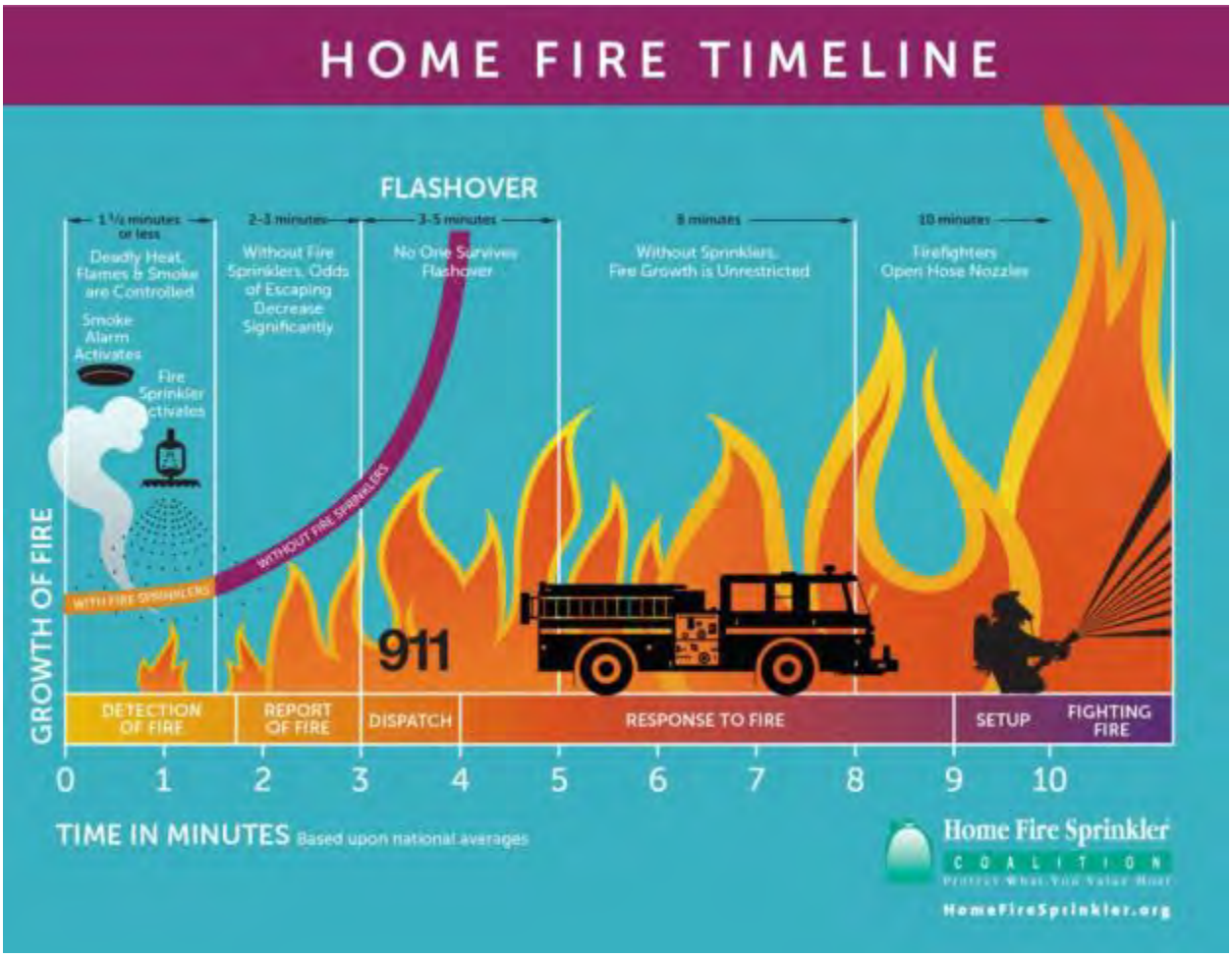
Overall Risk Score	Overall Risk Rating
0–5	*LOW*
6–11	*MODERATE*
12–15	*HIGH*
16–20	*MAXIMUM*

A.1.11 Building Fire Risk

One of the primary hazards in any community is building fire. Building fire risk factors include building density, size, age, occupancy, and construction materials and methods, as well as the number of stories, the required fire flow, the proximity to other buildings, built-in fire protection/alarm systems, an available fire suppression water supply, building fire service capacity, fire suppression resource deployment (distribution/concentration), staffing, and response time. Citygate used available data from the District, the U.S. Census Bureau, Association of Monterey Bay Area Governments (AMBAG), and the Insurance Services Office (ISO) to assist in determining the District's building fire risk.

Figure 16 illustrates the building fire progression timeline and shows that flashover, which is the point at which the entire room erupts into fire after all the combustible objects in that room reach their ignition temperature, can occur as early as 3:00 to 5:00 minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

Figure 16—Building Fire Progression Timeline

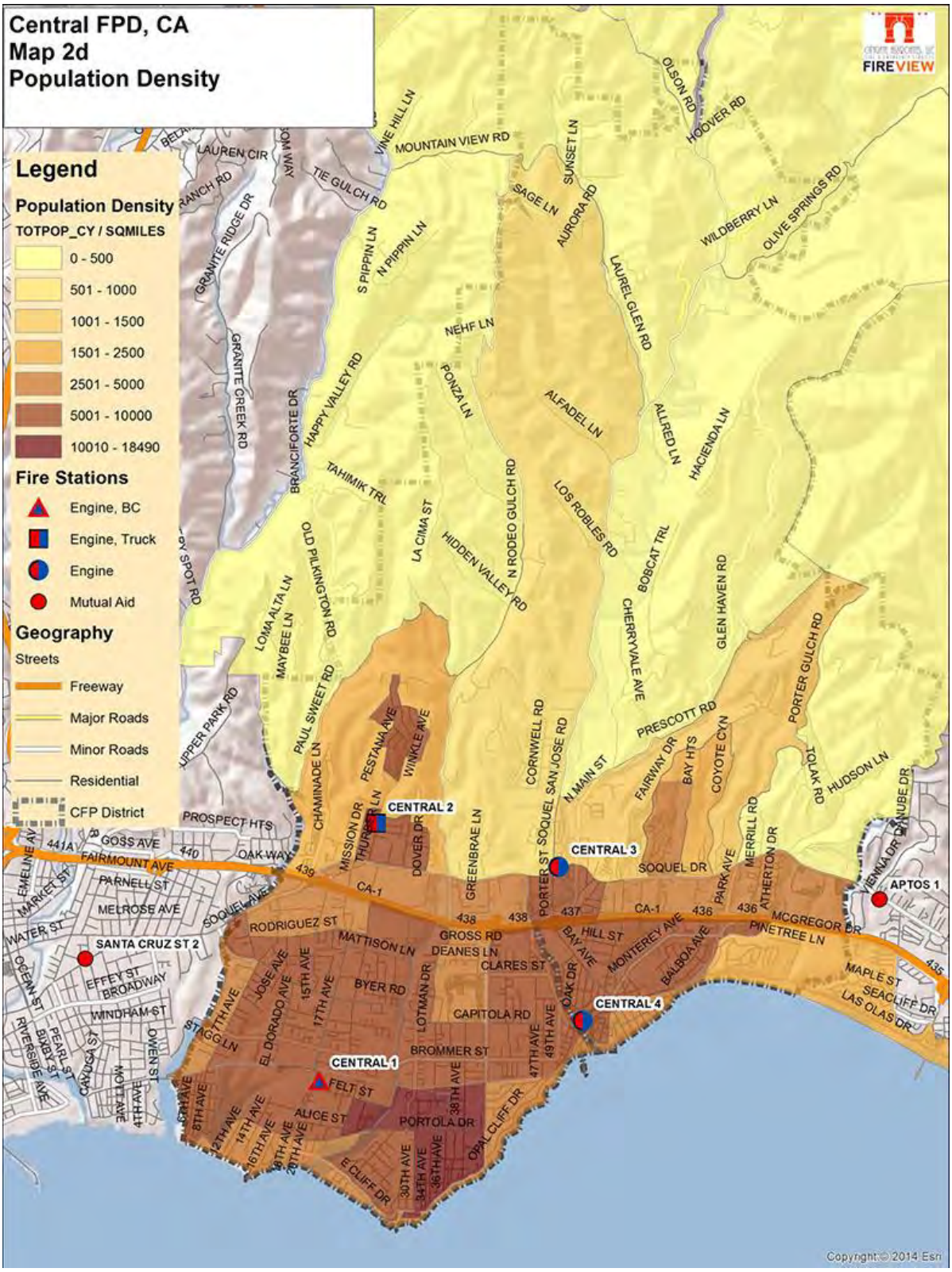


Source: http://www.firesprinklerassoc.org

Population Density

Population density within the District ranges from less than 100 to more than 18,000 people per square mile, as illustrated in Figure 17. Although risk analysis across a wide spectrum of other Citygate clients shows no direct correlation between population density and building fire occurrence, it is reasonable to conclude that building fire *risk* relative to potential impact on human life is greater as population density increases, particularly in areas with high-density, multiple-story buildings.

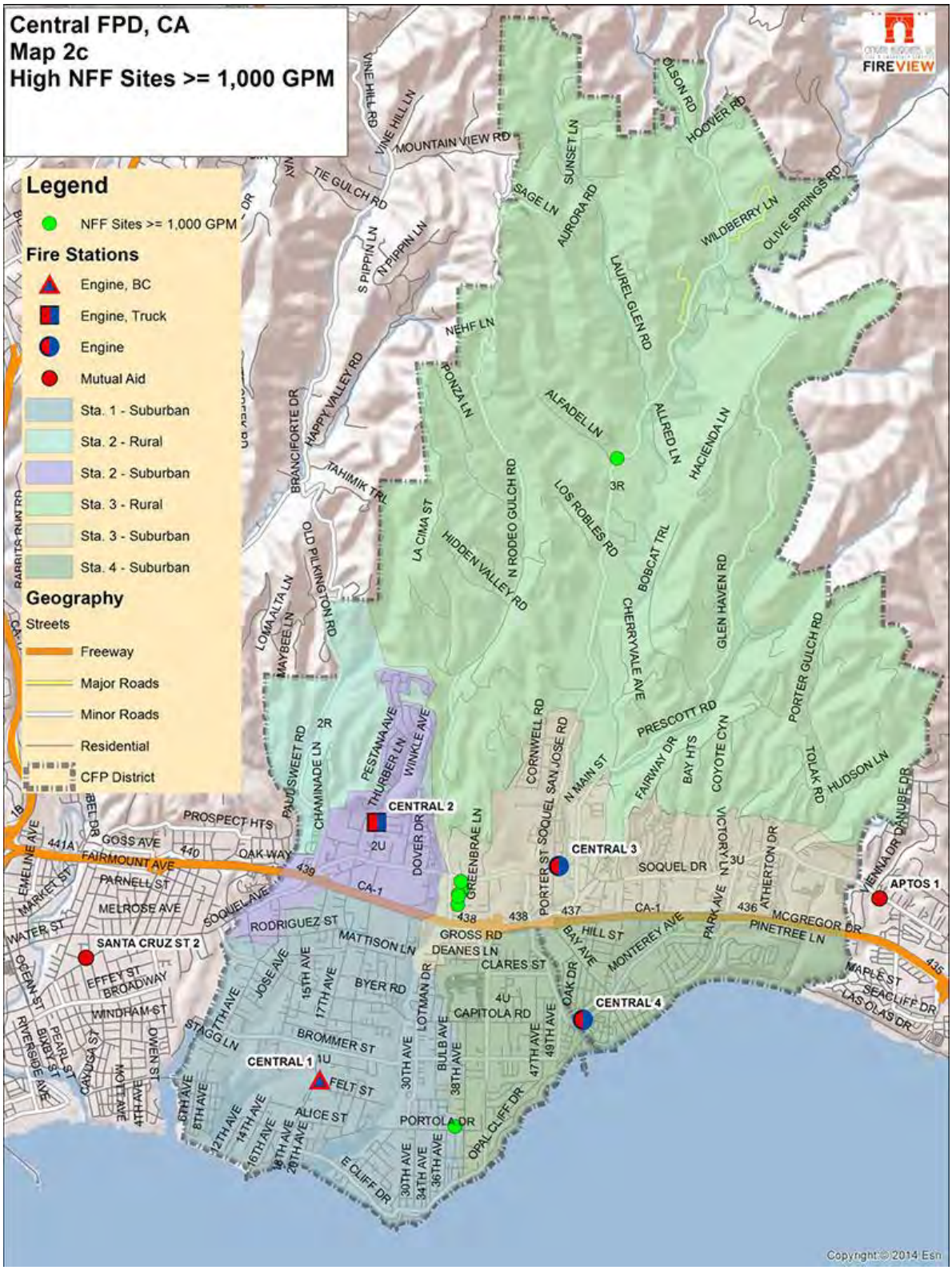
Figure 17—Population Density



High Fire Flow Requirements

One of the many factors evaluated by the Insurance Services Office (ISO) is needed fire flow (NFF), which is the amount of water that would be required in gallons-per-minute (GPM) if the building were seriously involved in fire. For the District, the ISO database identifies 24 evaluated buildings, 10 of which have an NFF greater than 1,000 GPM, as shown in Figure 18.

Figure 18—High Fire Flow Sites



This is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would require commitment of the District's entire on-duty force plus mutual aid. Using a generally accepted figure of 50 gallons-per-minute per firefighter on large building fires, a fire in a building requiring 1,000 gallons-per-minute would require 20 firefighters, which is greater than the District's current initial building fire ERF staffing. A significant fire in any of these buildings not protected by an automatic fire sprinkler and/or fire detection/alarm system would likely have a high-impact severity.

Water Supply

A reliable public water system providing adequate volume, pressure, and flow duration in close proximity to all buildings is a critical factor in mitigating the potential impact severity of a community's building fire risk. The Soquel Creek Water District and the City of Santa Cruz provide potable water for District residents and businesses.

According to District staff, available fire flow is excellent within the urban/suburban zone with fire hydrants. It is, however, insufficient or not available in the rural zones, which is partially mitigated with the automatic dispatch of a water tender to all building fires within these areas.

Building Fire Service Demand

For the three-year period from January 1, 2014, through December 31, 2016, the District experienced 102 building fire incidents comprising 0.68 percent of total service demand over the same period, as summarized in Table 39 and Figure 19.

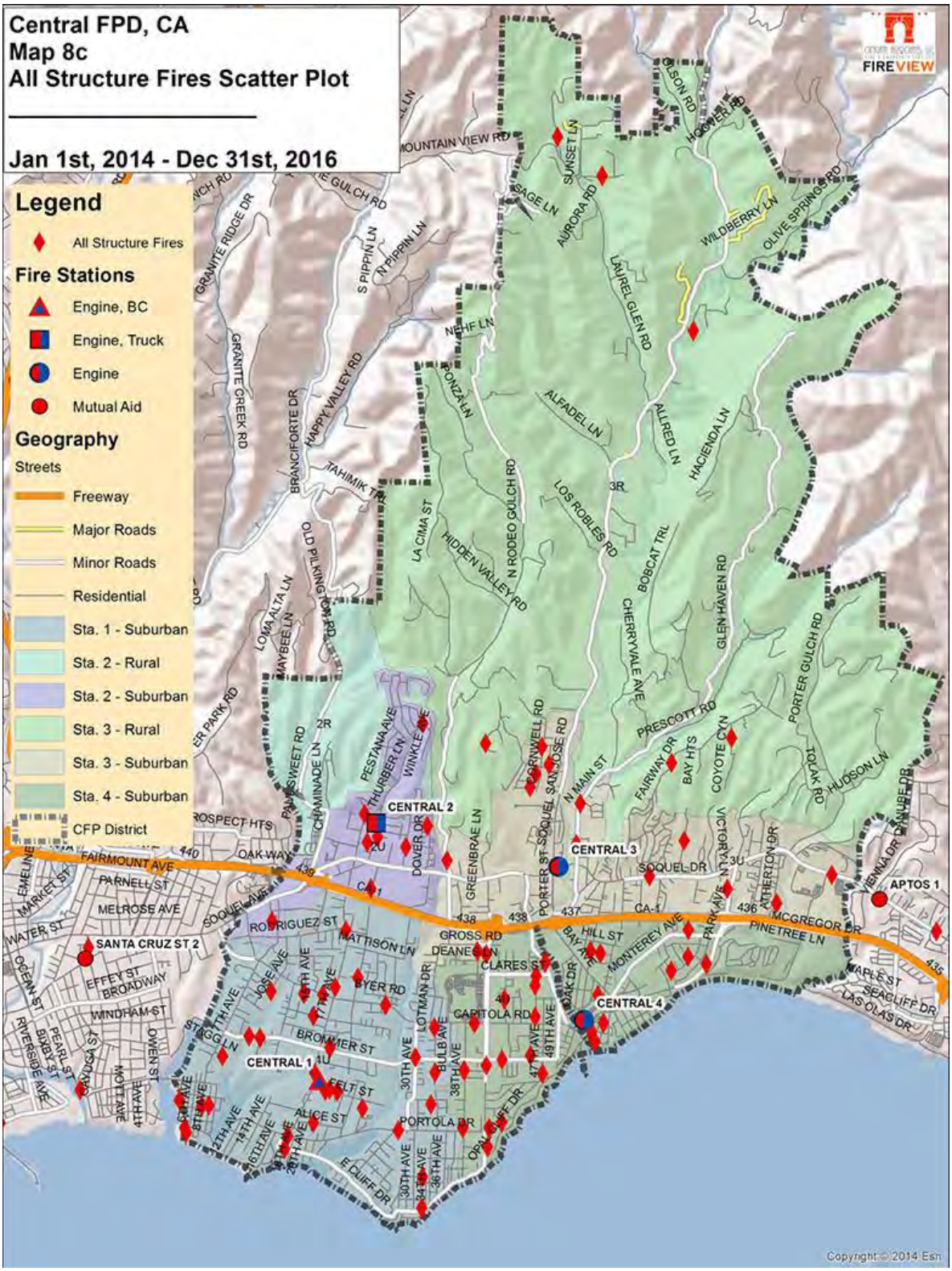
Table 39—Building Fire Service Demand

Risk	Year	Planning Zone				Total	Percent of Total Service Demand
		Station 1	Station 2	Station 3	Station 4		
Building Fire	2014	12	2	7	6	**27**	0.57%
	2015	15	2	10	13	**40**	0.78%
	2016	14	1	8	12	**35**	0.68%
Total		**41**	**5**	**25**	**31**	**102**	**0.68%**
Percent of Total Service Demand		0.89%	0.18%	0.87%	0.68%	0.68%	

Source: Central FPD incident records

As Table 39 shows, building fire service demand increased 48 percent from 2014 to 2015 then decreased 12.5 percent in 2016, with the highest volume of incidents occurring at Station 1 and the lowest at Station 2. Overall, the District's building fire service demand is very low, comprising less than one percent of all calls for service, which is typical of other California fire districts of similar size and demographics.

Figure 19—Building Fire Locations



Probability of Building Fire Occurrence

Table 40 scores the District's building fire probability by planning zone based on building fire service demand history from Table 39.

Table 40—Building Fire Probability Score

Building Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Probability of Occurrence	4	2	1	4	3	4

Building Fire Impact Severity

Table 41 scores the District's probable building fire impact severity by planning zone.

Table 41—Building Fire Impact Severity Score

Building Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Impact Severity	3	3	3	3	3	3

Overall Building Fire Risk

Table 42 identifies the District's overall building fire risk score and rating by planning zone.

Table 42—Overall Building Fire Risk

Building Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Overall Risk Score	12	6	3	12	9	12
Risk Rating	HIGH	MODERATE	LOW	HIGH	MODERATE	HIGH

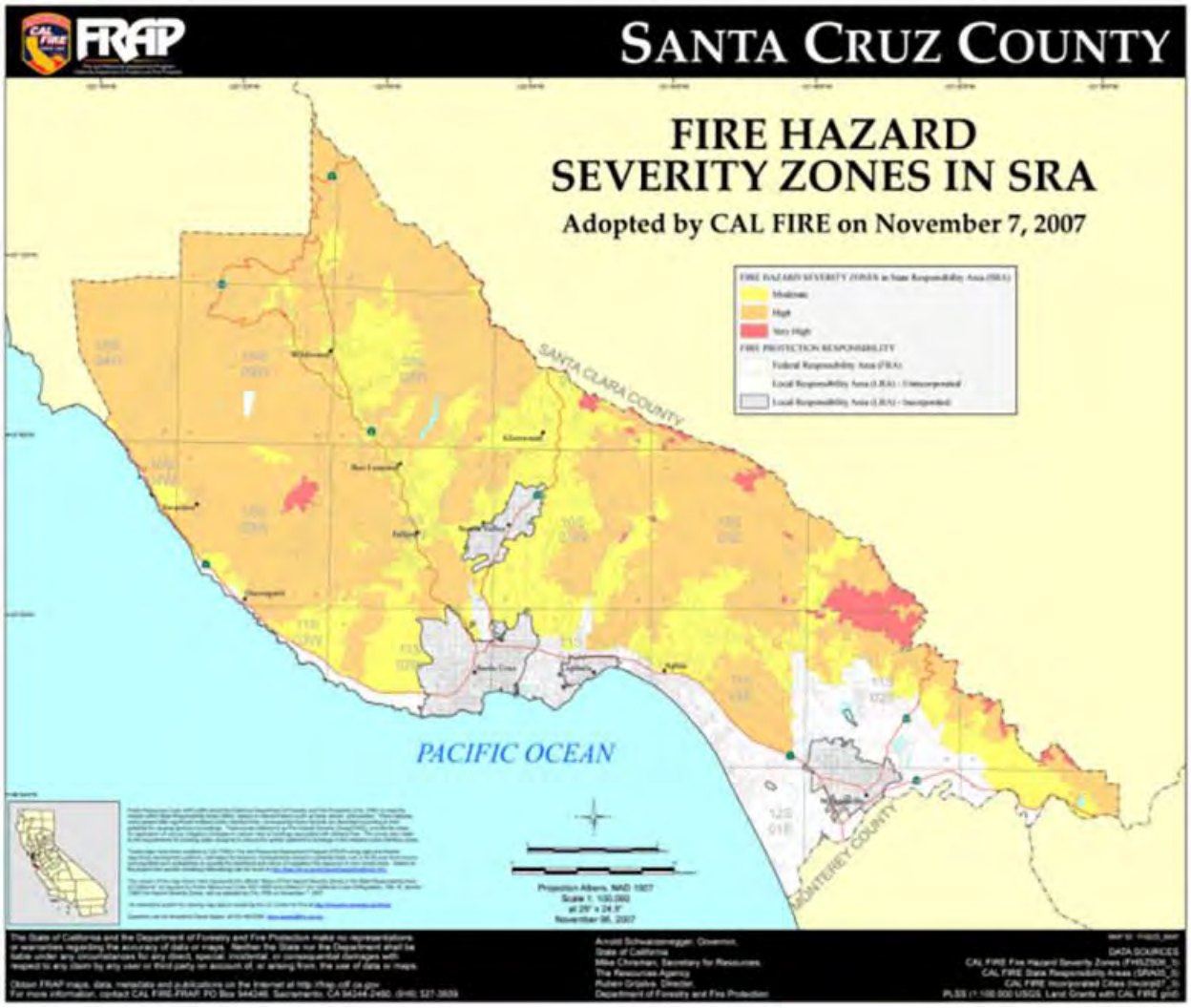
A.1.12 Wildland Fire Risk

Most of Santa Cruz County is vulnerable to a wildland fire; however, the highest risk is in the wildland-urban interface (WUI) areas where human population and related development exist within a predominantly wildland vegetation fuel environment.

Wildland Fire Hazard Severity Zones

CAL FIRE designates wildland Fire Hazard Severity Zones (FHSZ) throughout the state based on analysis of multiple wildland fire hazard factors and modeling of potential wildland fire behavior. For State Responsibility Areas (SRAs) where CAL FIRE has fiscal responsibility for wildland fire protection, CAL FIRE designates Moderate, High, and Very High FHSZs by county, as shown in Figure 20.

Figure 20—SRA Wildland Fire Hazard Severity Zones



CAL FIRE also identifies recommended FHSZs for Local Responsibility Areas (LRAs) where a local jurisdiction bears the fiscal responsibility for wildland fire protection, including the Central Fire Protection District of Santa Cruz County, as shown in Figure 21.

Figure 21—LRA Wildland Fire Hazard Severity Zones

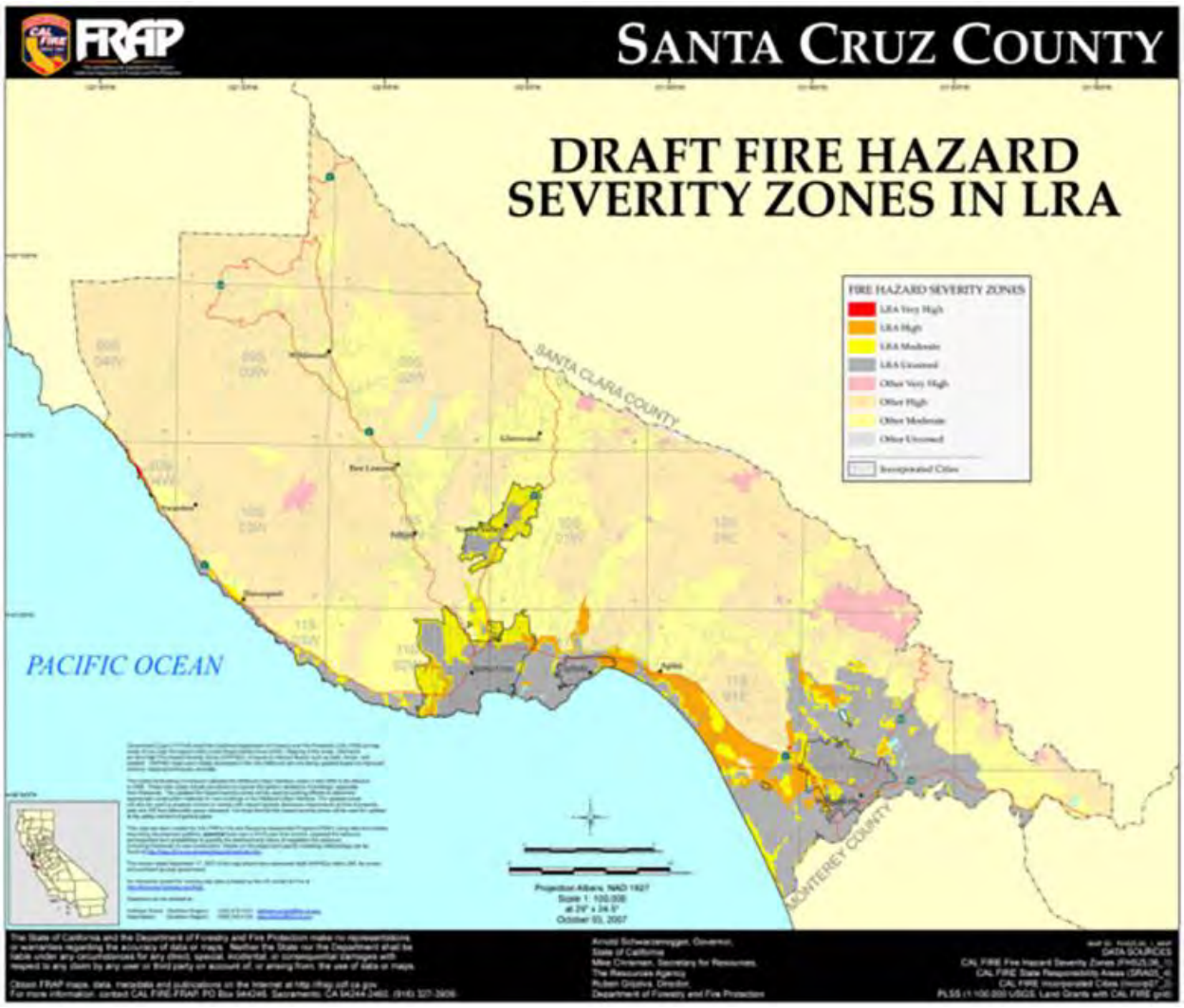


Figure 20 and Figure 21 show that much of the District's service area north of Highway 1 lies within a **Moderate** or **High** SRA FHSZ, and portions of the District's service area south of Highway 1 lie within a recommended **Moderate** or **High** LRA FHSZ.

Wildland Fuels

Wildland fuel factors influencing fire intensity and spread include fuel type (vegetation species), height, arrangement, density, and moisture. Wildland fuels within the District consist of a mix of annual grasses and weeds, manzanita / knob cone, chaparral, deciduous, eucalyptus, and mixed

conifer trees. Once ignited, wildland fires can burn intensely and contribute to rapid fire spread under the right fuel, weather, and topographic conditions.

Weather

Weather elements such as temperature, relative humidity, wind, and lightning also affect wildland fire potential and behavior. High temperatures and low relative humidity dry out wildland fuels, creating a situation where fuels will more readily ignite and burn more intensely. Wind is the most significant weather factor influencing wildland fire behavior; higher wind speeds increase fire spread and intensity. The annual wildland fire season in Santa Cruz County, when wildland fires are most likely to occur due to fuel and weather conditions, is from mid to late May through late October / early November. While normal weather conditions in the Santa Cruz Mountains can be categorized as cold and damp with extensive marine influence (fog), weather conditions occasionally result in fuel moisture levels below five percent, with temperatures above 90^{o} Fahrenheit and winds exceeding 45 MPH. Wildland fire risk during drought weather conditions or offshore wind events is even greater.

Topography

The District's varied topography, ranging from sea level to approximately 800 feet, is predominantly flat south of Highway 1 transitioning to gentle to moderate slope north of Highway 1, with multiple drainages running generally north to south toward Monterey Bay. This topography influences wildland fire behavior and spread as fires tend to burn more intensely and spread faster when burning uphill and up-canyon, except for a wind-driven downhill or down-canyon fire.

Wildland Fire History[21]

Santa Cruz County has a long history of large damaging wildland fires, as summarized in Table 43 and Figure 22.

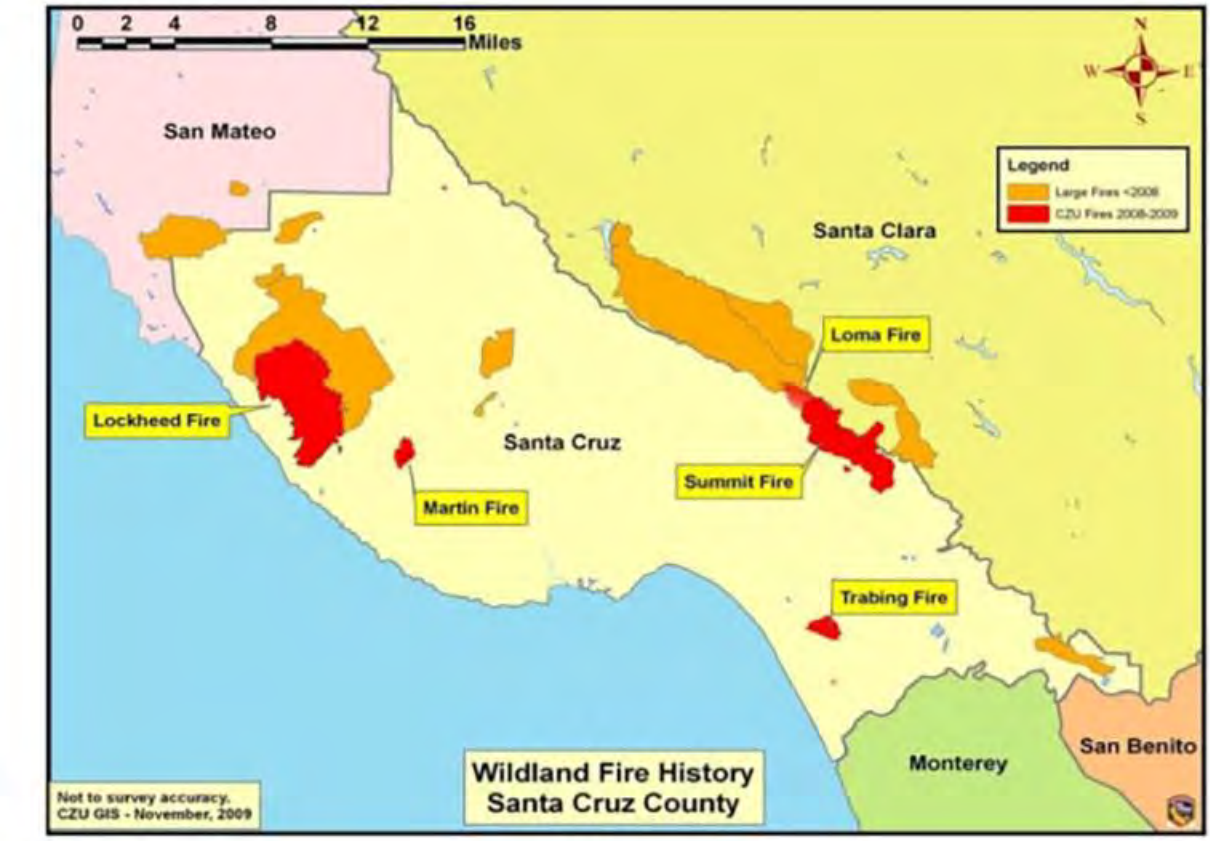
[21] Reference: Santa Cruz County 2015–2020 Local Hazard Mitigation Plan, Section 5.3.2

Table 43—Large Santa Cruz County Wildland Fires

Fire Name	Year	Acres Burned
Pine Mountain	1948	15,893
Newell Creek	1954	166
Newell Creek #2	1959	1,326
Austrian Gulch	1961	9,067
Lincoln Hill	1962	3,234
Big Basin #7	1980	378
Big Basin	1982	300
Rocha #2	1984	1,239
Lexington	1985	13,122
Croy	2002	3,006
Summit	2008	4,270
Martin	2008	520
Trabing	2008	630
Lockheed	2009	7,819
Loma	2009	485

Source: 2015–2020 Santa Cruz County LHMP, Table 5-1

Figure 22—Significant Santa Cruz County Wildland Fires



Water Supply

Another significant wildland impact severity factor is water supply immediately available for wildland fire suppression in high / very high fire hazard severity zones. As citied in the section discussing building fire risk, available water flow is insufficient or not available in many of the rural areas of the District, a deficiency partially mitigated with the automatic dispatch of a water tender to all wildland fires within these areas.

Wildland Fire Hazard Mitigation

Hazard mitigation refers to specific actions or measures taken to prevent a hazard from occurring and/or to minimize the severity of impacts resulting from a hazard occurrence. While none of the hazards subject to this study can be entirely prevented, measures *can* be taken to minimize the consequences or impacts when those hazards do occur.

The 2015–2020 Santa Cruz County LHMP identifies two wildland fire mitigation goals:

1. Avoid or reduce the potential for injury; loss of life; and property, economic, and environmental damage to Santa Cruz County from wildfire
2. Collaborate with other local fire districts and departments in mutual aid fire protection efforts.

In addition, the LHMP identifies 10 strategies to achieve these goals, as summarized in Table 44.

Table 44—Santa Cruz County Wildland Fire Mitigation Strategies

	Strategy	Priority
1	Early notification/warning of residents by technology-based applications	A-10
2	Establish and maintain cooperative fire protection and fire prevention agreements with other agencies	A-12
3	Increased visibility and reduced response times with proper road and address markings	A-13
4	Enhanced support for interoperability communications systems with local, state, and federal emergency services both inside and around the County	A-14
5	Reduction of fire risk in urban-wildland interface (WUI) through improved building materials and appropriate code enforcement, including defensible space programs	B-3
6	Maintain adequate Fire Suppression and Prevention staffing levels to meet the need of the County population and development trends.	B-4
7	Implement additional fire prevention programs in schools, institutions, and commercial buildings through inspections and education to promote fuel reduction and hazard abatement.	C-5
8	Promotion of built-in fire extinguishing systems and fire alarm system.	C-6
9	Land use planning to reduce incidence of human-caused wildfires, especially in very high fire hazard areas.	C-7
10	Appropriate road and secondary access improvement and creation program.	C-8

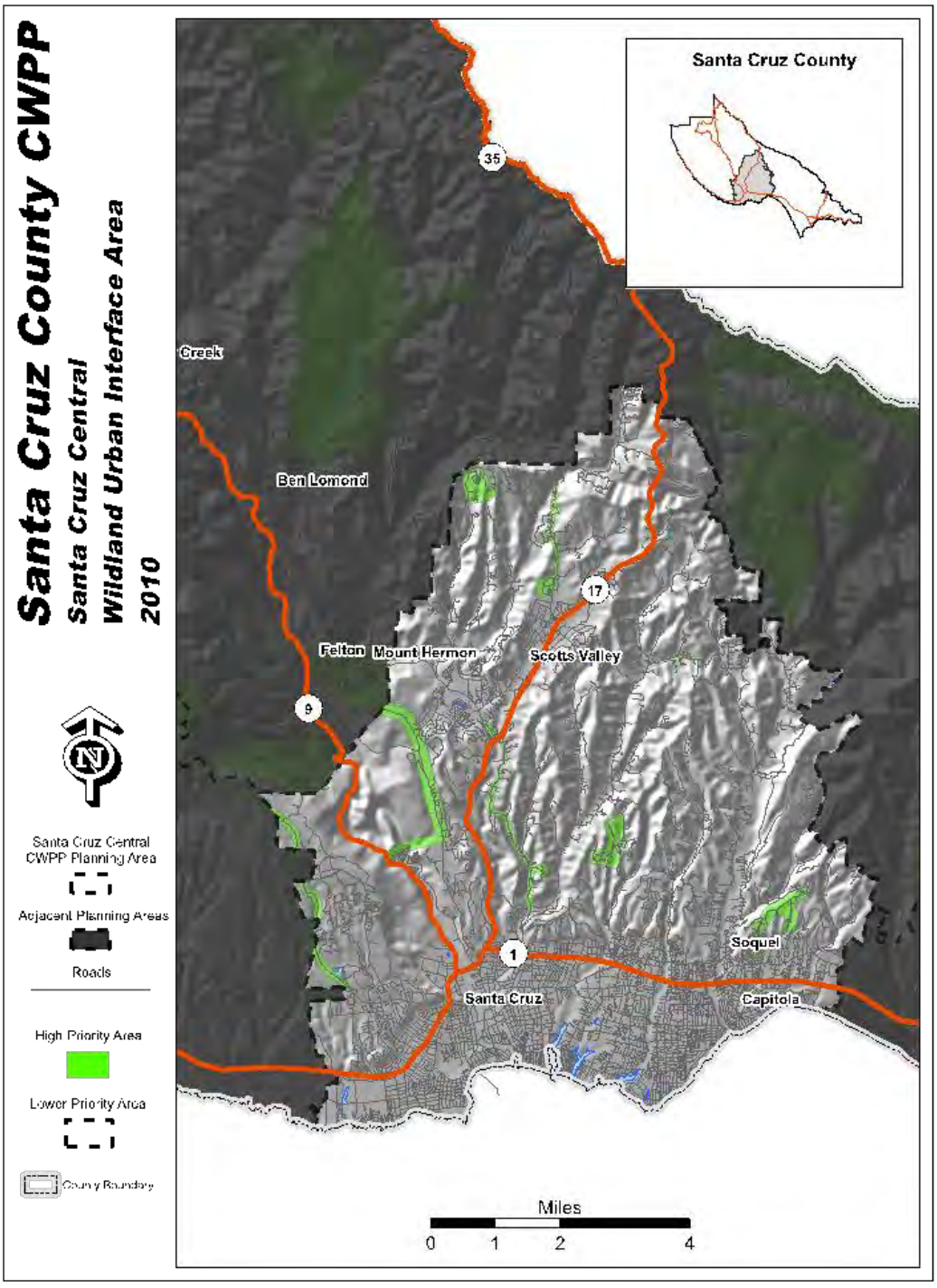
Source: Santa Cruz County 2015–2020 Local Hazard Mitigation Plan, Section 5.4.2

The 2010 San Mateo / Santa Cruz County Community Wildfire Protection Plan (CWPP) identifies 10 planning areas, including the Santa Cruz Central Wildland Urban Interface Area, which includes the Central Fire Protection District of Santa Cruz County. High priority project areas for the District are shown in Figure 23.

- Fairway Drive community
- Glen Haven corridor

- Laurel Glen community
- Mountain View community
- Olive Springs community
- Porter Gulch community
- Soquel San Jose Road corridor.

Figure 23—High-Priority CWPP Project Areas



According to the District Fire Marshal, no wildland fire mitigation projects have been undertaken by the District in recent years, and there has been no interaction with the Soquel Fire Safe Council for quite some time.

According to District staff, all parcels within the SRA are inspected on a two-year cycle beginning in April of each year.

Finding #19: Most of the District's service area north of Highway 1 is within a **Moderate** or **High** wildland Fire Hazard Severity Zone (FHSZ), as identified by CAL FIRE.

Finding #20: Portions of the District's service area south of Highway 1 lie within a **Moderate** or **High** wildland FHSZ, as recommended by CAL FIRE.

Finding #21: The District has established a goal to inspect every parcel north of Highway 1 within the State Responsibility Area at least every two years to ensure that required defensible space is appropriately established and maintained.

Finding #22: The San Mateo / Santa Cruz County Community Wildfire Protection Plan identifies several high-priority wildland fire mitigation project areas within the District.

Wildland Fire Service Demand

As summarized inn Table 45, the District experienced 41 wildland fires from January 2014 through December 2016, comprising 0.27 percent of total service demand over the same period.

Table 45—Wildland Fire Service Demand History

Risk	Year	Planning Zone				Total	Percent of Total Service Demand
		Station 1	Station 2	Station 3	Station 4		
Wildland Fire	2014	4	6	4	1	**15**	0.32%
	2015	4	3	5	2	**14**	0.27%
	2016	3	3	2	4	**12**	0.23%
Total		**11**	**12**	**11**	**7**	**41**	**0.27%**
Percent of Total Service Demand		0.24%	0.43%	0.38%	0.15%	0.27%	

Source: Central FPD incident records

As Table 45 shows, wildland fire service demand has been stable over the past three years, with the highest overall occurrence at Station 2 and the lowest overall occurrence at Station 4. Overall, the District's wildland fire service demand is very low.

Probability of Occurrence

Table 46 scores the District's wildland fire probability by planning zone based on wildland fire service demand history from Table 45.

Table 46—Wildland Fire Probability Score

Wildland Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Probability of Occurrence	4	3	4	3	4	3

Wildland Fire Impact Severity

Table 47 scores the District's probable wildland fire impact severity by planning zone.

Table 47—Wildland Fire Impact Severity Score

Wildland Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Impact Severity	2	2	3	2	3	2

Overall Wildland Fire Risk Rating

Table 48 identifies the District's overall wildland fire risk score and rating by planning zone.

Table 48—Overall Wildland Fire Risk Rating

Wildland Fire	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Overall Risk Score	8	6	12	6	12	6
Risk Rating	MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE

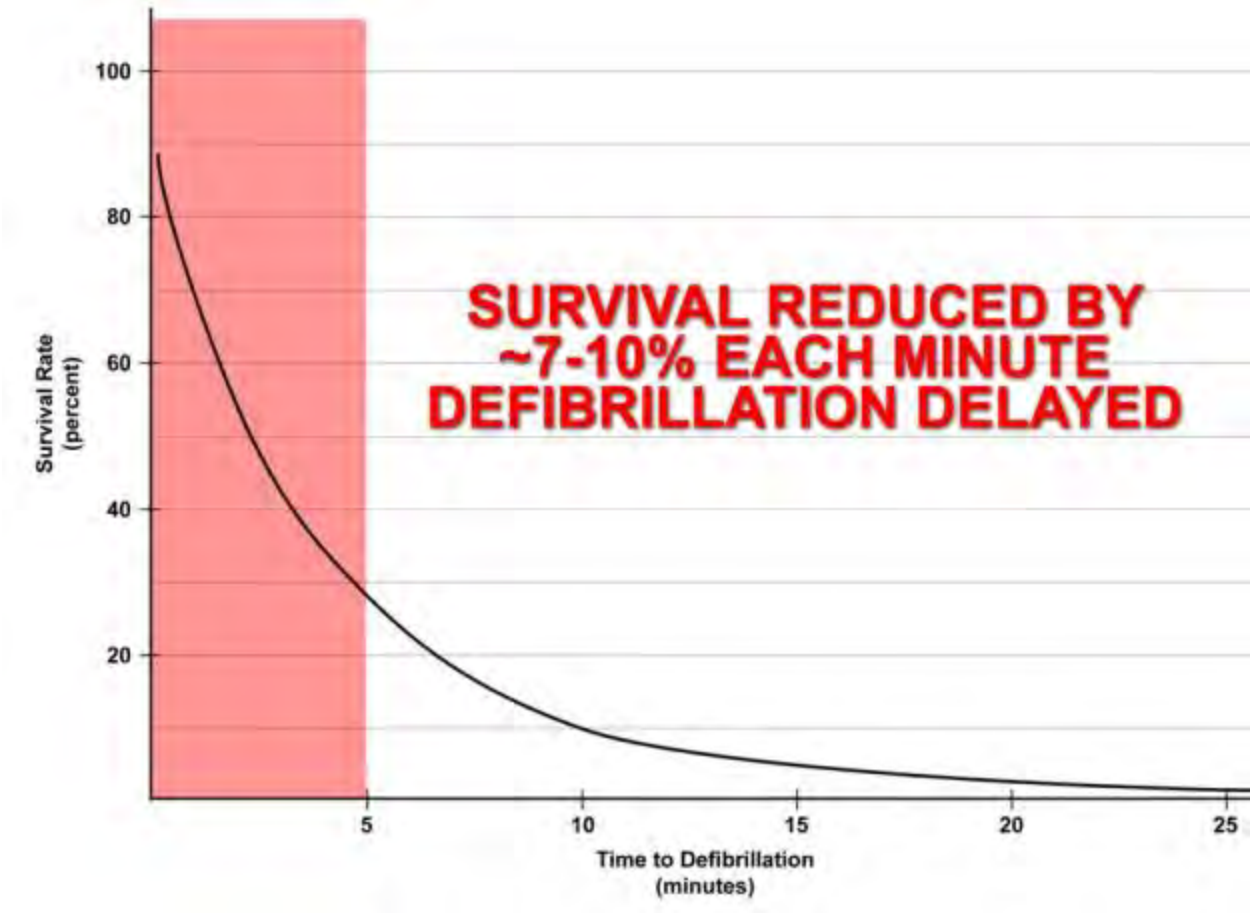
A.1.13 Medical Emergency Risk

Medical emergency risk in most communities is predominantly a function of population density, demographics, violence, health insurance coverage, and vehicle traffic.

Medical emergency risk can also be categorized as either a medical emergency resulting from a health-related condition or event, or a traumatic injury. One serious medical emergency is cardiac arrest or some other event where there is an interruption or blockage of oxygen to the brain.

Figure 24 illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases. While early defibrillation is one factor in cardiac arrest survivability, other factors such as early CPR and pre-hospital advanced life support interventions can also influence survivability.

Figure 24—Survival Rate versus Time of Defibrillation



Source: www.suddencardiacarrest.com

Population Density

Because medical emergencies involve people, it seems logical that higher population densities generate higher medical emergency service demand than lower population densities. In Citygate's experience, this is particularly true for urban population densities. As illustrated in Figure 17, the District's population density ranges from less than 100 per square mile to more than 18,000 per square mile.

Demographics

Medical emergency risk tends to be higher among older, poorer, less-educated, and uninsured populations. According to the U.S. Census Bureau, 14 percent of the District's population is 65 and older, 12.3 percent of the population is at or below poverty level, 40 percent of the

population over 24 years of age has less than a high school diploma or equivalent, and 12.5 percent of the population does not have health insurance coverage.[22]

Violence

As would be expected, medical emergency risk is also higher in communities or segments of communities with higher rates of violence. For 2014, the most recent year of available data, there were 737 violent crimes committed in unincorporated Santa Cruz County.[23] Given an estimated population of 155,000, this represents a violent crime rate of 0.4 percent, suggesting that violent crime minimally influences the County's and District's medical emergency risk.

Vehicle Traffic

Medical emergency risk tends to be higher in those areas of a community with high daily vehicle traffic volume, particularly those areas with high traffic volume travelling at high speeds. The District's transportation network includes Highway 1, which carries an annual average daily traffic volume of over 97,000 vehicles, with a peak-hour load of more than 6,400 vehicles.[24]

Medical Emergency Service Demand

As summarized in Table 49, medical emergency service demand over the previous three years included 8,663 calls for service comprising 57.62 percent of total service demand over the same period.

Table 49—Medical Emergency Service Demand History

Risk	Year	Planning Zone				Total	Percent of Total Service Demand
		Station 1	Station 2	Station 3	Station 4		
Medical Emergency	2014	891	607	556	716	**2,770**	58.29%
	2015	926	508	548	925	**2,907**	57.02%
	2016	1,005	601	538	842	**2,986**	57.60%
Total		**2,822**	**1,716**	**1,642**	**2,483**	**8,663**	**57.62%**
Percent of Total Service Demand		60.99%	61.22%	57.23%	54.52%	57.62%	

Source: Central FPD incident records

[22] Source: U.S. Census Bureau (2015)

[23] Source: Santa Cruz County Sheriff's Office website

[24] Source: California Department of Transportation (2015)

As Table 49 shows, medical emergencies comprise the majority of the District's overall service demand. While medical emergency service demand varies by station, overall it showed an upward trend of nearly four percent annually over the past two years. Overall, the District's medical emergency service demand is typical of other small districts with similar demographics.

Probability of Occurrence

Table 50 scores the District's medical emergency probability by planning zone based on recent medical emergency service demand history from Table 49.

Table 50—Probability of Medical Emergency Occurrence

Medical Emergency	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Probability of Occurrence	4	4	4	4	4	4

Medical Emergency Impact Severity

Table 51 scores the District's probable medical emergency impact severity by planning zone.

Table 51—Medical Emergency Impact Severity

Medical Emergency	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Impact Severity	3	3	3	3	3	3

Overall Medical Emergency Risk

Table 52 identifies the District's overall medical emergency risk score and rating by planning zone.

Table 52—Overall Medical Emergency Risk

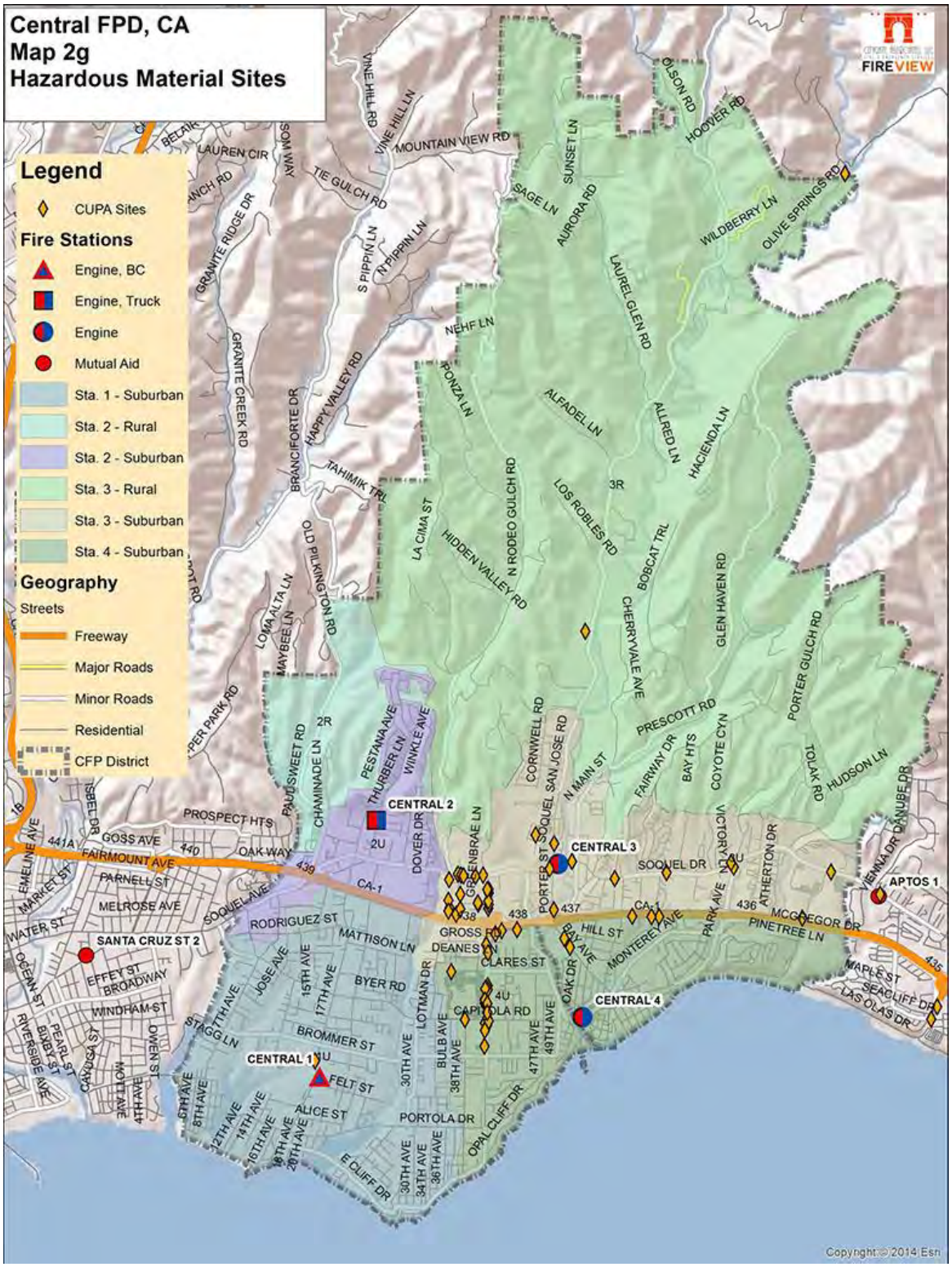
Medical Emergency	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Overall Risk Score	12	12	12	12	12	12
Risk Rating	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

A.1.14 Hazardous Material Risk

Hazardous material risk factors include fixed facilities that store, use, or produce hazardous chemicals or waste; underground pipelines conveying hazardous materials; aviation, railroad, maritime, and vehicle transportation of hazardous materials into or through a jurisdiction; vulnerable populations; emergency evacuation planning and related training; and specialized hazardous material service capacity.

The Santa Cruz County Environmental Health Services Department, serving as the designated Certified Unified Program Agency (CUPA) for the County, identified 85 facilities within the District's service area requiring a state or County hazardous material operating permit or Hazardous Materials Business Plan (HMBP), as summarized in Figure 25.

Figure 25—Hazardous Materials Sites



The District also has transportation-related hazardous material risk as a result of its road transportation network. Highway 1 contains heavy daily truck traffic volume, as summarized in Table 53.

Table 53—Average Annual Daily Truck Traffic

Highway	Crossing	AADT[1]	Truck AADT by Axles				% Truck AADT by Axles			
			2	3	4	5+	2	3	4	5+
1	Soquel Avenue	3,760	2,444	564	113	639	65.00%	15.00%	3.00%	17.00%

[1] AADT=Average Annual Daily Trips

Source: California Department of Transportation (2015)

Population Density

Because hazardous material emergencies have the potential to adversely impact human health, it is logical that the higher the population density, the greater the potential population exposed to a hazardous material release or spill. As previously illustrated in Figure 17, the District's population density ranges from less than 100 per square mile to more than 18,000 per square mile.

Vulnerable Populations

Persons vulnerable to a hazardous material release/spill include those individuals or groups unable to self-evacuate, generally including children under the age of 10, the elderly, and persons confined to an institution or other setting where they either cannot or are unable to leave voluntarily. More than 25 percent of the District's population is under age 10 or of the age of 65 and older.

Emergency Evacuation Planning, Training, Implementation, and Effectiveness

Another significant hazardous material impact severity factor is a jurisdiction's shelter-in-place / emergency evacuation planning and training. In the event of a hazardous material release or spill, time can be a critical factor in notifying potentially affected persons, particularly at-risk populations, to either shelter in place or to evacuate to a safe location. Essential to this process is an effective emergency plan that incorporates one or more mass emergency notification capabilities, as well as pre-established evacuation procedures. It is also essential to conduct regular, periodic exercises involving these two emergency plan elements to evaluate readiness and to identify and remediate any planning and/or training gaps to ensure ongoing emergency incident readiness and effectiveness.

Although the District does not have its own emergency evacuation plan or mass emergency notification capability, Santa Cruz County has established emergency evacuation protocols,

procedures, and resources as referenced in the County's Emergency Operations Plan, which is currently under review/revision as part of the County's Local Hazard Mitigation Plan update process.

As needed during emergencies, the Santa Cruz County Sheriff's Office utilizes these protocols to implement incident-specific evacuation procedures conforming to the Federal Emergency Management Agency (FEMA), the Incident Command System, and incident action planning principles and guidelines. Evacuation needs and instructions are communicated to the public using CodeRED, a mass emergency telephone notification system administered by Santa Cruz Regional 9-1-1 (SCR911) Dispatch Center. Authorized local County public safety officials can directly request emergency notifications through the SCR911 dispatcher. This system is regularly utilized throughout the County, and both public safety personnel and SCR911 staff are well-versed with its use and procedures, particularly during the multiple serious storm events this past winter.

Finding #23: The County has established appropriate emergency evacuation protocols, procedures, and resources in its Emergency Operations Plan.

Finding #24: The County has established a mass emergency telephone notification system to effectively communicate emergency information to the public in a timely manner.

Finding #25: The County regularly utilizes, validates, and evaluates its emergency evacuation protocols, procedures, and resources to ensure ongoing emergency evacuation readiness and effectiveness.

Hazardous Materials Service Demand

As summarized in Table 54, the District experienced 175 hazardous material incidents over the past three years comprising 1.16 percent of total service demand over the same period.

Table 54—Hazardous Materials Service Demand History

Risk	Year	Planning Zone				Total	Percent of Total Service Demand
		Station 1	Station 2	Station 3	Station 4		
Hazardous Materials	2014	16	8	15	15	**54**	1.14%
	2015	22	5	16	27	**70**	1.37%
	2016	21	7	4	19	**51**	0.98%
Total		**59**	**20**	**35**	**61**	**175**	**1.16%**
Percent of Total Service Demand		1.28%	0.71%	1.22%	1.34%	1.16%	

Source: Central FPD incident records

As Table 54 indicates, hazardous material service demand varies by station, with the highest total demand in Station 4's response area. Overall, hazardous materials service demand is low and is also fairly consistent on an annual basis.

Probability of Occurrence

Table 55 scores the probability of a future hazardous material occurrence by planning zone over the next 12 months based on recent hazardous material service demand history from Table 54.

Table 55—Probability of Hazardous Material Occurrence

Hazardous Materials	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Probability of Occurrence	**4**	**4**	**1**	**4**	**1**	**4**

Hazardous Materials Impact Severity

Table 56 scores the District's probable hazardous material impact severity by planning zone.

Table 56—Hazardous Material Impact Severity

Hazardous Materials	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Impact Severity	3	3	3	3	3	3

Overall Hazardous Materials Risk

Table 57 identifies the District's overall hazardous material risk score and risk rating by planning zone.

Table 57—Overall Hazardous Material Risk

Hazardous Materials	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Overall Risk Score	12	12	3	12	3	12
Risk Rating	HIGH	HIGH	LOW	HIGH	LOW	HIGH

A.1.15 Technical Rescue Risk

Technical rescue risk factors include active construction projects; structural collapse potential; confined spaces such as tanks and underground vaults; bodies of water and rivers or streams; industrial machinery; transportation volume; and earthquake, flood, and landslide potential.

Construction Activity

There is generally some construction activity occurring within the District's service area predominantly related to residential and/or light commercial activity.

Confined Spaces

There are some confined spaces within the District, including tanks, vaults, open trenches, etc.

Bodies of Water

There are numerous bodies of water within the District, including the Monterey Bay coastline, Soquel Creek, and other smaller bodies of water.

Transportation Volume

Another factor is transportation-related incidents requiring technical rescue. This risk factor is primarily a function of vehicle, railway, maritime, and aviation traffic. Vehicle traffic volume is the greatest of these factors within the District, with Highway 1 carrying more than 97,000 vehicles daily.

Earthquake Risk[25]

All of Santa Cruz County is vulnerable to an earthquake. There are several active and potentially active faults, including the San Andreas, San Gregorio, Zayante, and Monterey Bay Fault zones, as well as numerous fault complexes and branches of these major faults, as shown in Figure 26.

Figure 26—Earthquake Fault Zones

Source: 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, Figure 7

[25] Reference: 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, Chapter 4

The San Andreas Fault zone is the most significant threat to the County. The fault passes through the Santa Cruz Mountains along the northern portion of the County. Based on records from the 1906 San Francisco earthquake, it is estimated that the maximum credible earthquake likely to occur along the San Andreas Fault would equal magnitude 8.3, which represents more than 30 times the energy released by the 1989 Loma Prieta earthquake that caused significant damage in Santa Cruz County.

Flood Risk[26]

Numerous areas of Santa Cruz County are subject to flooding, including Soquel Creek within the District. Coastal flooding along the heavily developed Monterey Bay coastline may occur with the simultaneous occurrence of large waves and storm swells during the winter. Storm centers from the southwest produce the type of storm pattern most commonly responsible for the majority of severe coastline flooding. The strong winds combined with high tides that create storm surges are usually accompanied by heavy rains. Figure 27 shows the location of flood hazards within Santa Cruz County as identified by FEMA.

Figure 27—Santa Cruz County Flood Hazard Areas

Source: 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, Figure 18

[26] Reference: 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, Chapter 6

An earthquake anywhere in the Pacific Ocean can cause tsunamis around the entire Pacific basin, including offshore of Santa Cruz County. Since the Pacific Rim is highly seismically active, tsunamis are not uncommon but historically have been only a few meters in height. Significant damage occurred in the Santa Cruz Harbor as a result of a 9.0 earthquake in Japan. While the tsunami caused massive damage and casualties in Japan, the Santa Cruz Harbor suffered approximately $20 million in damage. However, the historic record is short and may not reflect the true tsunami hazard to the County. The potential outcome of a tsunami could be more significant damage and loss of life. Figure 28 illustrates the potential tsunami inundation areas of the County.

Figure 28—Tsunami Inundation Areas

Source: 2015–2020 Santa Cruz County Local Hazard Mitigation Plan, Figure 24

Technical Rescue Service Demand

As summarized in Table 58, over the most recent three years, there were 79 technical rescue incidents comprising 0.53 percent of total service demand for the same period.

Table 58—Technical Rescue Service Demand

Risk	Year	Planning Zone				Total	Percent of Total Service Demand
		Station 1	Station 2	Station 3	Station 4		
Technical Rescue	2014	8	0	2	5	**15**	0.32%
	2015	12	5	1	13	**31**	0.61%
	2016	19	1	2	11	**33**	0.64%
Total		**39**	**6**	**5**	**29**	**79**	**0.53%**
Percent of Total Service Demand		0.84%	0.21%	0.17%	0.64%	0.53%	

Source: Central FPD incident records

As Table 58 shows, technical rescue service demand is trending slightly higher, with the overall greatest demand in Station 1's response area.

Probability of Occurrence

Table 59 scores the probability of a future technical rescue occurrence by planning zone over the next 12 months based on recent service demand history from Table 58.

Table 59—Probability of Technical Rescue Occurrence

Technical Rescue	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Probability of Occurrence	**4**	**3**	**2**	**3**	**2**	**4**

Technical Rescue Impact Severity

Table 60 scores the District's probable technical rescue impact severity by planning zone.

Table 60—Technical Rescue Impact Severity

Technical Rescue	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Impact Severity	3	3	3	3	3	3

Overall Technical Rescue Risk

Table 61 identifies the District's overall technical rescue risk score and rating by planning zone.

Table 61—Overall Technical Rescue Risk

Technical Rescue	Planning Zone					
	Station 1	Station 2		Station 3		Station 4
	Suburban	Suburban	Rural	Suburban	Rural	Suburban
Overall Risk Score	12	9	6	9	6	12
Risk Rating	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	HIGH

APPENDIX B—INCIDENT STATISTICAL ANALYSIS

B.1 STATISTICAL ANALYSIS

B.1.1 Historical Effectiveness and Reliability of Response—What Statistics Say about Existing System Performance

SOC ELEMENT 7 OF 8
RELIABILITY AND HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The map sets described in Section 2.6 show the ideal situation for response times and the response effectiveness given perfect conditions with no competing calls, traffic congestion, units out of place, or simultaneous calls for service. Examination of the actual response time data provides a picture of response times in the real world of simultaneous calls, rush hour traffic congestion, units out of position, and delayed travel time for events such as periods of severe weather.

B.1.2 Data Set Identification

The District furnished three years of National Fire Incident Reporting System (NFIRS 5) data and related apparatus response times that were merged into a single data file. The resulting database includes 15,035 incidents and 17,063 apparatus movement records.

Dataset strengths include:

- Long-term use of NFIRS 5 reporting system; multiple years of data available
- Use of seconds in time fields
- Standardized incident numbers in NFIRS 5 and apparatus response data.

Dataset weaknesses include a lack of digital geospatial coordinates for incident locations. The District uses a state plane coordinate system that cannot be readily analyzed with popular geographic analytic tools. Addresses were extracted from the data and geocoded and imported back into the dataset. There were approximately 5,200 unique incident addresses in the three-year dataset.

The majority of data was exported from a legacy FIREHOUSE RMS system. It appears that system was changed to the hosted EMERGENCY REPORTING environment on July 1, 2016. Incident numbering systems were changed in the new software and required several changes before all three years of data could be merged.

B.1.3 Analysis Period

The data range for this statistical analysis is January 1, 2014, through December 31, 2016. This period incorporates 36 consecutive months over three calendar years.

B.1.4 Service Demand

For 2016, the District responded to 5,185 calls for service (incidents) for an average daily service demand of 14.21 incidents. Of those, 1.91 percent were fire incidents, 58.40 percent were EMS incidents, and 39.69 percent were other incidents (e.g., alarm activation with no fire, false alarm, no incident found, public assist, smoke scare, assist other agency, smoke or odor removal, electrical problem, water leak, rescue, hazardous material incident, animal problem, etc.).

As shown in Table 62 and Figure 29, annual service demand trended upward by an average of nearly 4.5 percent over the most recent three-year period.

Table 62—Annual Service Demand

Year	Incidents
2014	4,752
2015	5,098
2016	5,184
Total	**15,034**

Source: Central FPD incident records

Figure 29—Annual Service Demand by Year

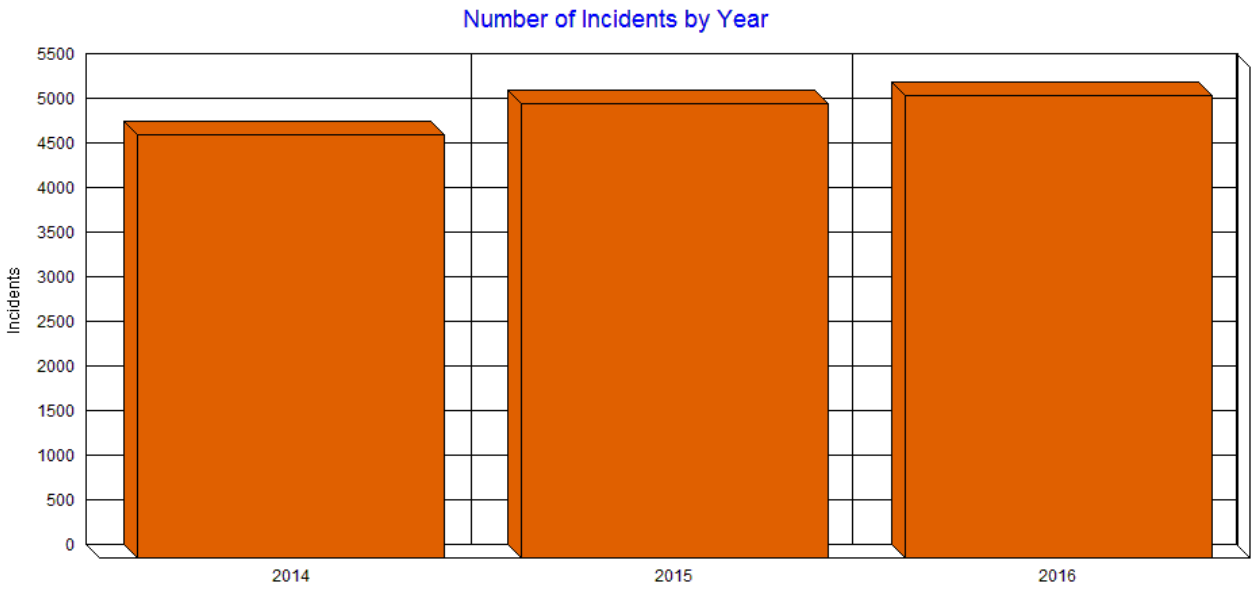
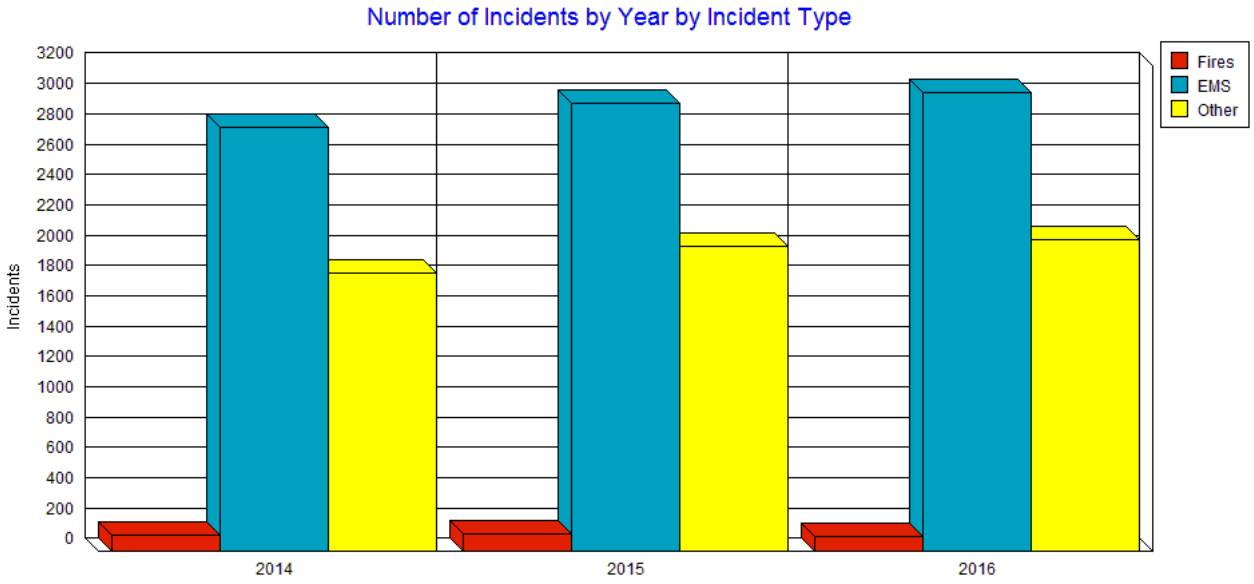


Figure 30 illustrates annual service demand by incident category. While fire incident service demand has remained constant, note the increase in EMS and other incidents over the three-year period.

Figure 30—Annual Service Demand by Incident Type



Service Demand over Time

Figure 31 illustrates annual service demand by month. Note that monthly service demand is fairly consistent throughout the year.

Figure 31—Number of Incidents by Month by Year

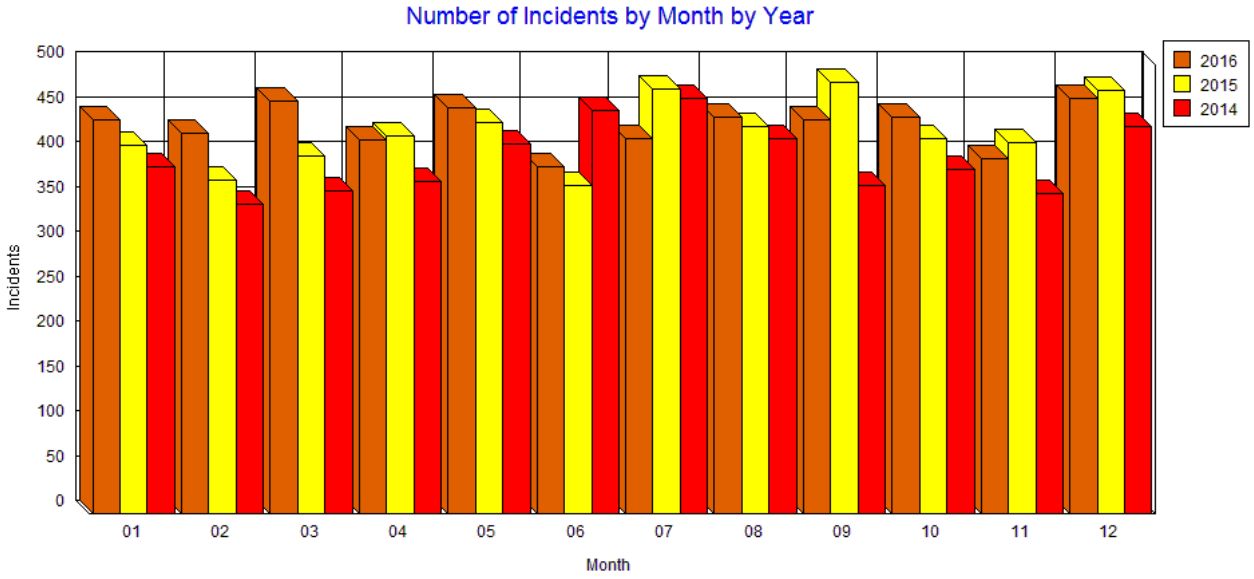


Figure 32 illustrates that service demand remains fairly consistent throughout the week, with a slight increase at the end of the week for 2016.

Figure 32—Number of Incidents by Day of Week by Year

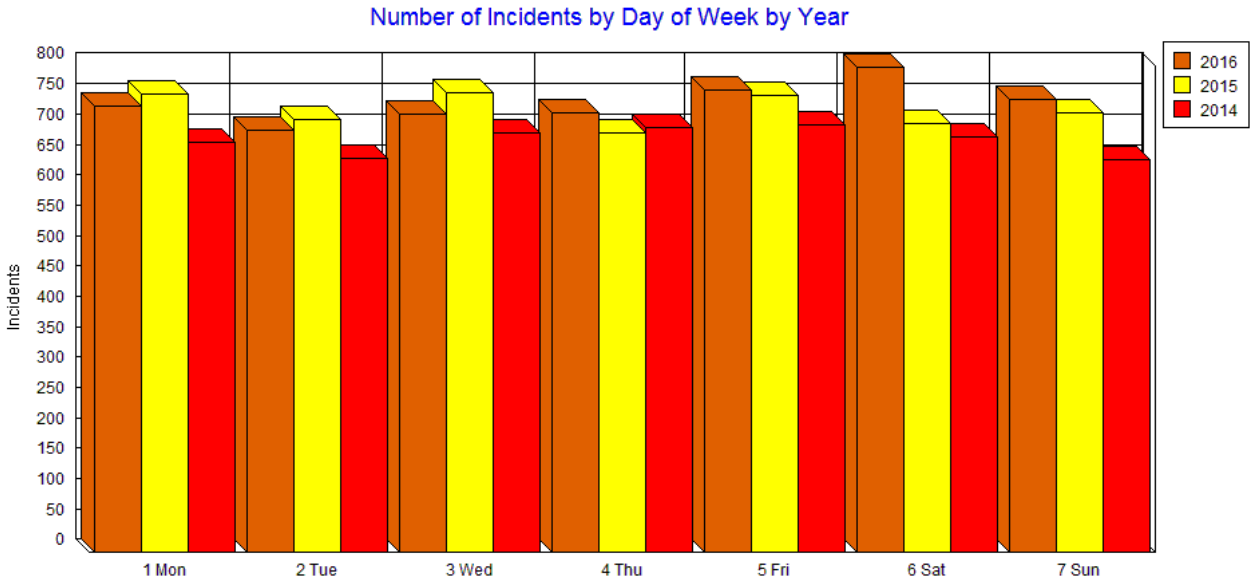
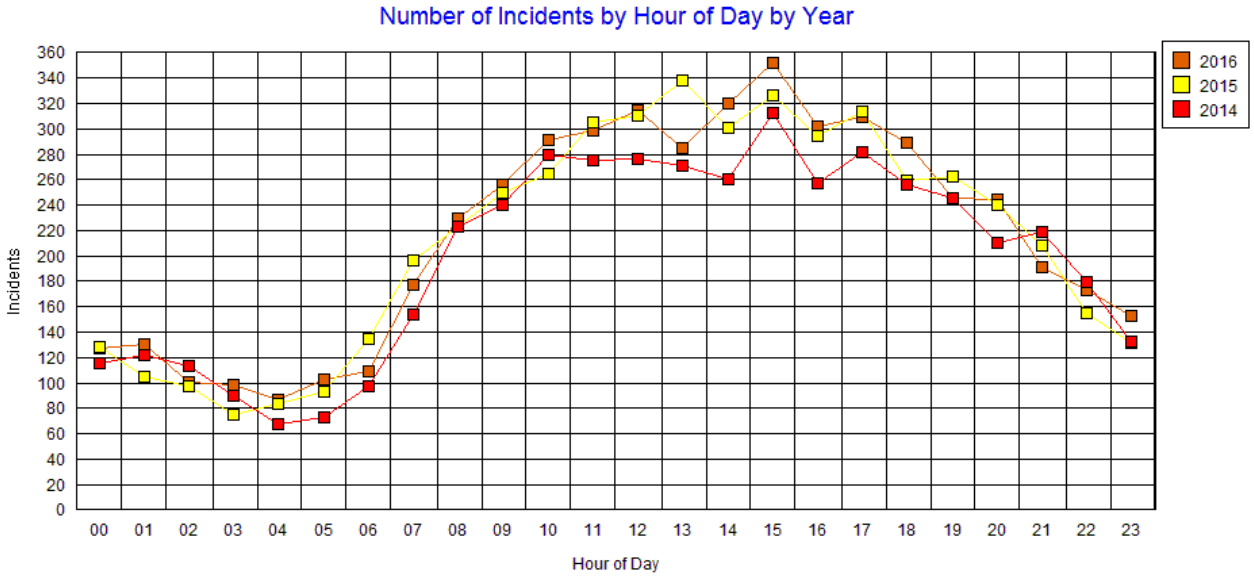


Figure 33 illustrates annual service demand by hour of day. Of note is the consistency of service demand during early morning hours, with larger variation from about 11:00 am to 8:00 pm. This service demand curve is typical for urban/suburban departments, with increased service demand during typical business hours and peak demand period from approximately 10:00 am to 10:00 pm.

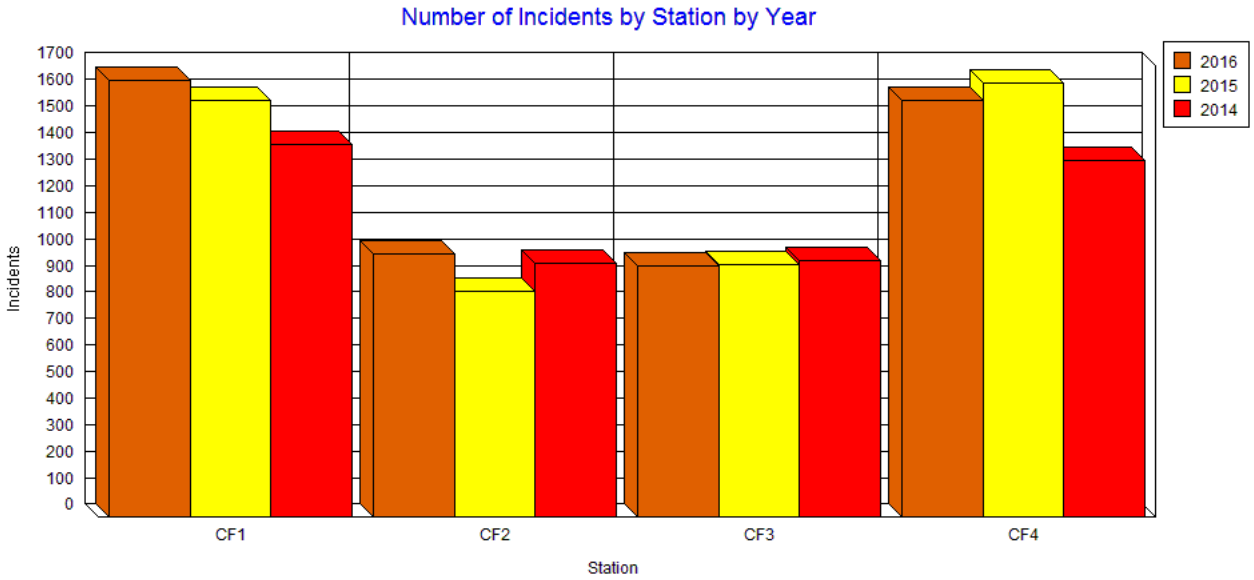
Figure 33—Service Demand by Hour of Day and Year



Service Demand by Station

Figure 34 illustrates annual service demand by station over the three-year study period. Of note is that service demand for Station 1 trended upward, while Station 2 and Station 3 have been relatively constant and Station 4's demand dropped slightly after an increase in 2015.

Figure 34—Service Demand by Station by Year



Service Demand by Incident Type

Table 63 ranks service demand by NFIRS 5 incident type for the most recent reporting year. Of note is the strong ranking of EMS-related incidents, with calls cancelled prior to arrival also ranking high. Building fires ranked 24th by volume. The table shows only incident categories with 20 or more incidents for 2016.

Table 63—Service Demand by Incident Type

NFIRS Incident Type	2016
321 EMS call, excluding vehicle accident with injury	2,761
611 Dispatched and canceled prior to arrival	735
554 Assist invalid	229
622 No incident found on arrival	195
322 Vehicle accident with injuries	118
553 Public service	107
550 Public service assistance, other	99
324 Motor vehicle accident; no injuries	78
700 False alarm or false call, other	59
743 Smoke detector activation; no fire	46
600 Good intent call, other	45
444 Power line down	38
552 Police matter	36
733 Smoke detector activation due to malfunction	33
651 Smoke scare	31
551 Assist police or other governmental agency	29
745 Alarm system activation; no fire	28
364 Surf rescue	28
323 Motor vehicle/pedestrian accident	26
412 Gas leak	24
440 Electrical wiring/equipment problem	23

Another way to understand fire department service delivery is to review the types of properties at which incidents occur. Table 64 summarizes annual service demand by NFIRS property use categories, indicating that nearly 65 percent of the District's annual service demand is generated by residential and roadway property uses. Only property types with greater than 100 occurrences over the three-year period of the dataset are shown.

Table 64—Service Demand by Property Use by Year

Property Use	2014	2015	2016	Total
1- or 2-family dwelling	1,447	1,430	1,540	**4,417**
24-hour care nursing homes (4 or more persons)	502	537	528	**1,567**
Multi-family dwellings	411	479	504	**1,394**
Residential street, road or residential driveway	346	245	303	**894**
Street or road in commercial area	241	233	257	**731**
Vehicle parking area	212	239	261	**712**
Residential, other	39	146	218	**403**
Beach	61	113	95	**269**
Asylum, mental institution	116	58	69	**243**
Street, other	51	61	99	**211**
Clinics, doctors' offices, hemodialysis centers	47	92	70	**209**
Outside or special property, other	61	73	69	**203**

Aid Provided and Received

Table 65 summarizes automatic and mutual aid provided by the District to other agencies/jurisdictions, as well as automatic and mutual aid received from other agencies/jurisdictions. Aid provided to other agencies accounts for *7.96 percent* of all service demand over the three-year study period. Also of note is the significant reduction in aid provided for 2016.

Table 65—Aid Provided and Received by Year

Aid Type	2014	2015	2016	Total
Mutual Aid Received	3	3	6	**12**
Automatic Aid Received	16	25	17	**58**
Mutual Aid Provided	4	8	14	**26**
Automatic Aid Provided	152	192	102	**446**
Total	**175**	**228**	**139**	**542**

Simultaneous Incident Activity

Simultaneous incident activity measures the percentage of concurrent or overlapping incidents. Figure 35 shows simultaneous incident occurrence by year for the District. Of note is that simultaneous incident activity is trending up.

Figure 35—Simultaneous Activity by Year

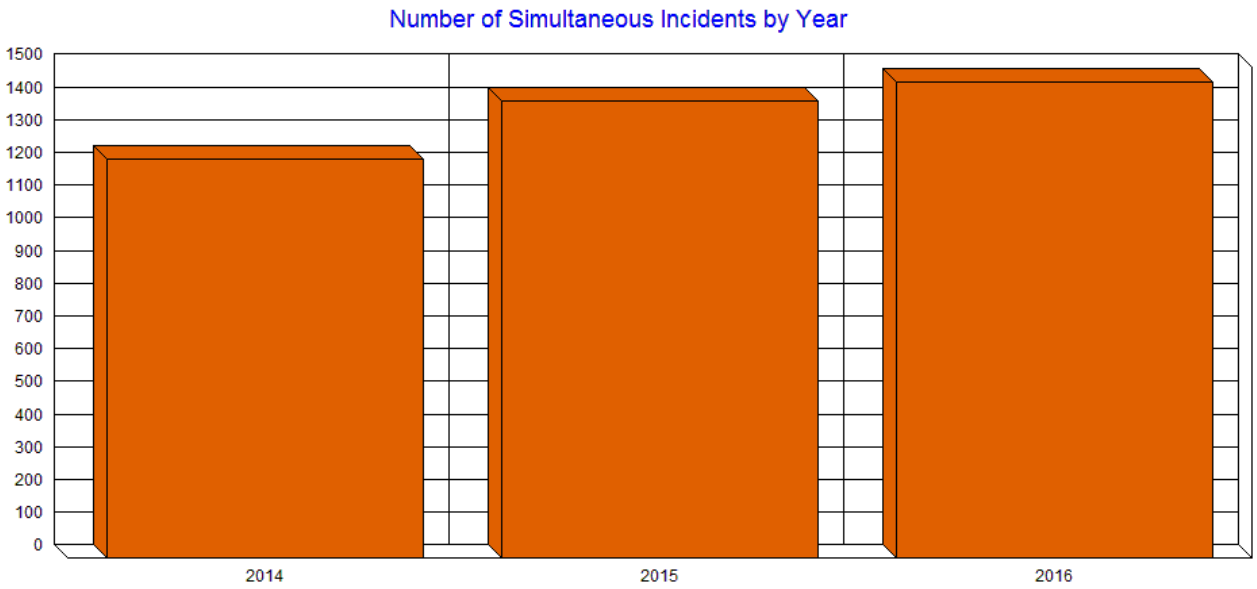


Table 66 shows the percentage of simultaneous incident activity for 2016.

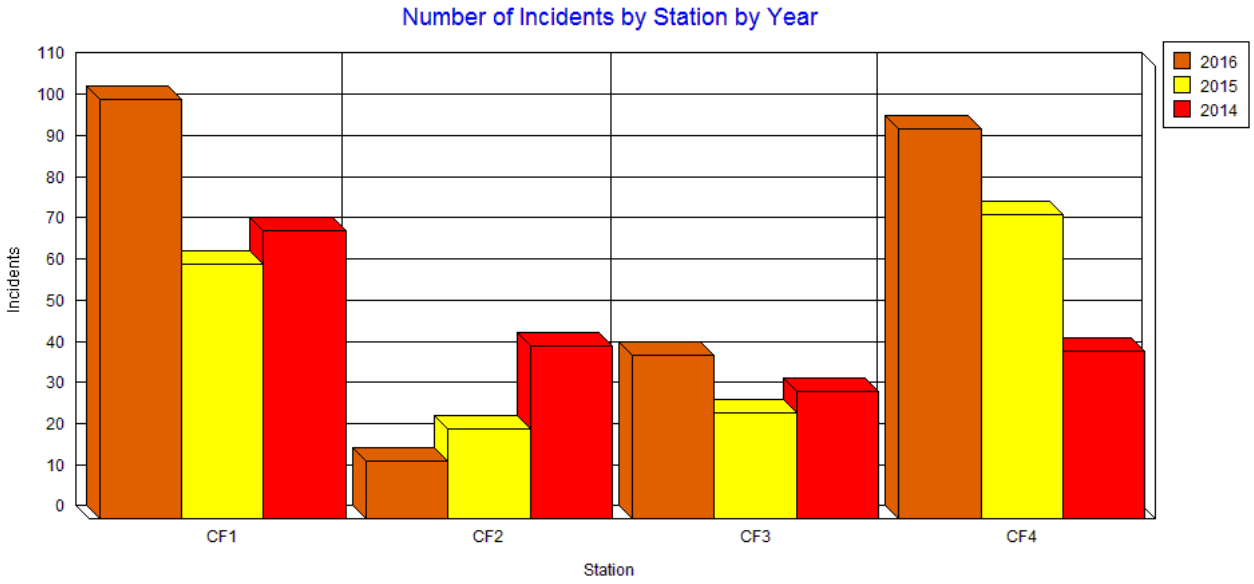
Table 66—Simultaneous Incident Activity

Number of Simultaneous Incidents	Percentage of All Incidents
1 or more	**28.08%**
2 or more	**4.57%**
3 or more	**0.48%**

For multiple-station departments, simultaneous incident activity in different station areas may have very little operational impact. However, simultaneous incidents within a single station response area can result in significantly slower response times because the second or successive concurrent call must be handled by an engine/resource from a more distant station. Figure 36 shows simultaneous incident activity within the same station response area by station. As shown in Figure 36, Station 1 and Station 4 have the most simultaneous incidents within their response areas. Given the nearly 100 simultaneous calls for each station in 2016 and the sharp rise from

prior years, simultaneous incident activity within these two station response areas can be expected to impact District first-due response performance somewhat.

Figure 36—Simultaneous Incident Activity within Same Station Response Area



Station Demand Percentage and Unit-Hour Utilization

Table 67 shows hourly service demand percentage by station for 2016, with the different colors illustrating variation in demand; the lowest rates of activity are green, progressing from yellow to red to indicate the highest quantity of incidents or rate of activity. The percentages shown depict the probability of an incident occurring within the station area during that hour of the day—the probability that a particular station is involved in an incident at any given hour. This percentage considers the number and duration of incidents over the three-year data set.

Table 67—Hourly Service Demand Percentage by Station

Time of Day	Station 1	Station 4	Station 3	Station 2
0:00	3.77%	5.00%	3.30%	2.64%
1:00	8.74%	5.29%	4.58%	2.28%
2:00	3.93%	3.90%	3.53%	2.85%
3:00	4.67%	3.02%	2.22%	1.79%
4:00	4.90%	4.10%	3.12%	2.09%
5:00	4.56%	3.90%	2.68%	2.37%
6:00	6.07%	4.42%	1.70%	3.53%
7:00	7.69%	8.83%	4.22%	4.91%
8:00	9.22%	8.23%	7.78%	4.90%
9:00	10.56%	10.48%	7.01%	5.40%
10:00	10.96%	9.55%	7.53%	6.02%
11:00	11.78%	10.74%	7.00%	8.52%
12:00	11.06%	11.74%	11.99%	7.10%
13:00	11.13%	12.01%	6.31%	5.00%
14:00	10.55%	10.47%	9.26%	7.49%
15:00	13.05%	18.13%	8.15%	6.55%
16:00	13.68%	9.02%	9.13%	7.29%
17:00	13.62%	12.14%	9.69%	6.68%
18:00	12.07%	11.71%	6.21%	4.98%
19:00	10.47%	8.48%	12.03%	5.53%
20:00	10.44%	12.88%	4.93%	4.79%
21:00	8.65%	6.69%	7.12%	5.90%
22:00	6.38%	6.62%	5.04%	3.97%
23:00	7.33%	4.41%	2.46%	3.65%
Overall	**8.97%**	**8.41%**	**6.12%**	**4.84%**

Table 67 shows that Station 1 is the busiest station, with peak service demand occurring from about 9:00 am to 9:00 pm. Overall hourly service demand is low, ranging from 1.70 percent to 18.13 percent.

Table 68 shows unit-hour utilization for 2016. The percentages shown depict the probability that the apparatus is involved in an incident during that hour of the day.

Table 68—Unit-Hour Utilization Percentage

Time of Day	E-3411	E-3414	E-3412	E-3413	E-3415
00:00	3.35%	4.35%	2.80%	2.72%	1.88%
01:00	7.03%	7.51%	4.72%	2.71%	6.01%
02:00	2.87%	3.10%	2.74%	3.38%	2.35%
03:00	4.12%	3.15%	1.97%	1.87%	1.22%
04:00	3.88%	3.68%	3.38%	2.28%	2.12%
05:00	4.06%	4.25%	2.37%	2.55%	1.02%
06:00	5.64%	4.12%	3.98%	1.35%	0.88%
07:00	8.35%	5.42%	5.13%	2.40%	3.11%
08:00	9.57%	9.51%	6.12%	6.12%	4.45%
09:00	10.21%	11.40%	6.39%	6.78%	5.89%
10:00	11.12%	9.39%	6.74%	7.00%	2.87%
11:00	10.23%	12.51%	8.62%	6.24%	4.29%
12:00	11.94%	12.11%	8.32%	6.66%	5.18%
13:00	10.82%	10.49%	5.85%	6.80%	5.16%
14:00	10.68%	11.98%	9.16%	7.67%	4.41%
15:00	13.41%	16.55%	9.10%	8.10%	5.58%
16:00	14.92%	10.59%	10.30%	6.10%	6.36%
17:00	14.00%	11.26%	8.90%	6.62%	5.07%
18:00	13.28%	12.35%	6.61%	7.17%	3.11%
19:00	15.33%	14.54%	12.42%	10.68%	4.04%
20:00	8.39%	6.46%	7.10%	3.66%	3.78%
21:00	8.55%	7.27%	5.07%	4.26%	3.16%
22:00	6.17%	6.46%	3.90%	3.85%	2.14%
23:00	7.04%	4.82%	4.15%	2.39%	1.99%
Overall	**8.96%**	**8.47%**	**6.08%**	**4.97%**	**3.59%**

What should be the maximum utilization percentage for a firefighting unit? For a nine-hour daytime work period when crews on a 24-hour shift need to also pay attention to apparatus checkout, station duties, training, public education, and paperwork, plus required physical training and meal breaks, Citygate believes the maximum commitment unit-hour utilization per hour *for an engine, ladder truck, or 24-hour ambulance unit* should not exceed 30 percent. Beyond that, the most important element likely to suffer will be training.

As Table 68 shows, Engines 3411 and 3414 have the highest unit-hour utilization rates; however, overall unit-hour utilization percentages are low, ranging from 3.59 percent to 8.96 percent, which is far below the 30 percent saturation rate.

B.1.5 Operational Performance

Once incident types are quantified, the analysis shifts to the time required to respond to those emergencies. Fractile analyses track the percentage (and count the number) of incidents meeting defined criteria such as the first apparatus to reach the scene within progressive time segments. Based on national best practice recommendations and Citygate's experience, this study's response time test measurement is for the 90 percent call to arrival to be *7:30 minutes or less* for urban planning zones. This is comprised of three component elements: call processing time, turnout time, and travel time.

Call Processing Time

Call processing time is the time it takes to answer the 9-1-1 call, determine the nature of the emergency, enter information into the computer-aided dispatch system, and dispatch the appropriate resource(s). Best practice[27] is for 90 percent of calls to be processed and dispatched within 90 seconds. Where language barriers exist or medical self-help instructions are needed, these calls should be dispatched within 120 seconds. Santa Cruz Regional 9-1-1, a Joint Powers Authority providing 9-1-1 and dispatch services for multiple public agencies in Santa Cruz and San Benito counties, including the District, serves as the primary Public Safety Answering Point (PSAP) for 9-1-1 calls. Table 69 shows 90th percentile call processing performance.

Table 69—90th Percentile Call Processing Performance

Incident Location	Overall	2014	2015	2016
District-Wide	**2:56**	**2:52**	**2:54**	**3:04**
Station 1	**2:55**	2:50	2:54	3:01
Station 2	**2:59**	2:56	2:59	3:05
Station 3	**3:01**	2:53	3:01	3:07
Station 4	**2:53**	2:51	2:46	3:02

Source: Central FPD incident records and SCR911 CAD data

As Table 69 shows, District-wide call processing performance is *95.5 percent slower* (1:29 minutes) than best practice standards over the three-year study period. SCR911 General Manager

[27] NFPA Standard 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (2016)

Dennis Kidd advised Citygate that the dispatch center strives to conform to nationally recognized best practices while maintaining a balance between speed and accuracy. Although the District has no direct control over 9-1-1 call processing performance, it is a significant element of the District's overall response performance and associated customer service. Citygate suggests that the District collaborate with SCR911 staff and other SCR911 user agencies to identify ways to improve this performance to a level that is more in alignment with industry-recognized best practice standards.

Turnout Time

Turnout time is the time it takes for the crew(s) to hear the dispatch message, confirm the response travel route, don appropriate safety clothing, and board the apparatus for response. While turnout time best practice standard is 60 to 80 seconds,[28] it has long been recognized as a standard rarely met in practical experience. Citygate has long recommended that, due to this and the floor plan design of some fire stations, most agencies should be able to reasonably achieve a 2:00-minute crew turnout time at 90 percent compliance. Table 70 shows the District's 90th percentile turnout time performance.

Table 70—90th Percentile Turnout Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	**2:45**	**2:40**	**2:44**	**2:48**
Station 1	**2:52**	2:52	2:50	2:52
Station 2	**2:53**	2:53	2:51	2:55
Station 3	**2:44**	2:32	2:48	2:47
Station 4	**2:29**	2:20	2:33	2:31

Source: Central FPD incident records; SCR911 CAD records

As Table 70 shows, District-wide turnout time performance fails to meet a recommended 2:00-minute target by 45 seconds (37 percent) over the three-year study period. Also of note is that turnout time performance is reasonably consistent across all three years and all four stations.

Travel Time

Travel time is defined as the time segment that begins with the start of apparatus movement and ends when that apparatus stops moving on arrival at the emergency. It is important to understand that this time segment *does not include* the time required to exit the apparatus and walk to an EMS patient or to deploy a hose line on a fire.

[28] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

First-Due Travel Time

Best practice standards for first-due travel time is 4:00 minutes or less for urban demand zones[29] and 8:00 minutes or less for rural demand zones.[30] Table 71 shows the District's 90th percentile first-due travel time performance.

Table 71—90th Percentile First-Due Travel Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	**5:50**	**5:42**	**5:41**	**6:08**
Station 1	**5:19**	5:05	5:16	5:30
Station 2	**5:35**	5:36	5:27	5:38
Station 3	**7:46**	6:50	7:51	9:02
Station 4	**5:40**	5:35	5:27	6:10

Source: Central FPD incident records; SCR911 CAD records

As Table 71 shows, first-due travel time performance fails to meet the recommended 4:00-minute goal for urban areas by nearly 46 percent (1:50 minutes); however, there are several reasons for this, including large first-due response areas, topography, a predominantly curvilinear road network, and morning/afternoon traffic congestion on Highway 1 and surface streets. Also of note is the significantly slower travel time performance for Station 3 than the other stations, likely due to a significantly larger first-due response area and topography.

Effective Response Force Travel Time

The District's Effective Response Force (ERF or First Alarm) for building fires is four engines, one ladder truck, and one Battalion Chief. Over the three-year study period, there was only one incident with that ERF deployment arrival at the incident, which is statistically insignificant. A more practical ERF travel time performance analysis would be to evaluate those incidents where four apparatus plus a Chief Officer were dispatched and arrived at the incident. There were 45 incidents meeting this ERF definition, 15 of which were building fires.

Best practice standards for ERF travel time is 8:00 minutes or less for urban/suburban areas[31] and 12:00 minutes or less for rural areas.[32] As Table 72 shows, District-wide 90th-percentile ERF

[29] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

[30] Citygate-recommended first-due travel time goal based on NFPA 1720 standard for rural areas: arrival of six or more personnel within 14:00 minutes of receipt of dispatch

[31] NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016)

travel time performance for four apparatus and one Chief Officer *nearly meets* or *is faster* than the 8:00-minute target for two of the three years studied. It is also important to note that this travel time analysis only involved 15 incidents over the three-year period, and the results should be considered with caution as these sample sizes are very small and can readily change significantly from year-to-year depending on the number and locations of the fires. For example, the ERF travel time performance for 2015 is abnormally skewed by a single incident out of the five total ERF incidents for that year. Also of note is that all but two of these 15 incidents occurred in urban planning zones, as shown in Figure 37.

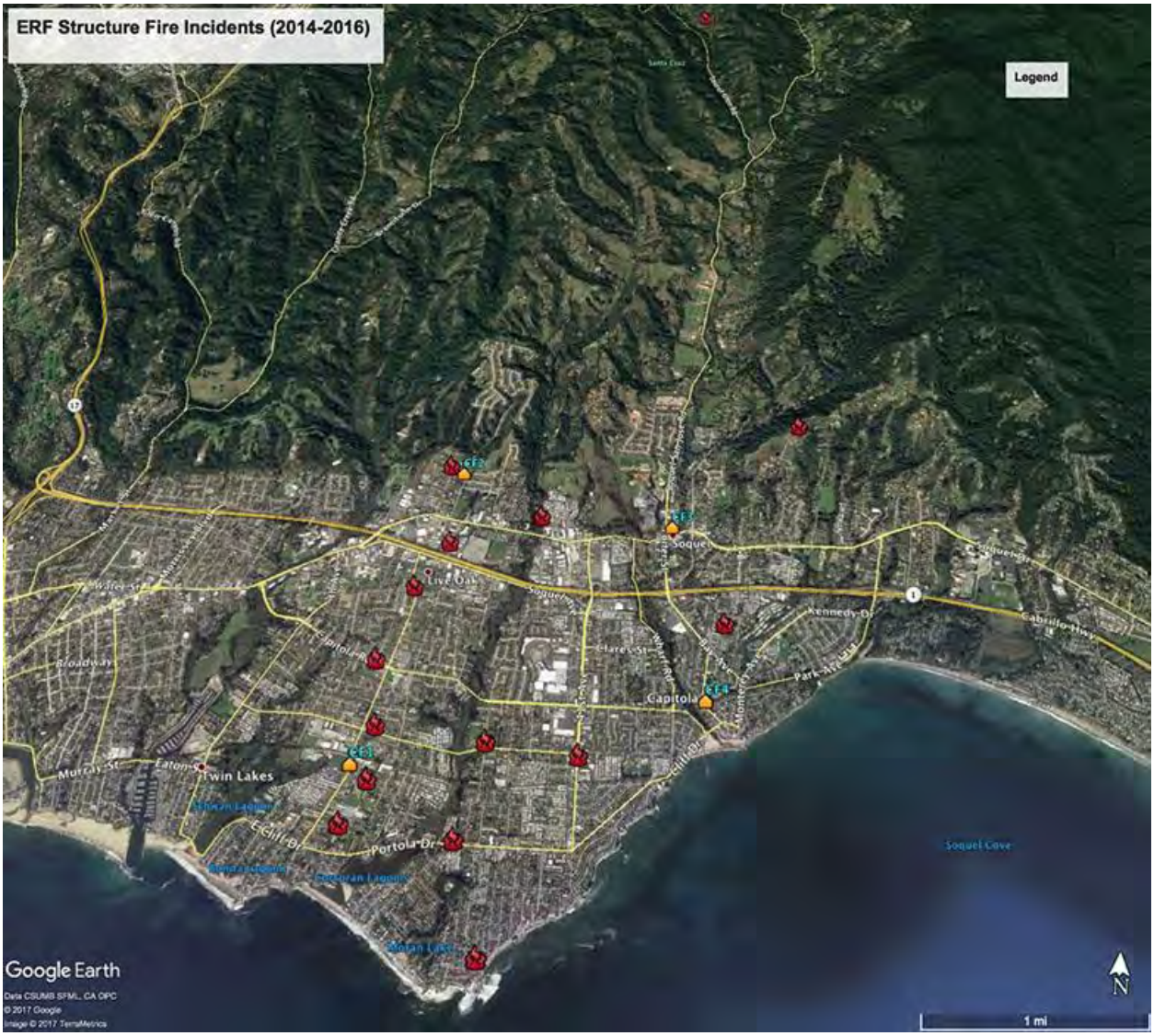
Table 72—90th Percentile ERF Travel Time Performance

Incident Location	Overall	2014	2015	2016
District-Wide	**13:21**	**6:27**	**37:50**	**8:57**
Station 1	**37:50**	6:27	37:50	7:09
Station 2	**13:21**	6:27	13:21	N/A
Station 3	**N/A**	N/A	N/A	N/A
Station 4	**8:57**	N/A	5:19	8:57

Source: Central FPD incident records; SCR911 CAD records

[32] NFPA 1720 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments (2014). A response time of 14:00 minutes or less from receipt of dispatch notification minus Citygate-recommended 2:00-minute turnout time goal.

Figure 37—ERF Structure Fire Incidents



Dispatch to First Arrival Performance

Citygate's recommended dispatch to first arrival time for positive outcomes is 6:00 minutes or less in urban/suburban service demand zones and 10:00 minutes or less for rural service demand zones. Dispatch to arrival time includes crew turnout time and travel time. Table 73 summarizes the District's dispatch to first arrival performance over the three-year study period.

Table 73—90th Percentile Dispatch to First-Due Performance

Incident Location	Overall	2014	2015	2016
District-Wide	**7:36**	**7:23**	**7:30**	**7:55**
Station 1	**7:14**	7:00	7:13	7:36
Station 2	**7:35**	7:30	7:17	7:51
Station 3	**8:56**	8:42	8:56	9:48
Station 4	**7:19**	7:04	7:13	7:38

Source: Central FPD incident records; SCR911 CAD records

As Table 73 shows, overall District dispatch to first arrival performance is 38 percent (2:06 minutes) *slower* than the District's response performance goal of 5:30 minutes or less and 27 percent (1:36 minutes) *slower* than the recommended 6:00 minutes or less best practice goal for positive outcomes in urban planning zones. However, this is not unexpected due to the slower crew turnout and travel times previously discussed. Also of note is the difference between Station 3's dispatch-to-arrival performance and the other three stations, which is likely primarily due to Station 3's significantly larger first-due response area.

Call to First Arrival Performance

A person needing help in an emergency measures the speed of the fire department response from the time assistance is first requested until the help arrives. This measure is referred to as "call to first arrival." Table 74 summarizes call to first arrival performance by station by year.

Table 74—90th Percentile Call to First Arrival Performance

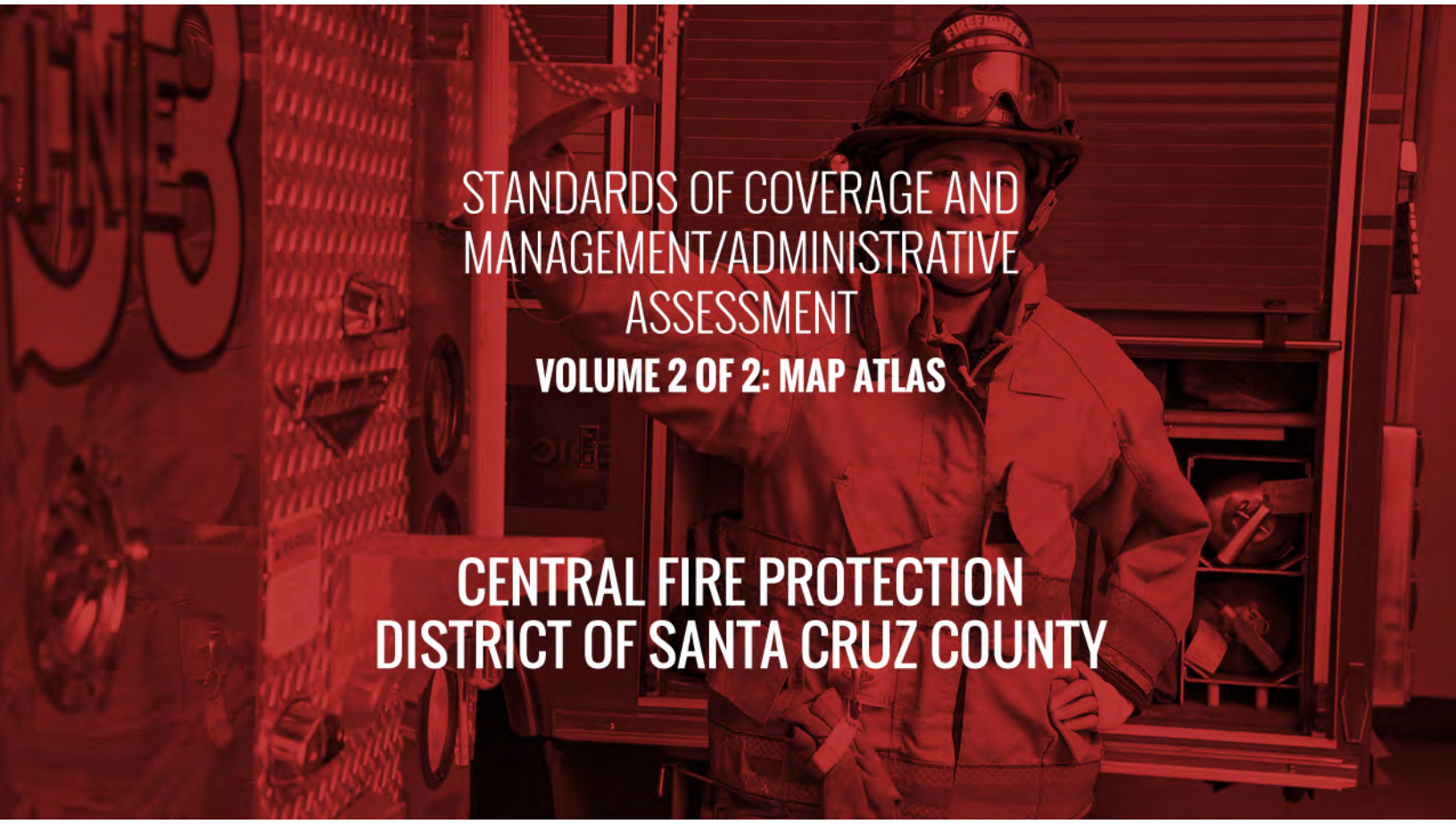
Incident Location	Overall	2014	2015	2016
District-Wide	**10:01**	**9:47**	**9:49**	**10:32**
Station 1	**9:43**	9:27	9:31	10:03
Station 2	**9:58**	9:49	9:32	10:25
Station 3	**11:47**	11:13	11:55	12:38
Station 4	**9:40**	9:19	9:12	10:16

Source: Central FPD incident records; SCR911 CAD records

As Table 74 indicates, District-wide call to arrival performance is 34 percent (2:31 minutes) *slower* than the recommended goal of 7:30 minutes or less for positive outcomes in urban areas, predominantly due to slower-than-expected call processing, turnout, and travel times previously discussed. Also of note is the significant difference between Station 3's call to arrival

performance and the other three stations, which is likely primarily due to Station 3's significantly larger first-due response area.

CITYGATE ASSOCIATES, LLC
PUBLIC SAFETY SERVICES



STANDARDS OF COVERAGE AND MANAGEMENT/ADMINISTRATIVE ASSESSMENT

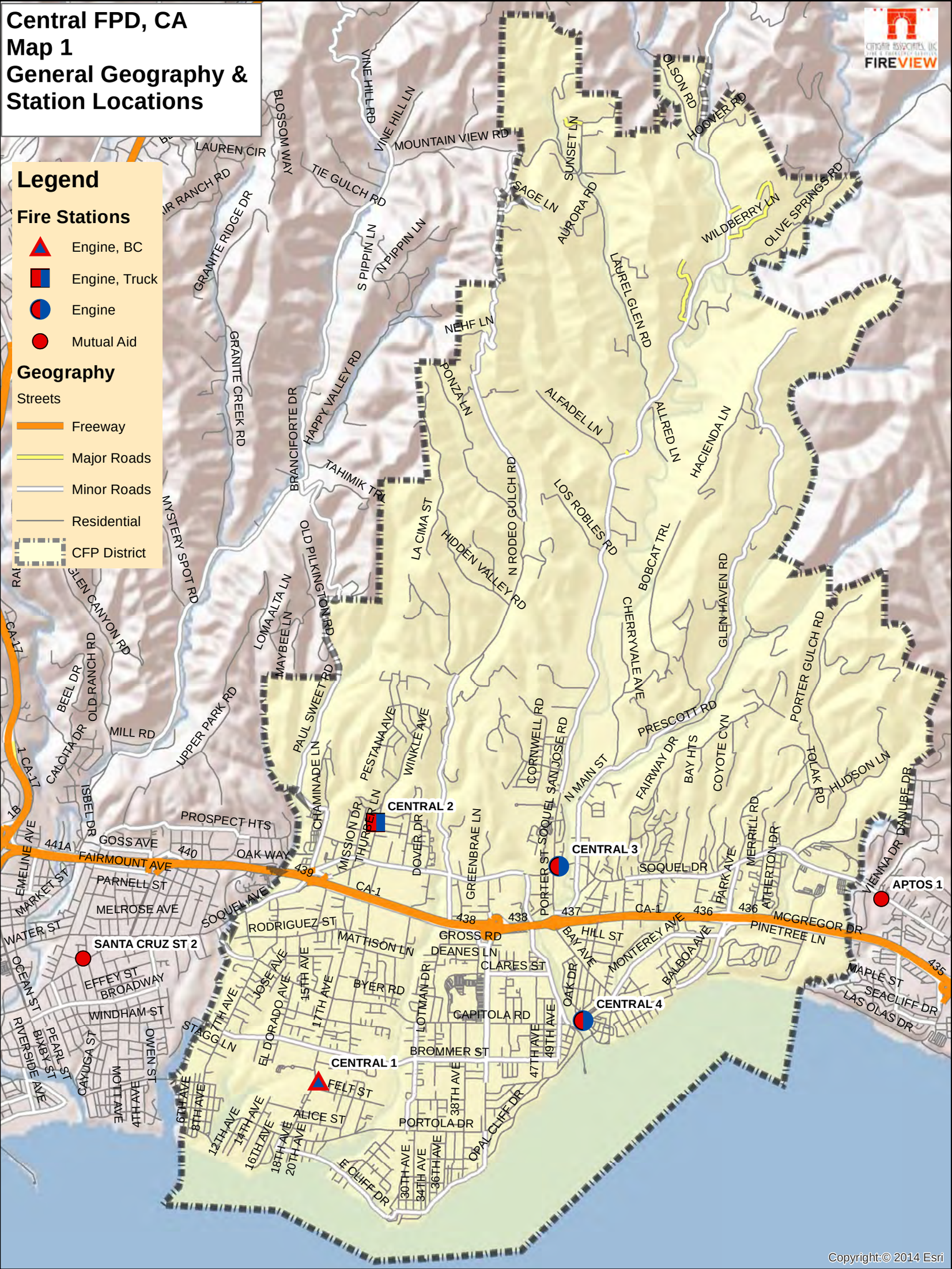
VOLUME 2 OF 2: MAP ATLAS

CENTRAL FIRE PROTECTION DISTRICT OF SANTA CRUZ COUNTY

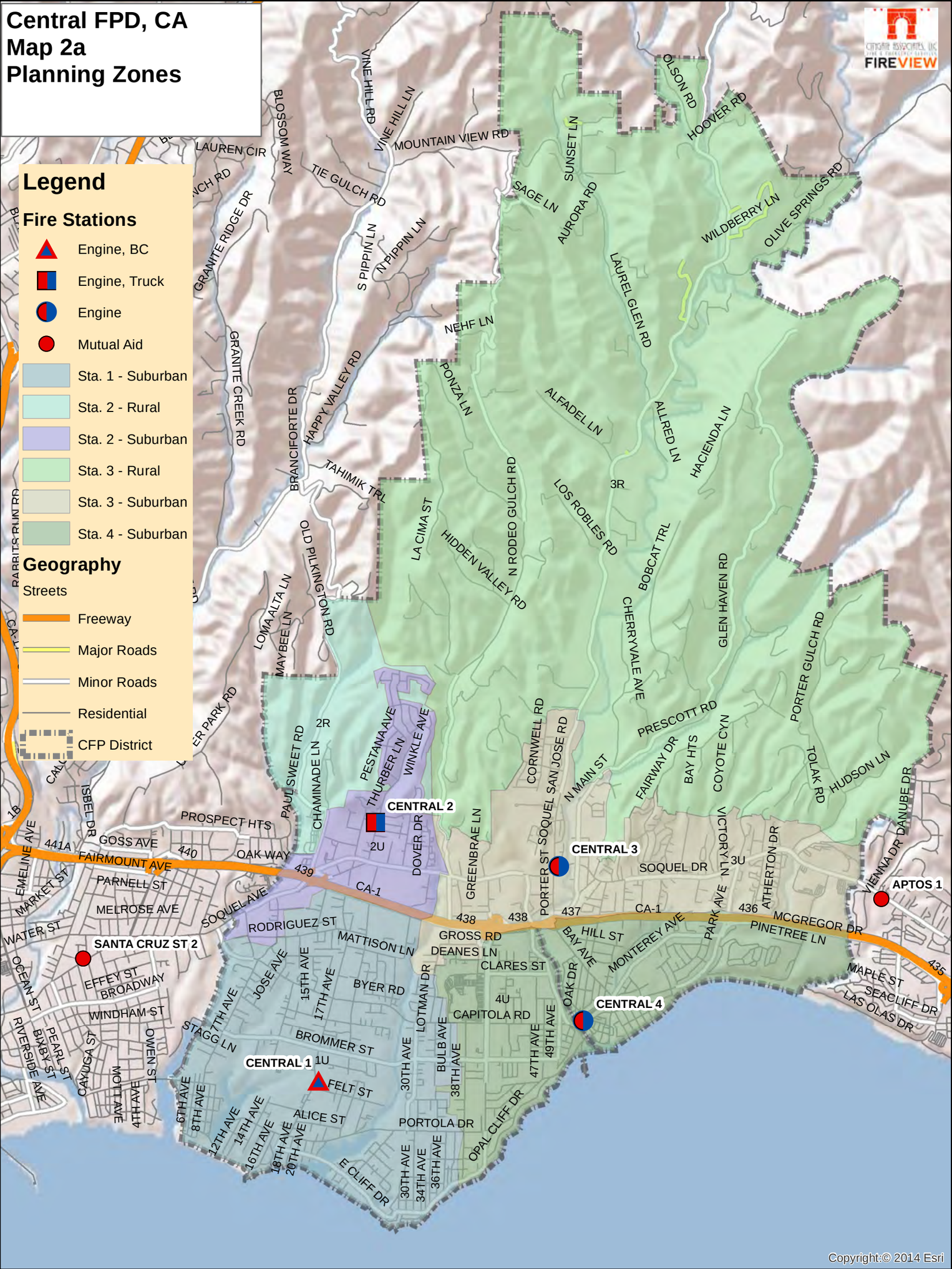
DECEMBER 21, 2017

CITYGATE ASSOCIATES, LLC
WWW.CITYGATEASSOCIATES.COM
2250 EAST BIDWELL ST., STE. 100
FOLSOM, CA 95630
PHONE: (916) 458-5100
FAX: (916) 983-2090

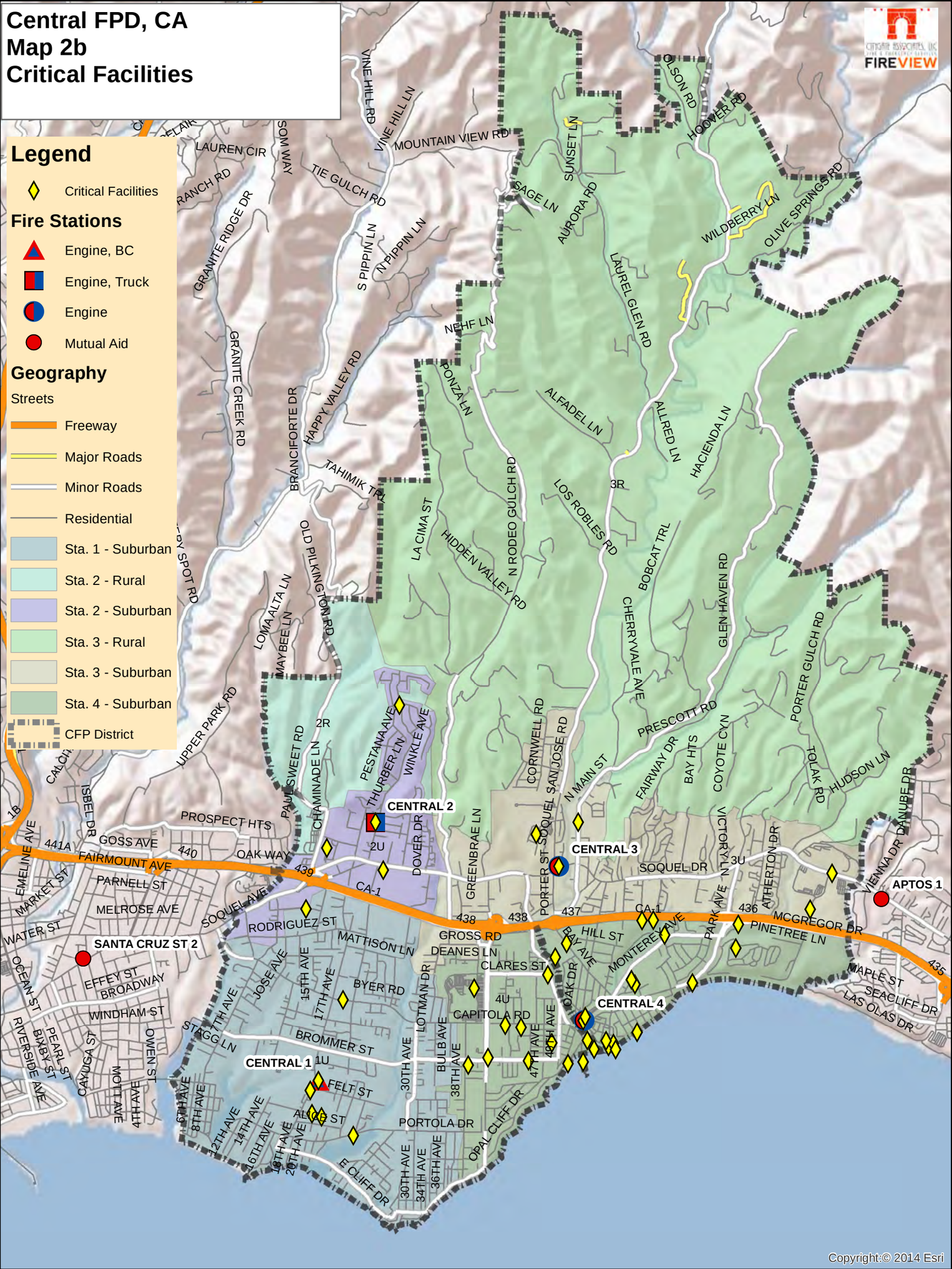
Central FPD, CA
Map 1
General Geography & Station Locations



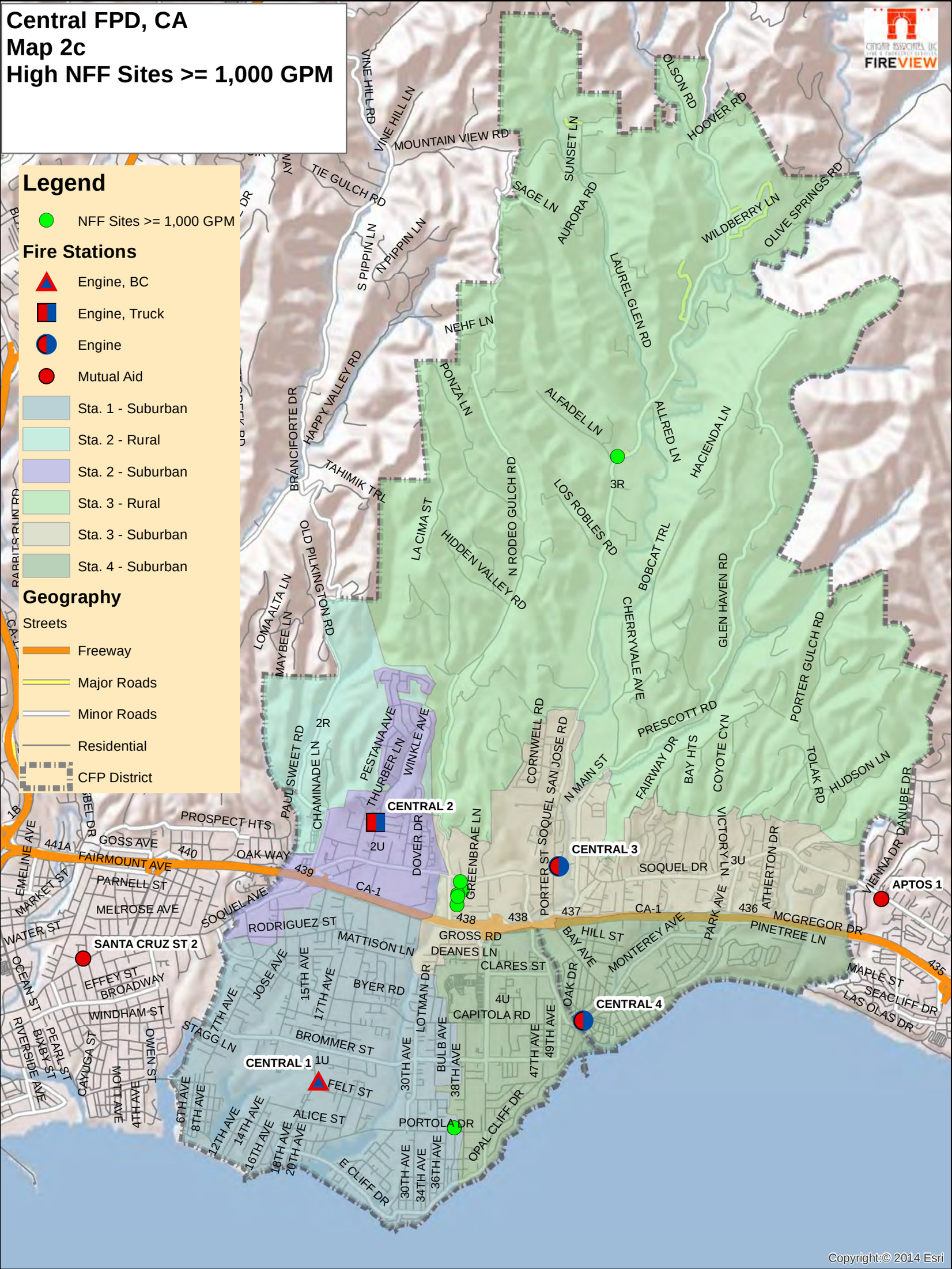
Central FPD, CA
Map 2a
Planning Zones



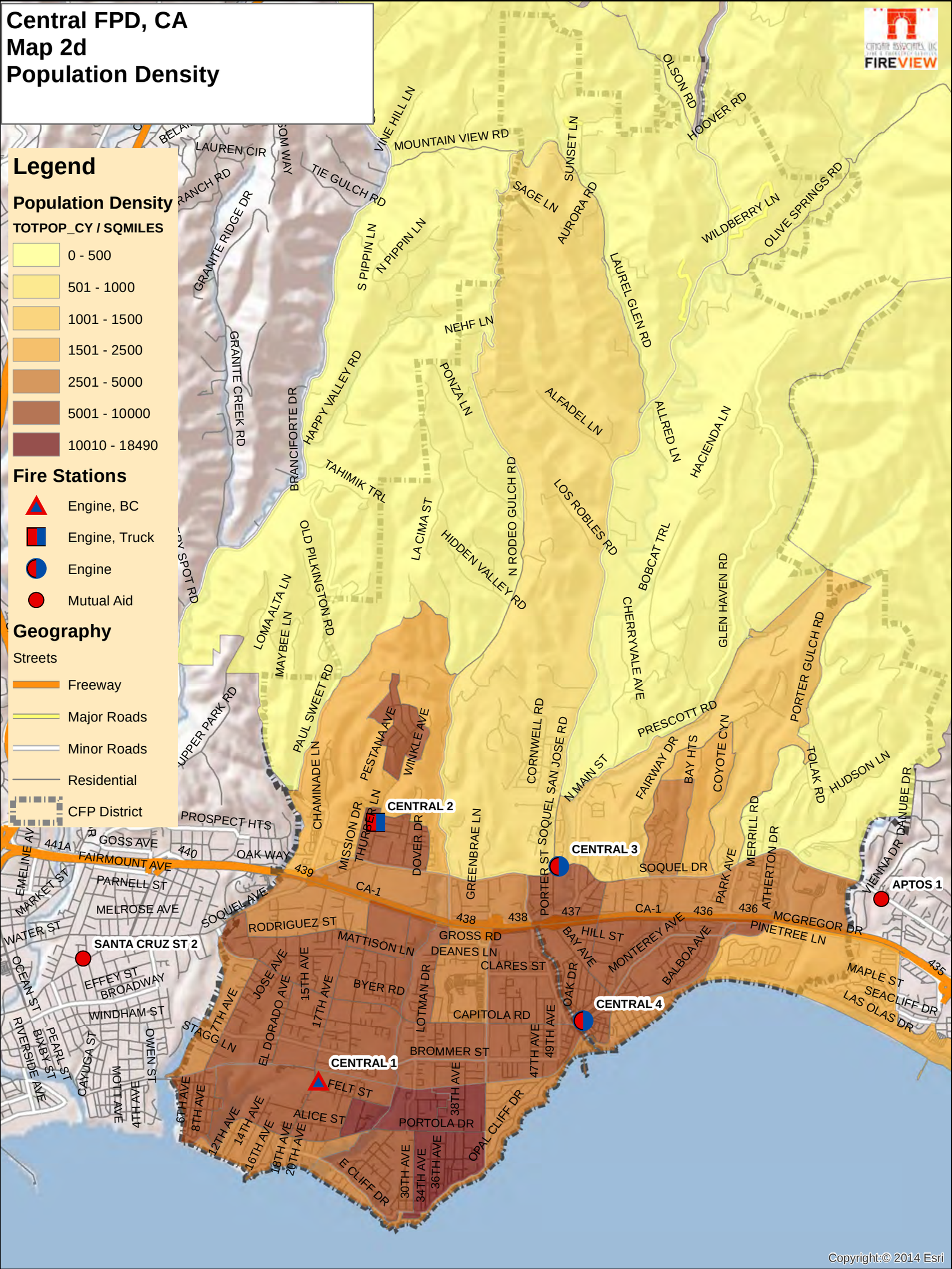
Central FPD, CA
Map 2b
Critical Facilities



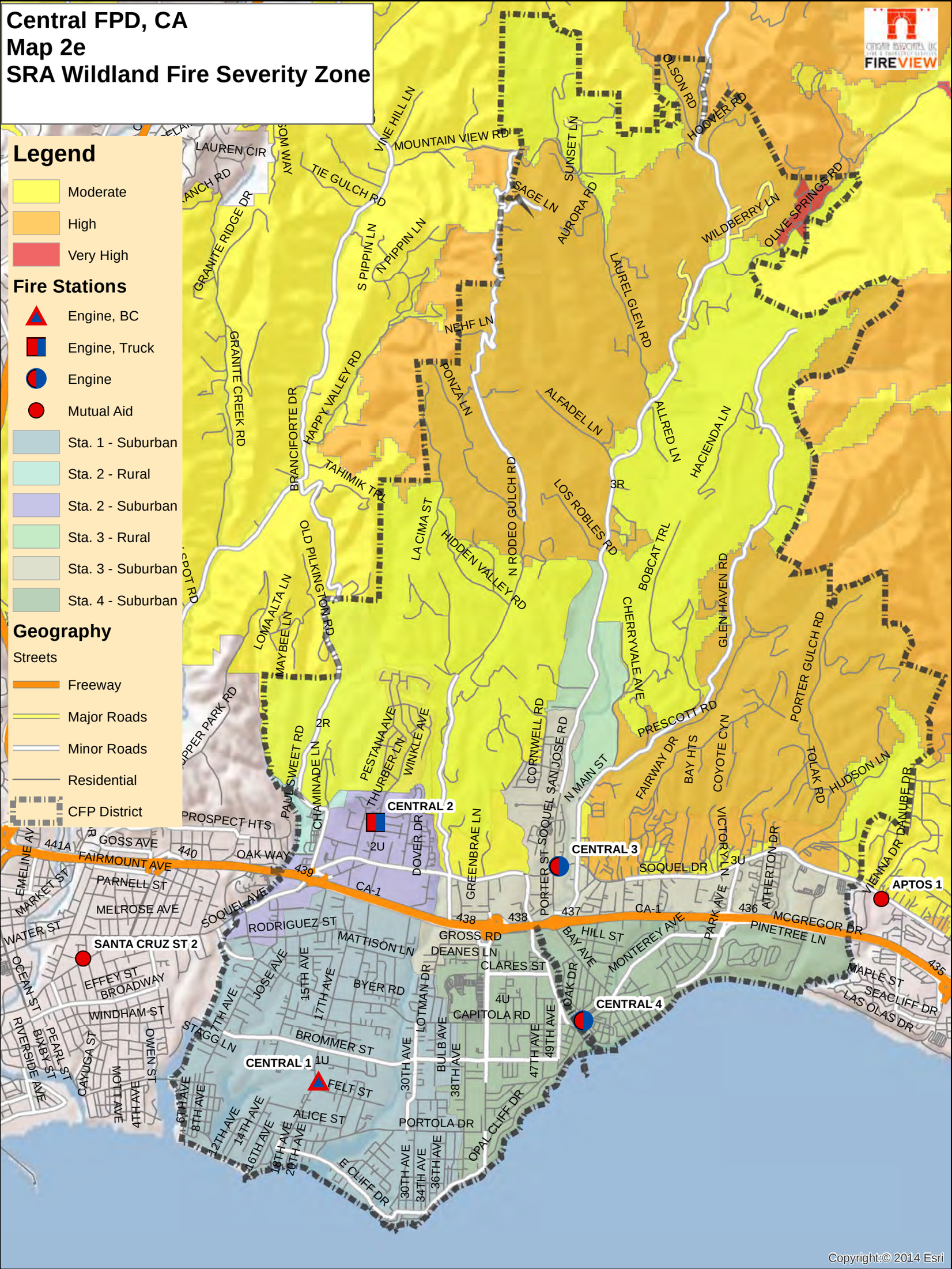
Central FPD, CA
Map 2c
High NFF Sites >= 1,000 GPM



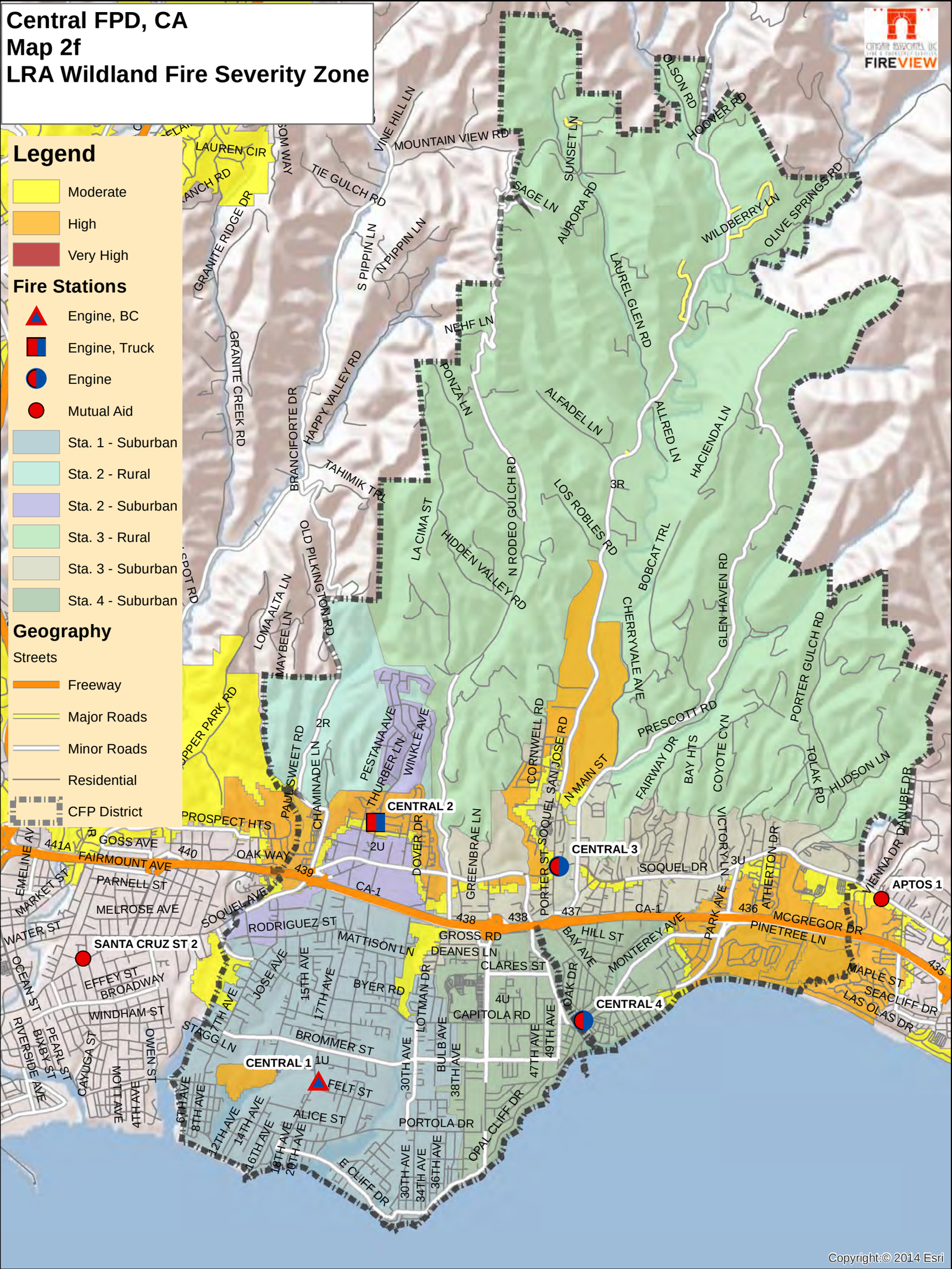
Central FPD, CA
Map 2d
Population Density



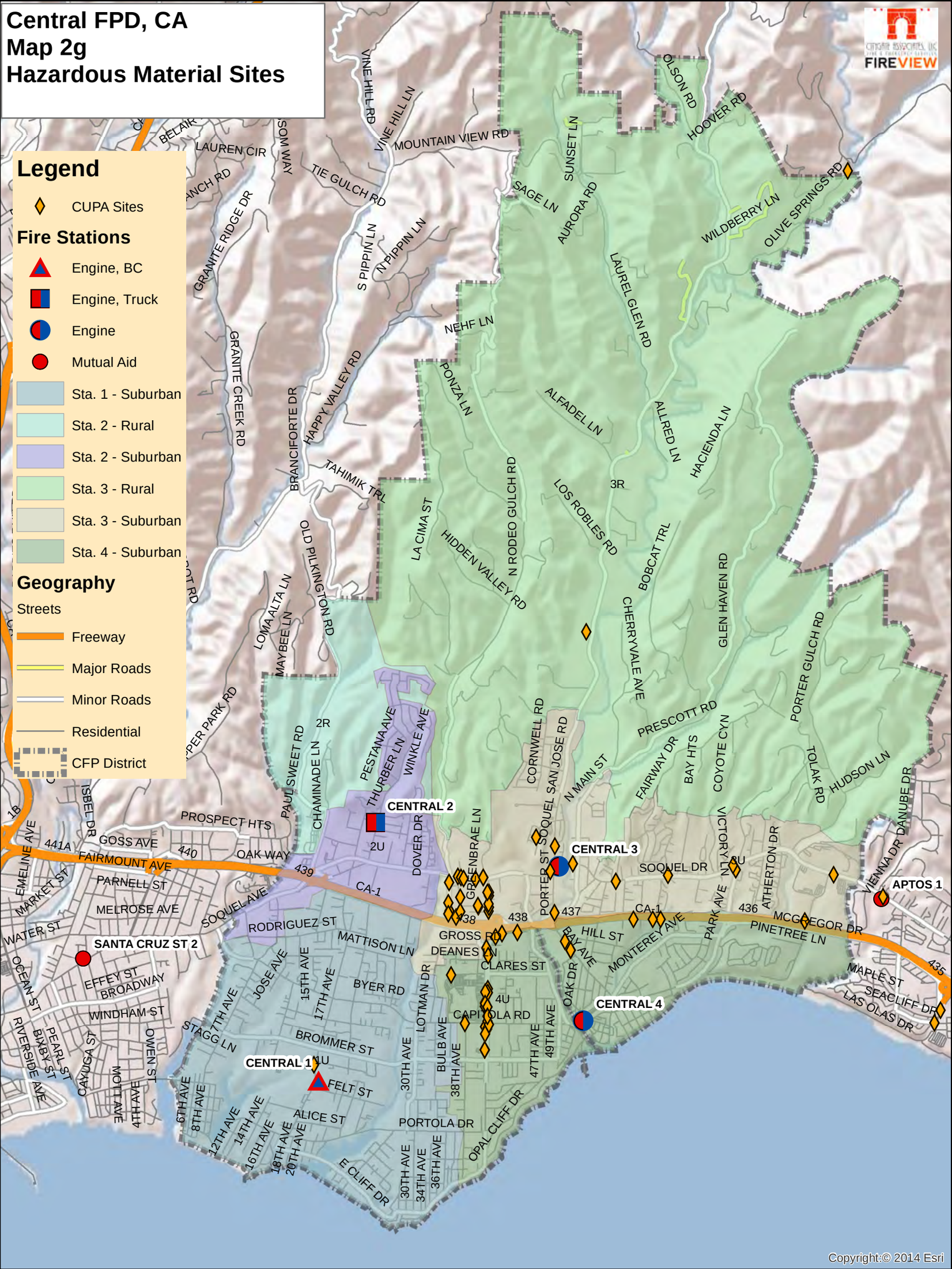
Central FPD, CA
Map 2e
SRA Wildland Fire Severity Zone



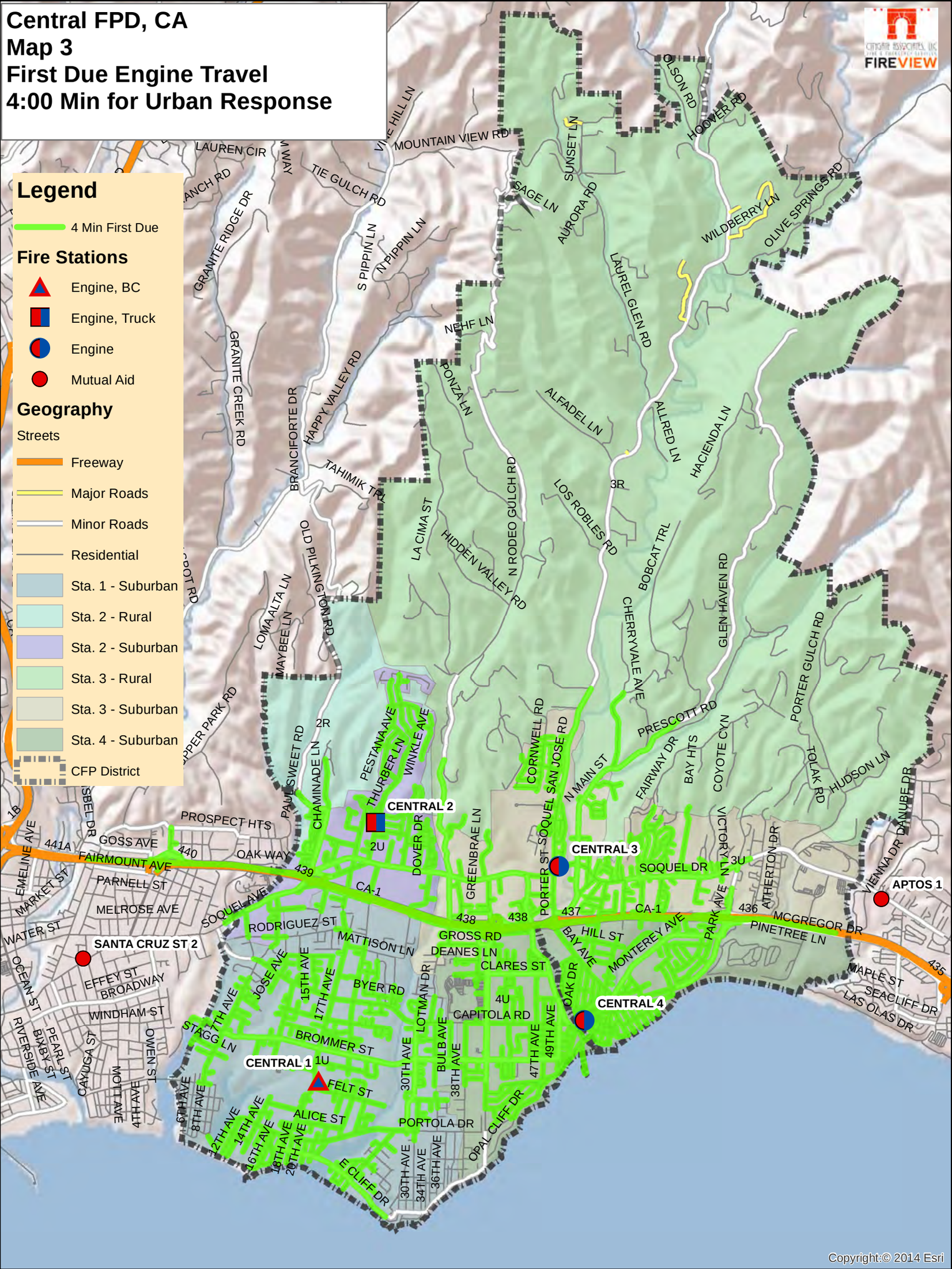
Central FPD, CA
Map 2f
LRA Wildland Fire Severity Zone



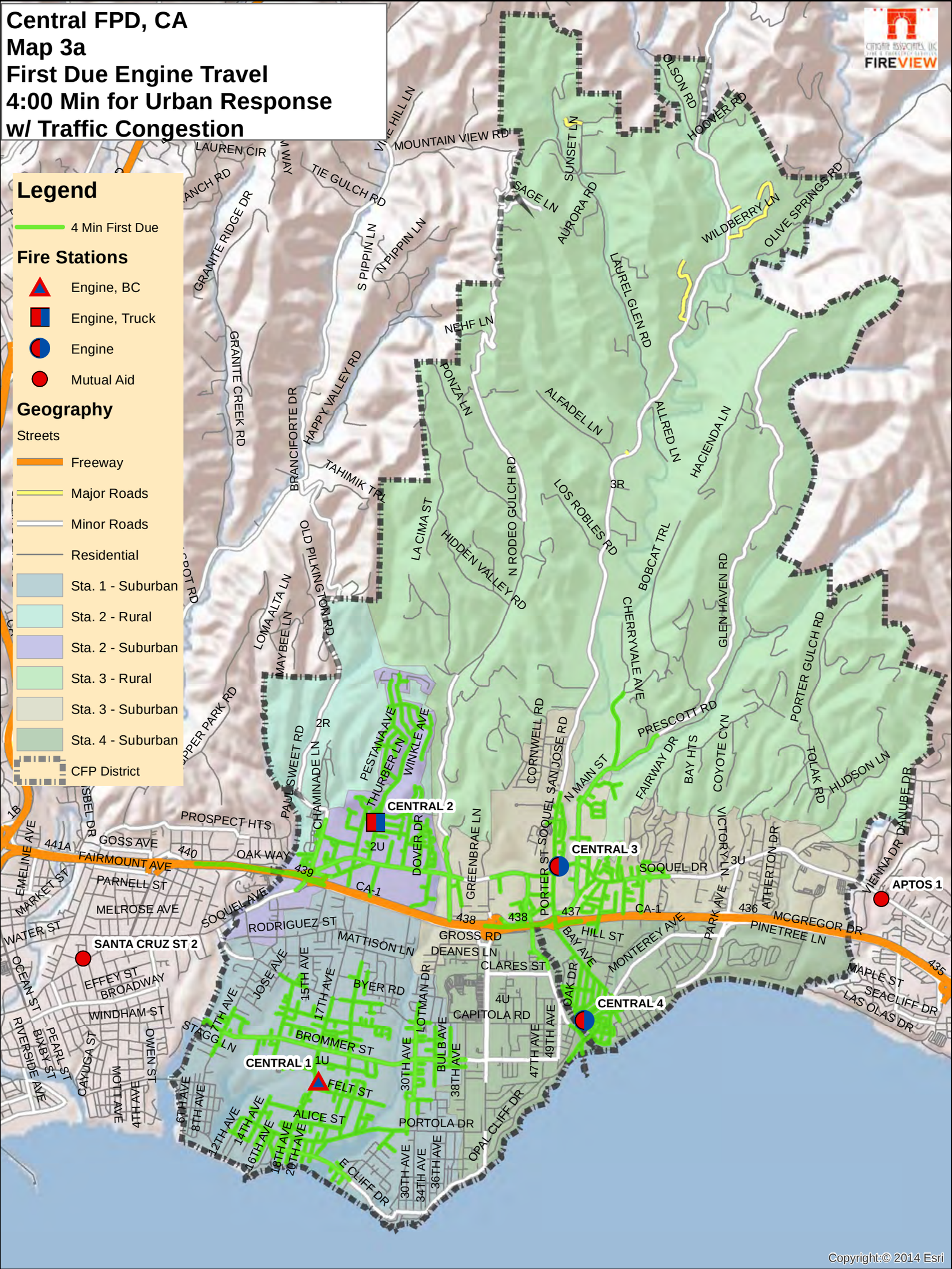
Central FPD, CA
Map 2g
Hazardous Material Sites



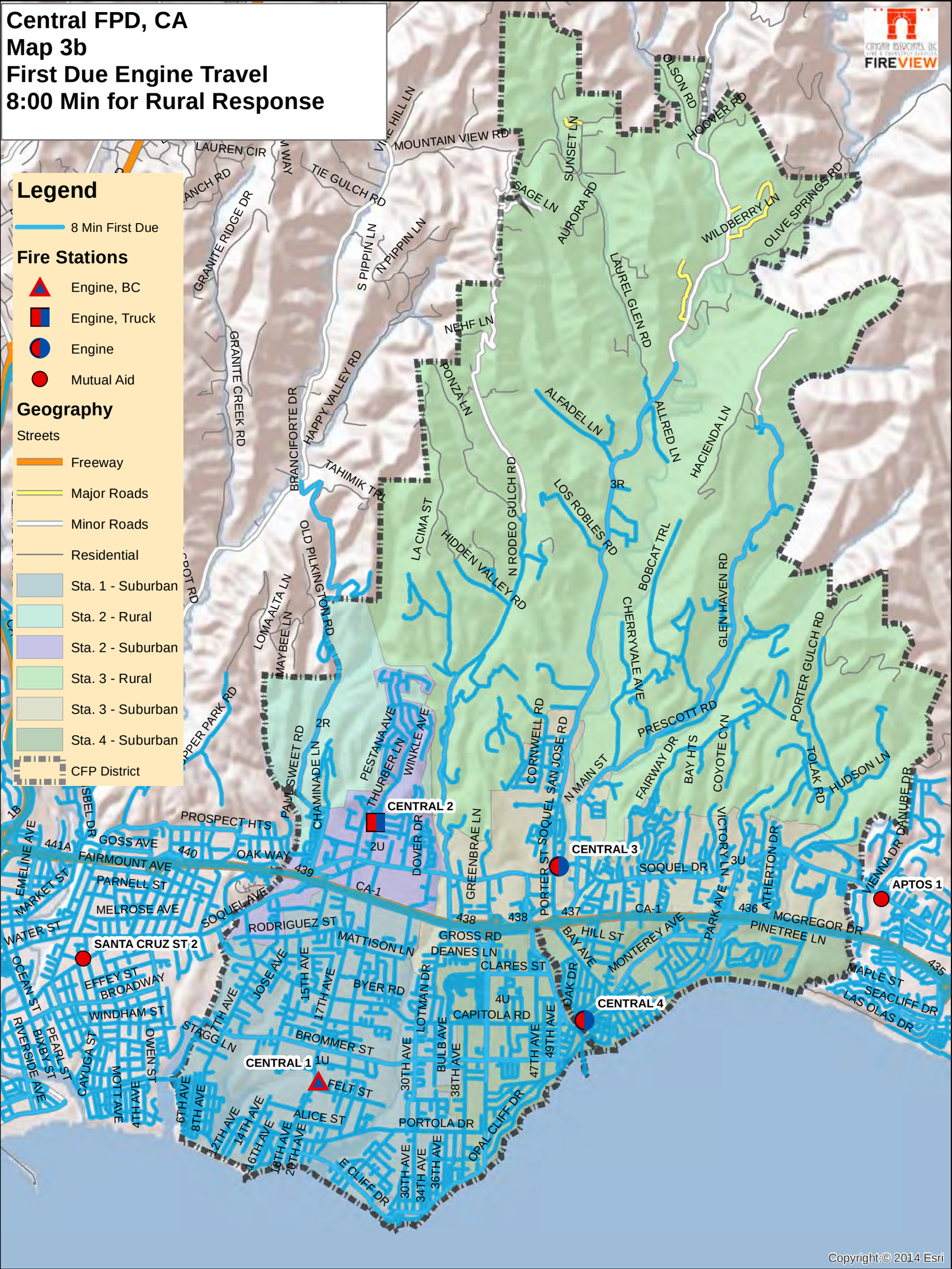
Central FPD, CA
Map 3
First Due Engine Travel
4:00 Min for Urban Response



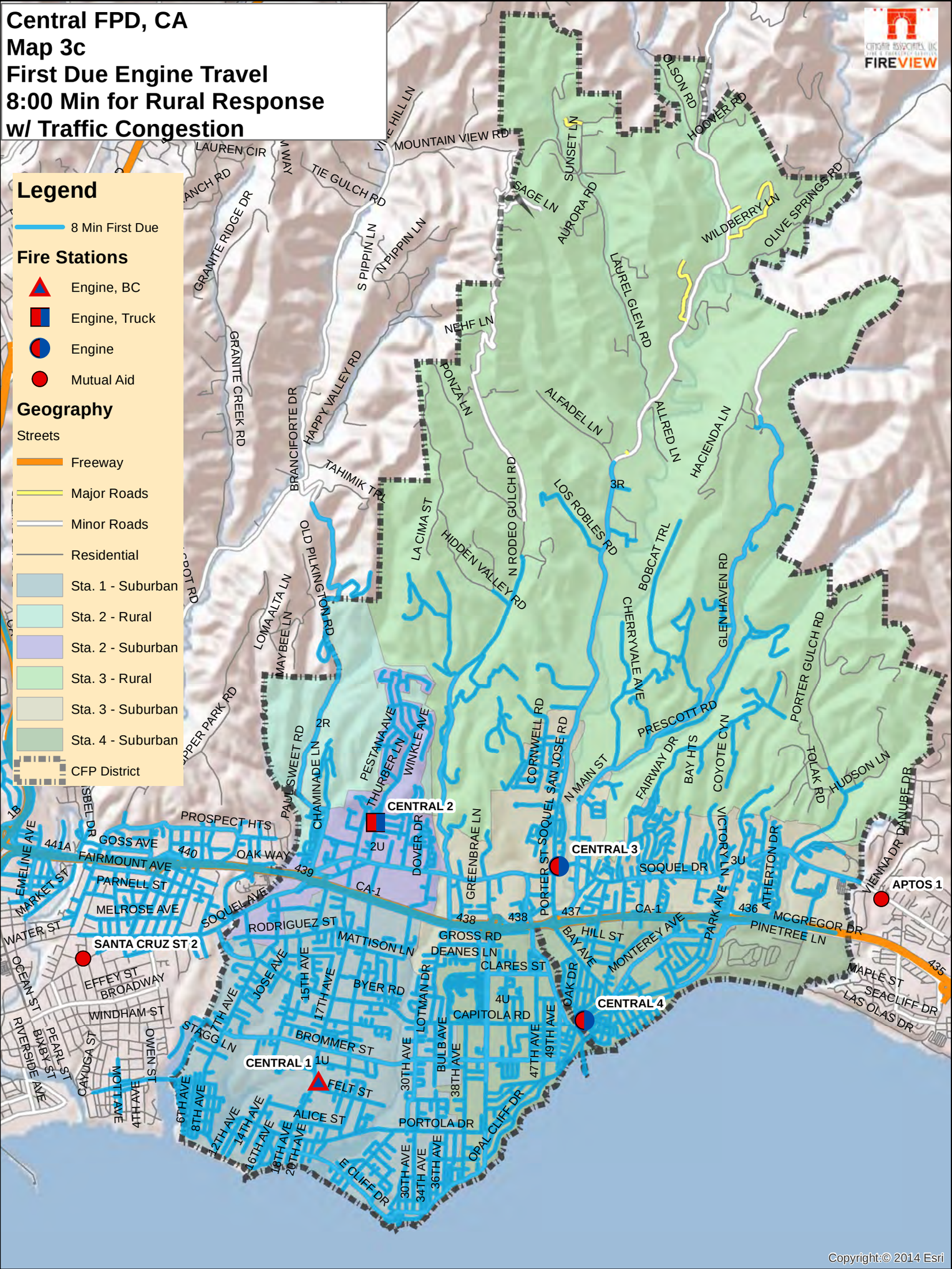
Central FPD, CA
Map 3a
First Due Engine Travel
4:00 Min for Urban Response
w/ Traffic Congestion



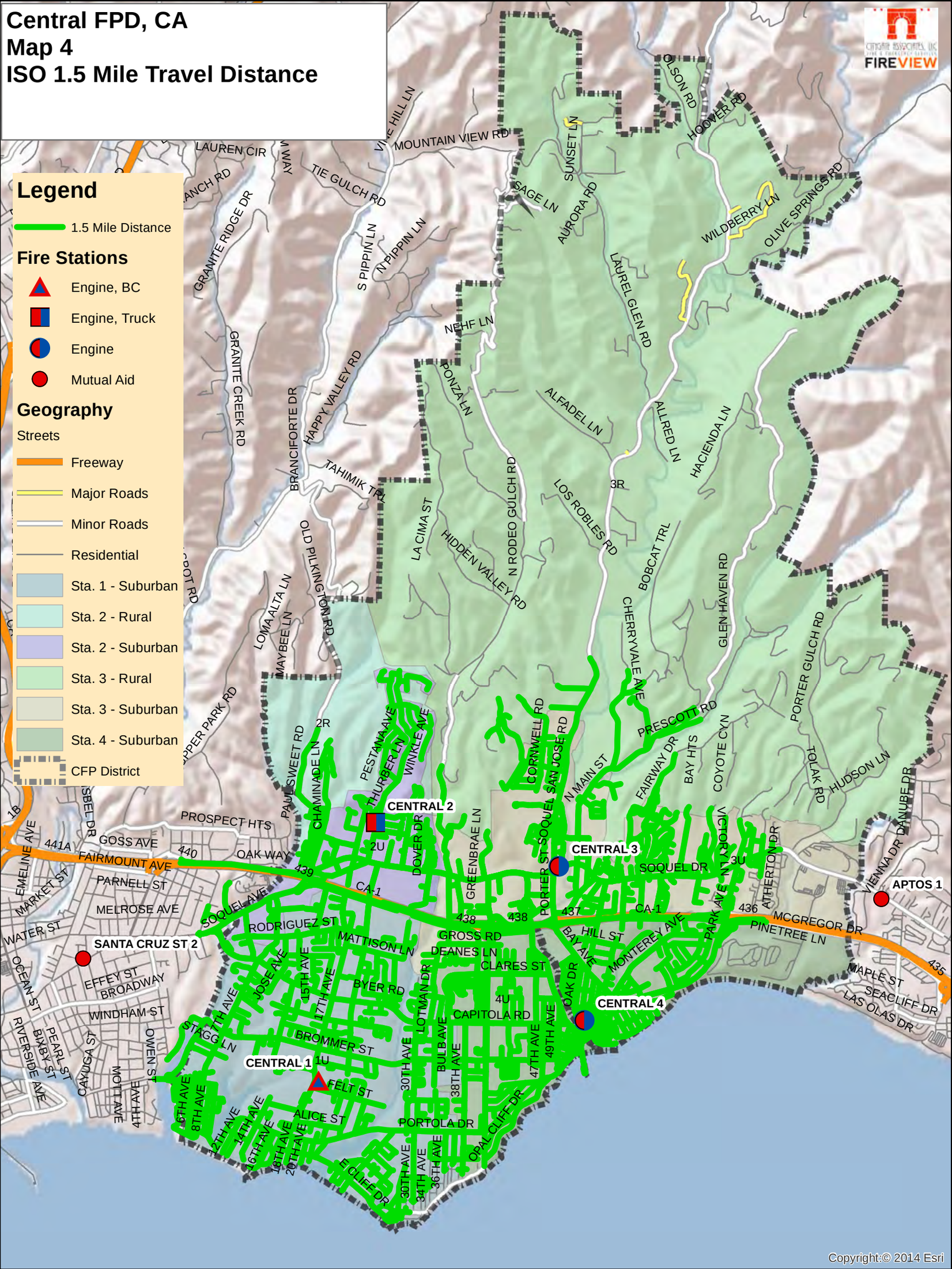
Central FPD, CA
Map 3b
First Due Engine Travel
8:00 Min for Rural Response



Central FPD, CA
Map 3c
First Due Engine Travel
8:00 Min for Rural Response
w/ Traffic Congestion



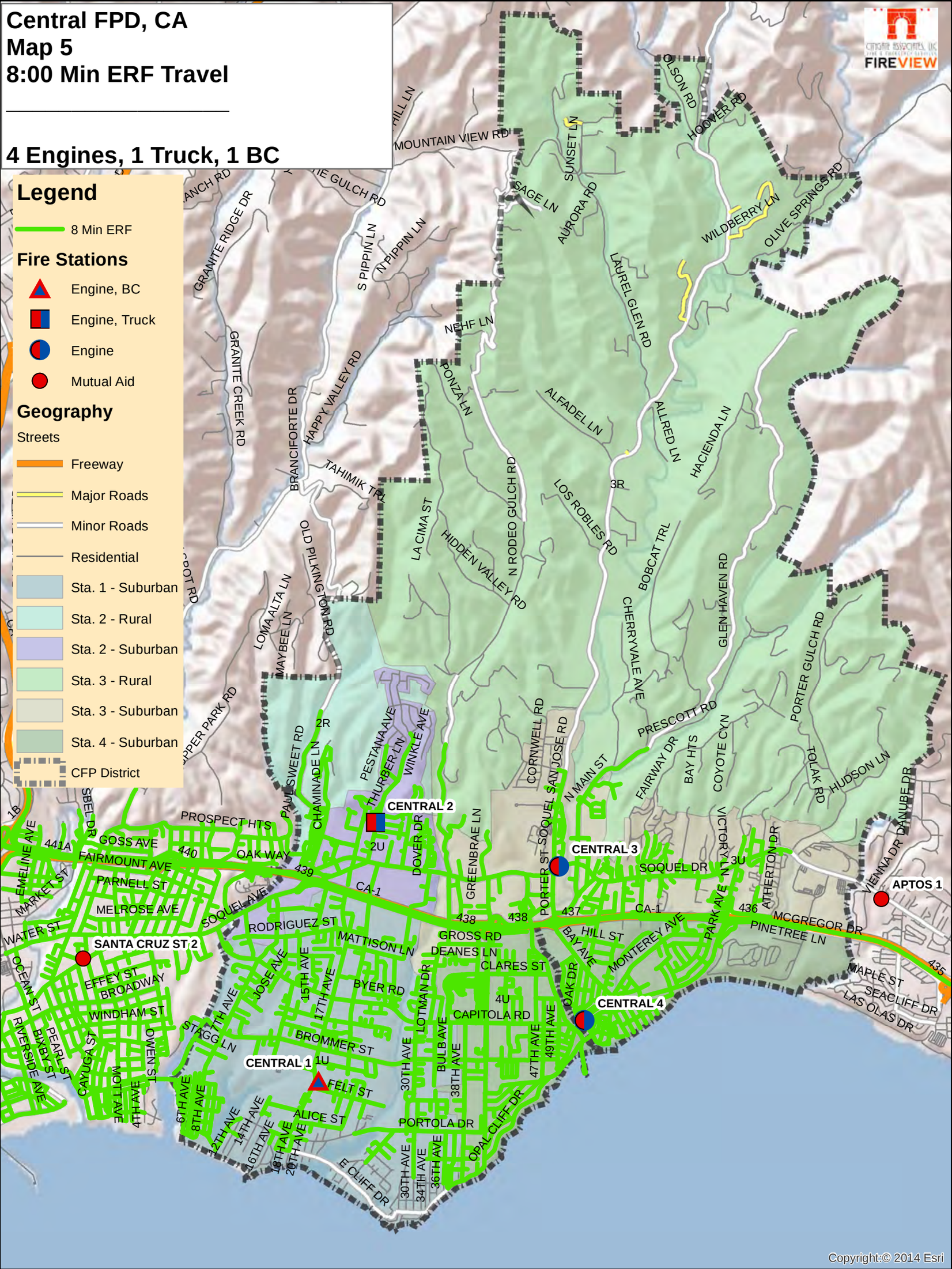
Central FPD, CA
Map 4
ISO 1.5 Mile Travel Distance



Central FPD, CA
Map 5
8:00 Min ERF Travel

---

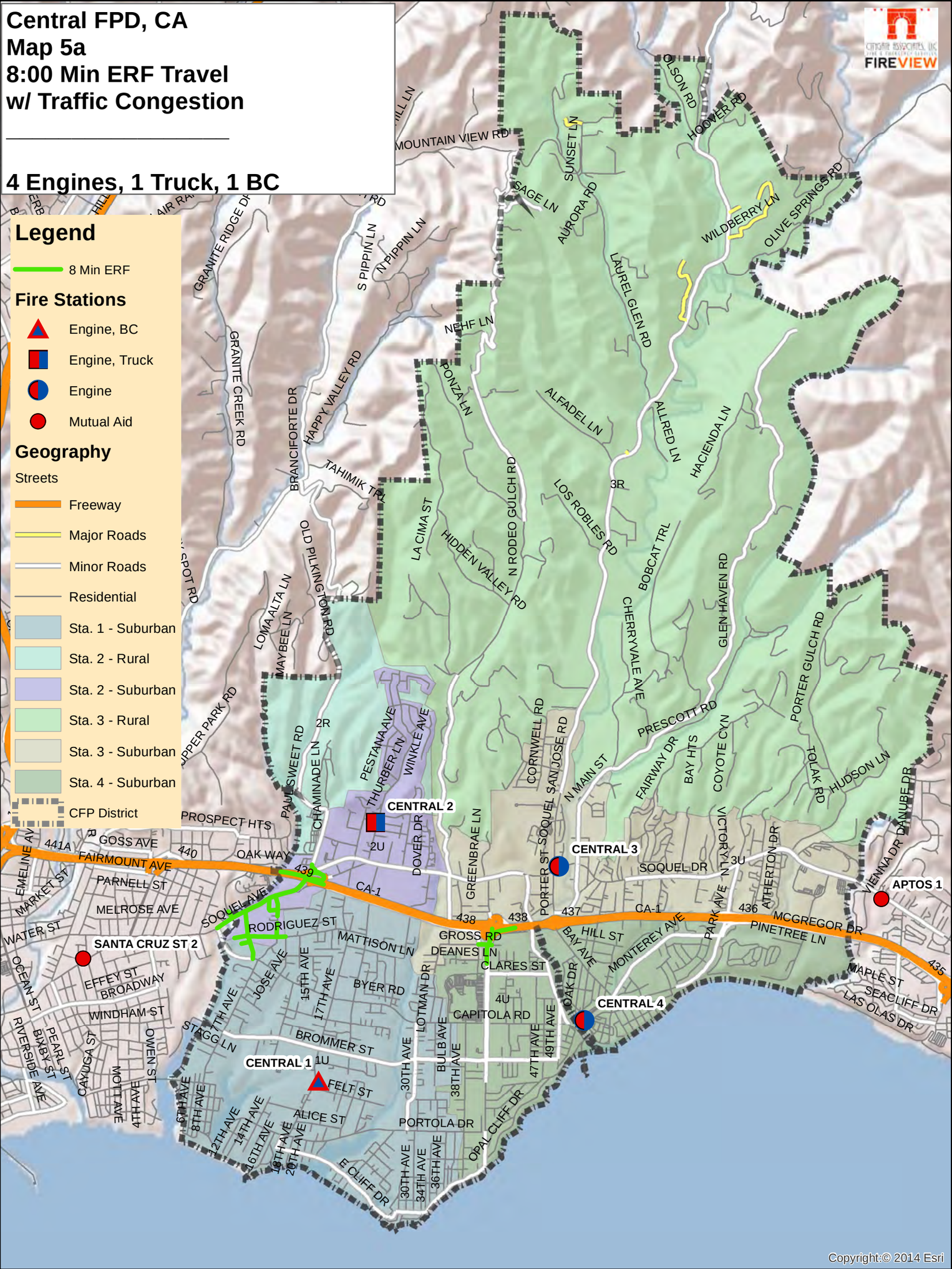
4 Engines, 1 Truck, 1 BC



Central FPD, CA
Map 5a
8:00 Min ERF Travel
w/ Traffic Congestion

---

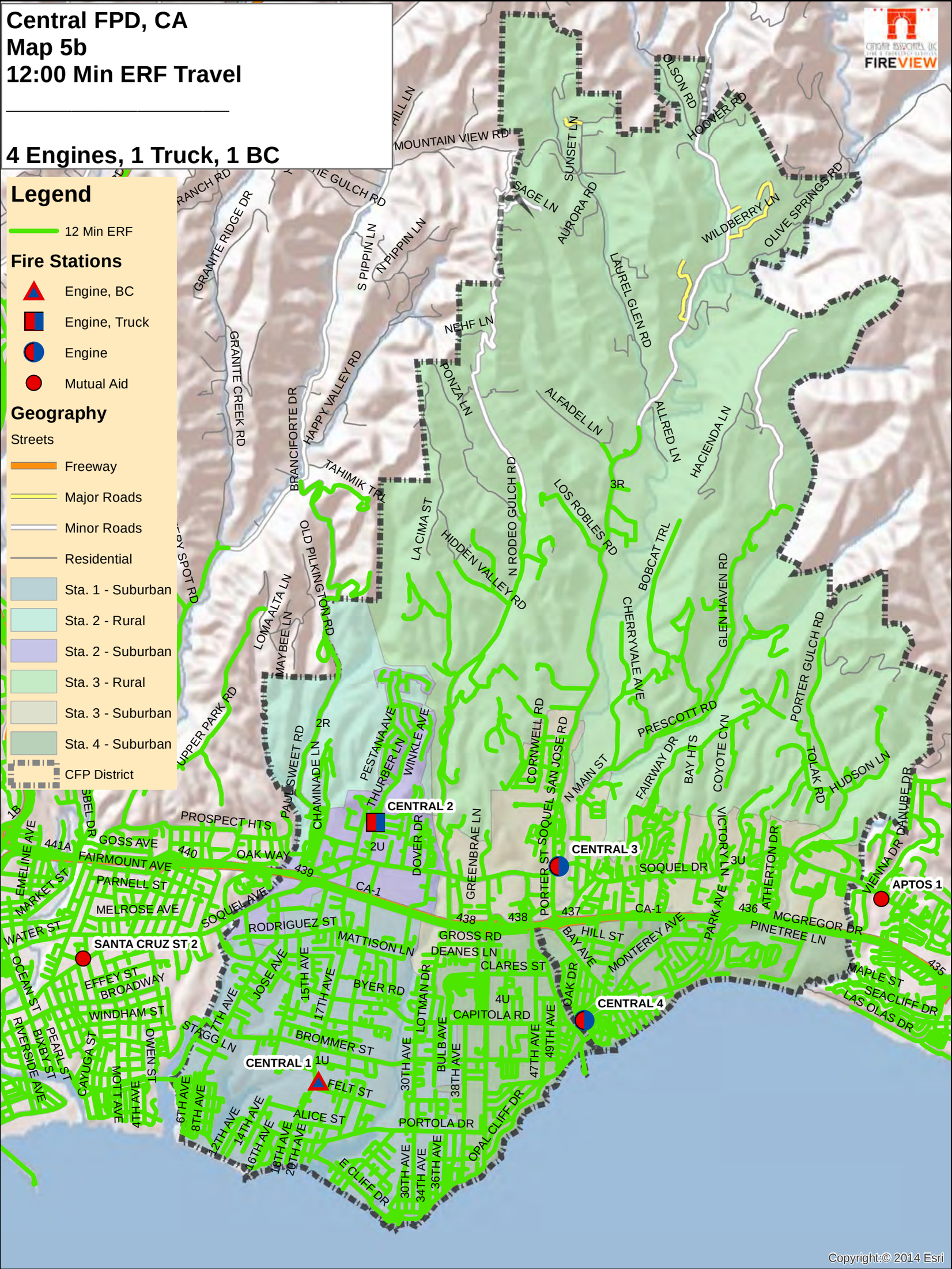
4 Engines, 1 Truck, 1 BC



Central FPD, CA
Map 5b
12:00 Min ERF Travel

---

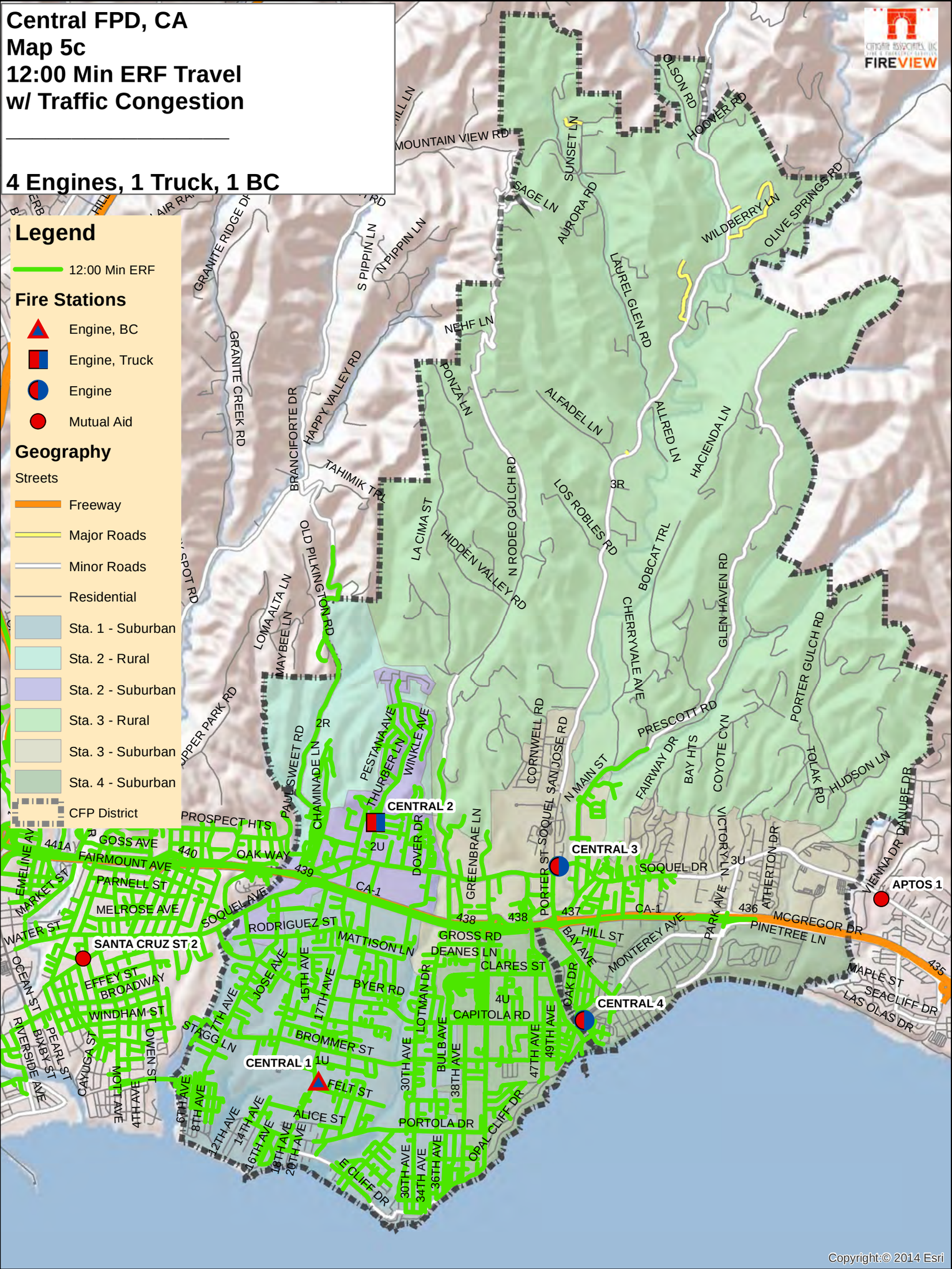
4 Engines, 1 Truck, 1 BC

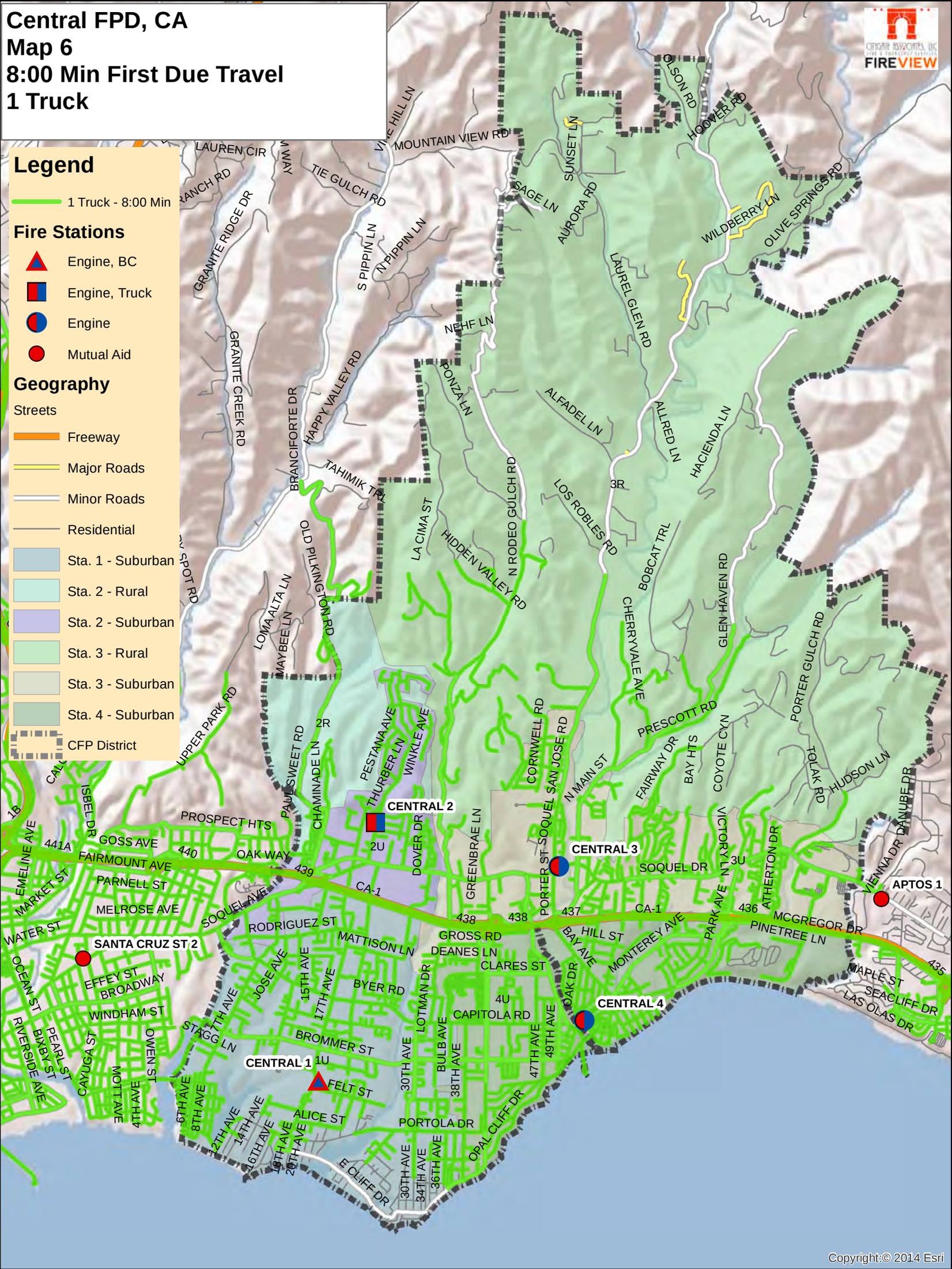


Central FPD, CA
Map 5c
12:00 Min ERF Travel
w/ Traffic Congestion

---

4 Engines, 1 Truck, 1 BC




Central FPD, CA
Map 6
8:00 Min First Due Travel
1 Truck
Legend
1 Truck - 8:00 Min
Fire Stations
Engine, BC
Engine, Truck
Engine
Mutual Aid
Geography
Streets
Freeway
Major Roads
Minor Roads
Residential
Sta. 1 - Suburban
Sta. 2 - Rural
Sta. 2 - Suburban
Sta. 3 - Rural
Sta. 3 - Suburban
Sta. 4 - Suburban
CFP District
FIREVIEW
CENTRAL 1
CENTRAL 2
CENTRAL 3
CENTRAL 4
SANTA CRUZ ST 2
APTOS 1
MOUNTAIN VIEW RD
TIE GULCH RD
GRANITE RIDGE DR
GRANITE CREEK RD
HAPPY VALLEY RD
BRANCIFORTE DR
TAHIMIK TRL
OLD PLANK RD
LOMA ALTA LN
MAYBEE LN
PAUL SWEET RD
CHAMINADE LN
PESTANA AVE
THURBER LN
WINKLE AVE
HIDDEN VALLEY RD
LA CIMA ST
N RODEO GULCH RD
LOS ROBLES RD
ALFADEL LN
PONZA LN
NEHF LN
LAUREL GLEN RD
AURORA RD
SUNSET LN
SAGE LN
S PIPPIN LN
N PIPPIN LN
OLSON RD
HOOVER RD
WILDBERRY LN
OLIVE SPRINGS RD
ALLRED LN
HACIENDA LN
BOBCAT TRL
CHERRYVALE AVE
GLEN HAVEN RD
PORTER GULCH RD
PRESCOTT RD
FAIRWAY DR
BAY HTS
COYOTE CYN
TOLAK RD
HUDSON LN
VIENNA DR
DANUBE DR
ATHERTON DR
VICTORY LN
CORNWELL RD
SOQUEL SAN JOSE RD
N MAIN ST
PORTER ST
GREENBRAE LN
DOVER DR
PROSPECT HTS
GOSS AVE
OAK WAY
FAIRMOUNT AVE
PARNELL ST
CA-1
SOQUEL DR
SOQUEL AVE
MELROSE AVE
RODRIGUEZ ST
MATTISON LN
GROSS RD
DEANES LN
CLARES ST
HILL ST
BAY AVE
MONTEREY AVE
PARK AVE
MCGREGOR DR
PINETREE LN
MAPLE ST
SEACLIFF DR
LAS OLAS DR
OAK DR
CAPITOLA RD
BYER RD
LOTMAN DR
BULB AVE
BROMMER ST
STAGG LN
FELT ST
ALICE ST
PORTOLA DR
OPAL CLIFF DR
E CLIFF DR
WINDHAM ST
EFFEY ST
BROADWAY
OCEAN ST
RIVERSIDE AVE
BIXBY ST
PEARL ST
CAYUGA ST
OWENS ST
MOTT AVE
EMELINE AVE
MARKET ST
WATER ST
ISBEL DR
UPPER PARK RD
JOSE AVE
15TH AVE
17TH AVE
7TH AVE
6TH AVE
8TH AVE
4TH AVE
12TH AVE
14TH AVE
16TH AVE
18TH AVE
20TH AVE
30TH AVE
34TH AVE
36TH AVE
38TH AVE
47TH AVE
49TH AVE
2R
3R
2U
3U
4U
1U
1B
441A
440
439
438
437
436
435
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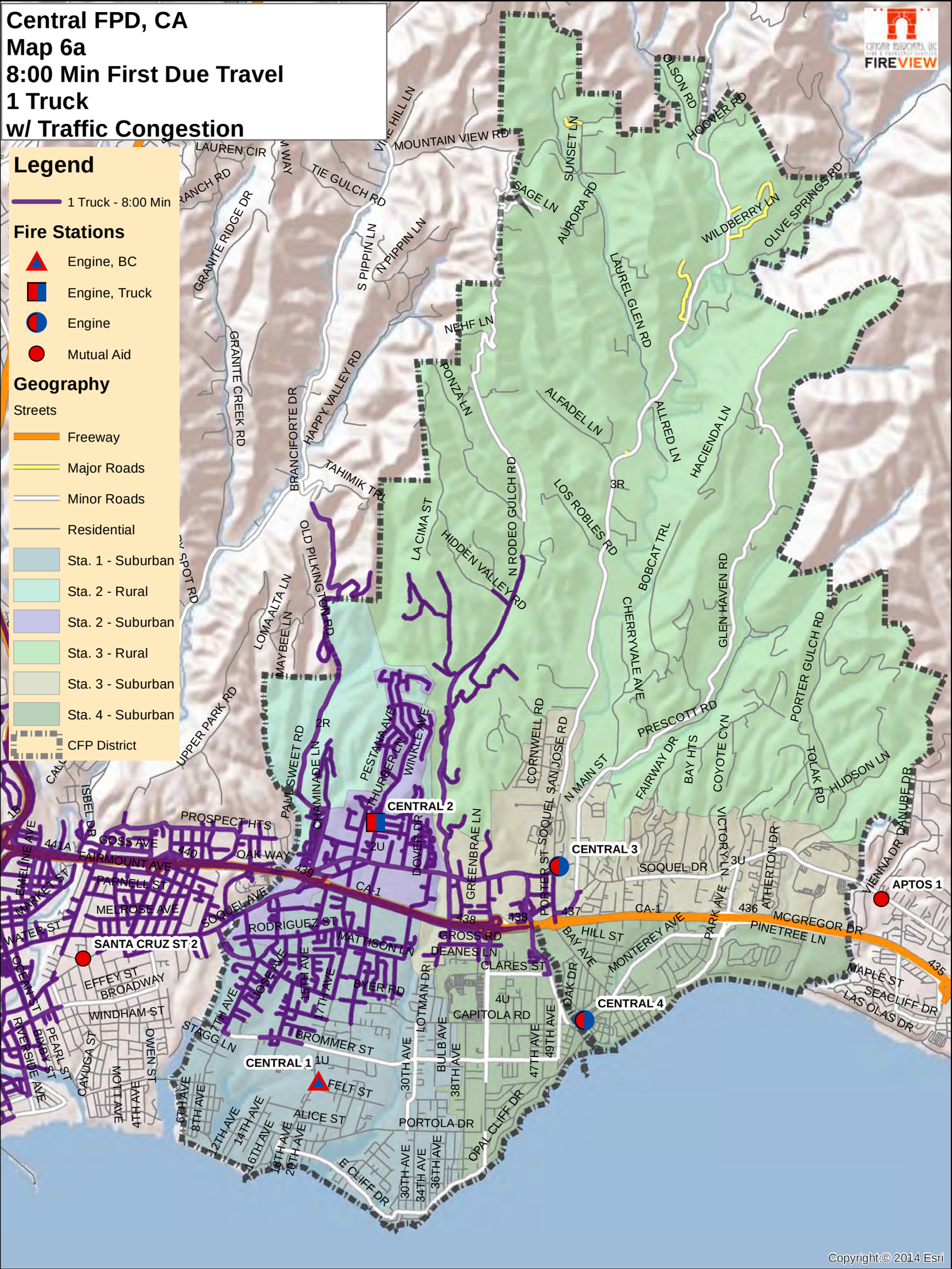
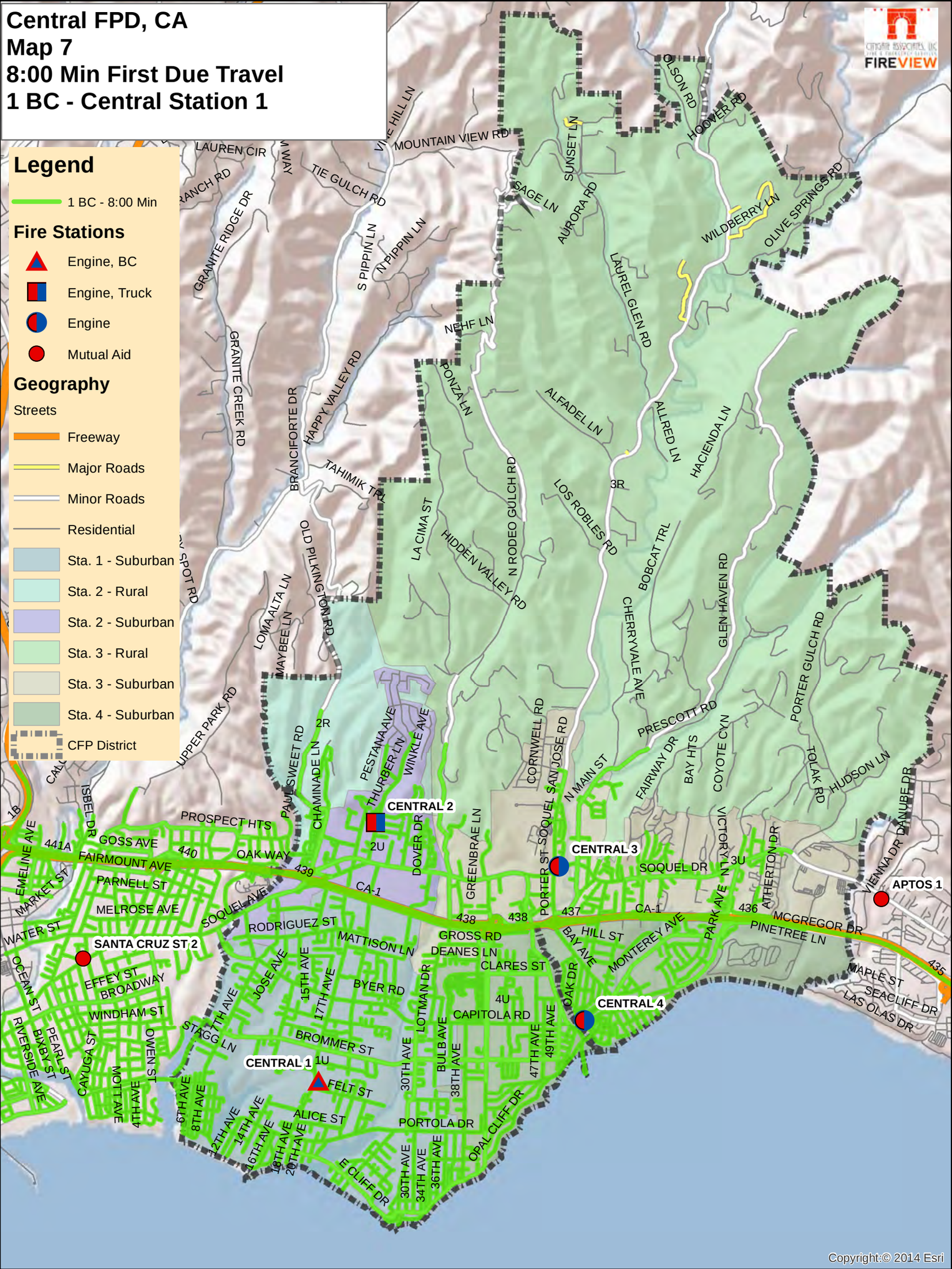
Central FPD, CA
Map 6a
8:00 Min First Due Travel
1 Truck
w/ Traffic Congestion




Central FPD, CA
Map 7
8:00 Min First Due Travel
1 BC - Central Station 1
FIREVIEW
Legend
1 BC - 8:00 Min
Fire Stations
Engine, BC
Engine, Truck
Engine
Mutual Aid
Geography
Streets
Freeway
Major Roads
Minor Roads
Residential
Sta. 1 - Suburban
Sta. 2 - Rural
Sta. 2 - Suburban
Sta. 3 - Rural
Sta. 3 - Suburban
Sta. 4 - Suburban
CFP District
CENTRAL 1
CENTRAL 2
CENTRAL 3
CENTRAL 4
SANTA CRUZ ST 2
APTOS 1
MOUNTAIN VIEW RD
SUNSET LN
OLSON RD
HOOVER RD
OLIVE SPRINGS RD
WILDBERRY LN
AURORA RD
SAGE LN
LAUREL GLEN RD
TIE GULCH RD
GRANITE RIDGE DR
GRANITE CREEK RD
S PIPPIN LN
N PIPPIN LN
NEHF LN
HAPPY VALLEY RD
BRANCIFORTE DR
TAHIMIK TRL
PONZA LN
ALFADEL LN
ALLRED LN
HACIENDA LN
LA CIMA ST
HIDDEN VALLEY RD
N RODEO GULCH RD
LOS ROBLES RD
BOBCAT TRL
CHERRYVALE AVE
GLEN HAVEN RD
PORTER GULCH RD
OLD PLANK RD
LOMA ALTA LN
MAYBEE LN
UPPER PARK RD
PAUL SWEET RD
CHAMINADE LN
PESTANA AVE
THURBER LN
WINKLE AVE
CORNWELL RD
SAN JOSE RD
N MAIN ST
PRESCOTT RD
FAIRWAY DR
BAY HTS
COYOTE CYN
TOLAK RD
HUDSON LN
VIENNA DR
DANUBE DR
ATHERTON DR
VICTORY LN
PROSPECT HTS
GOSS AVE
FAIRMOUNT AVE
OAK WAY
PARNELL ST
MELROSE AVE
SOQUEL AVE
RODRIGUEZ ST
MATTISON LN
GROSS RD
DEANES LN
CLARES ST
CAPITOLA RD
BYER RD
DOVER DR
GREENBRAE LN
PORTER ST
SOQUEL DR
CA-1
HILL ST
BAY AVE
MONTEREY AVE
PARK AVE
PINETREE LN
MCGREGOR DR
MAPLE ST
SEACLIFF DR
LAS OLAS DR
EMELINE AVE
MARKET ST
WATER ST
OCEAN ST
EFFEY ST
BROADWAY
WINDHAM ST
STAGG LN
JOSE AVE
15TH AVE
17TH AVE
7TH AVE
LOTMAN DR
OAK DR
BULB AVE
30TH AVE
38TH AVE
47TH AVE
49TH AVE
BROMMER ST
FELT ST
ALICE ST
PORTOLA DR
OPAL CLIFF DR
E CLIFF DR
34TH AVE
36TH AVE
CAYUGA ST
PEARL ST
BIXBY ST
RIVERSIDE AVE
OWENS ST
MOTTA AVE
4TH AVE
6TH AVE
8TH AVE
12TH AVE
14TH AVE
16TH AVE
18TH AVE
20TH AVE
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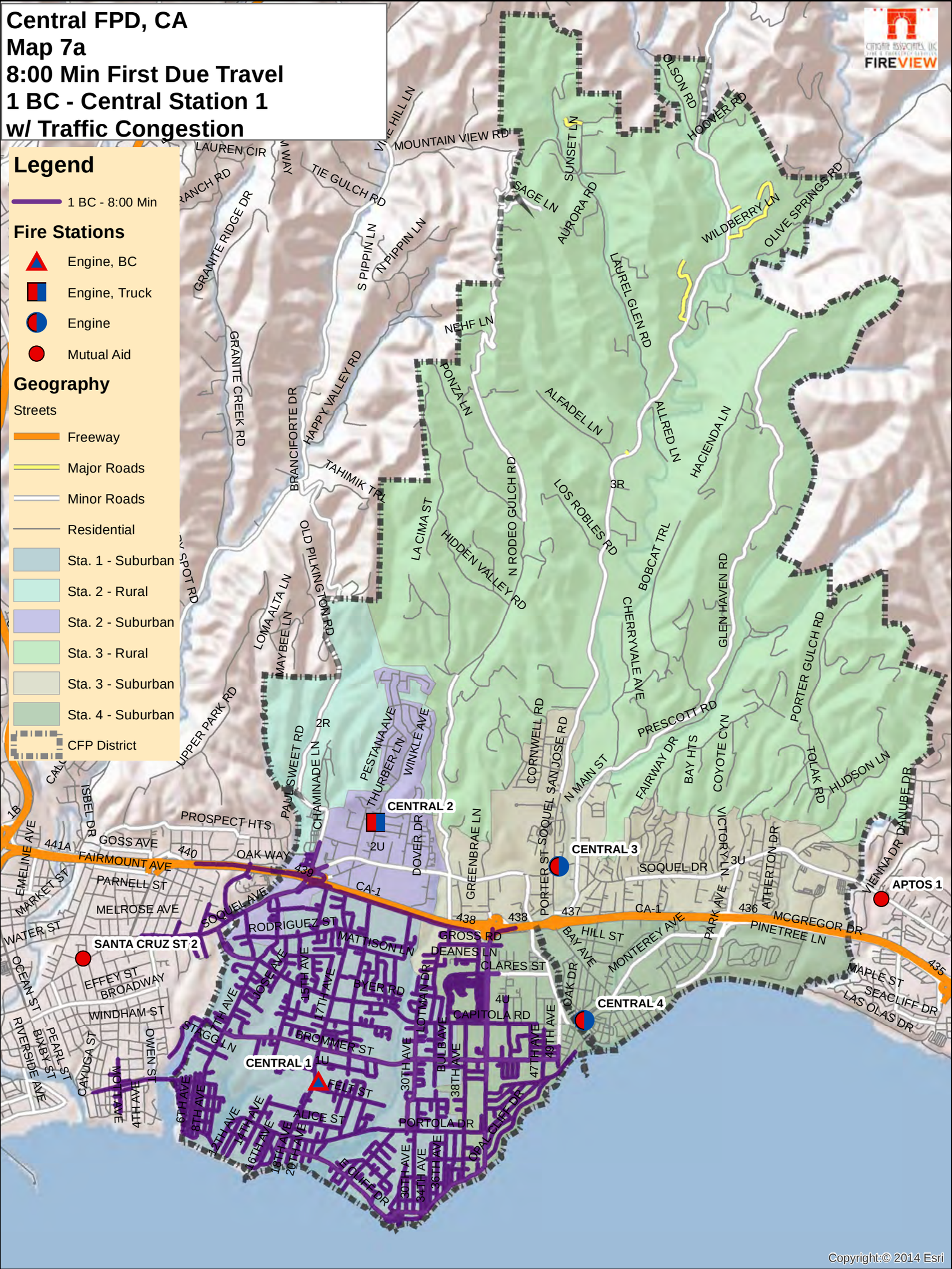
Central FPD, CA
Map 7a
8:00 Min First Due Travel
1 BC - Central Station 1
w/ Traffic Congestion
Legend
1 BC - 8:00 Min
Fire Stations
Engine, BC
Engine, Truck
Engine
Mutual Aid
Geography
Streets
Freeway
Major Roads
Minor Roads
Residential
Sta. 1 - Suburban
Sta. 2 - Rural
Sta. 2 - Suburban
Sta. 3 - Rural
Sta. 3 - Suburban
Sta. 4 - Suburban
CFP District
FIREVIEW
CENTRAL 1
CENTRAL 2
CENTRAL 3
CENTRAL 4
SANTA CRUZ ST 2
APTOS 1
MOUNTAIN VIEW RD
LAUREN CIR
TIE GULCH RD
GRANITE RIDGE DR
GRANITE CREEK RD
S PIPPIN LN
N PIPPIN LN
SUNSET LN
SAGE LN
AURORA RD
OLSON RD
HOOVER RD
WILDBERRY LN
OLIVE SPRINGS RD
LAUREL GLEN RD
NEHF LN
PONZA LN
HAPPY VALLEY RD
BRANCIFORTE DR
TAHIMIK TRL
ALFADEL LN
ALLRED LN
HACIENDA LN
LA CIMA ST
HIDDEN VALLEY RD
N RODEO GULCH RD
LOS ROBLES RD
BOBCAT TRL
CHERRYVALE AVE
GLEN HAVEN RD
PORTER GULCH RD
OLD PLIKINGTON RD
LOMA ALTA LN
MAYBEE LN
UPPER PARK RD
PAUL SWEET RD
CHAMINADE LN
PESTANA AVE
THURBER LN
WINKLE AVE
CORNWELL RD
SOQUEL SAN JOSE RD
N MAIN ST
PRESCOTT RD
FAIRWAY DR
BAY HTS
COYOTE CYN
TOLAK RD
HUDSON LN
VIENNA DR
DANUBE DR
ISBEL DR
PROSPECT HTS
GOSS AVE
441A
FAIRMOUNT AVE
440
OAK WAY
439
CA-1
DOVER DR
GREENBRAE LN
PORTER ST
SOQUEL DR
VICTORY LN
ATHERTON DR
EMELINE AVE
MARKET ST
PARNELL ST
MELROSE AVE
SOQUEL AVE
RODRIGUEZ ST
MATTISON LN
GROSS RD
DEANES LN
CLARES ST
438
437
436
435
HILL ST
BAY AVE
MONTEREY AVE
PARK AVE
MCGREGOR DR
PINETREE LN
MAPLE ST
SEACLIFF DR
LAS OLAS DR
WATER ST
EFFEY ST
BROADWAY
WINDHAM ST
OCEAN ST
RIVERSIDE AVE
PEARL ST
BIXBY ST
CAYUGA ST
OWEN ST
MONTE AVE
4TH AVE
6TH AVE
7TH AVE
8TH AVE
9TH AVE
10TH AVE
12TH AVE
14TH AVE
16TH AVE
18TH AVE
20TH AVE
30TH AVE
34TH AVE
36TH AVE
38TH AVE
47TH AVE
49TH AVE
BYER RD
LOTMAN DR
BULB AVE
CAPITOLA RD
4U
OAK DR
BROMMER ST
STAGG LN
FELT ST
ALICE ST
PORTOLA DR
OAKCLIFF DR
E CLIFF DR
1U
2U
3U
2R
3R
1B
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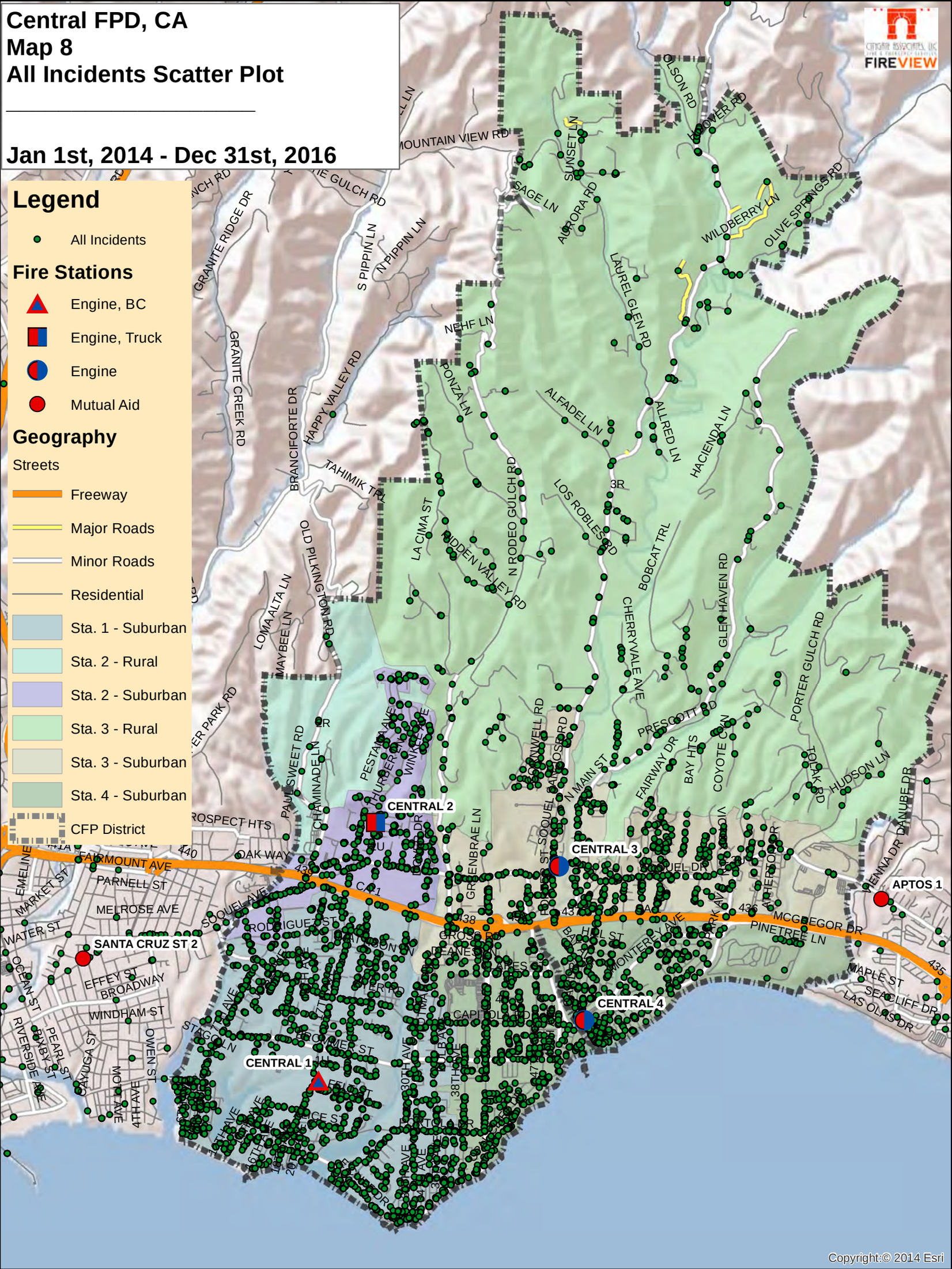
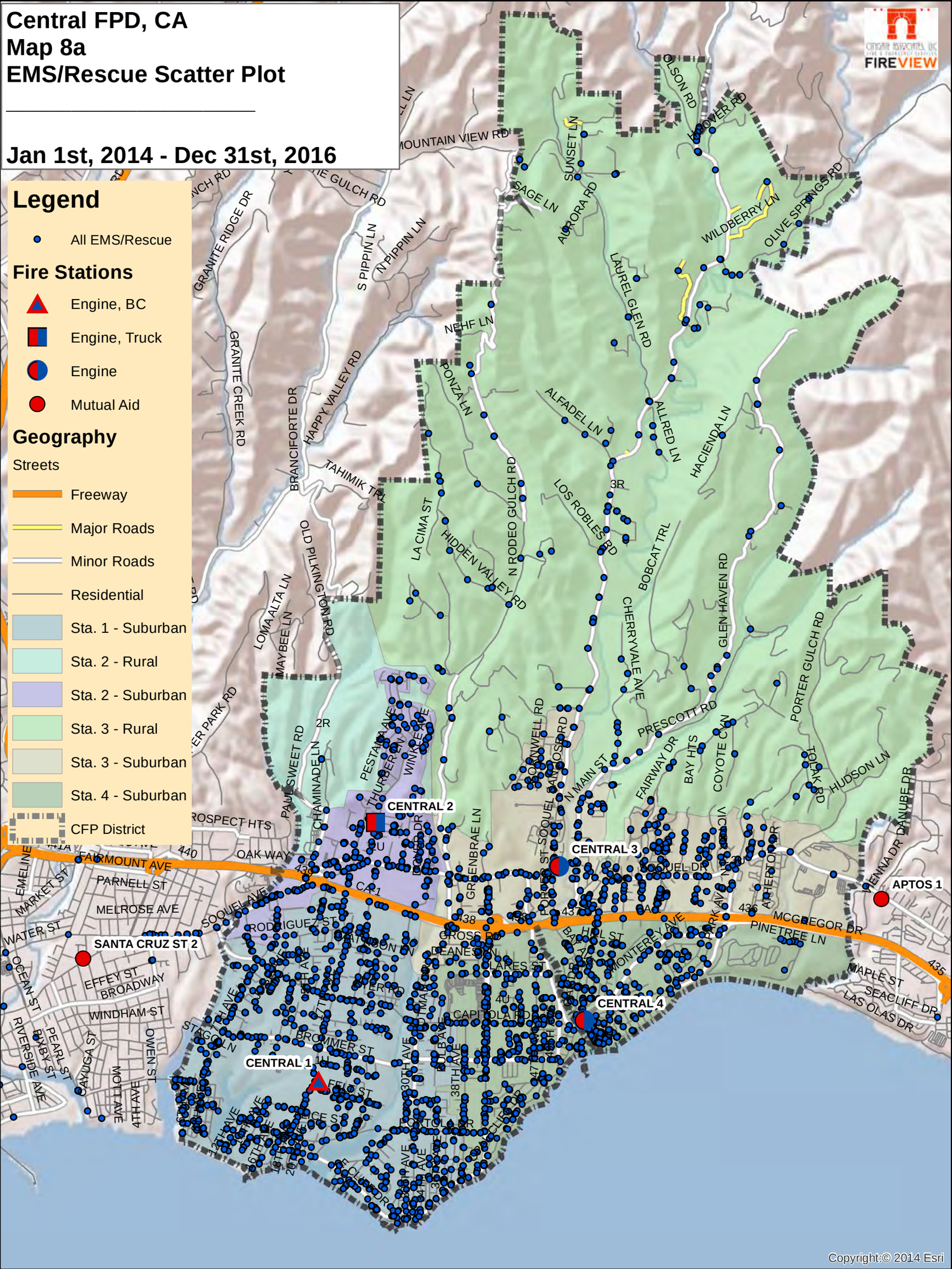
Central FPD, CA
Map 8
All Incidents Scatter Plot

Jan 1st, 2014 - Dec 31st, 2016



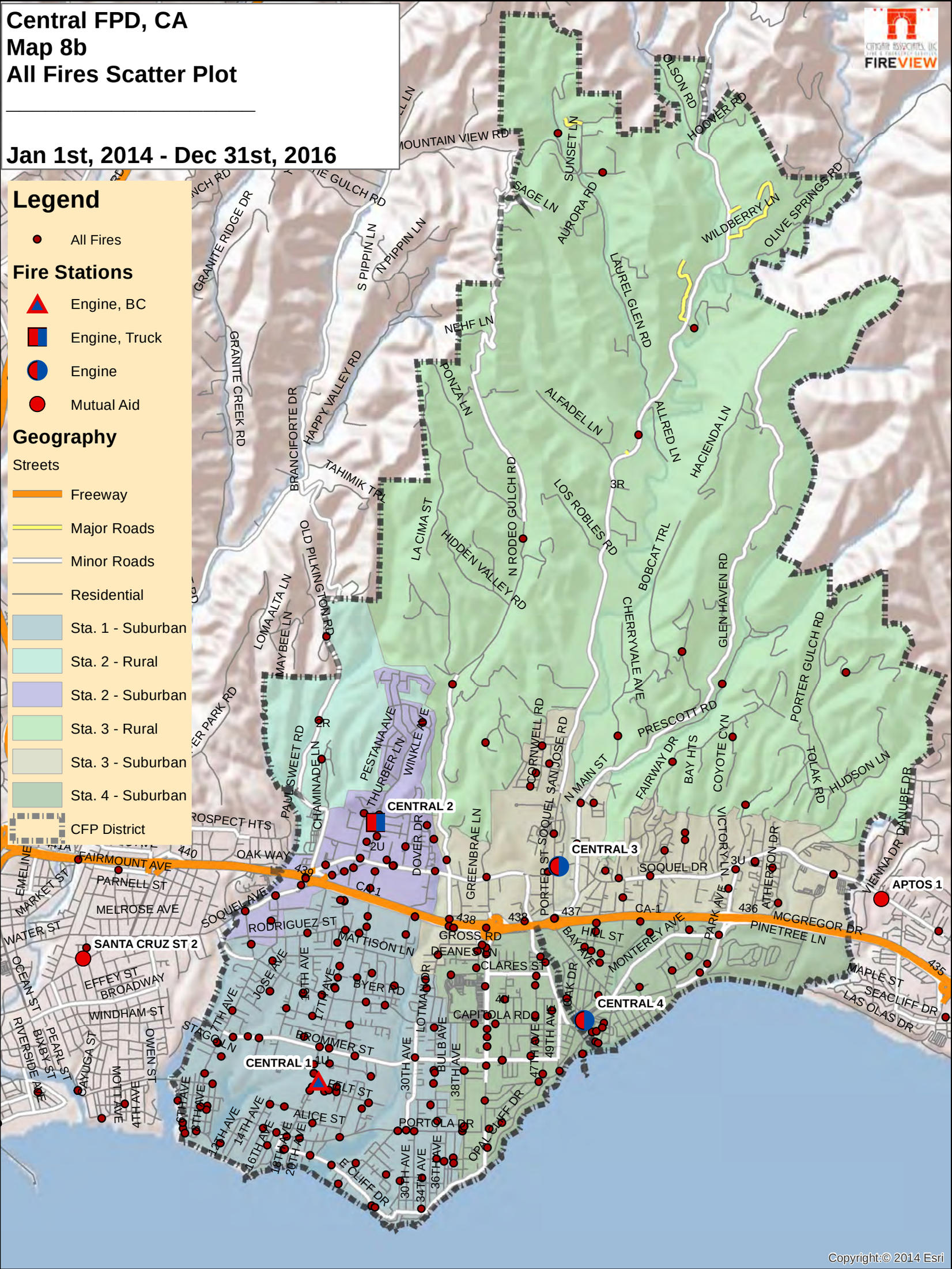
Central FPD, CA
Map 8a
EMS/Rescue Scatter Plot

Jan 1st, 2014 - Dec 31st, 2016



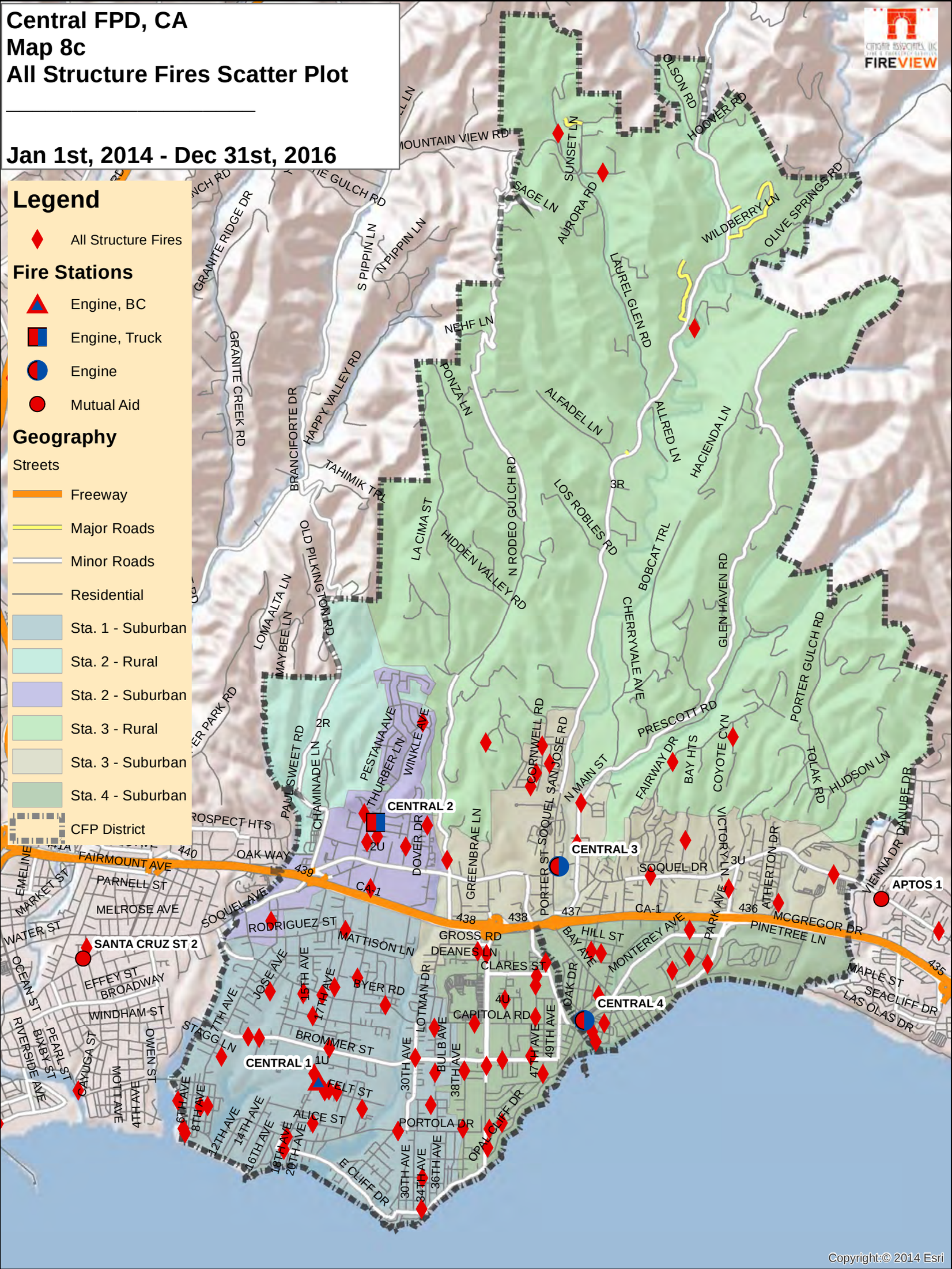
Central FPD, CA
Map 8b
All Fires Scatter Plot

Jan 1st, 2014 - Dec 31st, 2016



Central FPD, CA
Map 8c
All Structure Fires Scatter Plot

Jan 1st, 2014 - Dec 31st, 2016



Central FPD, CA
Map 9
Density/Hot Spots - EMS/Rescue

Jan 1st, 2014 - Dec 31st, 2016

Legend

EMS/ Rescue Hot Spot
Concentration of Incidents

- Very High
- High
- Moderate
- Low
- None

Fire Stations

- Engine, BC
- Engine, Truck
- Engine
- Mutual Aid

Geography

Streets

- Freeway
- Major Roads
- Minor Roads
- Residential
- Sta. 1 - Suburban
- Sta. 2 - Rural
- Sta. 2 - Suburban
- Sta. 3 - Rural
- Sta. 3 - Suburban
- Sta. 4 - Suburban
- CFP District

CENTRAL 1
CENTRAL 2
CENTRAL 3
CENTRAL 4
SANTA CRUZ ST 2
APTOS 1
1U
2U
3U
4U
2R
3R
CA-1
CA-17
1
1B
441A
440
439
438
437
436
435
MOUNTAIN VIEW RD
OLSON RD
HOOVER RD
SUNSET LN
SAGE LN
AURORA RD
WILDBERRY LN
OLIVE SPRINGS RD
S PIPPIN LN
N PIPPIN LN
LAUREL GLEN RD
NEHF LN
PONZA LN
ALFADEL LN
ALLRED LN
HACIENDA LN
LA CIMA ST
HIDDEN VALLEY RD
N RODEO GULCH RD
LOS ROBLES RD
BOBCAT TRL
CHERRYVALE AVE
GLEN HAVEN RD
PORTER GULCH RD
CANYON RD
OLD RANCH RD
BEEL DR
CALCITA DR
MILL RD
UPPER PARK RD
LOMA ALTA
MAYBEE LN
PAUL SWEET RD
CHAMINADE LN
PESTANA AVE
THURBER LN
WINKLE AVE
CORNWELL RD
SAN JOSE RD
N MAIN ST
PRESCOTT RD
FAIRWAY DR
BAY HTS
COYOTE CYN
TOLAK RD
HUDSON LN
VIENNA DR
DANUBE DR
PROSPECT HTS
GOSS AVE
OAK WAY
FAIRMOUNT AVE
EMELINE AVE
MARKET ST
PARNELL ST
MELROSE AVE
SOQUEL AVE
WATER ST
RODRIGUEZ ST
MATTISON LN
GREENBRAE LN
DOVER DR
PORTER ST
SOQUEL DR
VICTORY LN
ATHERTON DR
PARK AVE
GROSS RD
DEANES LN
CLARES ST
HILL ST
BAY AVE
MONTEREY AVE
MCGREGOR DR
PINETREE LN
OCEAN ST
EFFEY ST
BROADWAY
WINDHAM ST
JOSE AVE
15TH AVE
17TH AVE
BYER RD
LOTMAN DR
OAK DR
CAPITOLA RD
MAPLE ST
SEACLIFF DR
LAS OLAS DR
RIVERSIDE AVE
PEARL ST
BIXBY ST
CAYUGA ST
OWEN ST
MOTT AVE
4TH AVE
STAGG LN
7TH AVE
BROMMER ST
FELT ST
30TH AVE
BULB AVE
38TH AVE
47TH AVE
49TH AVE
6TH AVE
8TH AVE
12TH AVE
14TH AVE
16TH AVE
18TH AVE
20TH AVE
ALICE ST
PORTOLA DR
OPAL CLIFF DR
E CLIFF DR
30TH AVE
34TH AVE
36TH AVE

Central FPD, CA
Map 9a
Density/Hot Spots - All Fires

Jan 1st, 2014 - Dec 31st, 2016

Legend

Fire Stations

- Engine, BC
- Engine, Truck
- Engine
- Mutual Aid

Fire Hot Spots

Concentration of Incidents

- Very High
- High
- Moderate
- Low
- None

Geography

Streets

- Freeway
- Major Roads
- Minor Roads
- Residential

- Sta. 1 - Suburban
- Sta. 2 - Rural
- Sta. 2 - Suburban
- Sta. 3 - Rural
- Sta. 3 - Suburban
- Sta. 4 - Suburban
- CFP District