CITYGATE ASSOCIATES, LLC
PUBLIC SAFETY SERVICES

FIRE AND EMERGENCY MEDICAL SERVICES DEPLOYMENT ANALYSIS

CITY OF MILL VALLEY, CA

JUNE 13, 2018

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EXECUTIVE SUMMARY

The City of Mill Valley (City) retained Citygate Associates, LLC (Citygate) to perform a fire and emergency medical services (EMS) deployment analysis. This study included reviewing the adequacy of the existing deployment system from the current fire station locations and includes a technical report that details the Standards of Coverage (deployment) assessment.

Throughout this report, Citygate makes key findings and, where appropriate, specific action item recommendations. There are 8 key findings and 6 specific action item recommendations. These findings and recommendations are presented throughout Sections 4 through 7 and are provided in this Executive Summary for ease of reference.

POLICY CHOICES FRAMEWORK

There are no mandatory federal or state regulations directing the level of fire service response times and outcomes. The level of service and resultant costs are a local community choice in the United States. The body of regulations on the fire service provides that *if fire services are provided, they must be done so with the safety of the firefighters and citizens in mind.* There is a constructive tension between a desired level of fire services and the level that can be funded. Thus, many communities do not have the level of fire services they may desire.

In small communities like Mill Valley, it is an even harder challenge to keep fire service levels commensurate with need or desire along with all the other competing needs within the City.

This deployment analysis identifies that additional investment in fire services should be considered in the near term. The fundamental policy choices are derived from two key questions:

- *What outcome is desired for an emergency?* Is the desire to contain wildland fire to a quarter acre or less, restrict a building fire to the room, building, or block of origin, or is it to provide paramedic care in time to lessen the possibility of preventable death and severe disability?
- *Should equitable response time coverage be provided to all similar risk neighborhoods?* Once the desired outcomes are stated, the fire and EMS deployment system must be designed to cover the most geography in the fewest minutes with the correct number of personnel to meet the stated outcome goals.

CHALLENGE – FIELD OPERATIONS DEPLOYMENT (FIRE STATIONS)

Fire department deployment, simply stated, is about the **speed** and **weight** of the attack. **Speed** calls for first-due, all-risk intervention units (engines, ladder trucks, and/or ambulances) strategically located across a service area responding in an effective travel time. These units are

tasked with controlling moderate emergencies to prevent them from escalating to a second alarm or greater size, which unnecessarily depletes department resources as multiple requests for service occur. **Weight** is about multiple-unit response for serious emergencies, such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy-rescue incident. In these situations, enough firefighters must be assembled within a reasonable timeframe to safely control the emergency, thereby preventing it from escalating to greater alarms.

Citygate's analysis of response statistics and use of geographic mapping tools reveals that the City's current fire station placement from the two existing stations provides good coverage and a third station will likely never be necessary. However, as this report will describe, the City's minimum staffing is two firefighters per engine per day and thus it is dependent on mutual aid units outside of the City to provide sufficient staffing for anything more than a mild to moderate single-patient medical emergency or a small indoor or outdoor fire that four firefighters can themselves control. While two City paramedic/firefighters staff a Paramedic Ambulance, that unit is shared in the region and, as such, cannot always be present in the City for a firefighting response.

For effective outcomes on serious medical emergencies and to keep emerging fires small, best practices recommend that the first-due fire unit should arrive within **8:30 minutes** of County dispatch being alerted of an incident, 90 percent of the time. In the City, the current fire station system provides the following unit response time performance across a variety of population density/risk areas for emergency medical and fire incident types. As the table shows, Station 7's measure is just under the 8:30-minute, best-practice goal for an urban area.[1]

Table 1—2015 Call to Arrival Time

Station	2015
Department-Wide	08:39
Station 6	08:44
Station 7	08:27

While this study identifies that the regional fire dispatch processing times are slower than best practices, the slower-than-desirable total response times also extend to travel times, as shown in the following table:

[1] Most sources consider areas urban if they contain more than 1,000 or 1,500 people per square mile. The City is currently at 3,117 people per square mile.

Table 2—2015 Travel Time

Station	2015
Department-Wide	05:34
Station 6	05:46
Station 7	05:18

The longer travel times for Station 6 are due to the topography and street infrastructure in that response zone. National Fire Protection Association (NFPA) Standard 1710 recommends a 4:00-minute travel time goal in urban areas. As seen in the previous table, none of the travel times meet this goal and, given the City's road network and topography, that goal is unobtainable. However, the City's two station locations do deliver just past 5:00-minute travel time to 90 percent of the incidents. Thus, this study will benchmark and recommend the City use a 5:00-minute travel time goal because, with a total population of just over 14,000 residents, the City is not a large, contiguous urban area.

Overall Deployment Evaluation and Summary Recommendations

Communities the size of Mill Valley need not and cannot afford, in and of themselves, a local firefighting or multiple-patient medical emergency force that is sufficiently staffed for large emergency events. For these events, automatic and mutual aid partnerships exist, and they are very robust in Marin County and include a single, common dispatch center.

In a small city such as Mill Valley, accepted response strategy for large emergency events provides that an aggressive in-city response force can stop or slow the escalation of the emergency, thus preventing catastrophic situations and threats to the broader community, while neighboring out-of-city assistance travels to the scene to complete the mission. The balancing question becomes: What should be the size of the force inside a small city? The answer to this question must include the distance that out-of-city units must travel and the reliability of the response at peak-demand hours for all or some of the agencies involved.

If, for the foreseeable future, the risk of fire is to be limited to inside of an affected building, the City will need both a first-due firefighting unit and an Effective Response Force (multiple-unit force, also known as First Alarm) coverage in the populated areas of the City consistent with current best-practice recommendations. The minimum staffing of two firefighters per fire engine in the City presents challenges for the building and wildland fire risks present. While there is the hope that the two firefighters on the ambulance or mutual aid units will be immediately available, that may not always be the case.

Safety laws for firefighters require they operate as teams of two in conditions that are life threatening. If four City firefighters immediately respond to a building fire, then two can enter the

building that is on fire while the other two remain outside for their safety, command, and water pumping. Two firefighters cannot control a serious fire, nor can two firefighters handle more than one serious medical patient. If, however, six ambulance- and engine-based firefighters arrive, plus a chief officer for command and safety, then even without the ambulance team, two teams of two can be deployed and still have an outside safety team for the attack crew, plus command and water pumping. Stated this way, additional firefighters at scene more than doubles the in-City response capabilities and acts as an even larger force multiplier when the ambulance staffing is also quickly available.

Small fire departments have one chance to stop serious emergencies from becoming catastrophic. That one chance depends on a "weight of attack" that can reasonably slow the escalation of the incident while waiting for assistance. Given the size of the buildings, the geography, and twisting road network design in a valley surrounded with fire-prone vegetation, the first response force must be large enough to be successful "the first time," or there is great risk to the community. The current deployment performs well for the majority of calls for service but is thin and relies on outside support for more serious incidents. Staffing engines with two firefighters, instead of three or four, in a substantially developed city such as Mill Valley provides a thin line of initial, rapid response defense.

While the volume of, and response times to, EMS incidents consume much of the City's attention, all communities need a "stand-by and readily available" firefighting force to respond to fires that break out. The Department provides ambulance care, but the threat of fire, even if low, still requires resources *in addition to EMS hourly demand* for an effective response to emerging fires.

The first deployment step for the City in the near term is to adopt updated and complete performance measures from which to set forth fire service outcome expectations and regularly monitor Fire Department performance.

Since the provision of fire services is a local government issue, it is worth discussing that there are two beneficial reasons to establish a fire department response time goal. First, one or more fire service goals provides accountability for the City and community to understand if their investment in fire services is providing the level of service the City has determined. Second, when taxpayers ask about fire or EMS, or a developer wants to build something that could impact fire services, the adopted standards and response capability reports can be easily referenced.

Based on the deployment analysis contained in this study, Citygate's multiple recommendations will strengthen deployment performance and ensure quality paramedic coverage as incidents increase year to year. The broad goals of the recommendations are to:

- Provide for depth of response when multiple incidents occur.
- Provide for a concentration of response forces for high-risk properties.

- Lessen the potential that the ambulance staffing may not be available for a fire.

If the City wants to achieve these fire service delivery goals, the City can slightly increase its deployment plan by fielding an additional firefighter per day at Station 7, bringing the total to three, and work with the South Marin Ambulance Joint Powers Authority (JPA) to limit the use of Medic 6 to the core Mill Valley area to enable the two firefighters on the ambulance at Station 6 to be in the community more often. These changes would provide seven firefighters per day in the City. Citygate suggests these changes so that the City provides, to the degree possible, an equitable response to all similar risk neighborhoods.

Findings and Recommendations

Finding #1: Fire Station 7, which cross staffs the wildland fire engine, is not independently staffed to deliver the personnel needed at serious fire and medical incidents to slow or stop the escalation of an emerging incident threatening life or property.

Finding #2: The existing two fire stations located in the City provide adequate travel time coverage from their current locations to the most populated, core sections of the City.

Finding #3: The City's time-of-day, day-of-week, and month-of-year calls for service demands are fairly consistent. This means the City needs to operate a fairly consistent 24/7/365 response system.

Finding #4: The City is not in control of the Marin County Sheriff's Office Communications Center call processing performance time; however, for time-sensitive fire and EMS events, the Center's performance does not meet best practices and the time lost in call processing cannot be made up by driving faster.

Finding #5: The Department's turnout times need small improvement to fall consistently below 2:00 minutes.

Finding #6: The edges and upper slope areas of the City are very difficult to serve within a best-practice urban travel time of 4:00 minutes due to road design and topography, especially in Fire Station 6's first-due area which is very spread out and not easily accessible. As such, it would not be possible to lower overall travel time substantially without increasing the number of fire stations, which is clearly not a cost-effective solution given the modest quantity of incidents annually.

Finding #7: Both Mill Valley and the Southern Marin Fire Protection District have a shared service agreement for a Battalion Chief and training officer, plus a shared EMS

officer with the ambulance Joint Powers Authority (JPA). Both agencies are pursuing additional shared services as they continue to work closely.

Finding #8: The City has a plan for the replacement of capital fire apparatus and support vehicles that is funded in the City's General Fund Budget for Vehicle Replacement.

Recommendation #1: As funds permit, the City could consider adding a third firefighter per day to Engine 7 and work with the ambulance JPA to limit the use of Medic 6 to the Mill Valley area of the JPA. Doing so will strengthen the overall capabilities of the fire department and will provide more personnel from inside the City limits to more readily slow the escalation of emergencies threatening life and catastrophic building fire, thus improving outcomes.

Recommendation #2: Monitor the out-of-City time on Medic 6 over the next several years. If the volume and distance of transports significantly decrease the time Medic 6 is available for City firefighting and specialty response, then add a third firefighter per day to Engine 6.

Recommendation #3: **Adopt Deployment Measures Policies:** The City should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the Fire Department. The measures of time should be designed to save patients where medically possible and to keep fires from becoming greater alarm fires. With this is mind, Citygate recommends the following measures:

3.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within 8:30 minutes, 90 percent of the time from the receipt of the call in the Sheriff's Office Communications Center. This equates to a 90-second dispatch time, a 2:00-minute company turnout time, and a 5:00-minute drive time in the most populated areas.

3.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to contain wildland fires to a quarter acre or less when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of a *minimum* of three engines (one of which is via mutual aid), one ladder truck, one paramedic ambulance, one rescue unit, and one Battalion Chief totaling 15 personnel (based on unit staffing) should arrive within 11:30 minutes from the time

of 9-1-1 call receipt in fire dispatch, 90 percent of the time. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute drive time for multiple units in the most populated areas.

3.3 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 City response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. It can achieve this with a travel time for the first company capable of investigating a hazmat release at the operations level within 8:00 minutes travel time or less, 90 percent of the time. After size-up and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multiple-agency hazardous materials response partnership.

3.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first company in for size-up of the rescue within 8:00 minutes travel time or less, 90 percent of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 11:30 minutes, 90 percent of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

Recommendation #4: The Department needs to focus on slightly lowering fire crew turnout times.

Recommendation #5: The area's Fire Chiefs should meet with County Communications staff to determine how to reduce the call processing time to the California requirements of 90 seconds for 90 percent of the incidents when there is not a language barrier with the caller.

Recommendation #6: Mill Valley should continue to explore shared services with the Southern Marin Fire Protection District and other agencies to enhance operations and service delivery.

NEXT STEPS

The purpose of this assessment is to compare the City's current performance against the local risks to be protected and to compare against nationally recognized best practices. This analysis of performance forms the basis from which to make recommendations for changes, if any, in fire station locations, equipment types, staffing, and headquarters programs.

As one step, the City should adopt response time goals that are based on best practices and provide accountability for City personnel to meet those standards. The goals identified in Recommendation #3 meet national best practices. Measurement and planning will be necessary for the City to meet these goals. Citygate recommends that the City's next steps be to work through the issues identified in this study over the following time lines:

Short-Term Steps

- Absorb the policy recommendations of this fire services study and adopt updated City performance measures to drive the deployment of firefighting and emergency medical resources.
- Identify funding and timing for a third firefighter per day assigned to Engine 7.
- Work with the ambulance JPA to limit the response area of Medic 6 to the Mill Valley area.

Ongoing Steps

- Continue to investigate and understand the shared staffing and joint operations options with the Southern Marin Fire Protection District and others as available.

SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC's detailed work product for a fire and emergency medical services deployment analysis for the City of Mill Valley (City) is presented in this report. Citygate's scope of work and corresponding Work Plan was developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various NFPA 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 structured into the following sections.

Executive Summary: An overview of the study and its findings and recommendations.

Section 1 Introduction and Background: An introduction to the study and background facts about the City.

Section 2 Standards of Coverage Introduction: An introduction to the Standards of Coverage (SOC) process and methodology used by Citygate in this review.

Section 3 Deployment Goals/Measures and Risk Assessment: An in-depth examination of the City's ability to meet the community's risks, expectations, and emergency needs through deployment of firefighters and apparatus.

Section 4 Staffing and Station Location Analysis: A review of the critical tasks that must be performed to achieve the City's desired outcome, and the City's existing fire station locations and possible future locations.

Section 5 Response Statistical Analysis: A statistical data analysis of the City's incident responses and an overall deployment evaluation.

Section 6 SOC Evaluation and Deployment Recommendation: A summary of deployment priorities and an overall deployment recommendation.

Section 7 Summary Level Headquarters and Support Functions Staffing Adequacy Review: An analysis of key headquarters functions.

Section 8 Next Steps: A summary of short-term and ongoing steps.

1.1.1 Goals of Report

This report will cite findings and make recommendations, if appropriate, that relate to each finding. All the findings and recommendations throughout Sections 4 through 7 of this report are numbered sequentially. A complete list of all these same findings and recommendations, in order, is found

in the Executive Summary. Section 8 of this report brings attention to the highest priority needs and recommended next steps.

This document provides technical information about the way City fire services are provided and legally regulated and the way the City currently operates. This information is presented in the form of recommendations and policy choices for the City leadership to discuss.

1.2 Project Scope of Work

1.2.1 Standards of Coverage Review

The scope of the Standards of Coverage review includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not a study of fire departments adjacent to the City, the study does consider the impacts of the City's automatic and mutual aid agreements common throughout the County and the shared chief officer services agreement with Southern Marin Fire Protection District.
- Establishing deployment performance time goals for the City consistent with best practices and national guidelines from the NFPA and the CFAI.
- Using limited geographic information systems (GIS) mapping to review fire station coverage zones and risk analysis.

SOC Study Questions

This study addresses the following questions:

- Based on current service demands, how many fire stations should the City have and where should the stations be located, or relocated, for the most cost-effective and efficient service to meet the City's needs for the next 25–50 years?
- Is the Fire/EMS apparatus and staffing adequate (in quantity, size, and location) for current service demands?
- What other fire response options and strategies might be suitable for the City?

1.3 City Overview

The City is located on the eastern coastal corner of Marin County just north of the San Francisco area in California. Highway 101, a major north-south State transportation artery, runs parallel to the eastern City limits. The City includes the environs of an urban/suburban community, light industrial and commercial businesses, and a large Wildland-Urban Interface (WUI) fire threat. The City of Mill Valley encompasses 4.8 square miles. Approximately 42 percent of land use within

the City is residential, with 23 percent commercial/industrial and the remainder dedicated to public facilities, parks / open space, agriculture, and transportation corridors.

Geographically, many homes within the City, especially in the foothills within the WUI, are valued in the million-dollar range. This area, as well as the populated areas just to the north of the City, have a history of major wildfire incidents, such as the Great Mill Valley Fire of 1929. Additionally, the area is very susceptible to landslides and slope degradation.

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SECTION 2—STANDARDS OF COVERAGE INTRODUCTION

2.1 STANDARDS OF COVERAGE STUDY PROCESSES

The core methodology used by Citygate in the scope of its deployment analysis work is the "Standards of Cover" 5th Edition, which is a systems-based approach to fire department deployment published by the CFAI. Additionally, Citygate also used the 6th Edition of the Standards of Cover Manual. This approach uses local risk and demographics to determine the level of protection best fitting each city's needs.

The Standards of Coverage (SOC) method evaluates deployment as part of the self-assessment process of a fire agency. Citygate has adopted the SOC methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

In the United States, there are no federal or state government requirements for a minimum level of fire services; fire service levels are a local choice issue for each community to consider and fund as it deems necessary. Rather than a one-size-fits-all, prescriptive formula, the SOC systems approach to deployment 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 single 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.

The Standards of Coverage process consists of the following eight parts:

Table 3—Standards of Coverage Process Elements

Element	Meaning
Existing Deployment Policies	Reviewing the deployment goals the agency has in place today.
Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies.
Community Risk Assessment	Reviewing the assets at risk in the community. (See Section 3.2 Community Risk Assessment.)
Critical Task Study	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force.
Distribution Study	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies.
Concentration Study	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).
Reliability and Historical Response Effectiveness Studies	Using prior response statistics to determine the percent of compliance the existing system delivers.
Overall Evaluation	Proposing Standard of Coverage statements by risk type as necessary.

Fire department deployment, simply stated, is about the speed and weight of the attack. **Speed** calls for first-due, all-risk intervention units (engines, trucks, chiefs for incident command) strategically located across a department responding in an effective travel time. These units are tasked with controlling moderate emergencies, thus preventing the incident from escalating to second alarm or greater size, which unnecessarily depletes department resources as multiple requests for service occur. **Weight** is about multiple-unit response for serious emergencies such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled within a reasonable timeframe to safely control the emergency, thereby keeping it from escalating to greater alarms.

This deployment design paradigm is displayed in the following table:

Table 4—Fire Department Deployment Simplified

	Meaning	Purpose
***Speed* of Attack**	Travel time of first-due, all-risk intervention units strategically located across a department.	Controlling moderate emergencies without the incident escalating to second alarm or greater size.
***Weight* of Attack**	Number of firefighters in a multiple-unit response for serious emergencies.	Assembling enough firefighters within a reasonable timeframe to safely control the emergency.

Thus, small fires and medical emergencies require a single- or two-unit response with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late, or the total personnel sent to the emergency are too few for the emergency type, poor outcomes can be the result. The science of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies.

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SECTION 3—DEPLOYMENT GOALS/MEASURES AND RISK ASSESSMENT

3.1 WHY DOES THE CITY'S FIRE DEPARTMENT EXIST AND HOW DOES IT DELIVER THE EXISTING FIRE CREW DEPLOYMENT SERVICES?

3.1.1 Existing Response Time Policies or Goals—Why Does the Fire Department Exist?

SOC ELEMENT 1 OF 8*

EXISTING DEPLOYMENT POLICIES

**Note: This is an overview of Element 1. The detail is provided on page 27.*

The City has a long history of striving to provide fire services that can be annually documented in the Fire Department, as well as the number of fire companies and minimum daily staffing.

Agencies are encouraged to no longer use an average time measure when adopting response times goals. An average measure does not state performance past the average point of a data set. In addition, response time measures should specifically denote a beginning and end response time and staffing quantity, by risk type, consistent with the recommendations of the NFPA or CFAI best practices. A complete response time goal is a fractile (percent of goal completion) measure that includes dispatch processing time, crew turnout time, and travel time, along with the type of emergency outcome or staffing needed to accomplish an outcome goal.

The City also has not identified response goals for technical rescue and hazardous material responses; in addition to firefighting and EMS, response time goals for these incident types are required to meet the Standards of Coverage model for the CFAI. In this Standards of Coverage study, Citygate will recommend response time goals to include all risks, including fire, EMS, hazardous materials, and technical rescue responses. The goals will be consistent with the CFAI systems approach to response.

Since the provision of fire services is a local government issue, a common question is: Why set a response time goal? There are two beneficial reasons to do so, especially in a smaller, largely built-out community such as Mill Valley. First, one or more fire service goals provides a means for the City and community to assess if their investment in fire services is providing the level of results the City has determined best meets the City's needs. Second, taxpayers who ask about fire or emergency medical services, or a developer who wants to build something that could impact fire services, can be assured of the adequacy of coverage through the adopted standards in use for fire services, which include a goal statement and resultant response capability reports by fire department.

3.1.2 Existing Outcome Expectations

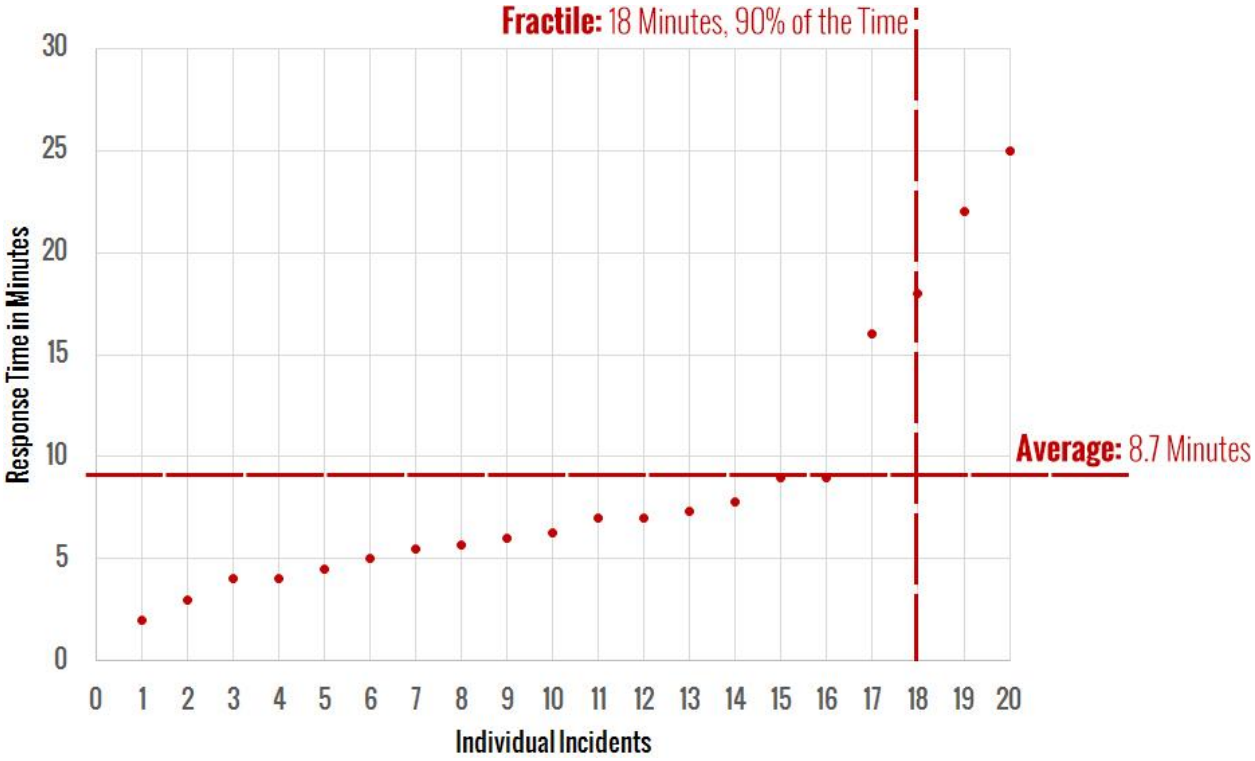
SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The Standards of Coverage process begins by reviewing existing emergency services outcome expectations. This can be restated as follows: For what purpose does the response system exist? Has the governing body adopted any response performance measures? If so, the time measures used need to be understood and good data must be collected.

The 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.[2] This is because an 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 over the average, or just over. For example, if a department had an average response time of 5:00 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5:00 minutes were answered in the sixth minute, or way out at 10:00 minutes. This is a significant issue if hundreds or thousands of calls are answered far beyond the average point. Fractile measures will identify, per minute, the number of incidents that are reached up to 100 percent. Figure 1 illustrates the use of fractal time measurements versus averages.

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

Figure 1—Fractile Time Measurement Details



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 efficient fire station spacing (distribution and concentrations). Emergency medical incidents involve situations with the most severe time constraints. The brain can only live 8:00 to 10:00 minutes without oxygen. Heart attacks are commonly known to deprive the brain of oxygen; however, heart attacks make up a small percentage of oxygen-depriving events. 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 8:00 to 10:00 minutes. 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 leaves 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, or that an incipient fire has grown beyond the room of origin and become very serious. Thus, the City 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 from 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, 90 seconds. Crew notification and travel time then take additional minutes. Once arrived, the crew must walk to the patient or emergency, assess the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 or more minutes. This timeframe may be increased considerably due to long driveways, apartment buildings with limited access, multiple-story apartments or office complexes, or shopping center buildings such as those found in parts of the City.

Unfortunately, there are situations in which an emergency has become too severe, even before 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 system, then only issues like bad weather, poor traffic conditions, or multiple emergencies will 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 dispatch processing, crew turnout, and road travel time steps. This is consistent with the recommendations of the CFAI. The City has not adopted complete deployment measures based on best practices or a set of specialty emergency response measures for all-risk emergency responses that includes the beginning time measure from the point of the Marin County Communications Center receiving the 9-1-1 phone call and a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet best-practice recommendations and allow the community to understand the level of fire services being provided.

3.2 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

The third element of the SOC process is a community risk assessment or analysis. The objectives of a community risk assessment are to:

1. Identify the hazards with potential to adversely impact the community or jurisdiction.
2. Quantify the probability of occurrence for each identified hazard.
3. Determine overall risk by hazard.

Citygate's detailed evaluation of the values at risk and hazards likely to impact the City's service area is detailed in Appendix A. The following is a summary of risk assessment factors and the risk assessment summary for Mill Valley.

A hazard is broadly defined as a situation or condition that can cause or contribute to harm. Hazard examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. Probability is the likelihood of occurrence of a particular hazard, and impacts are the adverse effects that a hazard occurrence has on people, property, and/or the community as a whole. Risk is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts*, and risk vulnerability is a measure of the probability of the existing deployment model's ability to protect against or mitigate a specific hazard.

3.2.1 People

Residents, employees, visitors, and travelers through a community or jurisdiction are considered to be 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 5 summarizes key City demographic data.

Table 5—Key City Demographic Data

Demographic	2015	Percentage
Population	14,243*	
Under 10 years	1,967	13.8%
10–19 year	1,939	13.6%
20–64 years	7,418	52.1%
65–74 years	1,665	11.8%
75 years and older	1,234	8.6%
Median age	46	
Housing Units		
Owner-Occupied	4,040	68.9%
Renter-Occupied	1,827	31.1%
Median Household Size	5.8 rooms	
Median Home Value	$1,157,500	
Ethnicity		
White	12,884	84.7%
Hispanic/Latino	1,039	7.3%
Black / African American	45	2.3%
Asian	467	5.7%
Other	21	.3%
Education (population over 24 years of age)		
High School Graduate	542	5.4%
Undergraduate Degree	4,492	44.5%
Graduate/Professional Degree	3,683	36.4%
Employment (population over 16 years of age)		
In Labor Force	11,113	62.8%
Employed	6,979	61.0%
Median Household Income	$143,005	
Population Below Poverty Level	431	3.3%
Population with Health Insurance Coverage	13,871	97.9%

*State of California 2018 E-1 Population Report

3.2.2 Growth and Development

Overview

The City of Mill Valley's General Plan plays a continual role in shaping the City and its character.

The General Plan contains the following themes:

- To protect and enhance the natural beauty and small-town character of Mill Valley.
- To encourage continued diversity of housing, income levels, and lifestyles in the community.

Through the development of the General Plan, community members consistently expressed their belief in the Mill Valley values of:

- Preserving the quality, diversity, and historic resources of the community's residential neighborhoods.
- Maintaining a strong, healthy economy that supports locally owned and local-serving businesses.
- Maintaining prudent municipal fiscal policies and practices and operational excellence by City officials and employees.
- Managing and restoring the scenic quality and physical character of the ridgelines and hillsides for open space, resource protection, and outdoor recreation.
- Preserving and enhancing creeks, marshes, woodlands, and other natural resources for health of habitat and natural species and the use and enjoyment by current and future generations.
- Fostering sustainable policies and practices that enhance climate protection and adapt to climate change.
- Minimizing traffic congestion and encouraging safe and convenient mobility alternatives.
- Planning for, preparing for, adapting to, and responding to natural and human-made disasters.
- Accommodating more housing choices for all income levels and community needs than may be possible under conditions in the private housing market.

Projected Growth

Growth projections in the City of Mill Valley's General Plan show a moderate growth of three percent from 2020–2030. If this estimate were to fully occur, a three percent increase to Mill

Valley's January 2018 population of 14,963 would only add 447 residents. This is likely only about 200 dwelling units over a decade, which would not substantially impact building fire risk or the level of fire services in the City.

Population Density Summary and Impact

Given that EMS is such a large part of the City's incident responses, it follows that population drives calls for service, including resident, employment, and transportation uses. There are no established population density definitions in the United States. Different national groups and the Federal Government use their own definitions. The CFAI considers an area as urban when it exceeds more than 2,500 people in a mostly contiguous area.

Table 6—Population Density

Community	Population Per Square Mile (2018 California Finance Count – Residents Only)
Mill Valley	3,117

The figure in Table 6 does not account for employees and visitors to Mill Valley, nor the pass-through traffic population when visitors come to that section of Marin County. Given this data, the more populated areas served by the Fire Department are urban in nature and, as such, generate emergency demand, and the threat of stopping fire spread from structure to structure must be planned for by the City's fire services.

Land Use and Future Development

Land use within the City is predominantly residential, with limited commercial and professional spaces. The City experiences infill development as older buildings are demolished and replaced, or the few open parcels are developed. The topography of the City is one of a small valley floor surrounded with rolling hills and, as such, the street design is curvilinear, and development has had to follow the landforms, unlike a flat city that can use an all right-angle grid street design.

The City is, in effect, placed in a natural drainage that runs to the east from the ridges in the center of the County. As such, the City is surrounded by heavily vegetated open space areas. While beautiful and environmentally protected, the resultant City design is not easy to serve with short response times from two fire stations.

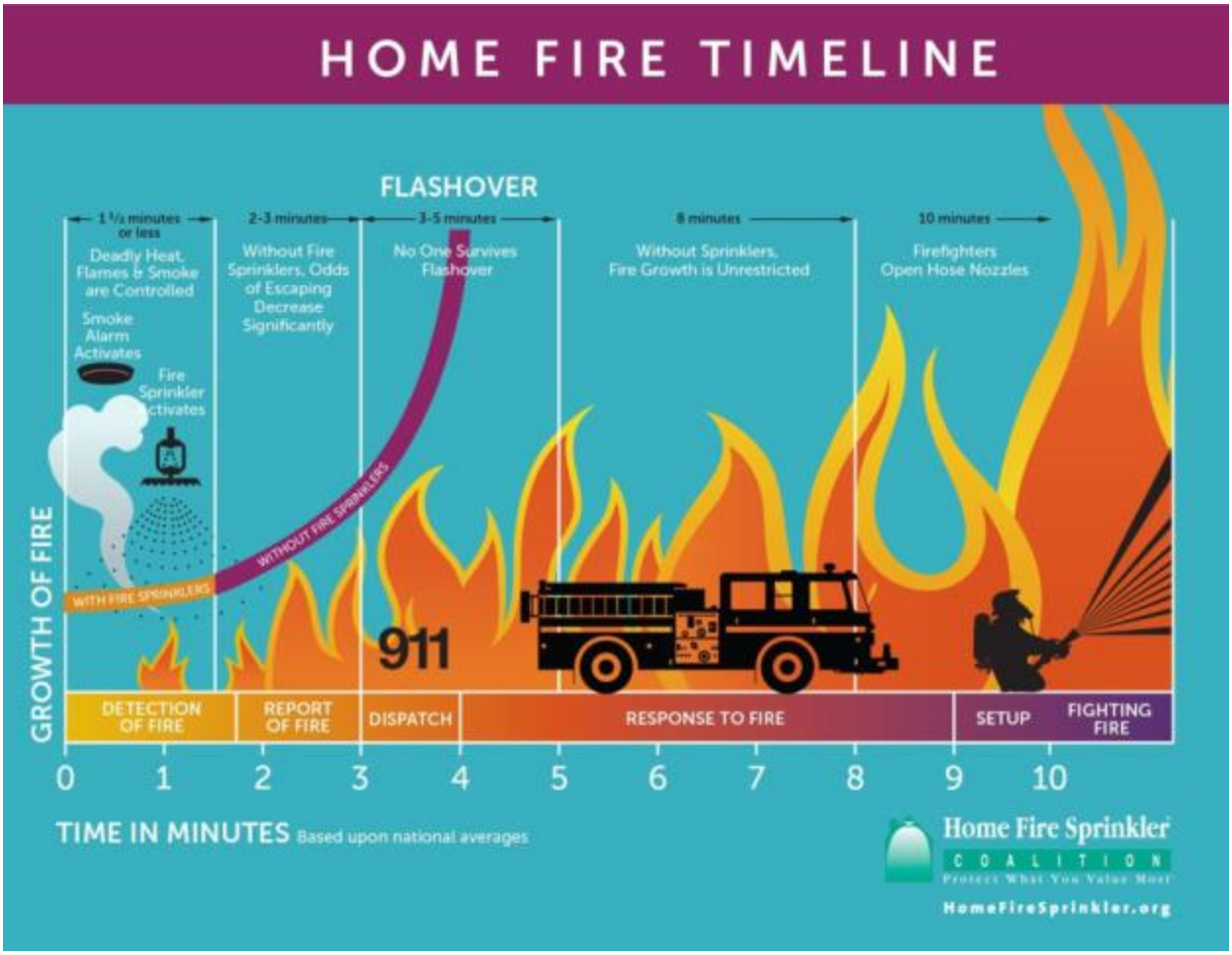
Building Fire Risk

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 2 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 2—Building Fire Progression Timeline



3.2.3 Medical Emergency Risk

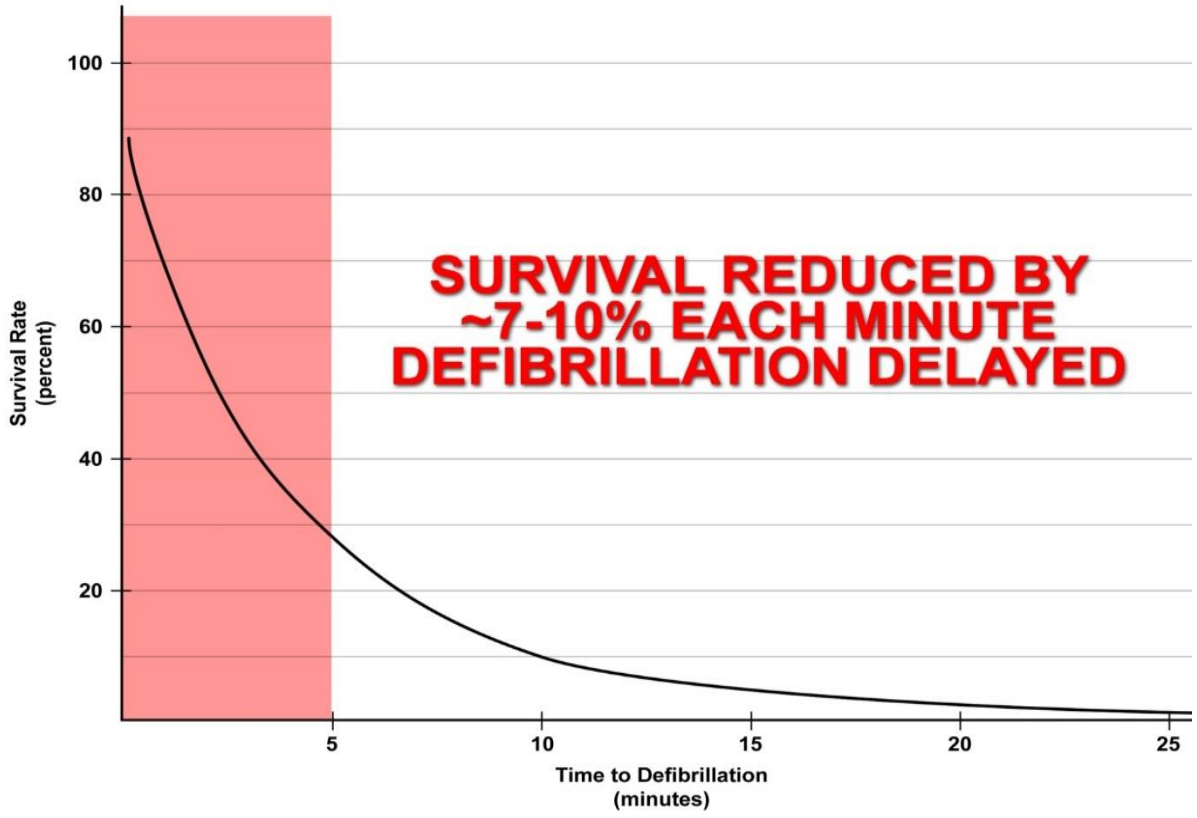
EMS Risk Factors

EMS risk in most communities is predominantly a function of population demographics, violence, and vehicle traffic. Relative to population demographics, EMS risk tends to be higher among poorer, older, less educated, and uninsured populations. As would be expected, EMS risk is also higher in communities or segments of communities with higher rates of violence. EMS risk is also

higher in those areas of a community with high vehicle traffic loads, particularly those areas with high traffic volume traveling at higher speeds. The City, while having above average socio-economic factors, has a very difficult-to-serve road network that twists and turns across hilly topography. So, while incident demand is modest due to the types of populations served, providing quick urban response times is all but impossible.

EMS risk can also be categorized as either a medical emergency resulting from a health-related condition or event, or traumatic injury. Emergencies in which there is an interruption or blockage of oxygen to the brain are especially problematic. Figure 3 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 can influence survivability as well, such as early CPR and pre-hospital advanced life support interventions.

Figure 3—Survival Rate vs. Time of Defibrillation



Source: www.suddencardiacarrest.org

3.2.4 Risk Assessment Summary for the City of Mill Valley

Overall risk conclusions for the City of Mill Valley are listed in Table 7. Overall risk for the five hazards related to emergency services provided by the City range from ***Low*** to ***High***.

Table 7—Overall Risk by Hazard

Hazard	Risk
Building Fire	Moderate
Wildland Fire	Moderate
Medical Emergency	High
Hazardous Materials	Moderate
Technical Rescue	Low

3.3 EXISTING DISTRICT DEPLOYMENT

3.3.1 Existing Deployment Situation—What the City Has in Place Currently

SOC ELEMENT 1 OF 8*

EXISTING DEPLOYMENT POLICIES

**Note: Continued from page 17.*

As the City has not adopted a response time policy based on best practices, this study will compare the City's response coverage abilities to recommendations of NFPA Standard 1710 for career fire service deployment for urban populated areas. These are:

- 4:00 minutes travel time for the first-due unit to all types of emergencies.
- 8:00 minutes travel time for multiple units needed at serious emergencies (First Alarm).

The City's current daily staffing plan is:

Table 8—City Daily Minimum Staffing per Unit – 2017

Unit	Number F/F	Staff	Total
2 Engines	2	Firefighters per day	4
1 Paramedic Ambulance	2	Firefighters per day	2
1 Shared Battalion Chief (BC)	1	Command per day	1
Total Firefighters and BC			**7**

The Paramedic Ambulance is part of the South Marin Ambulance Joint Powers Authority (JPA), comprised of several fire departments. The staffing on this unit is partially reimbursed by transport fees, and the ambulance itself is expensed by the JPA. This unit and its staffing is a shared regional

unit and, as such, is not dedicated to Mill Valley. Therefore, if it transports a patient to a hospital, the unit can be out of service due to the round trip taking at least 90 minutes. As such, the actual minimum staffing for firefighters in the City is only four on two engines.

Services Provided

The City is an "all-risk" fire department providing the people it protects with services that include structure and wildland fires, technical rescue, first-responder hazardous materials response, as well as other services.

Given these risks, the City uses a tiered approach of dispatching different types of apparatus to each incident category. The City contracts for dispatching with the Marin County Sheriff's Office which selects the closest and most appropriate resource types. As an example, the following table shows the resources dispatched to common risk types.

Table 9—Resources Sent to Common Risk Types

Risk Type	Minimum Type of Resources Sent	Total Firefighters Sent
1-Patient EMS	1 Engine* and/or Medic Unit*	2–4 FF
Auto Fire	1 Engine*	2 FF
Building Fire	1 Truck**, 3 Engines*, 1 Rescue****, 1 Medic Unit, 1 Battalion Chief***	15–17 FF
Wildland Fire	4 Engines*, 1 Rescue****, and 1 Battalion Chief***	14–16 FF
Technical Rescue	1 Engine*, 1 Rescue****, 1 Battalion Chief***	5–7 FF

* Mill Valley's two engines, or a wildland engine and one paramedic ambulance, are staffed with two personnel each.

** Mutual aid engine is staffed with three personnel, and the aerial ladder truck is staffed with three personnel.

*** Mutual aid Battalion Chief staffed with one person.

**** Rescue is from an automatic-aid department staffed with two to four personnel.

State and Federal Occupational Safety and Health Administration (OSHA) safety laws require four personnel on the scene of a structure fire before any member can enter the building to suppress the fire unless a known life is imminently at risk. This is known as the two-in/two-out rule. Teams of two must operate together inside areas immediately hazardous to the health and safety of the firefighters, with two firefighters outside in full protective gear to immediately rescue them if needed.

Like most communities in the Southern Marin Fire Protection District, the City's staffing for all types of serious fires is heavily dependent on automatic and mutual aid units, especially engine companies. In addition to firefighting units, the City utilizes a mutual aid Rescue Squad, equipped with technical rescue tools and equipment, for a regional approach to technical rescue incidents.

SECTION 4—STAFFING AND STATION LOCATION ANALYSIS

4.1 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 firefighters needed within a timeframe to accomplish the desired fire control objective on moderate residential fires and modest emergency medical rescues.

4.1.1 Firefighting Critical Tasks

The City's Effective Response Force (ERF) to structure fires in built-up, suburban areas includes one ladder truck, three engines (one of which is via mutual aid), one rescue squad, one medic unit, and one Battalion Chief, for a minimum ERF total of **15** personnel—*if mutual aid is immediately available to provide the additional nine personnel and the ambulance is in the City*. Otherwise, the City staffing of four are the only immediately available force.

The NFPA and other published critical staffing studies[3] recommend an ERF of 15–17 personnel. The following table shows what a force of 15 can accomplish. The larger the force (weight of attack), the faster the tasks are completed.

Scenario: *The following is a simulated one-story residential structure fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire. Upon arrival, they were told approximately 1,000 square feet of the home was involved in fire.*

[3] National Institute of Standards and Technology Report on Residential Fireground Experiments #1661 April 2010

Table 10—First Alarm Structure Fire – 15 Personnel Including Mutual Aid Units

Company Level Tasks
1st-Due City Engine and Medic Unit (if available) (4 total personnel)
1. Lay in a hydrant supply line.
2. Stretch the 150-foot, 1¾-inch hose line to the point of access for search and rescue.
3. Operate the pump to supply water and attach hydrant supply line.
4. Assume command of initial operations.
2nd-Due City Engine (2 personnel)
1. If necessary, lay in a hydrant supply line.
2. Or, stretch a 2nd 200-foot hose line as a back-up line and for fire attack.
3. Establish treatment (EMS) sector if needed.
4. Establish the initial Rapid Intervention Crew.
3rd-Due Auto Aid Engine (3 personnel)
1. If necessary, lay in a hydrant supply line.
2. Pump 1st Engine's supply line if needed.
3. Stretch 3rd 1¾-inch hose line if needed.
4th-Due Rescue – Auto Aid (2 personnel)
1. Establish a dedicated Rapid Intervention Crew.
1st-Due Ladder Truck –Auto Aid (2 personnel)
1. Perform positive pressure and/or vertical ventilation.
2. Secure utilities.
3. Raise ladders, open concealed spaces, and force entry as needed.
4. Provide salvage and overhaul.
1st-Due Incident Commander (1 person)
1. Establish exterior command.

The duties in Table 10, grouped together, form an *Effective Response Force*, or *First Alarm Assignment*. These tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the emergency from escalating. While firefighters accomplish the listed tasks, the incident progression clock keeps running. However, given the City's daily staffing of only four to six, few can be performed before mutual aid arrives.

Fire spread in a structure can double in size during its *free-burn* period before firefighting is started. 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 attack and search 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.

4.1.2 Emergency Medical Services Critical Tasks

The City responded to 1,073 EMS incidents in 2015. These incidents include car accidents, water emergencies, strokes, heart attacks, difficulty breathing, and many other medical emergencies. The wide variety and circumstances of EMS calls makes it difficult and impractical to chart the critical tasks for each call type.

The American Heart Association (AHA) recommends a minimum of two emergency medical technicians and two certified paramedics to minimally operate an emergency scene. A 2010 EMS study conducted by the National Institute of Standards and Technology (NIST) clearly demonstrates a crew of a minimum of four first responders on-scene, including two paramedics, is the most expedient and efficient means of delivering advanced emergency medical care.

The City routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, water rescues, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in close proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

Dispatchers are responsible for screening calls to establish the correct initial response. The first fire department officer on-scene amends the response, if needed, once conditions have been assessed. Standard operating procedures are used to request adequate personnel and resources.

For comparison purposes, the following critical task table reviews the tasks needed on a typical cardiac arrest.

Table 11—Cardiac Arrest – 4 Firefighters (1 Engine and 1 Ambulance)

Task	Personnel Required	Type of Treatment Administered
Compressions	1–2	Compression of chest to circulate blood
Ventilate/oxygenate	1–2	Mouth-to-mouth, bag-valve-mask, apply O_2
Airway control	1–2	Manual techniques / intubation / cricothyroidotomy
Defibrillate	1–2	Electrical defibrillation of dysrhythmia
Establish I.V.	1–2	Peripheral or central intravenous access
Control hemorrhage	1–2	Direct pressure, pressure bandage, tourniquet
Splint fractures	2–3	Manual, board splint, HARE traction, spine
Interpret ECG	2	Identify type and treat dysrhythmia
Administer drugs	2	Administer appropriate pharmacological agents
Patient charting	1–2	Record vitals, treatments administered, etc.
Hosp. communication	1–2	Receive treatment orders from physician
Treat en route	2–4	Continue to treat/monitor/transport patient
Total	**5–7**	**Personnel required per patient**

4.1.3 Critical Task Analysis and Effective Response Force Size Discussion

What does a deployment study derive from a company task analysis? The total task needs (as displayed in Table 10 and Table 11) to stop the escalation of an emergency must be compared to outcomes. Based on nationally published fire service "time vs. temperature" tables, after about 4:00 to 5:00 minutes of free burning, a room fire will grow to the point of flashover. At this point, the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. Additionally, brain death begins to occur within 4:00 to 6:00 minutes of the heart having stopped. Thus, the Effective Response Force must arrive in time to stop these catastrophic events from becoming worse.

The on-scene tasks discussed in Table 10 and Table 11 show that the residents of the City are not able to expect positive outcomes based on urban area best practices, nor will they have a good chance of survival in a *severe* fire or multiple-patient medical emergency requiring all of the listed critical tasks if only the current City's staffing is immediately available.

Mitigating an emergency event is a team effort *once* the units have arrived. If too few personnel arrive too slowly, then the emergency will worsen instead of improving. The outcome times, of course, will be longer, with 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 multiple-story buildings could well require the initial firefighters needing to rescue trapped

or immobile occupants. If a lightly-staffed force arrives, it **cannot** simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that the other units arrive in time to complete an effective intervention. Time is one factor that comes from **proper station placement**. Good performance also comes from **adequate staffing** and training. In the critical tasks identified previously, the City's firefighters can only perform well in terms of time *when mutual aid is close by*. Given how far apart the fire stations are spaced in the City and its neighboring communities, when one unit must cover another unit's area, or multiple units are needed, these units can be too far away and the emergency will worsen.

Previous critical task studies conducted by Citygate, the Standard of Coverage documents reviewed from accredited fire departments, and NFPA 1710 recommendations all arrive at the need for 15+ firefighters arriving within 11:00 minutes from the time of call at a room and contents structure fire to be able to **simultaneously and effectively** perform the tasks of rescue, fire attack, and ventilation. Like most communities within the Southern Marin Fire Protection District, the City of Mill Valley is dependent on mutual aid to send *at least a total of 15 personnel* to an incident involving a working First Alarm building fire. The City intends for firefighting crews to arrive closely enough together to deliver a positive outcome that protects lives and property by stopping the escalation of the emergency as found by the arriving force.

A question one might ask is, "If fewer firefighters arrive, *what* from the list of tasks mentioned 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 above the first-floor deployment. Rescue is conducted with only two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. It must always be remembered: effective deployment is about the **speed** *(travel time)* and the **weight** *(number of firefighters)* of the attack.

Six to seven initial City firefighters plus seven mutual aid firefighters and a shared chief officer could handle a moderate-risk house fire if they all arrive and are not delayed by other incidents. However, even a City / mutual aid Effective Response Force of 15 will be seriously slowed if the fire is above the first floor, in a hillside property that is difficult to reach, in a low-rise apartment building, or in a commercial/industrial building. This is where the capability to add alarms to the standard response becomes important.

The fact that the City's First Alarm (Effective Response Force) strives to deliver four to six City-based firefighters plus another seven via mutual aid, along with a shared Battalion Chief, to a moderate risk building fire reflects the City's unpublished goal to confine serious building fires to within the room(s) of origin and prevent the spread of fire to the entire building. This is a typical desired outcome in urban/suburban areas and requires more firefighters more quickly than a rural outcome of keeping the fire contained to the building, not room, of origin.

Table 10 and Table 11 identify the required number of personnel to conduct and complete the required tasks for either a structure fire or a severe medical emergency, such as a heart attack. The daily minimum on-duty staffing for the City of Mill Valley Fire Department is six personnel, two on each engine and two on the regionally shared Southern Marin Emergency Paramedic Medical Services (SMEMPS) paramedic unit. This SMEMPS unit is dedicated to the area and is not a City-only resource. Therefore, on occasion, it is not an available resource for firefighting. That means the City's minimum firefighting personnel for fire suppression duties is sometimes four.

Immediately staffing a building or wildland fire with only four personnel only permits a single fire attack line be placed in service by two firefighters. For a structure fire, this only allows for limited reach and water flow for interior firefighting; federal law requires two personnel be on standby outside before any entry by firefighters to suppress the fire, unless a known life is imminently in need of rescue.

Similarly, on other types of fires (vehicle fire, brush fire, dumpster fire, etc.) only one firefighter on a two-person unit will be on the hose line. This creates a safety issue in the event that person has a problem or the situation worsens.

In the event of a serious medical emergency, such as a heart attack, the staffing required is a minimum of four to five personnel performing specific tasks identified in Table 11. The SMEMPS ambulance is staffed with two firefighters, as is an engine, for a total of four personnel responding. Needed personnel to perform the critical tasks on a severe medical emergency is five to seven personnel, so *both* Mill Valley engines and/or the regional Rescue 9 unit must respond.

Finding #1:	Fire Station 7, which cross staffs the wildland fire engine, is not independently staffed to deliver the personnel needed at serious fire and medical incidents to slow or stop the escalation of an emerging incident threatening life or property.

Given that there is not a current City response time policy, the City's current physical response to building fires is, in effect, the City's de-facto deployment measure to built-up urban/suburban areas. Thus, this becomes the baseline policy for the deployment of firefighters.

4.2 Distribution and Concentration Studies—How the Location of First-Due and First Alarm Resources Affects the Outcome

SOC Element 5 and 6 of 8
Distribution and Concentration Study

The City is served today by two fire stations. It is appropriate to understand what the existing stations do and do not cover, if there are any coverage gaps needing one or more stations, and what, if anything, to do about them.

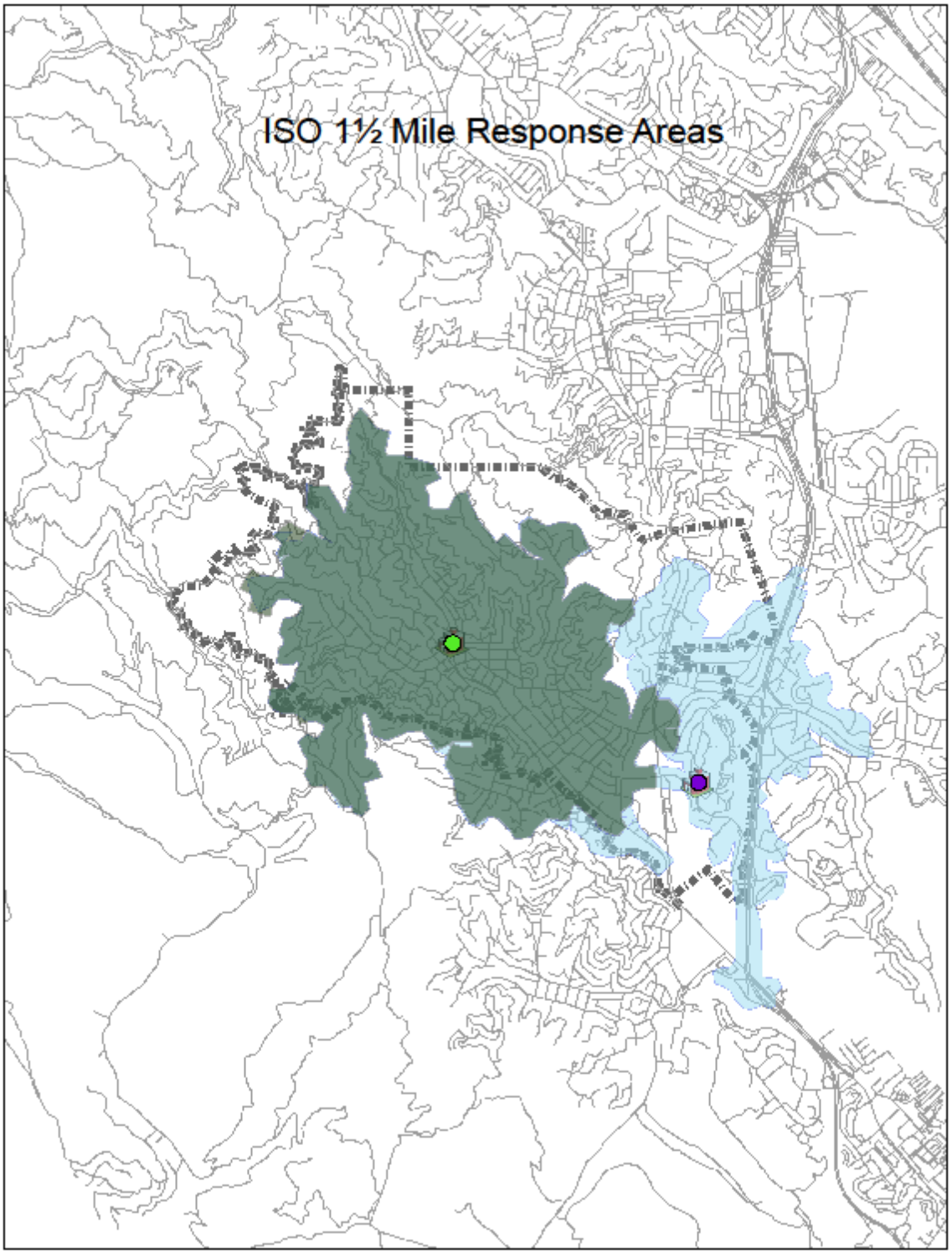
In brief, there are two geographic perspectives to fire station deployment:

- **Distribution** – the spacing of first-due fire units to stop routine emergencies.
- **Concentration** – the clustering of fire stations close enough together so that serious calls for service, including building fires, 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.

Citygate used limited geographic mapping for this study to develop a model that measured first-due unit response areas based on current fire station locations using the travel distances recommended by the Insurance Services Office (ISO). Citygate's mapping evaluated the City's current fire station locations compared to the ISO-recommended response area of 1.5 miles travel *distance* for an engine.

Figure 4 illustrates that the existing Mill Valley fire stations reach most of the public streets within the 1.5-mile travel distance. A third station will likely never be needed given current development patterns.

Figure 4—Mill Valley 1½-Mile ISO Response Areas



Finding #2:	The existing two fire stations located in the City provide adequate travel time coverage from their current locations to the most populated, core sections of the City.

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SECTION 5—RESPONSE STATISTICAL ANALYSIS

5.1 HISTORICAL EFFECTIVENESS AND RELIABILITY OF RESPONSE—WHAT STATISTICS SAY ABOUT EXISTING SYSTEM PERFORMANCE

SOC ELEMENT 7 OF 8
RELIABILITY & HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The map in Section 4 shows the City's current fire station locations compared to the ISO-recommended response area of 1.5 miles travel *distance* for an engine. Examination of the actual response time data in this section provides a picture of how response times are in the "real" world of simultaneous calls, rush hour traffic conditions, units out of position, and delayed travel time for events such as periods of severe weather.

5.1.1 Data Set Identification[4]

The Mill Valley Fire Department provided National Fire Incident Reporting System (NFIRS, version 5) incident and computer aided dispatch (CAD) apparatus response data for 1/1/2013 through 12/31/2015. NFIRS 5 data resulted in 6,515 incidents and 7,430 apparatus response records.

5.2 SERVICE DEMAND

In 2015, the Mill Valley Fire Department responded to 2,217 incidents. During this period, Mill Valley had a daily demand of more than 6.07 incidents, of which 2.44 percent of the total incidents were fire incidents, 48.40 percent were EMS incidents, and 49.16 percent were "other" incident types.

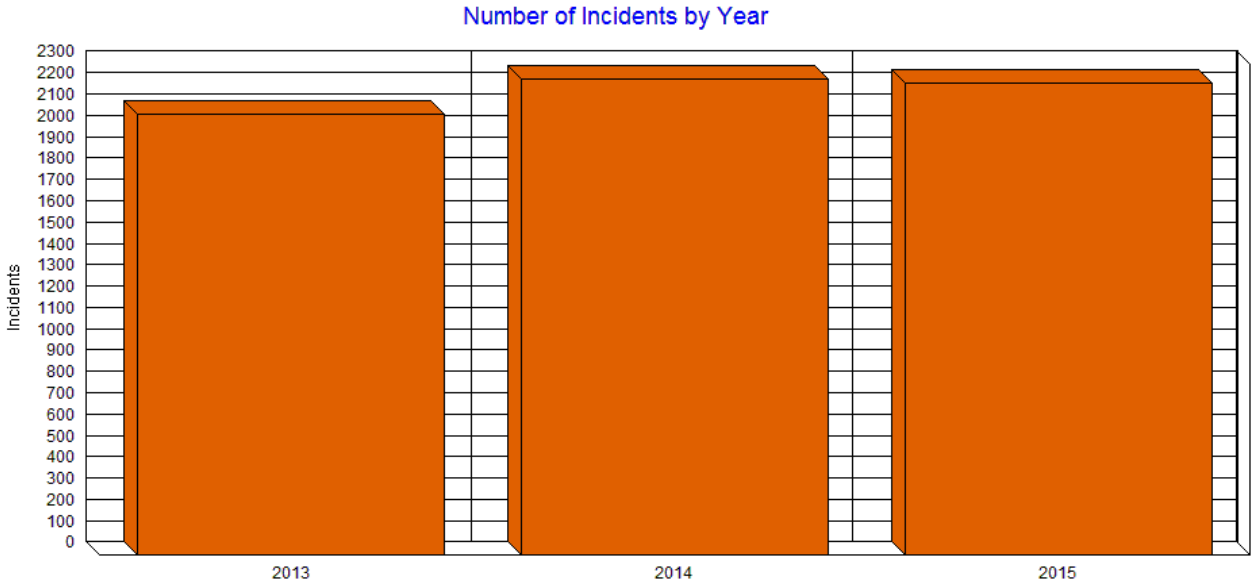
During this same period, there were 3,134 apparatus responses. This means there was an average of 1.41 apparatus responses per incident.

5.2.1 Breakdown of Incident Demand over Time

The Mill Valley Fire Department experienced a slight growth in incidents from 2013 to 2014, but a very slight decrease from 2014 to 2015.

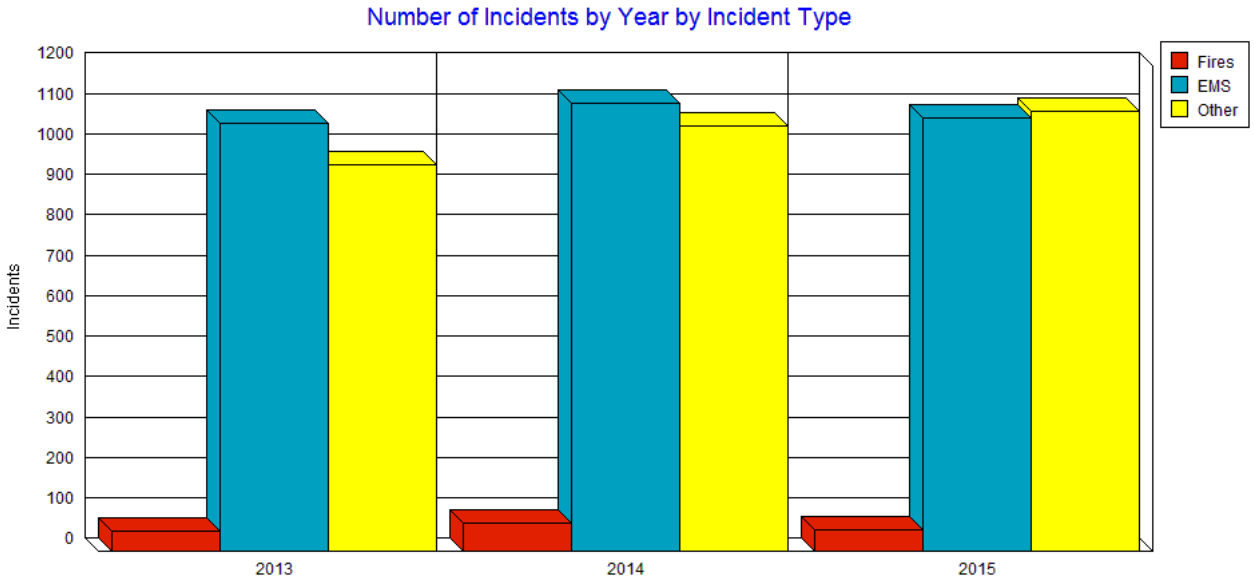
[4] 2016 Dispatch data was not completely available due to a system replacement at Marin County Communications.

Figure 5—Number of Incidents by Year



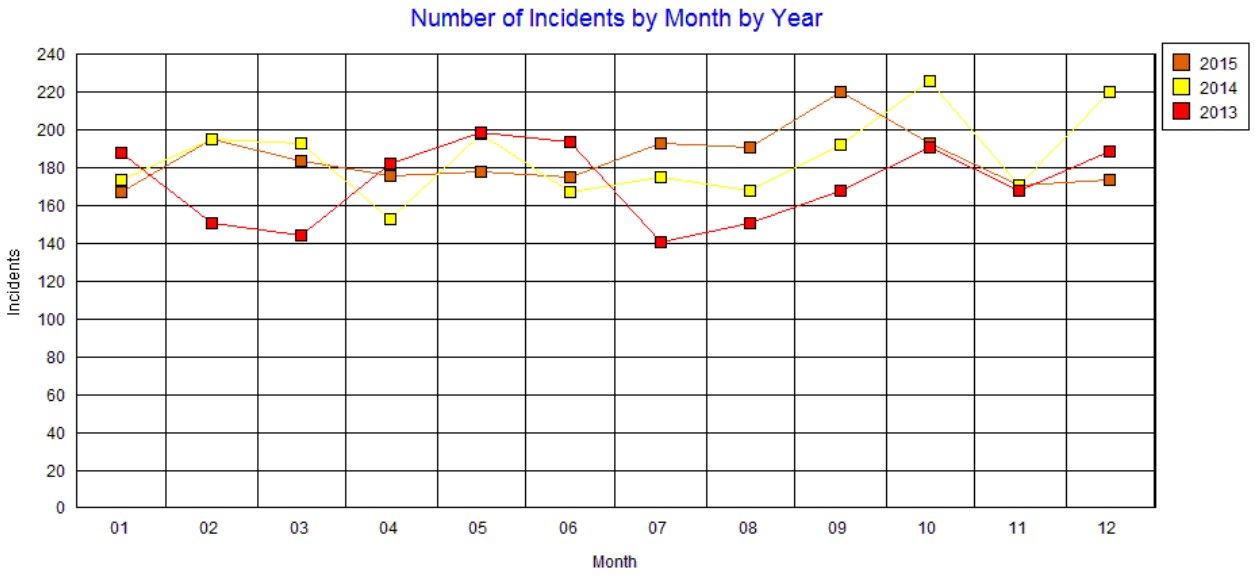
The following graph illustrates the number of incidents by incident type. Notice the number of EMS incidents rose in 2014 and dropped off in 2015. The number of fires also peaked in 2014.

Figure 6—Number of Incidents by Year by Incident Type



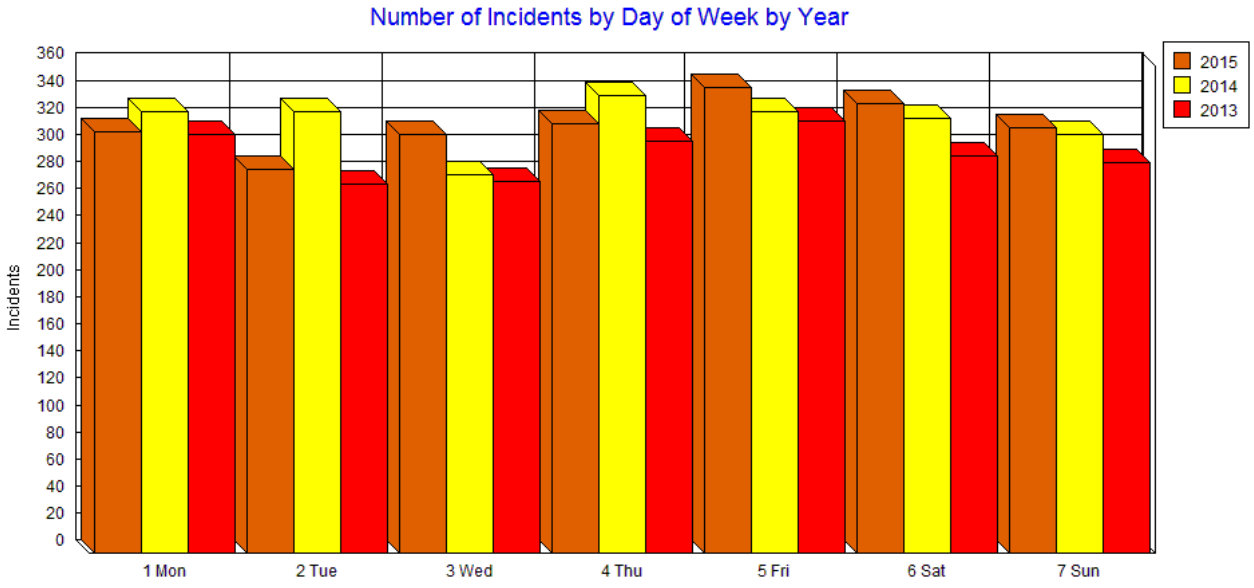
The number of incidents by month modulates year-to-year with peak activity occurring in the fall and early winter.

Figure 7—Number of Incidents by Month by Year



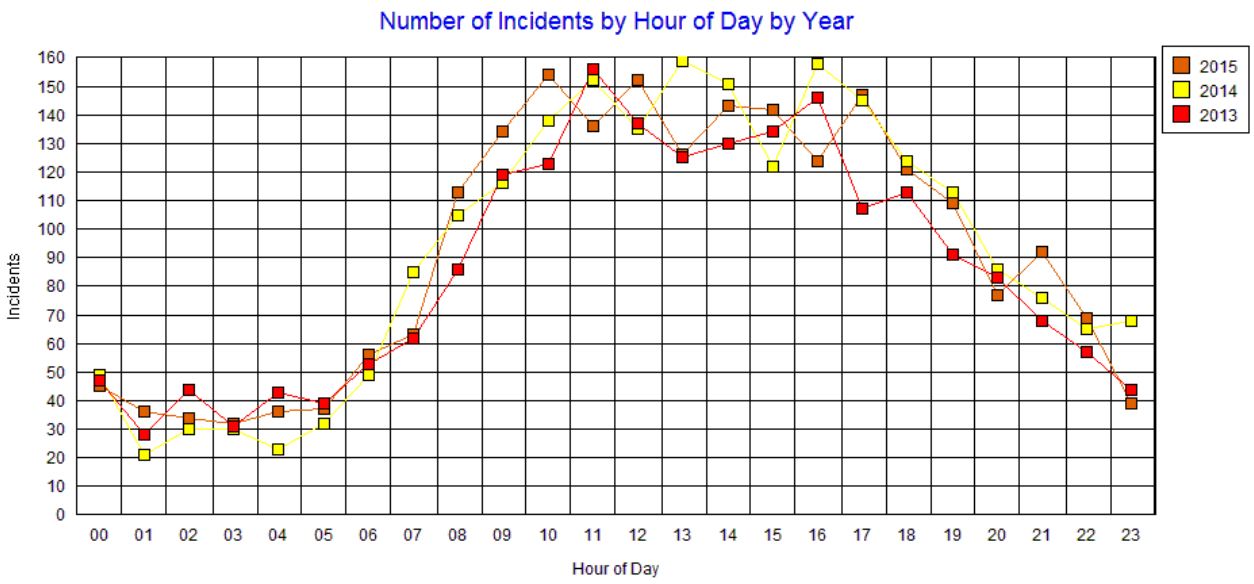
When broken down by day of week, incident activity tends to peak on Thursday and Friday.

Figure 8—Number of Incidents by Day of Week by Year



The following chart shows the breakdown of incidents by hour of the day by year. Activity is consistent by hour of day with the exception of volatility in the afternoon and early evening hours.

Figure 9—Number of Incidents by Hour of Day by Year



Finding #3:	The City's time-of-day, day-of-week, and month-of-year calls for service demands are fairly consistent. This means the City needs to operate a fairly consistent 24/7/365 response system.

5.2.2 Breakdown of Incident Demand by Type

The following table shows the activity rankings of incidents by incident type from 2013 to 2015. Notice the strong ranking for EMS incidents and incidents that are cancelled before the apparatus reaches the scene. Building fires ranked 20th place by volume. There were 10 building fires in 2015.

Table 12—Incident by Type

Incident Type	2013	2014	2015	Total
321 EMS call, excluding vehicle accident with injury	916	877	813	2,606
611 Dispatched & canceled en route	275	270	269	814
500 Service Call, other	97	151	148	396
300 Rescue, emergency medical call (EMS) call, other	21	121	149	291
554 Assist invalid	110	42	85	237
600 Good intent call, other	33	72	102	207
700 False alarm or false call, other	38	57	81	176
322 Vehicle accident with injuries	71	60	42	173
510 Person in distress, other	36	76	41	153
520 Water problem, other	21	43	36	100
622 No incident found on arrival of incident address	47	20	28	95
553 Public service	23	18	27	68
324 Motor vehicle accident no injuries	23	20	25	68
651 Smoke scare, odor of smoke	16	21	27	64
745 Alarm system sounded, no fire - unintentional	30	13	10	53
571 Cover assignment, standby, move up	25	8	12	45
550 Public service assistance, other	11	25	9	45
444 Power line down	17	14	14	45
412 Gas leak (natural gas or LPG)	12	13	19	44
111 Building fire	16	18	10	44
400 Hazardous condition, other	10	15	14	39
511 Lock-out	14	14	10	38
522 Water or steam leak	11	14	12	37
320 Emergency Medical Service, other	14	8	14	36
743 Smoke detector activation, no fire - unintentional	7	9	18	34
733 Smoke detector activation due to malfunction	3	14	16	33
531 Smoke or odor removal	10	7	14	31
735 Alarm system sounded due to malfunction	13	11	5	29
740 Unintentional transmission of alarm, other	10	10	8	28
100 Fire, other	4	12	9	25
440 Electrical wiring/equipment problem, other	7	6	10	23
812 Flood assessment		21	1	22

Incident Type	2013	2014	2015	Total
113 Cooking fire, confined to container	6	10	6	22
730 System malfunction, other	3	10	5	18
323 Motor vehicle/pedestrian accident (MV Ped)	5	9	3	17
800 Severe weather or natural disaster, other	4	6	6	16
551 Assist police or other governmental agency	8	5	3	16
445 Arcing, shorted electrical equipment	7	6	3	16
311 Medical assist, assist EMS crew	3	3	8	14
141 Forest, woods or wildland fire	3	4	6	13
653 Barbecue, tar kettle	4	3	5	12
131 Passenger vehicle fire	2	6	4	12

5.2.3 Simultaneous Analysis

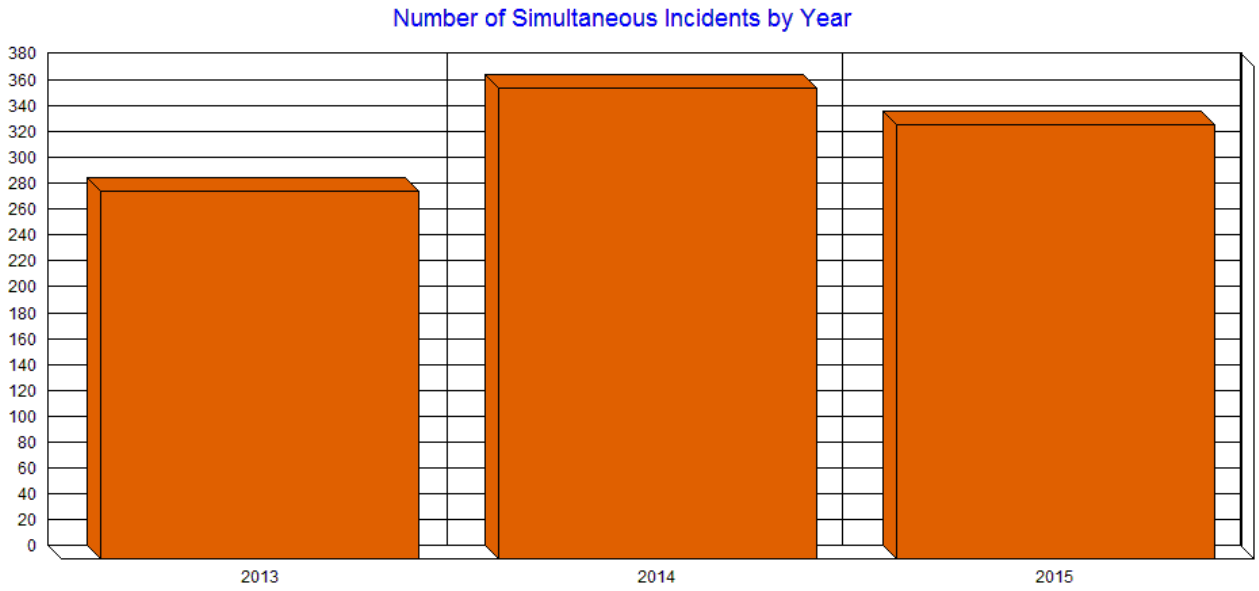
Simultaneous incidents are incidents that begin when other incidents are already underway. Over the three-year study period, 15.16 percent of incidents occurred while one or more other incidents were underway. The following table shows the percentage of simultaneous incidents broken-down by the number of simultaneous incidents.

Table 13—Simultaneous Incident Occurrences

Simultaneous Incidents	Percentage of Occurrences
1 or more simultaneous incidents	15.16%
2 or more simultaneous incidents	1.08%

The following graph shows that the number of simultaneous incidents peaked in 2014 and dropped in 2015.

Figure 10—Number of Simultaneous Incidents by Year



5.2.4 Unit-Hour Utilization

The utilization percentage for apparatus is calculated by two primary factors: the number of responses and duration of responses. The result is the percentage of each hour, over a year's time that each unit is assigned on emergency incidents. The following table is a unit-hour utilization (UHU) summary for each City engine; the busiest engine is listed first.

Table 14—City Engine Unit-Hour Utilization in 2015

Hour	E7	E6
0:00	2.14%	1.23%
1:00	1.62%	2.07%
2:00	1.31%	0.75%
3:00	1.84%	0.74%
4:00	1.73%	1.49%
5:00	1.88%	1.72%
6:00	2.31%	1.97%
7:00	3.15%	2.03%
8:00	4.81%	3.18%
9:00	5.15%	3.07%
10:00	6.64%	3.94%
11:00	6.19%	3.89%
12:00	5.52%	4.16%
13:00	4.56%	4.61%
14:00	6.31%	4.48%
15:00	4.40%	2.91%
16:00	4.28%	2.41%
17:00	5.28%	5.13%
18:00	4.12%	3.31%
19:00	3.88%	3.71%
20:00	2.77%	2.51%
21:00	3.91%	2.42%
22:00	3.47%	2.85%
23:00	1.23%	1.14%
Overall	**3.69%**	**2.74%**
Runs	**999**	**656**

The following table illustrates the UHU for the paramedic ambulance responses for 2015.

Table 15—City Medic Company Unit-Hour Utilization in 2015

Hour	M6
0:00	5.38%
1:00	3.58%
2:00	3.19%
3:00	4.74%
4:00	5.91%
5:00	4.39%
6:00	7.12%
7:00	6.38%
8:00	13.37%
9:00	12.73%
10:00	19.43%
11:00	16.69%
12:00	13.17%
13:00	10.97%
14:00	15.66%
15:00	12.13%
16:00	8.74%
17:00	16.58%
18:00	13.65%
19:00	9.42%
20:00	6.77%
21:00	8.33%
22:00	7.09%
23:00	2.50%
Overall	**9.50%**
Runs	**835**

What should be the maximum utilization percentage on a firefighting unit? During the 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 UHU per hour should not exceed 30 percent. Beyond that, the most important element to suffer will be training hours.

For a dedicated unit, such as an ambulance or low acuity squad working less than a 24-hour shift, then UHU can rise to 40–50 percent at a maximum. At that UHU level, peak-hour medic crews must then have additional duty days for training only, and not responding to incidents, to meet their annual continuing education and training hours requirements.

In the City's case, the modest incident volume per hour is not yet taxing the units to the point of needing another unit *solely* for peak-hour workload. The units have the capacity for more incident load per hour *if there are not simultaneous* incidents. Even then, at this time, the actual rate of simultaneous occurrences at 15.16 percent is still relatively low as compared to other suburban areas.

5.3 Response Time Analysis

Once the types of incidents are quantified, incident analysis shifts to the time required to respond to those incidents. Fractile breakdowns show the percentage (and count the number) of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments.

5.3.1 Citywide Response Time Performance

A resident or visitor of the City measures the speed of fire department response from the time assistance is requested until the assistance arrives. This measurement is called "Call to First Apparatus Arrival" (or "Call to Arrival"). Police and sheriff's departments, under California state law, act as a Public Safety Answering Point (PSAP) for 9-1-1 calls. All 9-1-1 calls for fire service in the City are received and dispatched under contract by the County Sheriff's Communications Center.

Based on national recommendations, Citygate's response time test goal is for the 90 percent Call to Arrival to be 7:30 minutes. This is comprised of three component parts:

Call Processing Time: 1:30 minute (receive, determine need, alert crew)

Turnout Time: 2:00 minutes (notify, don required protective gear, get moving)

Travel Time: 4:00 minutes (travel time)

The following table shows the breakdown of fire dispatch calls received to first apparatus arrival for the overall City and by station area by year *for fire and emergency medical* incidents.

Table 16—Call to Arrival Response Time

Station	2013	2014	2015
Department-Wide	08:04	08:20	08:39
Station 6	09:00	10:00	08:44
Station 7	08:00	07:51	08:27

While all the call to arrival times to 90 percent of the emergent incidents in Table 16 are past a Citygate-recommended 7:30 minutes. The next set of tables will present the individual segments of total response time—dispatch time, crew turnout time, and travel time—to understand which measure(s) are responsible for the total time being longer than 7:30 minutes.

5.3.2 Call Processing Time

Call processing time: This measure is the time it takes to answer the 9-1-1 call received at the Marin County Sheriff's Office Communications Center to when the notification is sent to the City to determine the emergency, enter information into the computer-aided-dispatch system, and alert the closest crew. NFPA 1710's advice is for 90 percent of the calls to be dispatched in 90 seconds. Where language barriers exist, or medical self-help instructions are needed, these calls should be dispatched within 120 seconds. The performance of the Marin County Sheriff's Office Communications Center is shown in the following table.

Table 17—Call Processing Time

Station	2013	2014	2015
Department-Wide	02:06	02:10	02:19
Station 6	01:27	02:00	02:26
Station 7	02:19	02:14	02:14

Finding #4: The City is not in control of the Marin County Sheriff's Office Communications Center call processing performance time; however, for time-sensitive fire and EMS events, the Center's performance does not meet best practices and the time lost in call processing cannot be made up by driving faster.

5.3.3 Turnout Time

Turnout time: This measure is the time it takes for all crews to hear the dispatch message, don safety clothing, and begin moving the assigned apparatus.

Table 18—Turnout Time

Station	2013	2014	2015
Department-Wide	02:24	02:37	02:35
Station 6	02:47	02:49	02:38
Station 7	02:19	02:26	02:33

While the NFPA recommends 60–80 seconds for turnout time, it has long been recognized as a standard rarely met in practical experience. Crews must not just hear the dispatch message; they must also don the personal protective clothing mandated by OSHA for the type of emergency. Citygate has long recommended that, due to this and the floor plan design of some stations, agencies can reasonably achieve a 2:00-minute crew turnout time to 90 percent of the emergency incidents.

Finding #5: The Department's turnout times need small improvement to fall consistently below 2:00 minutes.

5.3.4 Travel Time

Travel time – Travel time is defined as the time between when the Communications Center is notified, either verbally or electronically, that the unit is en route to the call and when it arrives at the address or location street front (not the patient's side).

Table 19—Travel Time

Station	2013	2014	2015
Department-Wide	06:04	05:18	05:34
Station 6	07:17	07:03	05:46
Station 7	05:09	04:52	05:18

NFPA Standard 1710 recommends a 4:00-minute travel time goal in urban and suburban areas. As seen in Table 19, all travel times are higher than this goal. There are several reasons for slower travel time, not all of which can be cost-effectively improved. Traffic congestion variation, non-grid road network areas, open spaces, and limited cross access boulevards all affect travel time.

Finding #6:	The edges and upper slope areas of the City are very difficult to serve within a best-practice urban travel time of 4:00 minutes due to road design and topography, especially in Fire Station 6's first-due area which is very spread out and not easily accessible. As such, it would not be possible to lower overall travel time substantially without increasing the number of fire stations, which is clearly not a cost-effective solution given the modest quantity of incidents annually.

5.3.5 First Alarm (Effective Response Force) Performance to Building Fires

First Alarm or Effective Response Force Performance to Building Fires: The City responds to building fires with three engines (one of which is via mutual aid), one paramedic ambulance, one rescue squad (mutual aid), one ladder truck (mutual aid), and one shared Battalion Chief.

This response force is needed to provide enough units when fires are very serious at the time of the 9-1-1 call. However, in a given year, there are few building fires in each station area where the entire force, including mutual aid units, is needed at the incident location. Therefore, the following multiple-unit response time sample size is very small.

The best representation for the First Alarm or Effective Response Force units is **travel** time across the City's street network. The NFPA 1710 recommendation is for all units to arrive within 8:00 minutes travel time.

Data for the analysis period indicated that only two responses in 2013 met the total number of units needed for this response requirement and that data would not be a complete representation of the response times.

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SECTION 6—SOC EVALUATION AND DEPLOYMENT RECOMMENDATION

6.1 OVERALL EVALUATION

SOC ELEMENT 8 OF 8
OVERALL EVALUATION

The City serves a diverse, spread out population pattern that, in some locations, is geographically challenged with open spaces and limited cross access boulevards, which limits quick response times. Population drives service demand, and development brings population. The City has historically funded the best fire services it can afford and, even post-recession, continues to do so. The incident volumes in the City are modest, and reflective of the strong socioeconomics of the area.

For the foreseeable future, the City will need both a first-due firefighting unit and Effective Response Force (First Alarm) coverage in all parts of the populated areas of the City, consistent with best practices, if the risk of fire is to be limited to only part of the inside of an affected building or wildland fires are to be stopped when small. While residential fire sprinklers are now included in the state fire codes, it will be decades before the existing housing stock will be upgraded or replaced, even as these codes are applied to all new construction.

While the volume of and response times to EMS incidents consume much of the City's attention, all communities need a stand-by and readily available firefighting force for when fires break out. If the City wants to continue providing the following elements, the City can slightly increase its deployment plan by fielding an additional firefighter per day at Station 7, bringing the total to three, and work with SMEMPS to limit the use of Medic 6 to the core Mill Valley area to enable the two firefighters on the ambulance at Station 6 to be in the community more often. These changes would provide seven firefighters per day in the City. Citygate suggests these changes so that the City provides, to the degree possible, an equitable response to all similar risk neighborhoods to:

- Provide for depth of response when multiple incidents occur.
- Provide for a concentration of response forces for high-risk properties.
- Lessen the potential that the ambulance staffing may not be available for a fire.

For its current risks and likely desired outcomes, the City does have a sufficient quantity of fire engines spaced across the City's most populated areas. Given the low number of building fires annually, the City can continue to request mutual aid when needed.

While the City does not separately staff an aerial ladder truck, it does have a mutual aid ladder truck at Southern Marin Fire Protection District Station 4, which is cross-staffed by that station's engine crew.

The first deployment step for the City in the near term is to adopt updated and complete performance measures from which to set forth service outcome expectations and regularly monitor Fire Department performance.

6.1.1 Deployment Recommendation

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

Recommendation #1:	As funds permit, the City could consider adding a third firefighter per day to Engine 7 and work with the ambulance JPA to limit the use of Medic 6 to the Mill Valley area of the JPA. Doing so will strengthen the overall capabilities of the fire department and will provide more personnel from inside the City limits to more readily slow the escalation of emergencies threatening life and catastrophic building fire, thus improving outcomes.
Recommendation #2:	Monitor the out-of-City time on Medic 6 over the next several years. If the volume and distance of transports significantly decrease the time Medic 6 is available for City firefighting and specialty response, then add a third firefighter per day to Engine 6.
Recommendation #3:	**Adopt Deployment Measures Policies:** The City should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the Fire Department. The measures of time should be designed to save patients where medically possible and to keep fires from becoming greater alarm fires. With this is mind, Citygate recommends the following measures:

3.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within 8:30 minutes, 90 percent of the time from the receipt of the call in the Sheriff's Office Communications Center. This equates to a 90-second dispatch time, a 2:00-minute company turnout time, and a 5:00-minute drive time in the most populated areas.

3.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to contain wildland fires to a quarter acre or less when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of a *minimum* of three engines (one of which is via mutual aid), one ladder truck, one paramedic ambulance, one rescue unit, and one Battalion Chief totaling 15 personnel (based on unit staffing) should arrive within 11:30 minutes from the time of 9-1-1 call receipt in fire dispatch, 90 percent of the time. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute drive time for multiple units in the most populated areas.

3.3 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 City response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. It can achieve this with a travel time for the first company capable of investigating a hazmat release at the operations level within 8:00 minutes travel time or less, 90 percent of the time. After size-up and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multiple-agency hazardous materials response partnership.

3.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first company in for size-up of the rescue within 8:00 minutes travel time or less, 90 percent of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 11:30 minutes, 90 percent of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

Recommendation #4: The Department needs to focus on slightly lowering fire crew turnout times.

Recommendation #5: The area's Fire Chiefs should meet with County Communications staff to determine how to reduce the call processing time to the California requirements of 90 seconds for 90 percent of the incidents when there is not a language barrier with the caller.

SECTION 7—SUMMARY LEVEL HEADQUARTERS AND SUPPORT FUNCTIONS STAFFING ADEQUACY REVIEW

7.1 INTRODUCTION

Citygate conducted a high-level review of key City headquarters programs and staffing necessary to support the field crew deployment in the fire stations. It is considered a good practice to corroborate that the headquarters and support functions are in alignment with the response operations. This ensures that not only are responses timely, but that the personnel are well trained and properly supported and that enough prevention activities have been performed to reduce calls for service.

7.2 MANAGEMENT ORGANIZATION

NFPA 1201[5] states, in part, "the [department] shall have a leader and organizational structure that facilitates efficient and effective management of its resources to carry out its mandate as required [in its mission statement]."

A fire department needs a management organization that is properly sized, adequately trained, and appropriately supported. There are increasing regulations to comply with in operating fire services, and the proper hiring, training, and supervision of response employees requires an equally serious commitment to leadership and general management functions.

The City, in conjunction with the Southern Marin Fire Protection District, is exploring the option for joint management of both organizations. Currently, both jurisdictions are using a shared Battalion Chief for on-scene command, training, and EMS.

[5] NFPA 1201 – Standard for Providing Emergency Services to the Public (2015 Edition)

Figure 11—City Management Organization

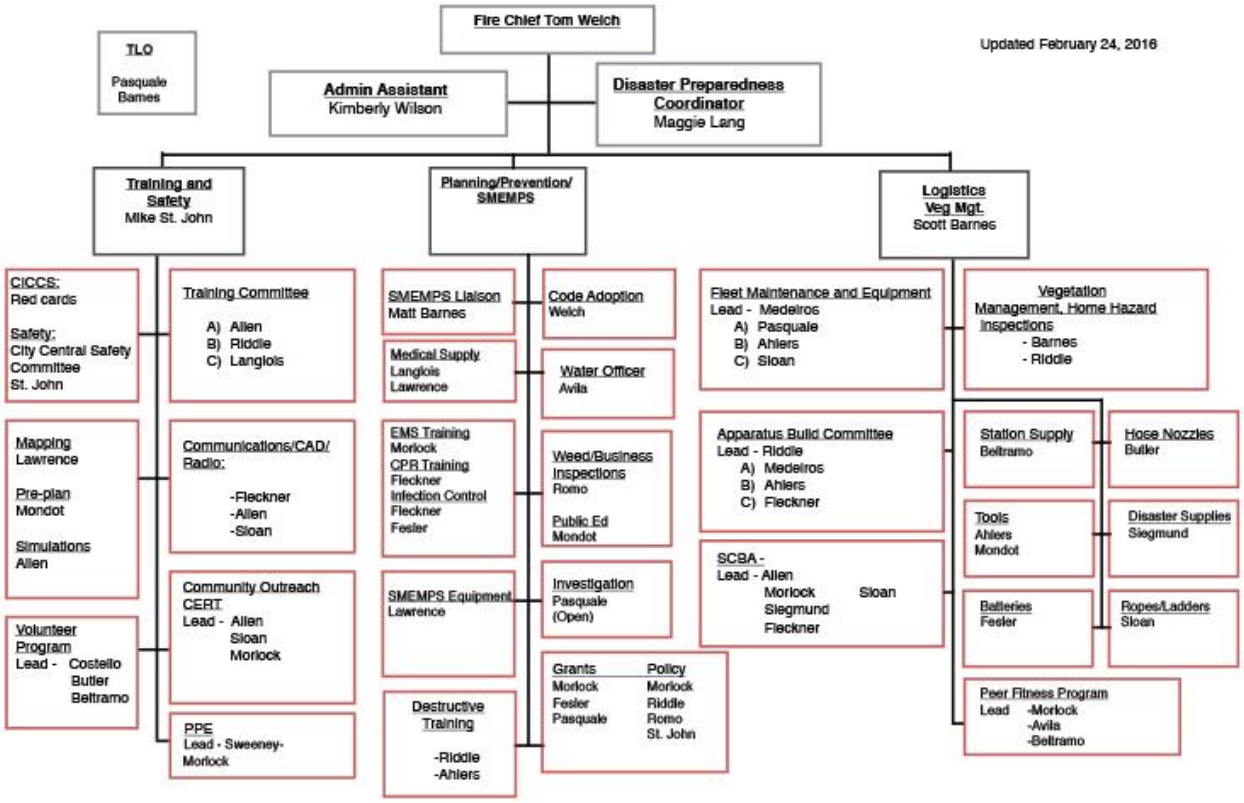

Figure 11 depicts the minimal command staff management structure appropriate to meet the operational and support needs of a two-station City fire department, including an effective chain of command and manageable span of control.

While the organization is currently able to meet mandated responsibilities, it lacks sufficient capacity and depth to conduct organizational performance benchmarking / ongoing evaluation, long-term strategic planning, risk analysis, and more effective community engagement. Many daily and periodic support service needs are handled by the on-duty personnel as program specialists under the overall guidance of the Fire Chief; however, many of these programs are completed part-time and are heavily regulated by Federal and State safety laws.

While the headquarters team is the smallest possible, it cannot complete all its responsibilities effectively, including developing future chief officers. The City has no clear second-in-command in the Fire Chief's absence. Stated this way, the team only functions when everyone is available and able to work long hours to make ends meet.

The City and the Southern Marin Fire Protection District have been exploring methods for shared resources at the administration level. The City and District have developed a shared resources

agreement for on-scene command and control, as well as training. Both agencies are pursuing further management sharing options at this time.

7.3 TRAINING DIVISION

The training program for the Department is led by a shared Battalion Chief with the Southern Marin Fire Protection District. The City and District have an annual training plan that tracks the subject hours, by employee, annually for mandated classes and certifications for both organizations.

7.4 EMERGENCY MEDICAL SERVICES PROGRAM

The City operates a paramedic transport program in coordination with the Southern Marin Emergency Medical Paramedic Services (SMEMPS). One shared Battalion Chief oversees emergency medical training, patient care quality assurance, and certification records. Assistance is received from line personnel in handling all the functions of the City's EMS plan within State and County EMS Agency regulations.

While the goal is always to deliver the best patient care, in many instances it is not up to the City to determine the method for providing care. Unlike other aspects of firefighting, EMS care is heavily regulated with mandated oversight requirements. All these requirements, while medically necessary, add to the City's overhead cost to provide EMS. The City has no choice but to follow laws and regulations related to training, clinical oversight, data for tracking trends in care and paramedic skills, shelf-life of medical supplies, biomedical equipment certification, controlled drug tracking, etc.

The concept of providing focus and emphasis on continuous quality improvement (CQI) in patient care delivery became a top priority in EMS in the early 1990s. EMS providers and EMS oversight agencies across the United States developed systems that guaranteed objective feedback about performance both internally (to support CQI efforts) and externally (to demonstrate accountability to partners and oversight agencies).

An effective CQI program must be consistent and systematic, based on evidence, and free of any perceived or real punitive involvement. It will include a fact-based decision-making process that involves industry-accepted performance measures and comparison of treatment to standard protocols for patient conditions. It will foster learning and knowledge sharing and will motivate care providers to be the best possible clinicians with every patient contact.

Clinical training, oversight, and command staff in the EMS program supports the field personnel. In turn, these technical positions must have office support professionals to *support them.* Functions such as recordkeeping, notifications, filing, internal communications, budgeting, purchase

requests, telephone inquiries, scheduling, and a multitude of other assignments must be provided by the EMS oversight team.

The EMS Battalion Chief also directs EMS education within the City via the overall Training Division team. Each EMT and paramedic is annually trained regarding policy and protocol updates/changes, infrequently used skills, CPR skills, etc.

7.5 Fire Apparatus and Equipment

Fire apparatus need to be properly maintained to ensure response readiness, safe arrival, effective operation, and return to readiness for the next assignment. Considering that a fire apparatus driver is entrusted to drive a vehicle weighing up to 17 tons or more at speeds up to 65 miles per hour, often against prevailing traffic at controlled intersections, officials should ensure that the maintenance, as well as the training program, meets all applicable legal and best-practice standards.

The fire service generally groups fire apparatus into two categories: (1) engine companies, which are primarily responsible for pumping and delivering water and performing basic firefighting functions, including search and rescue; and (2) truck companies, which are primarily responsible for forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work. Other types of apparatus include water tenders, which are primarily responsible for carrying large quantities of water; squads or rescue companies, which carry a variety of rescue and emergency medical equipment; medic units or ambulances; command vehicles; and other auxiliary or specialized response apparatus. To be effective, fire apparatus must be properly designed and well equipped with the proper hose, appliances, tools, ladders, and other equipment necessary to perform the complex work of firefighting, rescue, emergency medical, and public service tasks.

Two basic NFPA standards apply to fire apparatus:

- NFPA 1901 *Standard for Automotive Fire Apparatus* defines the requirements for new fire apparatus designed to be used under emergency conditions to transport personnel and equipment and to support the suppression of fire and mitigation of other hazardous situations.
- NFPA 1906 *Standard for Wildland Fire Apparatus* defines the requirements for new fire apparatus designed primarily to support wildland fire suppression operations.

In addition to these standards having application for the development of purchase specifications, there are additional performance standards useful for evaluating in-service apparatus:

- NFPA 1911 *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.* This standard defines the minimum requirements for establishing an inspection, maintenance, and testing program for in-service fire apparatus. This standard also includes guidelines for fire apparatus refurbishment and retirement. It identifies the systems and items on a fire apparatus that are to be inspected and maintained, the frequency of such inspections and maintenance, and the requirements and procedures for conducting performance tests on components. It also provides sample forms for collecting inspection and test data.

There should also be a system of testing, maintenance, and repair, which ensures a high state of readiness of apparatus and critical equipment. In 2000, the NFPA issued NFPA 1915 *Standard for Fire Apparatus Preventative Maintenance Program*, which defines the minimum requirements for a fire department preventative maintenance program. Under this standard, the personnel who conduct the preventative maintenance program should meet NFPA 1071 *Standard for Emergency Vehicle Technician Professional Qualifications*. This standard defines the minimum job requirements an emergency vehicle technician should possess. These include the ability to diagnose, maintain, repair, and test the functions of the apparatus.

The Federal Department of Transportation also has motor vehicle safety standards that are applicable to fire apparatus. The City's fire apparatus and vehicle fleet inventory is summarized in Table 20.

Table 20—City Fire Apparatus and Vehicles

Radio Number	Fire Unit Equipment Number	Chassis Make	Build-up Make	In-Service Year	Capacity	NIMS Type	Status	Current Replacement Cost
E6	N/A	Dash	Pierce	2007	1250	1	Front	650,000
E7	N/A	Spartan	Rosenbauer	2013	1250	1	Front	650,000
E8	4235	Saber	Pierce	2001	1250	1	Reserve	650,000
E607	N/A	International	West Mark	1998	500	3	Front	450,000
M6	N/A	Ford E-350	Horton	2014	N/A	N/A	Front	170,000

7.5.1 Apparatus/Vehicle Replacement Program

The City's Vehicle Replacement Plan includes a fire apparatus/vehicle replacement schedule as summarized in Table 21.

Table 21—Apparatus/Vehicle Replacement Schedule

Unit Number	Shop Number	Chassis Make	Make	Year	Pump	Status	Miles	Replacement Cost
E6	4237	Dash	Pierce	2007	1250	Front	50,570	650,000
E7	4244	Spartan	Rosenbauer	2013	1250	Front	13,887	650,000
E8	4235	Saber	Pierce	2001	1250	Reserve	79,299	650,000
E607	4234	International	West Mark	1998	500	Front	49,280	450,000
M6		Ford E-350	Horton	2014	N/A	Front	23,970	170,000
U6	4232	Ford	F-150	1998	N/A	Utility	80,745	45,000
U7/B8	4236	Ford	F-150	2008	N/A	Front	30,822	50,000

Finding #7: Both Mill Valley and the Southern Marin Fire Protection District have a shared service agreement for a Battalion Chief and training officer, plus a shared EMS officer with the ambulance JPA. Both agencies are pursuing additional shared services as they continue to work closely.

Finding #8: The City has a plan for the replacement of capital fire apparatus and support vehicles that is funded in the City's General Fund Budget for Vehicle Replacement.

Recommendation #6: Mill Valley should continue to explore shared services with the Southern Marin Fire Protection District and other agencies to enhance operations and service delivery.

SECTION 8—NEXT STEPS

8.1 NEXT STEPS

The purpose of this assessment is to compare the City's current performance against the local risks to be protected and to compare against nationally recognized best practices. This analysis of performance forms the basis from which to make recommendations for changes, if any, in fire station locations, equipment types, staffing, and headquarters programs.

As one step, the City should adopt response time goals that are based on best practices and provide accountability for City personnel to meet those standards. The goals identified in Recommendation #3 meet national best practices. Measurement and planning will be necessary for the City to meet these goals. Citygate recommends that the City's next steps be to work through the issues identified in this study over the following time lines:

8.1.1 Short-Term Steps

- Absorb the policy recommendations of this fire services study and adopt updated City performance measures to drive the deployment of firefighting and emergency medical resources.
- Identify funding and timing for a third firefighter per day assigned to Engine 7.
- Work with the ambulance JPA to limit the response area of Medic 6 to the Mill Valley area.

8.1.2 Ongoing Steps

- Continue to investigate and understand the shared staffing and joint operations options with the Southern Marin Fire Protection District and others as available.

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APPENDIX A—RISK ASSESSMENT DETAIL

The following sections will describe the analysis process and risk factors used to determine overall risk in more detail, beginning with a discussion of growth and development in the City's service area.

A.1 HAZARD IDENTIFICATION

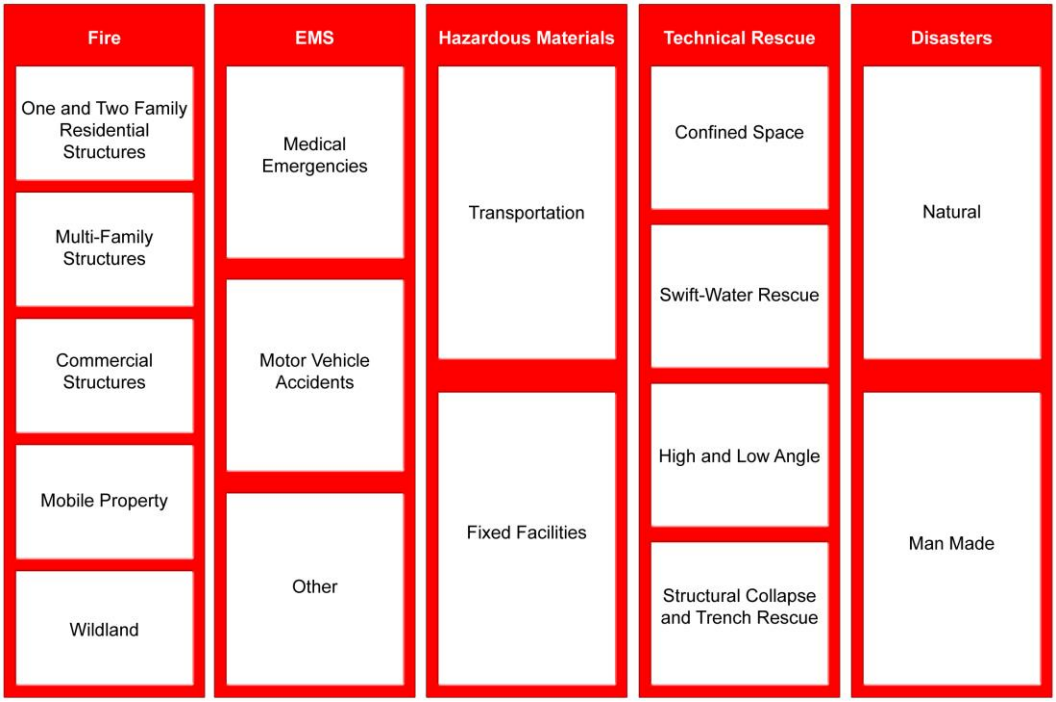
Citygate utilizes prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study.

The Marin County Local Hazard Mitigation Plan (LHMP) identifies five natural hazards relating to services provided by the City, including earthquake/liquefaction, wildfire, flood, tsunami, and landslide. Although the City has no legal authority or responsibility to mitigate earthquake, liquefaction, flood, tsunami, or landslide risk other than for City-owned facilities, it does provide services related to these hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

In this report Citygate references and uses previous data from the Southern Marin Fire Protection District report of 2016 which also included a review of Mill Valley incident statistics. In 2012, the Marin County Department of Emergency Management published its update to the Multi-Jurisdictional Local Hazard Mitigation Plan (LHMP) for the County. The City of Mill Valley has adopted the County's plan.

The CFAI groups hazards into fire and non-fire categories as shown in Figure 12. 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 12—CFAI Hazard Categories



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

Following review and evaluation of the hazards identified in the City's and Marin County's 2012 LHMP, Citygate evaluated the following five[6] hazards for this risk assessment:

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

A.2 BUILDINGS

Risk assessment identifies four risk categories that relate to building occupancy as follows:

[6] Natural Hazards review was completed in the City and County's LHMP and is thus not detailed in this report.

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.

A.3 Service Capacity

Service capacity refers to the City'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.

Emergency Service Capacity

The City's service capacity for initial response to all risks consists of a minimum daily on-duty response force of six personnel, with apparatus from two fire stations: two engine companies staffed with two firefighters each and one paramedic ambulance staffed with two firefighters. All calls for medical assistance receive the closest fire engine and the ambulance with two personnel for a total of four.

A.4 Probability of Occurrence

Probability of occurrence refers to the probability of a future hazard occurrence during a specific period. Because the CFAI accreditation process requires annual review of an agency's risk assessment and baseline performance measures, Citygate recommends using the 12 months prior to an SOC study as an appropriate period for the probability of occurrence evaluation. Table 22 describes the five probability categories and related scoring used for this analysis.

Table 22—Probability of Occurrence

Score	Probability of Occurrence	Description	General Descriptors
0	Very Low	Improbable	Hazard occurrence is infeasible or improbable for this location
1	Low	Rare	Hazard could occur at this location under rare or unusual circumstance
2	Moderate	Infrequent	Hazard should occur infrequently at this location
3	High	Likely	Hazard likely to occur regularly at this location
4	Very High	Frequent	Hazard is expected to occur frequently at this location

A.5 IMPACT SEVERITY

Impact severity refers to the probable extent of hazard occurrence impacts on people, buildings, lifeline services, the environment, and community as a whole, as described in Table 23.

Table 23—Impact Severity

Score	Impact Severity	General Descriptors
1	Insignificant	No serious injuries or fatalities Few persons displaced for only a short duration No damage or inconsequential damage None or very minimal disruption to community No measurable environmental impacts Little or no financial loss
2	Minor	Few injuries; minor medical treatment only No fatalities 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 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	Extensive injuries; significant number of persons hospitalized Many fatalities 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	Large number of severe injuries and fatalities Local/regional hospitals 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.6 OVERALL RISK

Overall hazard risk is determined by multiplying the *probability of occurrence score* by the *impact severity score*. The resultant product determines the overall *risk ranking*, as described in Table 24.

Table 24—Overall Risk Ranking

Overall Risk Ranking	Overall Risk Score
Low	0–5
Moderate	6–11
High	12–15
Maximum	16–20

A.7 BUILDING FIRE RISK

One of the primary hazards in any community is a building fire. Citygate used available data from the City, the U.S. Census Bureau, and the Insurance Services Office (ISO) to assist in determining the City's building fire risk.

Buildings with Fire Sprinkler Systems

The City has 1,039[7] buildings protected by automatic fire sprinkler systems. This includes commercial buildings, residential occupancies, and business occupancies.

High Fire Flow Requirements

One of the factors used by 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 City of Mill Valley, the ISO database identifies 192 buildings, of which 73 have needed fire flow of 1,500–3,000 GPM, 13 buildings have a fire flow of 3,000–5,000 GPM, and no buildings need a fire flow higher than 5,000 GPM.

Fire flows at and above 2,000 GPM are significant amounts of firefighting water to deploy, and a major fire at any one of these buildings would require the total commitment of the City's on-duty force along with immediate mutual aid. Using a generally accepted figure of 50 GPM per firefighter on large building fires, a fire in a building requiring 2,000 GPM would require 40

[7] Information provided by the Fire Department

firefighters, which is more than not only the City's on-duty quantity of firefighters, but also the number of firefighters close by in the mutual aid system.

Table 25—Fire Flows of > 2000 GPM by Planning Zone

Planning Zone									Total
6A	6B	6C	6D	6E	7A	7B	7C	7D	
3	0	0	0	16	12	5	0	1	37

Historic Buildings

There are 27 historical buildings in the City of Mill Valley, dating from the late 1800s to mid-1960s. All five of them are listed in the National Register of Historic Places. The City has a very progressive preservation ordinance.

Building Fire Service Demand

For the three-year study period, the City experienced 44 building fire incidents, as summarized in Table 26. Data was collected and used from the Department's Records Management System (RMS) and regional dispatch system data where available.

Building Fire Service Capacity

The City's service capacity for a building risk consists of a minimum daily on-duty response force of six personnel plus a shared Battalion Chief with apparatus from two fire stations. In the City, the closest two Fire Department engines with two personnel each initially responds to the incident. This level of response provides a minimum of four firefighters to every building fire call for service.

Table 26—Building Fire Service Demand

Hazard	Year	Total
Building Fires	2013	16
	2014	18
	2015	10

Probability of Building Fire Occurrence

Table 27 scores the probability of future building fire occurrence based on building fire service demand history from Table 26 for 2013–2015 combined.

Table 27—Probability of Future Building Fire Occurrence Score

Hazard	Probability
Building Fire	3

Building Fire Impact Severity

Table 28 scores the City's probable building fire impact severity.

Table 28—Building Fire Impact Severity Score

Hazard	Severity
Building Fire	3

Overall Building Fire Risk

Table 29 identifies the City's overall building fire risk of a **Moderate** rating based on probability of occurrence from Table 27 and impact severity from Table 28.

Table 29—Overall Building Fire Risk

Hazard	Overall Risk
Building Fire	9

A.8 WILDLAND FIRE RISK

Fire Hazard Severity Zones

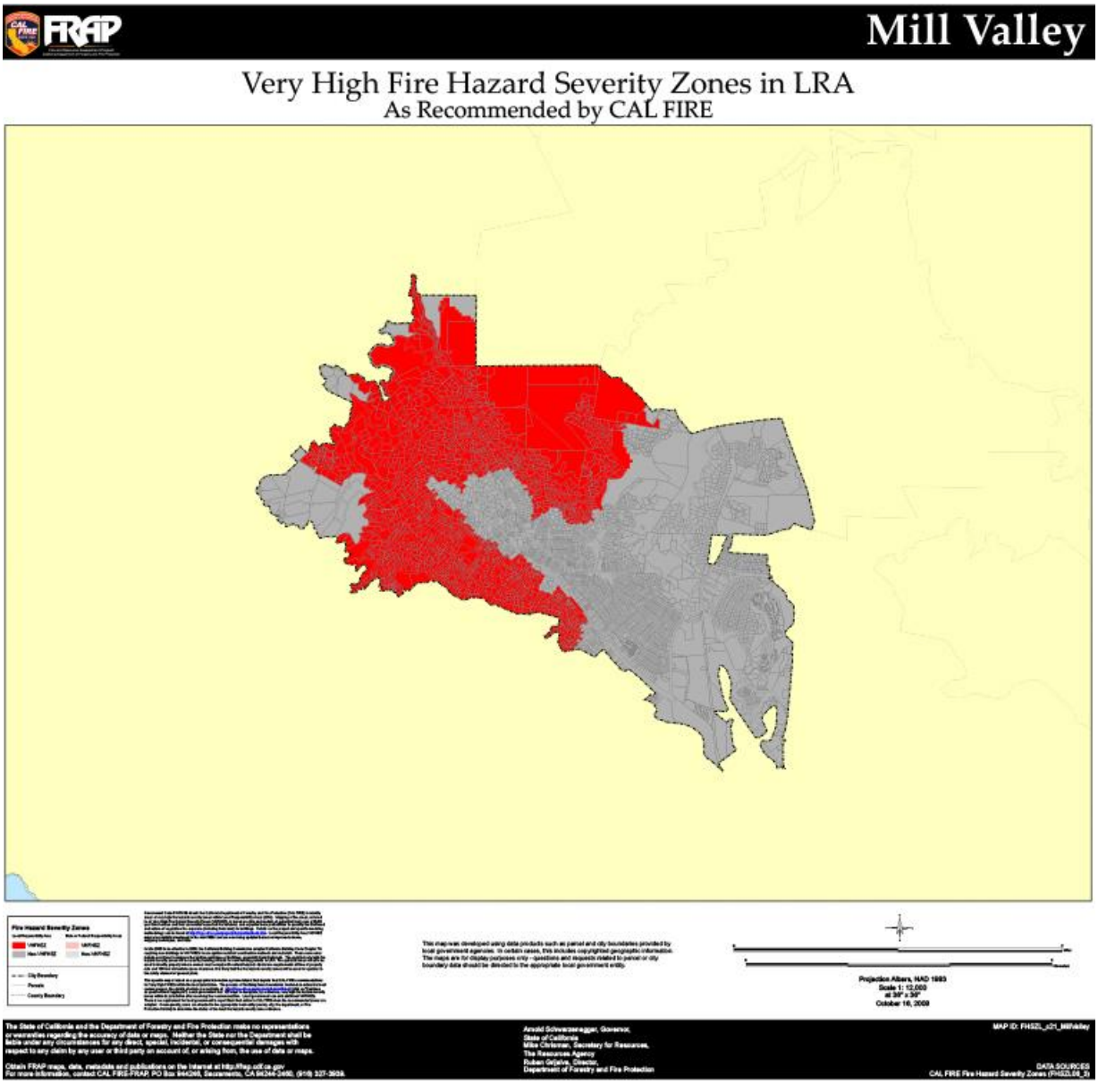
The California Department of Forestry and Fire Protection (CAL FIRE) designates *Moderate, High,* and *Very High* Wildland Fire Hazard Severity Zones (FHSZ) throughout the state based on analysis of multiple wildland fire hazard factors and modeling of potential wildland fire behavior for State Responsibility Areas (SRA) where CAL FIRE has fiscal responsibility for wildland fire protection. CAL FIRE also identifies recommended *Moderate, High,* and *Very High* FHSZs for Local Responsibility Areas (LRA) where a local jurisdiction bears the fiscal responsibility for wildland fire protection, including cities.

The City of Mill Valley falls under the LRA requirements for wildland fire suppression. CAL FIRE has identified the following areas of the City as having ***Very High*** wildland fire hazard severity risk, as shown in Figure 13.

Wildland Service Capacity

The City's service capacity for wildland risk consists of a minimum daily on-duty response force of six personnel and one shared Battalion Chief with apparatus from two fire stations. In the City, the closest Fire Department engine with two personnel initially responds to the incident. This level of response provides a minimum of two firefighters to every Wildland fire call for service.

Figure 13—Wildland Fire Severity Areas



Wildland Fire Service Demand

The City experienced 39 wildland fires from January 2013 through December 2015 as summarized in Table 30. According to Citygate's mapping, **all** responses occurred in the ***Very High*** fire danger areas.

Table 30—Wildland Fire Service Demand

Hazard	Year	Total
Wildland	2013	12
	2014	14
	2015	13

Probability of Occurrence

Table 31 scores the City's probability of future wildland fire occurrence over the next 12 months based on wildland fire service demand from Table 30.

Table 31—Wildland Fire Probability Score

Hazard	Probability
Wildland Fire	3

Wildland Fire Impact Severity

Table 32 scores the City's probable wildland fire impact severity based on GIS data and CAD/RMS information.

Table 32—Wildland Fire Impact Severity Score

Hazard	Severity
Wildland Fire	3

Overall Wildland Fire Risk

Table 33 summarizes the City's overall wildland fire risk of **Moderate**, based on probability of occurrence from Table 31and impact severity from Table 32.

Table 33—Overall Wildland Fire Risk

Hazard	Overall Risk
Wildland Fire	9

A.9 EMERGENCY MEDICAL SERVICES (EMS) RISK

Emergency Medical Service Capacity

The City's service capacity for EMS risk consists of a minimum daily on-duty response force of six personnel and one shared Battalion Chief with apparatus from two fire stations. In the City, all calls for medical assistance receive the closest Fire Department unit response, typically an ambulance with two personnel and/or the closest fire engine with two personnel. This level of response provides a minimum of two to four firefighters to every EMS-related call for service. All City response personnel are trained to either the Emergency Medical Technician (EMT) level capable of providing Basic Life Support (BLS) pre-hospital emergency medical care or Paramedic level capable of providing Advanced Life Support (ALS) pre-hospital emergency medical services.

Emergency Medical Service Demand

Table 34 shows annual EMS risk service demand for the period 2013–2015. More in-depth data analysis is available by reviewing Citygate's Southern Marin Emergency Medical Paramedic Services (SMEMPS) report for 2016.

Table 34—Emergency Medical Services Risk Demand by Year

Hazard	Year	Total
Medical Emergency	2013	967
	2014	877
	2015	813

Probability of Occurrence

Table 35 scores the City's probability of future medical emergencies occurrence over the next 12 months based on medical services demand from Table 34.

Table 35—Emergency Medical Services Probability

Hazard	Probability
Medical Emergency	4

Emergency Medical Services Impact Severity

Table 36 scores the City's probable EMS impact severity based on CAD/RMS data.

Table 36—Emergency Medical Services Severity Level

Hazard	Severity
Medical Emergency	3

Overall Emergency Medical Services Risk

Table 37 summarizes the City's overall EMS risk of **High**, based on probability of occurrence from Table 35 and impact severity from Table 36.

Table 37—Overall Emergency Medical Services Risk

Hazard	Overall Risk
Medical Emergency	12

A.10 Hazardous Materials Risk

Hazardous Material Risk Service Demand

Table 38 summarizes annual hazardous material risk service demand for the City during the study period, which is 1.6 percent of total service demand over the same period.

Table 38—Hazardous Material Risk Service Demand by Year

Incident Type	2013	2014	2015	Total
Gas leak	24	33	30	87
Flammable liquid spill	4	5	6	15
Other flammable gas or liquid condition	2	5	3	10
Chemical spill or leak	2	0	1	3
Chemical hazard (no spill or leak)	1	1	1	3
Other toxic condition	2	0	1	3
Other hazard/condition	15	18	14	47
Total	**50**	**62**	**56**	**168**

Source: MVFD NFIRS incident records

Hazardous Materials Risk Capacity

The City's service capacity for a hazardous material response consists of a minimum daily on-duty response force of six personnel and one shared Battalion Chief with apparatus from two fire stations. In the City, the closest Fire Department engine with two personnel initially responds to the incident. This level of response provides a minimum of two firefighters to every initial hazardous materials incident call for service.

Probability of Occurrence

Table 39 scores the City's probability of future hazardous materials incidents over the next 12 months based on hazardous materials demand from Table 38.

Table 39—Hazardous Material Demand Probability

Hazard	Probability
Hazardous Materials	3

Hazardous Materials Impact Severity

Table 40 scores the City's probable hazardous materials impact severity based on CAD/RMS information.

Table 40—Hazardous Material Severity Rating

Hazard	Severity
Hazardous Materials	2

Overall Hazardous Materials Risk

Table 41 summarizes the City's overall Hazardous Materials risk of **Moderate**, based on probability of occurrence from Table 39 and impact severity from Table 40.

Table 41—Overall Hazardous Materials Services Risk

Hazard	Overall Risk
Hazardous Materials	6

A.11 TECHNICAL RESCUE RISK

Technical Rescue Risk Factors

Technical rescue risk factors include construction work, structural collapse, confined spaces such as tanks and underground vaults, bodies of water and rivers or streams, urban flooding, machinery, transportation accidents, and other factors that may create a need for technical rescue skills and/or equipment.

Technical Rescue Risk Response Capacity

The City's service capacity for a technical rescue risk consists of a minimum daily on-duty response force of six personnel and one shared Battalion Chief with apparatus from two fire stations. In the City, the closest Fire Department engine with two personnel initially responds to the incident. This level of response provides a minimum of two firefighters to every technical rescue call for service.

The City participates in a regional approach to technical rescue responses for conducting low-angle and high-angle rope rescue, structural collapse, confined space, trench rescue, and water rescue operations.

Technical Rescue Response

Coastal Technical Rescue Response for Land Based Rescue: 3 Engines, 1 Rescue, 1 Medic Unit, 1 Rescue Helicopter, Marin Search and Rescue (S&R), 1 Battalion.

Coastal Response for a Surf Zone Water Rescue: 2 Engines, 1 Truck, 1 Rescue, 1 Medic Unit, 1 Inflatable Rescue Boat, 1 Rescue Helicopter, United States Coast Guard (USCG), Golden Gate National Recreation Area Life Guards, CA-Swiftwater/Flood S&R 11, and 1 Battalion.

Coastal Response for an Open Ocean Water Rescue: 2 Engines, 1 Truck, 1 Rescue, 1 Medic Unit, Fireboat Liberty, 1 Rescue Helicopter, United States Coast Guard, Golden Gate National Recreation Area Life Guards, CA-Swiftwater/Flood S&R 11, and 1 Battalion.

Coastal Response for a Bay Water Rescue: 1 Engine, 1 Truck, 1 Rescue, 1 Medic Unit, 2 Fireboats, USCG, 1 Rescue Helicopter, and 1 Battalion.

In the event of a possible entrapment or submersion component, the Southern Marin Dive Team and Marin County Sheriff's Office Dive Teams are added to the response.

Technical Rescue Risk Service Demand

Over the study period, there were 29 rescue incidents in the City comprising 1.05 percent of total service demand over the same period as shown in Table 42.

Table 42—Technical Rescue Risk Service Demand

Incident Type	2013	2014	2015	Total
341 Search for Person on Land		4	3	7
342 Search for Person in Water			3	3
350 Extrication, rescue, other		1	2	3
352 Extrication of victim(s) from vehicle	2			2
353 Removal of victim(s) from stalled elevator	3			3
356 High angle rescues		2	4	6
360 Water & ice related rescue, other			1	1
361 Swimming/recreational water areas rescue			1	1
364 Surf rescues		1	1	2
365 Watercraft rescue			1	1
Total	**5**	**8**	**16**	**29**

Source: MVFD NFIRS incident records

Probability of Occurrence

Table 43 scores the City's probability of future technical rescue occurrence over the next 12 months based on technical rescue demand from Table 42.

Table 43—Technical Rescue Probability

Hazard	Probability
Technical Rescue	2

Technical Rescue Impact Severity

Table 44 scores the City's probable technical rescue impact severity based on CAD/RMS information.

Table 44—Technical Rescue Risk Severity

Hazard	Severity
Technical Rescue	2

Technical Rescue Risk Analysis

The City's technical rescue risk is ***Low***. This risk rating reflects a light daily vehicle and commercial activity along with very infrequent water-related rescue risk. Mill Valley has a moderate probability of rescue occurrences, even though any one incident could have significant consequences of life loss. Given the regional shared rescue unit, Mill Valley has a good technical rescue service capacity.

Overall Technical Rescue Risk

Table 45 summarizes the City's overall technical rescue risk of **Low**, based on probability of occurrence from Table 43 and impact severity from Table 44.

Table 45—Overall Technical Rescue Services Risk

Hazard	Overall Risk
Technical Rescue	4