Attachment 2

City of Santa Rosa Fire Department

California

Standards of Coverage and Deployment Plan

2016

Emergency Services Consulting International

Introduction

The following report serves as the Santa Rosa Fire Department Standards of Coverage and Deployment Plan. It follows closely the Center for Fire Public Safety Excellence (CPSE) Standards of Coverage model that develops written procedures to determine the distribution and concentration of a fire and emergency service agency's fixed and mobile resources. The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations.

Creating a Standards of Coverage and Deployment Plan document requires that a number of areas be researched, studied, and evaluated. This report will begin with an overview of both the community and the agency. Following this overview, the plan will discuss topics such as community risk assessment, critical task analysis, agency service level objectives, and distribution and concentration measures. The report will provide analysis of historical performance and will conclude with policy and operational recommendations.

ESCI extends its appreciation to the elected and appointed officials of the City of Santa Rosa, the Santa Rosa Fire Department, and all others who contributed to this plan.

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Executive Summary

This document describes Santa Rosa Fire Department's Standards of Coverage and Deployment Plan. Community risks, response resources, deployment strategies, and service levels have been evaluated in this study. It establishes response time goals and standards for measuring the effectiveness of fire department services and the deployment of its resources. The document is segregated into components generally based on the format recommended by the Center for Public Safety Excellence.

The Santa Rosa Fire Department (SRFD) is a department of the city of Santa Rosa, a city established and organized under California law. It provides fire protection, emergency medical, and rescue services to its community. The department's service area encompasses all of the city of Santa Rosa, the Roseland Fire District, and a number of county islands within the city boundary. SRFD also provides service to adjacent agencies in accordance with mutual and automatic aid agreements.

SRFD serves a resident population of approximately 181,900 people and protects an area of approximately 44.4 square miles. The city operates 10 fire stations and 23 response apparatus including reserve apparatus. 9-1-1 calls are answered by a number of different primary public safety answering points. Calls for fire department service are transferred to the Redwood Empire Communications Authority (REDCOM), a multi-agency public safety dispatch center.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department, and the community's pressurized hydrant or tanker-based water supply. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. As of the latest survey (2016) ISO gave SRFD a rating of Class 1/1Y.

The analysis completed during this study revealed a number of important findings. These include:

- Total response workload has increased 35.3 percent over the past ten years.
- 67.9 percent of all responses are requests for emergency medical service.
- Response workload is greatest in the Fire Station 1 and 11 service areas.
- Engine 1 and 11 both exceed 10 percent unit hour utilization.
- The current fire department services utilization rate is 144 incidents per 1,000 population. This is higher than typical for similar sized communities.
- The Primary Public Safety Answer Points are unable to quantify the time required to answer and transfer a 9-1-1 call to REDCOM.
- The amount of time REDCOM takes to dispatch fire department response units exceeds SRFD's performance goal.
- The amount of time response units spend traveling to an incident exceeds SRFD's performance goal.

- 78 percent of priority incidents within the SRFD service area met its five-minute response time goal.
- Response times to deliver the full effective response force exceed the SRFD performance goal by nearly three minutes.
- The outer portions of the SRFD service area and the area around Chanate Rd. cannot be provided with the effective response force within the time specified in the SRFD performance goal.
- SRFD arrived at an emergency medical incident first ahead of the ambulance 64 percent of the time and as much as five minutes before the ambulance 90 percent of the time.

In the SOC process, potential service area classifications are broken down into five categories:

- Metropolitan—Geography with populations of over 200,000 people in total and a population density predominately over 3,000 people per square mile. These areas are distinguished by inner city neighborhoods and numerous mid-rise and high-rise buildings often interspersed with smaller structures.
- Urban—Geography with a population of over 30,000 people and/or a population density predominately over 2,000 people per square mile. These areas are characterized by significant commercial and industrial development, dense neighborhoods, and some mid-rise or high-rise buildings.
- Suburban—Geography with a population of 10,000 to 29,999 and/or a population density predominately between 1,000 and 2,000 people per square mile. These areas are characterized by single and multifamily neighborhoods and smaller commercial developments.
- Rural—Geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile. These areas are characterized by low density residential, little commercial development, and significant farm or open space uses.
- Wilderness/Frontier/Undeveloped—Geography that is both rural and not readily accessible by a publicly or privately maintained road.

SRFD's service area, based on population density, is primarily urban and suburban. The community's risk classification should influence how response resources are distributed now and in the future. Since suburban areas are anticipated to develop to greater population densities, response performance goals have been established that are uniform across the entire developable service area.

A Performance Statement as well as goals for the services provided by SRFD has been developed. These further define the quality and quantity of service expected by the community and consistently pursued by the department.

Overall Performance Statement

The SRFD has adopted the following Performance Statement consisting of its Mission, Vision, and Performance Goals:

Performance Statement

Mission

As a professional, all-risk fire department, we protect lives, property, and the environment through emergency response, prevention, and community involvement.

Vision

Santa Rosa Fire Department Vision

- *Be a progressive and innovative organization that anticipates and influences change.*
- *Continue to develop our role as a community and regional leader on and off duty.*
- *Be an organization committed to the safety and development of our members.*
- *Be a team whose members are effective, empowered, and enthusiastic in their service.*
- *Prepare ourselves and our community for natural and man-made disasters.*

In addition to the overall Performance Statement, the following response-specific performance goals have been established by SRFD.

1) **Dispatch Call Processing Time**
   Response resources shall be notified of a priority incident within 70 seconds from receipt of the call at the dispatch center 90 percent of the time.
2) **Turnout Time**
   Response personnel shall initiate response to a priority fire and special operations incident within 60 seconds from notification 90 percent of the time.
3) **Response time for arrival of the first response unit at a priority incident**
   The first response unit capable of initiating effective incident intervention shall arrive at a priority incident within five minutes from notification of response personnel 90 percent of the time.
4) **Response time for arrival of the effective response force at a moderate risk structure fire**
   The full effective response force shall arrive at a moderate risk structure fire within eight minutes of notification of response personnel 90 percent of the time.

The analysis conducted during the evaluation phase of this process identified a number of opportunities to improve service (improvement goals). The following improvement goals are offered for consideration. These goals and specific recommendations for each are described in more detail at the end of this report (Component H).

RECOMMENDATIONS

Improvement Goal A: Reduce dispatch time through earlier pre-alerting of response personnel

The dispatch center should modify its procedures to alert response personnel as soon as the location and basic nature of the incident has been determined. This can be facilitated by certain technology improvements at the dispatch center.

Improvement Goal B: Create a more efficient emergency medical response system

Several initiatives are discussed including using emergency medical dispatch protocols to better define what resources should be sent to different types of medical incidents, reducing system demands by high frequency EMS system users, and working with high frequency facilities to reduce their demand on the system.

Improvement Goal C: Improve the capture and utilization of incident data

Use of accurate data can offer insight into additional system improvements. Currently the time from the initial 9-1-1 call to its transfer to REDCOM cannot be quantified. Creating this ability will provide a better understanding of total system performance. In addition, SRFD response personnel should more accurately report enroute time. Finally, SRFD should increase its use of data it captures to target specific fire and life safety prevention efforts.

Improvement Goal D: Enhance fire prevention and public education programs

Managing current and future response workload will be important for SRFD. There are initiatives that can help. These include initiating an aggressive wildland fuels modification program to reduce the risk of a major wildland/urban interface fire and providing CPR and AED training to the public.

Improvement Goad E: Improve first-due coverage of the city's south central area

An additional fire station is being considered for the city's south central area. An alternative is offered that would relocate an existing station rather than adding an additional station. This alternative provides an equal level of service improvement.

Improvement Goal F: Add a peak period response unit at Station 11

There is a significant amount of response workload in the Station 1 and 11 areas. Engine 1 and 11 are currently beyond target unit utilization. Adding a two person quick response unit only during the high workload period is recommended.

Improvement Goal G: Improve response resource management and incident command

SRFD staffs each shift with one battalion chief. The system should have two. Adding an additional battalion chief per shift will improve overall response resource management and provide an additional person for incident command responsibilities.

Improvement Goal H: Utilize in-station video conferencing systems

Keeping response units in their primary service areas reduces response time. Use of in-station video conferencing to deliver training, conduct meetings and the like will help accomplish this.

Component A – Description of Community Served

ORGANIZATION OVERVIEW

Governance and Lines of Authority

SRFD has existed as a fire protection agency within the state of California since 1894. The city of Santa Rosa was incorporated in March 1868. The city is provided the authority to levy taxes and raise revenue to operate an organized fire department.

Policy direction for SRFD is provided by a mayor, vice mayor, and five city council members (Council). The Council is provided the necessary power and authority to govern the provision of fire protection and emergency services. The Council appoints a city manager who is responsible for implementing Council policy and overseeing the operation of the fire department. The city manager appoints the fire chief.

Organizational Finance

Establishment of financial policy for the SRFD is the responsibility of the Council with the city manager, city finance director, and fire chief responsible for fiscal administration.

The city of Santa Rosa has an assessed valuation of $22.3 billion.

The city uses a one-year budget cycle to prepare the operating budget and the capital improvement plan based on a July through June fiscal year. The total fire department general fund budget for 2016-17 is $37,839,855.

The fire department's operating funds are generated primarily from sales taxes and property taxes. SRFD also generates additional revenue through service and permit fees.

The following figure lists the revenue for SRFD by source for fiscal year 2016-17.

Figure 1: SRFD Revenue – FY 2016-2017

Revenue Type	2016-17
Fees and permits	2,693,884
Measure O	3,628,700
General Fund contribution	31,517,271
TOTAL	**$37,839,855**

The next figure shows the general operating expenditure history for the current and previous five fiscal years. During the six-year period, the department's overall budget increased 25.6 percent.

Figure 2: Budget/Expenditures by Year, FY 2012 – FY 2017

	Actual 2011-2012	Actual 2012-2013	Actual 2013-2014	Actual 2014-2015	Actual 2015-2016	Budget 2016-2017
General Administration	882,094	995,922	1,239,034	1,240,059	1,346,608	1,553,453
Fire Prevention	1,712,314	1,399,832	1,464,061	1,551,806	1,696,424	1,756,213
Fire Operations	24,273,952	25,875,787	26,407,648	26,435,255	28,455,368	30,917,610
Measure O Fire	2,066,872	2,482,254	2,548,476	2,636,678	2,819,167	2,722,192
CIP and O & M Projects	1,102,785	1,757,710	3,754,910	7,074,967	3,181,782	890,387
Total	**$30,038,017**	**$32,511,505**	**$35,414,129**	**$38,938,765**	**$37,499,349**	**$37,839,855**

A comprehensive capital improvement and replacement program is important to the long-term financial and operational stability of any fire and emergency medical service organization. Such programs provide systematic development and renewal of the physical assets and rolling-stock of the agency. A capital program must link with the planning process to anticipate and time capital expenditures in a manner that does not adversely influence the operation of the agency or otherwise place the agency in a negative financial position. Items usually included in capital improvement and replacement programs are facilities, apparatus, land acquisition, and other major capital projects. SRFD has a formally adopted and funded capital improvement plan for facilities and major equipment. SRFD uses lease-purchase funding for the purchase and replacement of vehicles and fire apparatus.

SERVICE AREA OVERVIEW

The city of Santa Rosa is the county seat for Sonoma County. It is the largest city in the north coast wine country with a total population of 174,170 and an area of 42 square miles. Including the Roseland Fire Protection District and county islands, the service area population is 181,900 and total service area is 44.4 square miles

The Santa Rosa area was long inhabited by Pomo natives known as the Bitakomtara. The first European settlement in the Santa Rosa area was a homestead established in the early 1800s. Spanish and Mexican settlers also raised livestock in the area.

Sonoma County recognized Santa Rosa as an incorporated city in 1867 with state confirmation in 1868. The city's population grew steadily but not rapidly. The 1906 San Francisco earthquake devastated the downtown area, slowing population growth.

Starting about 1950, the city's population began to grow rapidly gaining about 1,000 new residents each year. That rate of growth increased following the city's adoption of its first comprehensive General Plan in 1991.

Major employers in the city include the County of Sonoma, Kaiser Permanente, Sutter Medical Center, and the St. Joseph Health System. As the northwestern gateway to the Napa and Sonoma wine country Santa Rosa also has a strong tourism economy.

Santa Rosa has an historic downtown area consisting of shops, restaurants, theaters and other businesses and professional offices. City hall, along with state and federal offices, are also located in downtown. The balance of the city is a mix of residential neighborhoods, commercial corridors and some industrial development.

The city has many parks and other recreational attractions. It has also been the filming location for a number of movies including Alfred Hitchcock's *Shadow of a Doubt*.

Component B – Review of Services Provided

SERVICES PROVIDED

The SRFD's service area includes all of the city of Santa Rosa. In addition it serves the Roseland Fire District and county islands within the city's boundary by contract. SRFD also provides automatic and mutual aid to other agencies within Sonoma County. The SRFD provides a variety of response services, including structural and wildland fire suppression, advanced life support level emergency medical care, and entrapment extrication. SRFD also provides technical rescue services including high-angle, trench, and confined space. Finally, SRFD provides fully capable hazardous materials emergency response.

SRFD also provides non-response services including staff training, new construction building plan review and inspection, existing occupancy fire safety inspections, public safety education, and fire investigation.

SRFD is also the Certified Unified Program Agency (CUPA) for the city and has oversight and enforcement responsibility for the State related to all six elements of the hazardous materials program; underground storage tanks, above ground storage tanks, hazardous materials business plans and inventory statements, hazardous waste, tiered permitting/treatment and the California Accidental Release Prevention Program (Cal ARP). The Fire Prevention Division also works with the North Coast Regional Water Quality Control Board on cases of soil contamination and clean-up.

9-1-1 calls are answered by a number of different primary public safety answering points. Requests for fire department services are transferred to the Redwood Empire Communications Authority (REDCOM), a multi-agency public safety dispatch center.

There are 146 full-time and one part-time personnel involved in delivering services to the jurisdiction. Staffing coverage for emergency response is through the use of career firefighters on 48-hour shifts. For immediate response, no less than 39 personnel are on-duty at all times

The following figure provides basic information on each of the department's core services, its general resource capability for that service, and information regarding staff resources for that service.

Figure 3: Core Services Summary

Service	General Resource/Asset Capability	Basic Staffing Capability per Shift
Fire Suppression	10 staffed engines 2 staffed ladder trucks 1 command response unit Additional automatic and mutual aid engines, aerials, and support units available	39 suppression-trained personnel Additional automatic and mutual aid firefighters available
Emergency Medical Services	10 engines - ALS equipped 2 ladder trucks - ALS equipped	72 certified emergency medical technicians 55 paramedics

Service	General Resource/Asset Capability	Basic Staffing Capability per Shift
Vehicle Extrication	2 trucks and one engine equipped with hydraulic rescue tools, hand tools, air bags, cutting torch, stabilization cribbing, and combination cutter-spreader hydraulic rescue tool	All firefighters vehicle rescue trained
High-Angle Rescue	2 trucks equipped with high-angle rescue capabilities 1 cross-staffed heavy rescue equipped with rescue-rated rope and all associated hardware	All personnel trained to Rescue System 1 standards
Trench and Collapse Rescue)	2 trucks equipped with trench and collapse rescue capabilities 1 cross-staffed heavy rescue equipped with rescue-rated rope and all associated hardware	All personnel trained to Trench Rescue standards
Swift-Water Rescue	All staffed apparatus equipped with swift water rescue capabilities 1 cross-staffed heavy rescue equipped with rescue-rated rope and all associated hardware and 1 trailer and boat	All personnel trained to Swift Water Rescue standards
Confined Space Rescue	2 trucks equipped with confined space rescue capabilities 1 cross-staffed heavy rescue equipped with rescue-rated rope and all associated hardware	All personnel trained to Confined Space Rescue standards
Hazardous Materials Response	1 Hazardous Materials response vehicle equipped with personal protective equipment, gas and radiation monitoring equipment, containment supplies, and non-sparking tools	All personnel trained to HazMat Awareness level and 38 personnel are trained to Technician level

ASSETS AND RESOURCES

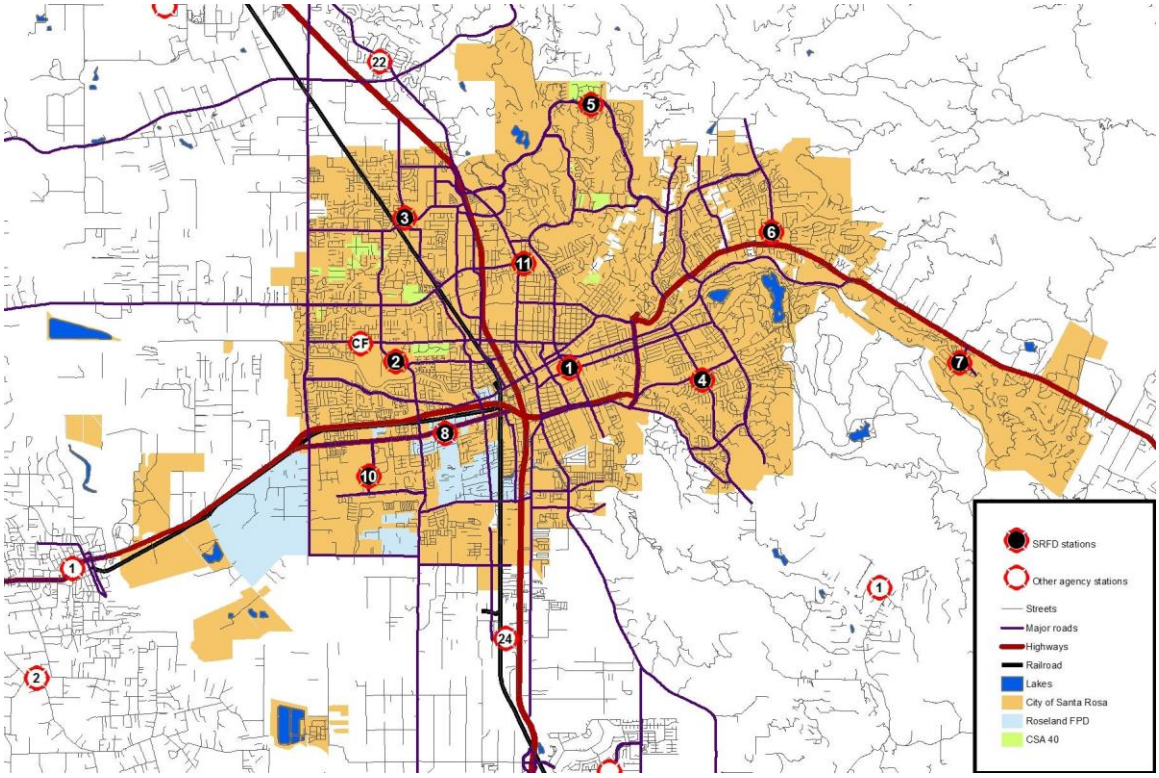
Fire Stations

Fire stations play an integral role in the delivery of emergency services for a number of reasons. A station's location will dictate, to a large degree, response times to emergencies. Fire stations also need to be designed to adequately house equipment and apparatus, as well as the firefighters and other personnel assigned to the station.

Station Location and Deployment

The SRFD delivers fire, emergency medical service (EMS), and other emergency response from ten fire stations located throughout the city. The following map shows the city boundaries, and the locations of SRFD and adjacent agency fire stations.

Figure 4: Current Facility Deployment



A detailed assessment of the condition and serviceability of each station was completed and is found in the Appendix.

Apparatus

Response vehicles are an important resource of the emergency response system. If emergency personnel cannot arrive quickly due to unreliable transport, or if the equipment does not function properly, then the delivery of emergency service is likely compromised. Fire apparatus are unique and expensive pieces of equipment, customized to operate efficiently for a specifically defined mission. The following figure lists apparatus assigned to each of the ten SRFD fire stations.

Figure 5: SRFD Fire Stations and Apparatus

Station 1							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Battalion 1	SUV	2011	Chevy/Tahoe	Good	4	N/A	N/A
Engine 1	Type 1 Engine	2015	Ferrara	Excellent	5	1500	500
Truck 1	Truck	2016	Pierce	Excellent	5	N/A	N/A
Truck 31	Truck	1999	KME/Excel	Fair	5	N/A	N/A
Rescue 1	Rescue	2005	Spartan Ferrara	Good	5	N/A	N/A
Water Tender 1	Tender	2001	HME Central	Good	5	750	1500
Reserve BC	SUV	2007	Chevy Tahoe	Good	5	N/A	N/A
Utility 7140	Pickup	2011	Ford F150	Good	2	N/A	N/A
Utility 7141	SUV	2004	Ford Expedition	Good	4	N/A	N/A

Station 2							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 2	Type 1 Engine	2015	Ferrara	Excellent	5	1500	500
Truck 2	Truck	2001	Freightliner ALF	Good	5	N/A	N/A
Engine 22	Type 6 Wildland	2010	Ford F550	Good	3	300	350
Engine 34	Type 1 Engine	1996	Spartan/Ferrara	Good	5	1500	500
Utility 7142	Pickup	2009	Ford 250	Good	4	N/A	N/A

Station 3							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 3	Type 1 Engine	2015	Ferrara	Excellent	5	1500	500
Engine 33	Type 1 Engine	2002	Spartan/Ferrara	Good	5	1500	500

Station 4							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 4	Type 1 Engine	2006	Spartan/Ferrara	Good	5	1500	500
OESEngine363[1]	Type1Engine	2010	HME/Ahrens	Good	4	1250	850

[1] Not a Santa Rosa owned asset.

OES Engine 363[1]	Type 1 Engine	2010	HME/Ahrens	Good	4	1250	850

Station 5							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 5	Type 1 Engine	2006	Spartan/Ferrara	Good	5	1500	500
Engine 25	Type 3 Wildland	2009	Rosenbauer/ International	Good	5	500	500

Station 6							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 6	Type 1 Engine	2006	Spartan/Ferrara	Good	5	1500	500
Engine 32	Type 1 Engine	2001	Spartan/Ferrara	Good	5	1500	500

Station 7							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 7	Type 1 Engine	2002	Spartan/ Ferrara	Good	5	1500	500

Station 8							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 8	Type 1 Engine	2006	Spartan/ Ferrara	Good	5	1500	500

Station 10							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 10	Type 1 Engine	2006	Spartan/Ferrara	Good	5	1500	500
Hazmat 1	Hazmat	2002	Peterbilt SVI	Good	2	N/A	N/A
Prevention 71	Investigation van	2005	Chevy	Good	2	N/A	N/A

Station 11							
Apparatus Designation	Type	Year	Make/Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 11	Type 1 Engine	2015	Ferrara/ Ferrara	Excellent	5	1500	500
Engine 31	Type 1 Engine	1996	Spartan/ Ferrara	Good	5	1500	500

SRFD uses several types of apparatus as shown in the table above. Each type is further described as follows:

[1] Not a Santa Rosa owned asset.

- Engine – Primary response unit from each station for most types of service requests. Each is equipped with a pump and carries water.
- Truck – A specialized apparatus equipped with long ladders, salvage, overhaul equipment, and rescue tools. Used for structure fires, rescues, and other service requests.
- Tender – A vehicle designed to carry large quantities of water to a fire incident. Used for fires in areas without fire hydrants.
- Wildland Engine – A smaller vehicle with pump and water tank designed to be used for brush and grass fires in wildland areas.
- HazMat – A vehicle that carries specialized equipment for use on hazardous materials emergencies.
- Fire Investigation Van – A vehicle that carries specialized equipment for use on hazardous materials and fire investigation incidents.

STAFFING INFORMATION

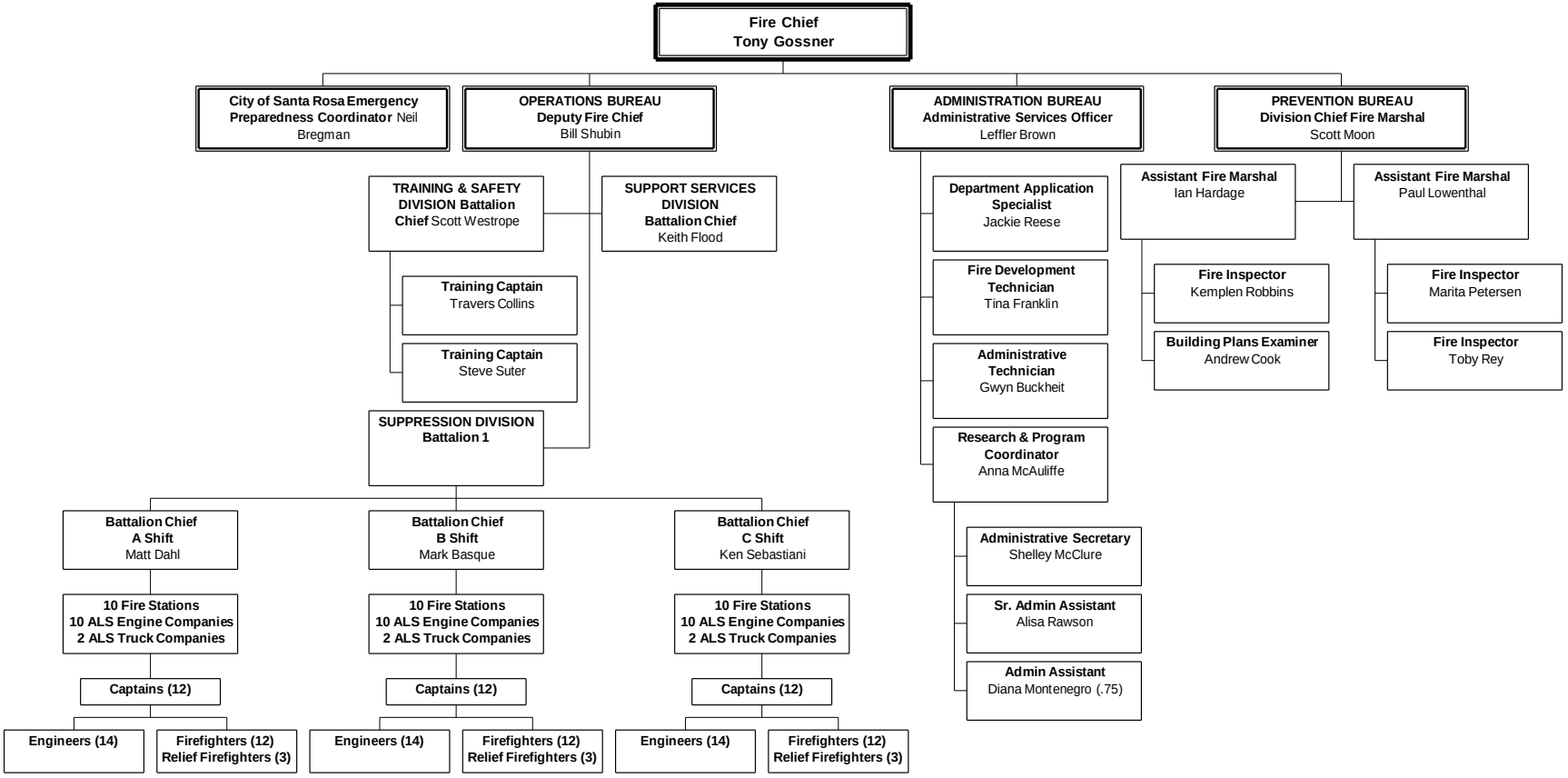
SRFD provides staffing in three key areas; administration, operations, and fire prevention services.

Organizational Structure

SRFD is organized in the typical top-down hierarchy. The chain of command is identified with common roles for a fire department of this size. SRFD has 10 fire stations that house emergency response resources. The department's multiple facilities and its three-shift, 24-hour-per-day, seven-day-per-week operational schedule create numerous internal communications and management challenges. The SRFD organizational chart is functional and primary roles are well identified.

Figure 6: Organizational Structure

Santa Rosa Fire Department



Administration and Support Staff

One of the primary responsibilities of a fire department's administration and support staff is to ensure that the operational entities of the organization have the ability to accomplish their service delivery responsibilities to the public. Without sufficient oversight, planning, documentation, training, and maintenance, the operational entities will struggle to perform their duties well. Administration and support services require appropriate resources to function properly.

There are 146 full-time and one part-time personnel involved in delivering services to the jurisdiction. The fire department's primary management team includes the Fire Chief, Deputy Fire Chief, Division Chief/Fire Marshal, Battalion Chief of Training and Safety, Battalion Chief of Support Services, Administrative Services Officer, and the Emergency Preparedness Coordinator. Additional administrative and support personnel include training captains, office staff, emergency management staff, and fire prevention staff. SRFD has 20.75 full time equivalent management, administration, and support staff.

Figure 7: Management, Administration, and Support Personnel by Position

Position	Number
Fire Chief	1
Deputy Chief	1
Division Chief/Fire Marshal	1
Assistant Fire Marshal	2
Building Plans Examiner	1
Fire Inspector	3
Administrative Services Officer	1
Research and Program Coordinator	1
Senior Administrative Assistant	1
Community Development Technician	1
Emergency Preparedness Coordinator	1
Administrative Technician	1
Battalion Chief – Training and Safety	1
Battalion Chief – Support Services	1
Department Application Specialist	1
Training Captains	2
Administrative Assistant	0.75
TOTAL	**20.75**

Emergency Services Staff

It takes an adequate and well-trained staff of emergency responders to put the community's emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an emergency decreases the effectiveness of the response and potentially increases damage and injury.

SRFD uses career personnel to carry out emergency response functions. The following figure shows the distribution of emergency personnel by rank.

Figure 8: Emergency Response Personnel by Rank

	Position	Number
	Battalion Chief	3
	Fire Captain	36
	Engineer	42
	Firefighter	45
TOTAL		**126**

SRFD employs 126 emergency response personnel for EMS, rescue, and fire suppression activities. No less than 39 personnel are on-duty at all times. The resident population of the SRFD service area is 181,900. SRFD provides its community with 0.69 career firefighters per 1,000 population and 0.21 firefighters per 1,000 population on duty at all times.

Methodology for Incident Staffing

This document will provide an analysis of how well SRFD is doing at providing personnel and other resources for incidents within its primary service area. This data is important and can be an indicator of the effectiveness of its staffing efforts.

For larger incidents, SRFD commonly acts together with one or more neighboring fire departments in providing fire and life protection through a coordinated regional response system of mutual and automatic aid agreements. This is particularly true for large structure fires, other high-risk incidents where staffing needs are great, and during periods of significant incident activity. This document will provide an overall view of aggregate staffing provided by SRFD and neighboring agencies.

The prompt arrival of at least four personnel is critical for structure fires. Federal regulations (CFR 1910.120) require that personnel entering a building involved in fire must be in groups of two. Further, before personnel can enter a building to extinguish a fire, at least two personnel must be on scene and assigned to conduct search and rescue in case the fire attack crew becomes trapped. This is referred to as the two-in, two-out rule.

There are, however, some exceptions to this regulation. If it is *known* that victims are trapped inside the building, a rescue attempt can be performed without additional personnel ready to intervene outside the structure. Further, there is no requirement that all four arrive on the same response vehicle. Many fire departments rely on more than one unit arriving to initiate interior fire attack. SRFD staffs fire engines with three firefighters, thus it must wait for a second unit to arrive before it can initiate interior fire attack operations in a non-rescue incident.

Some incidents (such as structure fires) require more than one response unit. The ability of SRFD and its automatic aid neighbors to assemble an effective response force for a multiple unit incident within the specific period of time, also known as *resource concentration*, will be analyzed in a later section of this document.

The following figure lists each station, staffed unit, and the staffing assigned to each at minimum staffing.

Figure 9: Staffing Complement

Station	Apparatus	Minimum On-duty Staffing
Station 1	Battalion 1	1
	Engine 1	3
	Truck 1	4
	Rescue 1	0
	Water Tender 1	0
	Spare BC01 Vehicle	0
	Utility 7140	0
	Utility 7141	0
	Truck 31	0
Station 2	Engine 2	3
	Engine 22	0
	Engine 34	0
	Truck 2	4
	Utility 7142	0
Station 3	Engine 3	3
	Engine 33	0
Station 4	Engine 4	3
	OES Engine 363	0
Station 5	Engine 5	3
	Engine 25	0
Station 6	Engine 6	3
	Engine 32	0
Station 7	Engine 7	3
Station 8	Engine 8	3
Station 10	Engine 10	3
	HazMat 1	0
	Fire Investigation Van	0
Station 11	Engine 11	3
	Engine 31	0
TOTAL		**39**

Santa Rosa and other fire agencies in the area have developed a very comprehensive system for sharing resources. Regional fire agencies rely on the regional mutual and automatic aid agreements for major structure fires, other higher risk incidents, and during periods of high incident activity. Though this system is not a substitute for locally delivered services, it provides significant depth of coverage for unusual circumstances.

INSURANCE SERVICES OFFICE PUBLIC PROTECTION CLASSIFICATION

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department, and the community's pressurized hydrant or tanker-based water supply. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. As of the latest survey (2016) ISO gave SRFD a rating of Class 1/1Y. Class 1 applies to all properties within 1,000 feet of a fire hydrant. Class 1Y applies to all properties beyond 1,000 feet of a fire hydrant.

The emergency communications function includes the capabilities of the call receipt and dispatch system along with the quality and redundancy of communications systems between dispatchers and response units. ISO gave 9.55 points out of a possible 10 points to this element. Minor deficiencies were noted in certain elements of technology related to the enhanced 9-1-1 system.

The fire department is evaluated on its ability to provide needed apparatus within specified distances of developed property, the pump capacity and equipment carried on those apparatus, and the number of personnel staffing each. In addition, the fire department is evaluated on its training programs and facilities. The fire department received 42.61 points out of a possible 50 points for this element. Deficiencies primarily related to insufficient on-duty personnel

The water system is evaluated on the amount of storage, size of water mains, distribution and condition of fire hydrants, and the ability of the system to deliver needed quantities of water based on specific risks within the service area. The water system received 36.91 points out of a possible 40 points. Minor deficiencies were noted in the water supply system (when needed water flow from fire hydrants is compared to available water flow) and in the fire hydrant inspection program.

CURRENT SERVICE DELIVERY GOALS

The SRFD has adopted the following Performance Statement:

Performance Statement

Mission

As a professional, all-risk fire department, we protect lives, property, and the environment through emergency response, prevention, and community involvement.

Vision

Santa Rosa Fire Department Vision

- Be a progressive and innovative organization that anticipates and influences change.
- Continue to develop our role as a community and regional leader on and off duty.
- Be an organization committed to the safety and development of our members.
- Be a team whose members are effective, empowered, and enthusiastic in their service.
- Prepare ourselves and our community for natural and man-made disasters.

In addition to the overall Performance Statement, the following response-specific performance goals have been established by SRFD.

1) Dispatch Call Processing Time
   Response resources shall be notified of a priority incident within 70 seconds from receipt of the call at the dispatch center 90 percent of the time.
2) Turnout Time
   Response personnel shall initiate response to a priority fire and special operations incident within 60 seconds from notification 90 percent of the time.
3) Response time for arrival of the first response unit at a priority incident
   The first response unit capable of initiating effective incident intervention shall arrive at a priority incident within five minutes from notification of response personnel 90 percent of the time.
4) Response time for arrival of the effective response force at a moderate risk structure fire
   The full effective response force shall arrive at a moderate risk structure fire within eight minutes of notification of response personnel 90 percent of the time.

The SRFD is not currently achieving most of these goals as will be demonstrated in a later section of this report.

Component C – Review of the Community Expectations for Type and Level of Service

The ultimate goal of any emergency service delivery system is to provide sufficient resources (personnel, apparatus, and equipment) to the scene of an emergency in time to take effective action to minimize the impacts of the emergency. This need applies to fires, medical emergencies, and any other emergency situation to which the fire department responds. Obtaining and understanding the desires and expectations of community stakeholders is an important first step. SRFD is committed to incorporating the needs and expectations of residents and policy makers in the service delivery planning process.

It is important to note that the information solicited and provided during this process was provided in the form of "people inputs," some of which are perceptions as reported by stakeholders. The project team reviewed the information for consistency and frequency of comment to identify specific patterns and/or trends. The observations included in this report were confirmed by multiple sources or the information provided was significant enough to be included. Based on the information review, the team was able to identify a series of observations, recommendations, and needs which are included in this report.

Stakeholder Input

Community attitudes about the Santa Rosa Fire Department and the services it delivers were gathered in two ways. Residents were interviewed in a focus group sessions and by use of an internet survey tool. The other was by direct interviews of most of the members of the Santa Rosa City Council who are the community's elected representatives.

The community residents provided the following information. Additional details can be found in the Santa Rosa Fire Department Strategic Plan (2016).

- Citizen priorities included ensuring facilities and equipment are reliable and functional, ensuring technical competence of responders, and maintaining or improving response times.
- Fire suppression and emergency medical services were the most valued service types followed closely by fire prevention, technical rescue and emergency preparedness.
- Services desired by the participants included improving defensible space/fuels reduction efforts and improved fire prevention/public education programs.
- There was a strong consensus that response times should be five minutes or less. Participants encourage the SRFD to use innovative practices to ensure an appropriate response based on the urgency and nature of the incident.

In general the community feels very positively about its fire department and the services it provides.

City council members also spoke positively about the SRFD. As a group they believe the services provided by the department are appropriate. The SRFD should increase its fire prevention and public education efforts providing more timely new construction plans review and improved existing occupancy inspection frequency.

Council members encouraged the SRFD to provide additional outreach to the community. This is especially true in the area of emergency preparedness, AED/CPR training, and post incident victim assistance. SRFD should consider implementing a citizen volunteer program such as Community Emergency Response Teams (CERT) to augment the community's ability to cope with disasters.

Council members also encouraged the SRFD to consider innovative approaches to delivery of emergency services. This would include staffing based on expected workload and use of smaller vehicles for some response types. There was concern about the overuse of SRFD resources at assisted and skilled living facilities.

In general, council members believe resources should be deployed to ensure the most prompt response to the next most likely emergency. This strategy suggests that resources should be placed based on expected workload rather than geography.

Component D – Community Risk Assessment

This section analyzes certain categorical risks present within the SRFD service area that potentially threaten the people and property within the community and that can create response workload for the SRFD. These risks are identified to assist the SRFD in identifying where to locate response resources in the types and numbers needed to effectively respond to likely emergencies.

Another very good reference describing community risks is the Sonoma County Hazard Mitigation Plan and the City of Santa Rosa Local Hazard Mitigation Plan. These documents contain a great deal of information regarding risks within the region, including Santa Rosa.

OVERALL GEOSPATIAL CHARACTERISTICS

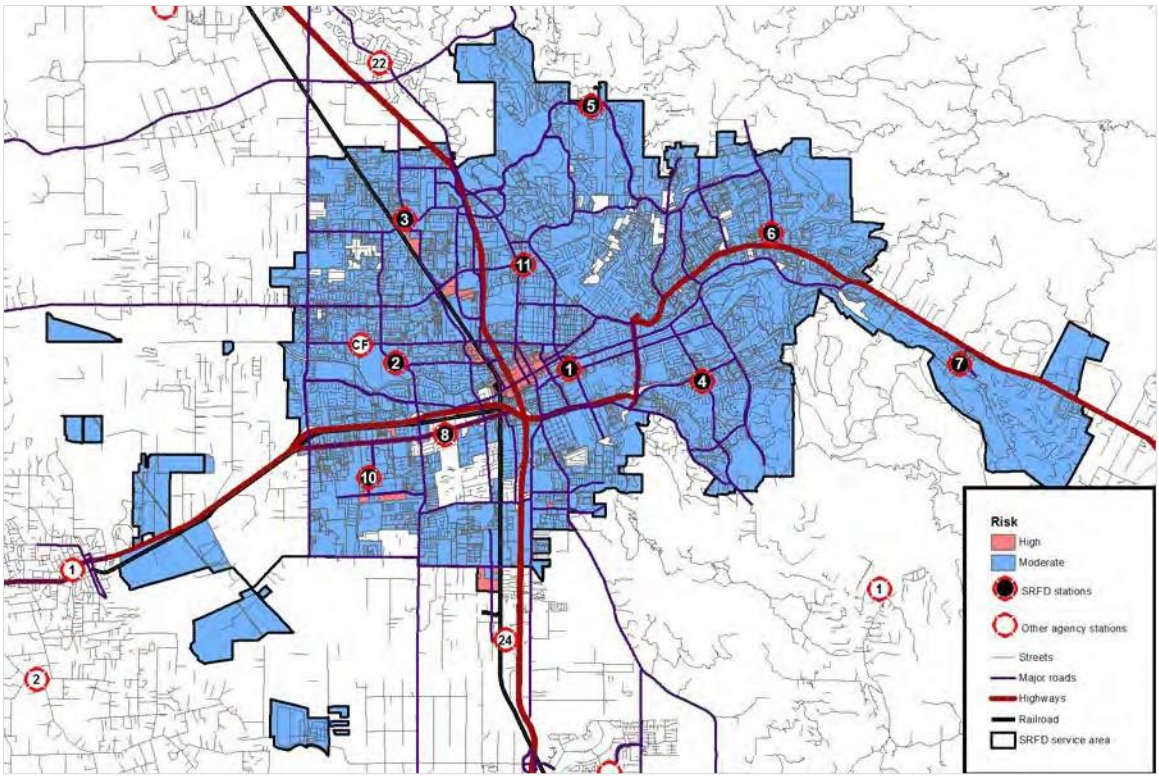
The fire service assesses the relative risk of properties based on a number of factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration to the level of risk within geographic sub-areas of a community.

The following community risk assessment has been developed based on intended land uses as described in the city of Santa Rosa zoning designations. The following figure translates zoning to categories of relative fire and life safety risk.

- Low risk – Areas zoned and used for agricultural purposes, open space, and very low-density residential and uses.
- Moderate risk – Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High risk – Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.

Most of the SRFD service area is moderate risk. There are pockets of high risk mainly in the downtown area.

Figure 10: Fire and Life Safety Risk Based on Zoning



GEOGRAPHIC AND WEATHER-RELATED RISKS

Weather Risk

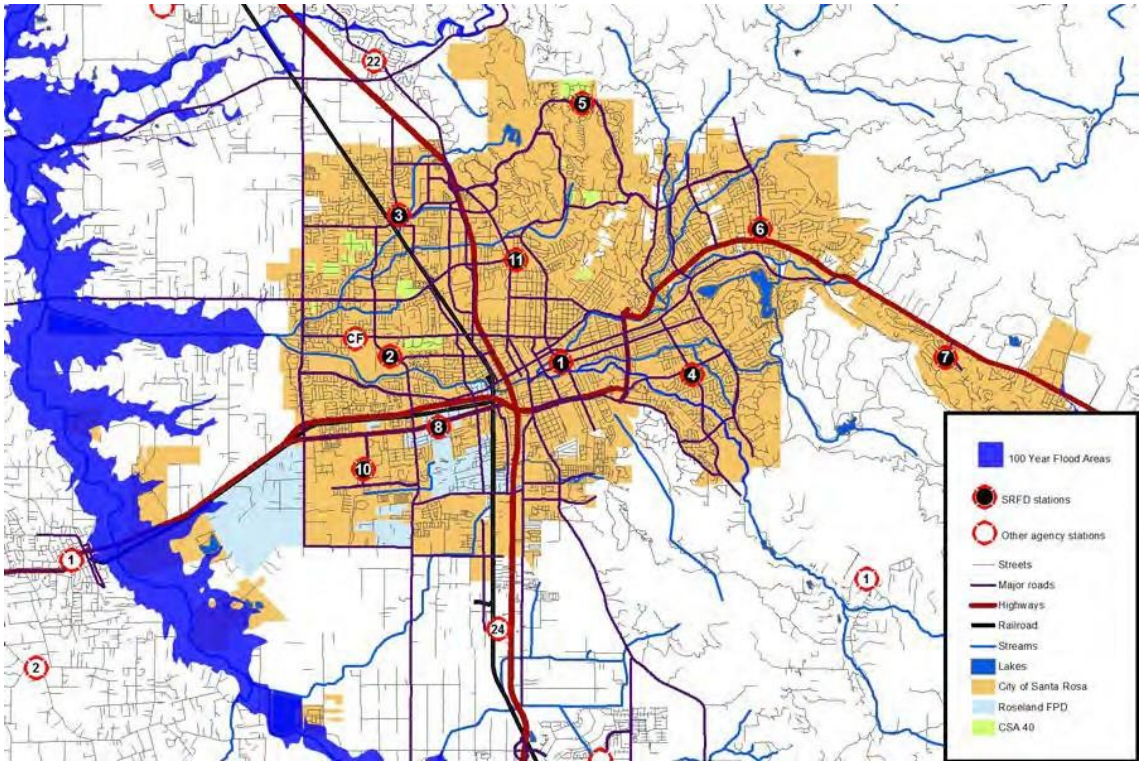
Santa Rosa's climate is best described as Mediterranean characterized by warm, dry summers and cool, wet winters. The lowest temperature recorded was 9 degrees Fahrenheit in 1924 and the highest temperature recorded was 113 degrees Fahrenheit in 1913. Santa Rosa receives an average of 32 inches of rainfall each year. Average temperatures range from lows of 39 degrees Fahrenheit in January to highs of 82 degrees during summer months.

Extreme weather occurs rarely. Heavy rains have produced floods. Drought occurs on occasion and there has been one reported tornado in Sonoma County.

Flood Risk

Waterway flooding is a risk within the community. During heavy rains, local streams overfill causing local area flooding. The following figure illustrates the area designated by FEMA as special flood hazard represented by the blue hashed shading on the map.

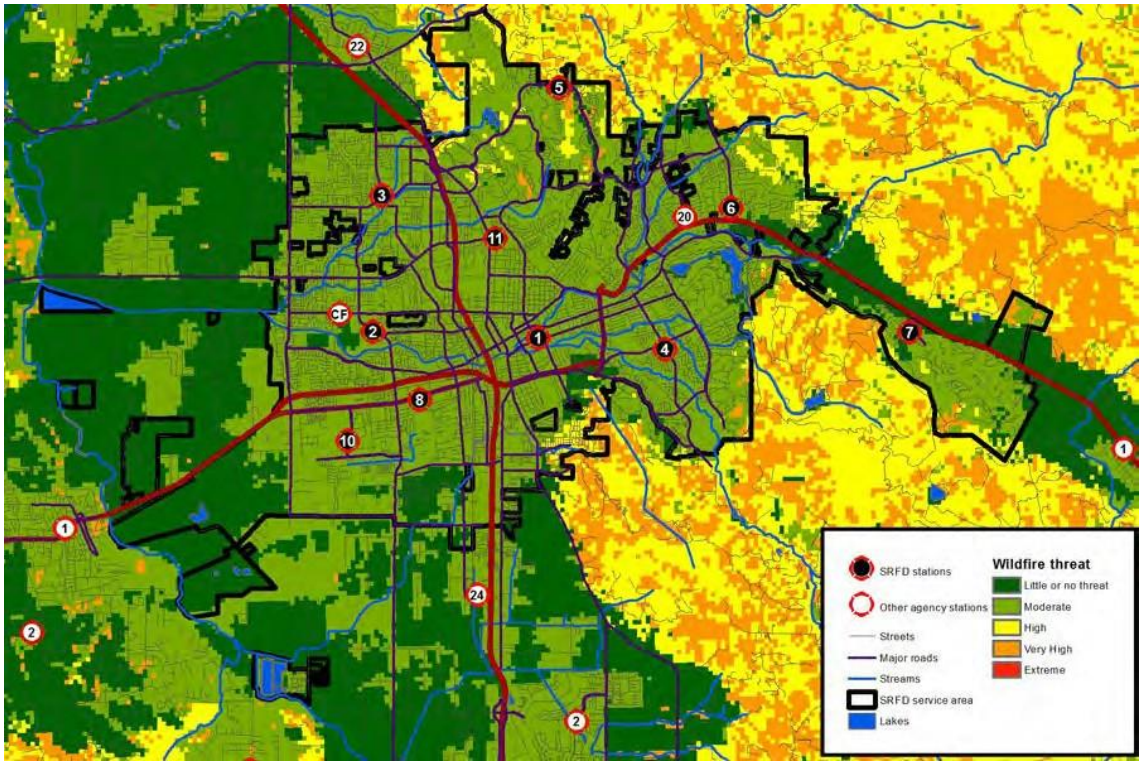
Figure 11: FEMA Special Flood Hazard Areas



Wildfire Risk

In spite of Santa Rosa's climate, the risk of wildland fires exists. Areas to the city's north, east and south have been classified by the California Division of Forestry as high threat. Within the city and to the west, southwest, and northwest the threat is low. These areas are defined as Wildland-Urban Interface Fire Areas through local ordinance and cover approximately 30% of the City. The values of property within these areas equate to approximately 5 billion dollars with a population of approximately 22,000 people, nearly 13% of the communities population.

Figure 12: Wildfire Threat



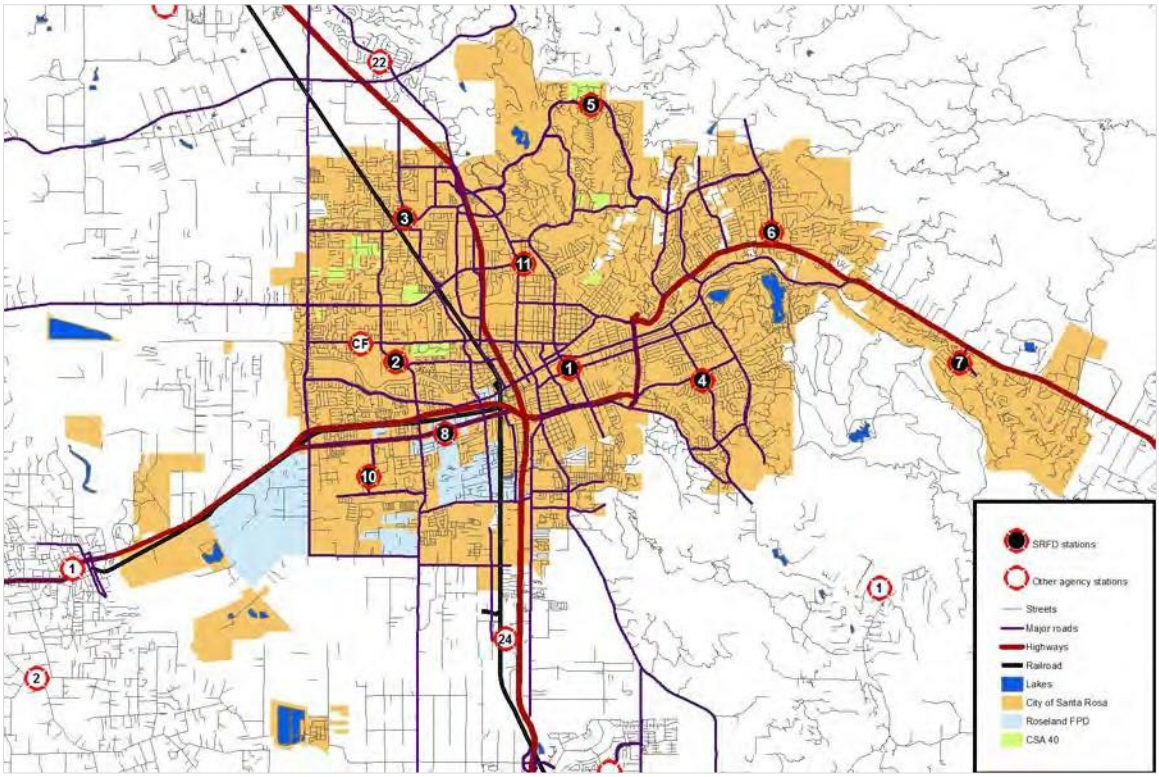
TRANSPORTATION RISKS

Transportation corridors provide necessary access and egress for the department. The configuration of transportation systems can also affect the response capability of emergency services. Limited access freeways and rail lines can interrupt street connectivity, forcing apparatus to negotiate a circuitous route to reach an emergency scene.

Roads

Surface streets dominate the SRFD service area. Highway 101, Highway 12, and other major roads provide collector and arterial level traffic circulation. The balance of the department's service has a mix of relatively well interconnected street networks and neighborhoods characterized by cul-de-sacs and other dead end street systems. Traffic signals within the service area are equipped with signal pre-emption equipment. This provides a significant response time performance advantage as well as improved safety to motorists.

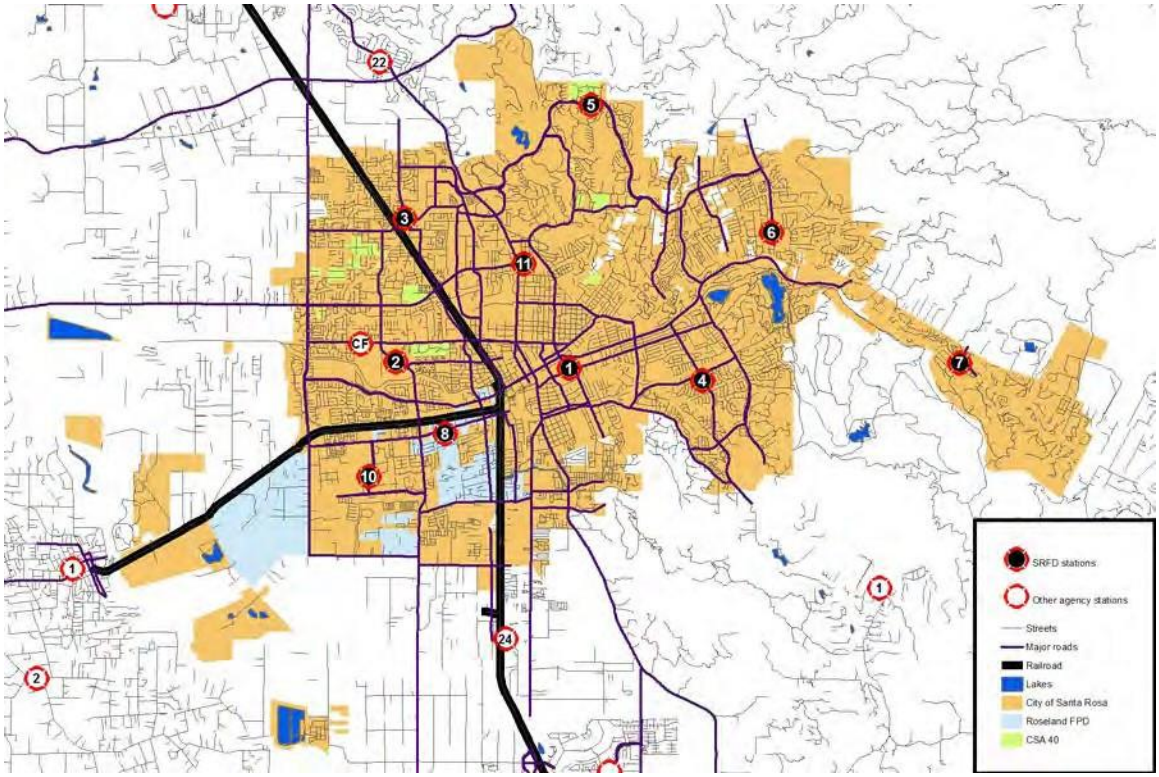
Figure 13: Street System



Railroads

Two railroad lines have existed within Santa Rosa. The Petaluma and Santa Rosa Railroad operated a track that has since been abandoned and acquired for a regional trail system. The Northwestern Pacific Railroad operates a line that bisects Santa Rosa from north to south. Use of that line has since been acquired by the Sonoma-Marin Area Rail Transit, a soon to be operating commuter train system. Shared service on this line is expected to commence in late 2016.

Figure 14: Railroads



Airport

There are no airports within Santa Rosa. The Charles M. Schulz Sonoma County Airport lies several miles north of the city. This airport handles scheduled service airline flights. Numerous aircraft transit the sky above the city daily.

PHYSICAL ASSETS PROTECTED

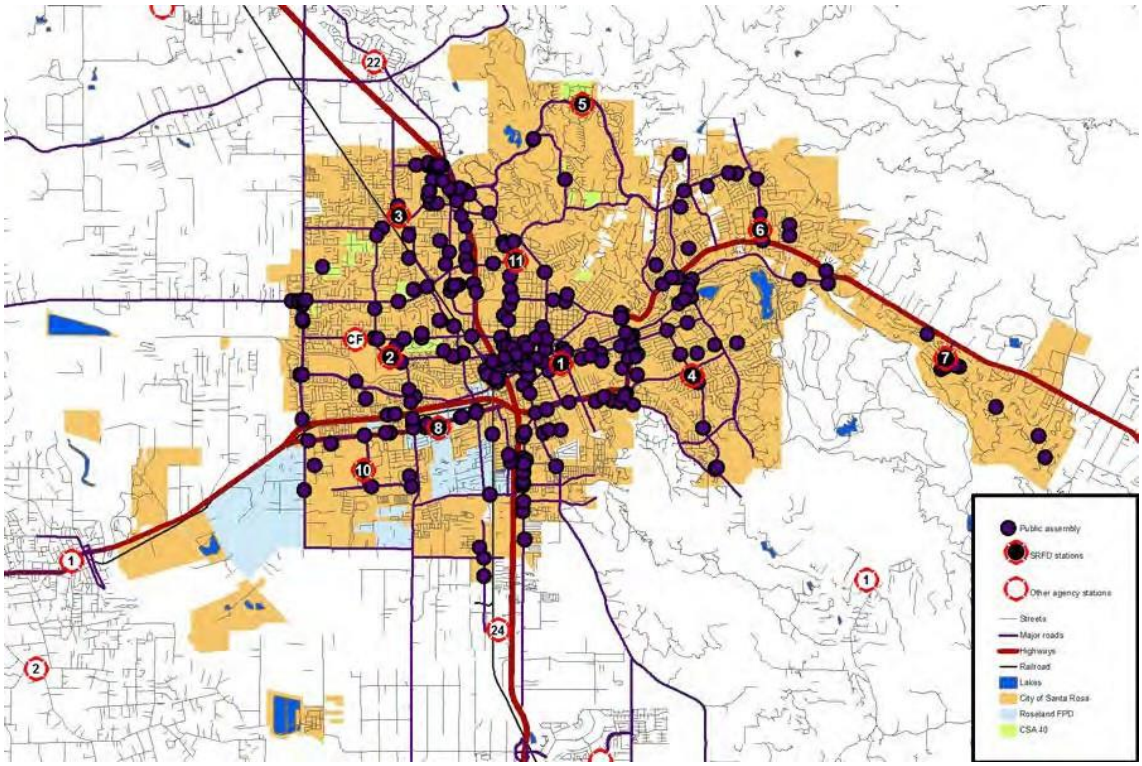
Many buildings in the city are used for purposes that create more significant risk than others. High occupancy buildings, facilities providing care to vulnerable populations, and others may require greater numbers of emergency response resources during an emergency. This section draws on information from SRFD records and other sources.

Public Assembly

Numerous buildings lie within the city in which large numbers of people gather for entertainment, worship, and such. A variety of nightclubs, theaters, and other entertainment venues exist.

These facilities present additional risk, primarily for mass casualty incidents. Fire, criminal mischief, and potentially terrorism could cause a major medical emergency requiring significant emergency service resources. The following figure shows the locations of buildings identified as public assembly facilities within the city.

Figure 15: Public Assembly Facilities

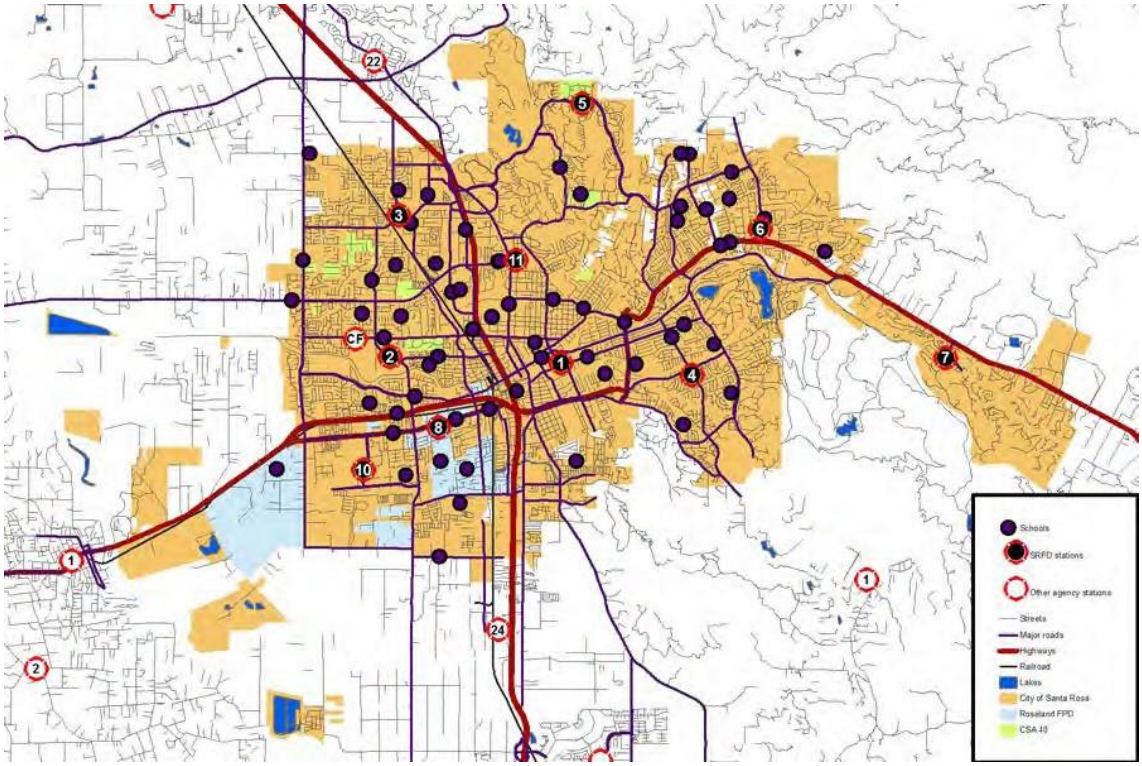


Schools/Day Care

Santa Rosa City Schools provides public education to the city's children. The district operates ten elementary schools, five middle schools, five high schools, and eight charter and alternative schools. There are also a number of private and pre schools within the city.

The following figure shows the locations of most of the school facilities.

Figure 16: Public and Private School Facilities

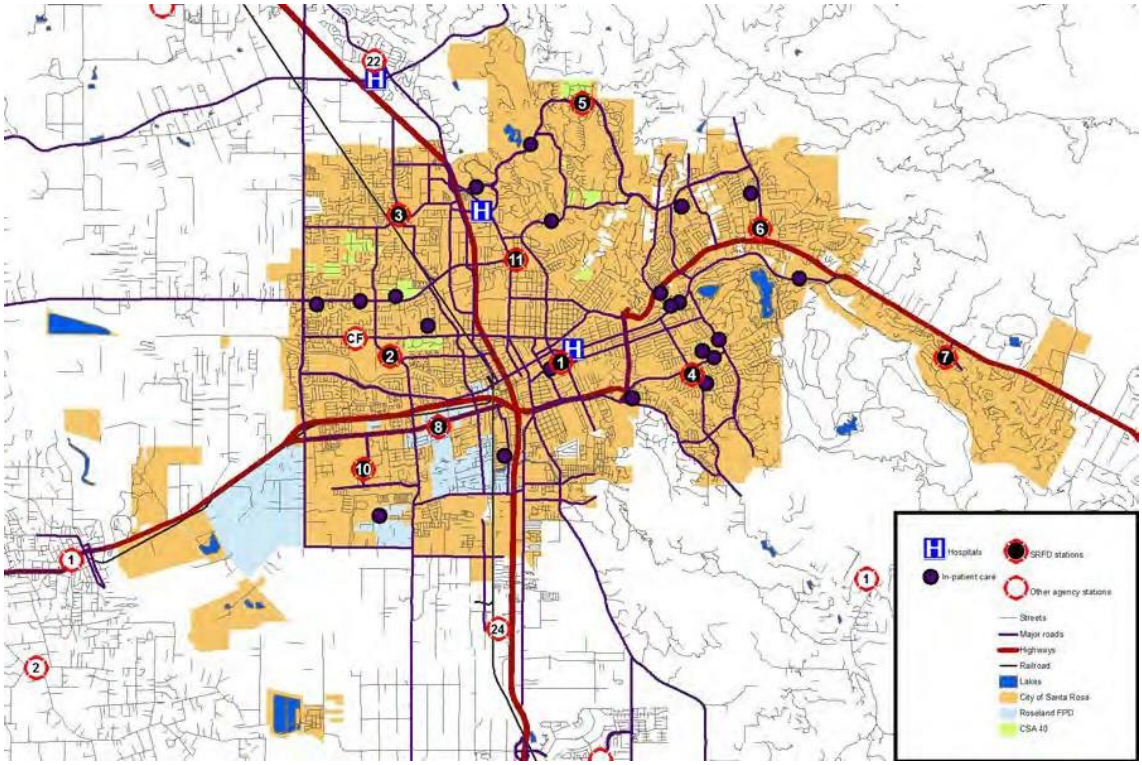


Medical and Congregate Care Facilities

Medical and congregate care facilities, particularly hospitals and nursing homes, house vulnerable populations. Although these facilities are generally built of highly fire resistive construction with built-in fire suppression, emergencies can occur that require the quick movement of patients away from the hazard.

The following figure shows the location of hospitals and skilled nursing care facilities.

Figure 17: In Patient Care Facilities

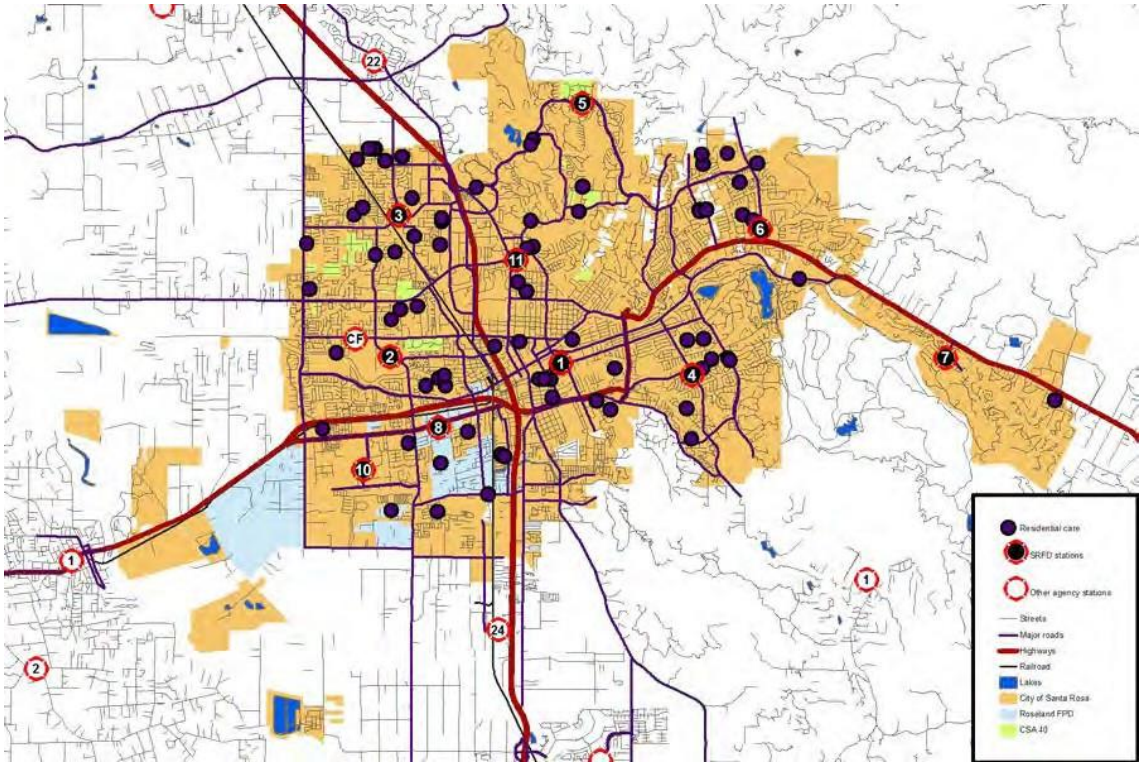


Residential Care Facilities

For those not needing regular skilled nursing care, residential care homes offer a good alternative. Most of these facilities operate out of homes and serve six or fewer residents. However, many residents have limited mobility complicating evacuation during a fire.

The following figure shows the locations of residential care facilities.

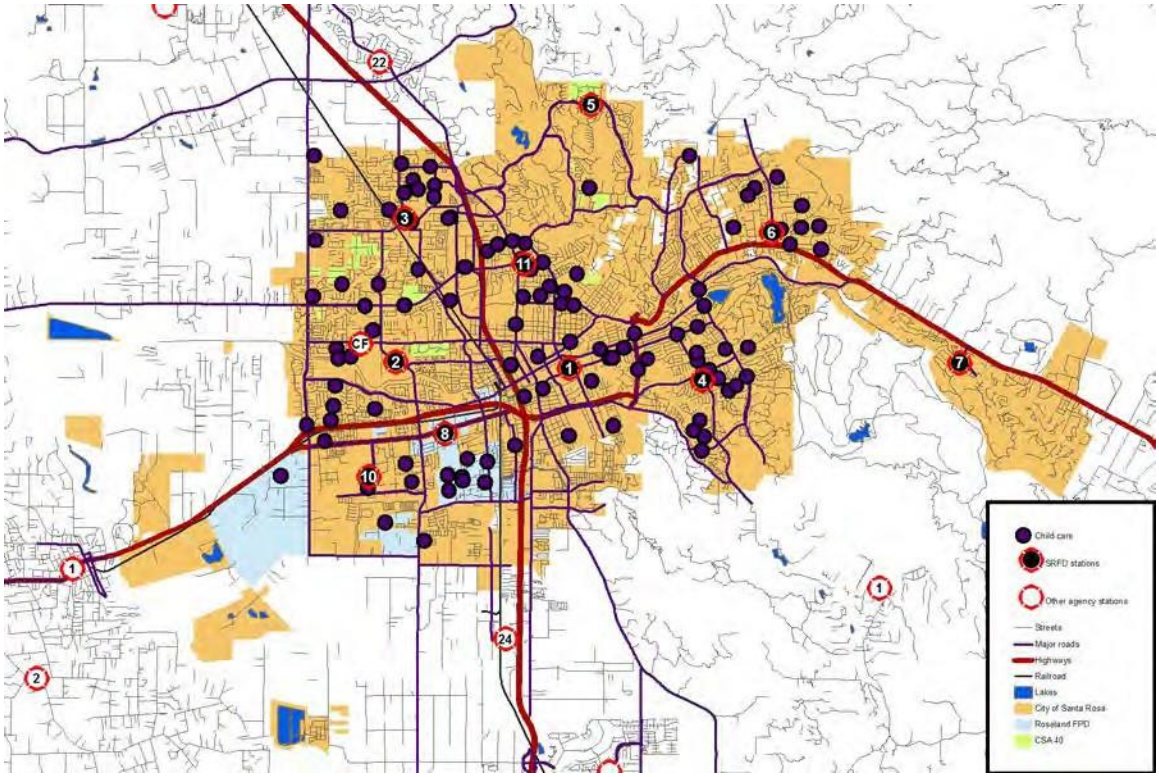
Figure 18: Residential Care Facilities



Child Care Facilities

There are numerous facilities that provide day care for children. These are either in commercial buildings or operate from homes. These facilities care for vulnerable populations. Child care facilities can be found throughout the city.

Figure 19: Child Care Facilities



Other Critical Infrastructure

In this section, other types of infrastructure critical to a community are discussed in general terms. Though SRFD does not have any unusual critical community infrastructure, it is important the fire department plan for emergencies at any of these facilities.

Water Distribution

The most obvious concern to the fire department is the water reservoir, water main, and fire hydrant system. Providing sufficient storage, distribution, and access to this valuable firefighting resource through well-distributed fire hydrants is very important.

Communications

Emergency communication centers and the associated transmitting and receiving equipment are essential facilities for emergency response. A number of agencies provide emergency 9-1-1 call receipt. Redwood Empire Communications Authority provides dispatch service to a number of regional fire agencies. This center provides for the interrogation of 9-1-1 calls for help, dispatching of fire and other emergency responders, and important support to the incident management function.

There are other communication facilities and equipment that are equally important to the community and government operations. These are the telephone company central offices and the transmission lines of local telephone service providers. Internet service providers, along with wireless cellular communication providers, provide essential communication capabilities for the community as well as emergency personnel through their facilities and equipment.

Energy

Previously discussed community services, from communications to traffic signals to normal operations, require the use of energy. Whether it is electricity generation and transmission systems, fuel distribution and storage tanks, or natural gas pipelines and regulator stations, the community is dependent upon energy sources.

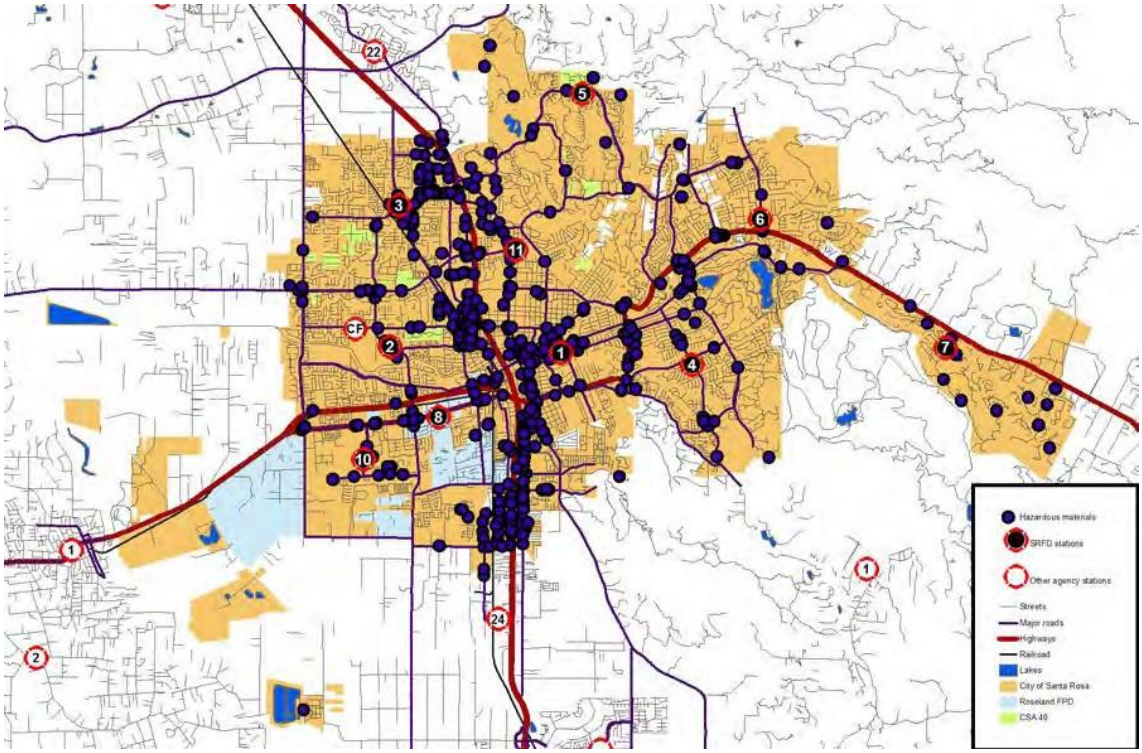
Structural Risks

Certain buildings, their contents, functions, and size present a greater firefighting challenge and require special equipment, operations, and training. Information for this section has been drawn from SRFD records and the Insurance Services Office (ISO) database.

Hazardous Materials

Buildings that have been identified as containing hazardous materials can create a dangerous environment to the community as well as the firefighters during a spill or fire. Special equipment such as protective clothing and sensors, along with specialized training, is necessary to successfully mitigate a hazardous materials incident. The following figure shows the locations of the facilities classified as using more than small quantities of hazardous materials.

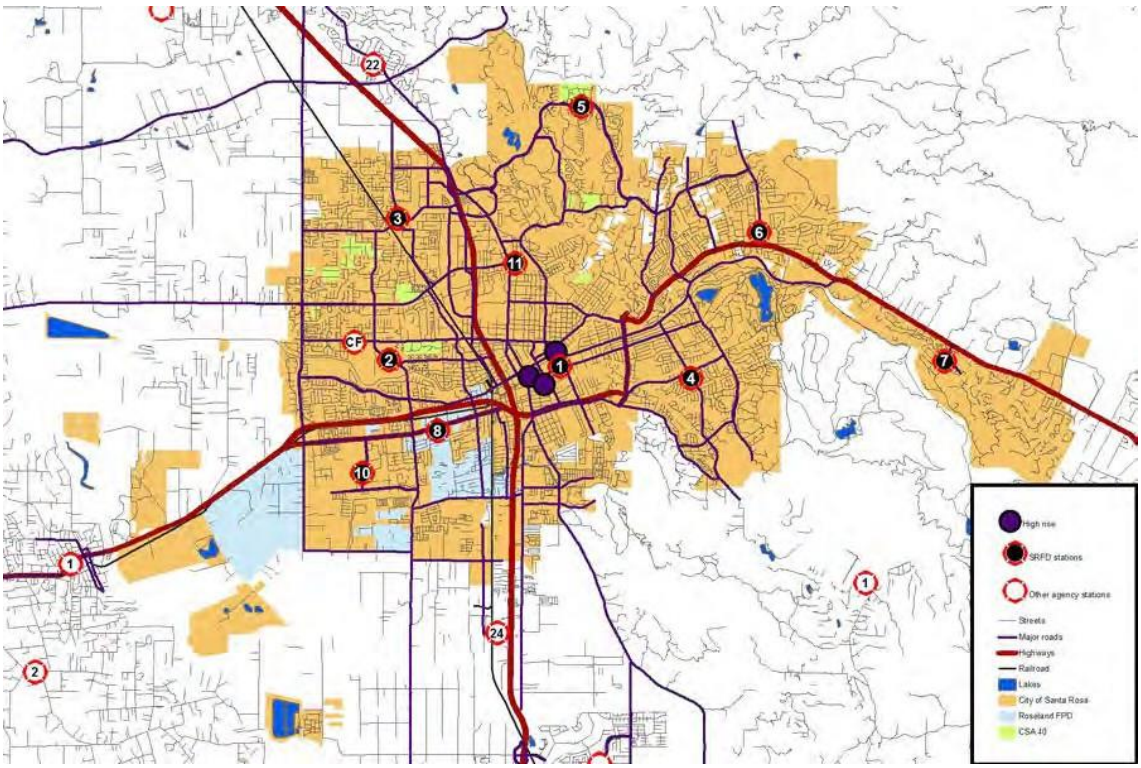
Figure 20: Hazardous Material Use Locations



High Rise Buildings

High rise buildings present a unique challenge to fire departments. Additional personnel are required to move hose and equipment to upper floors of these buildings. A high rise building, as defined by the city's building code, is any building having floors used for human occupancy located more than 75 feet above the lowest floor level having building access (approximately seven or eight stories). The following figure shows the locations of high rise buildings.

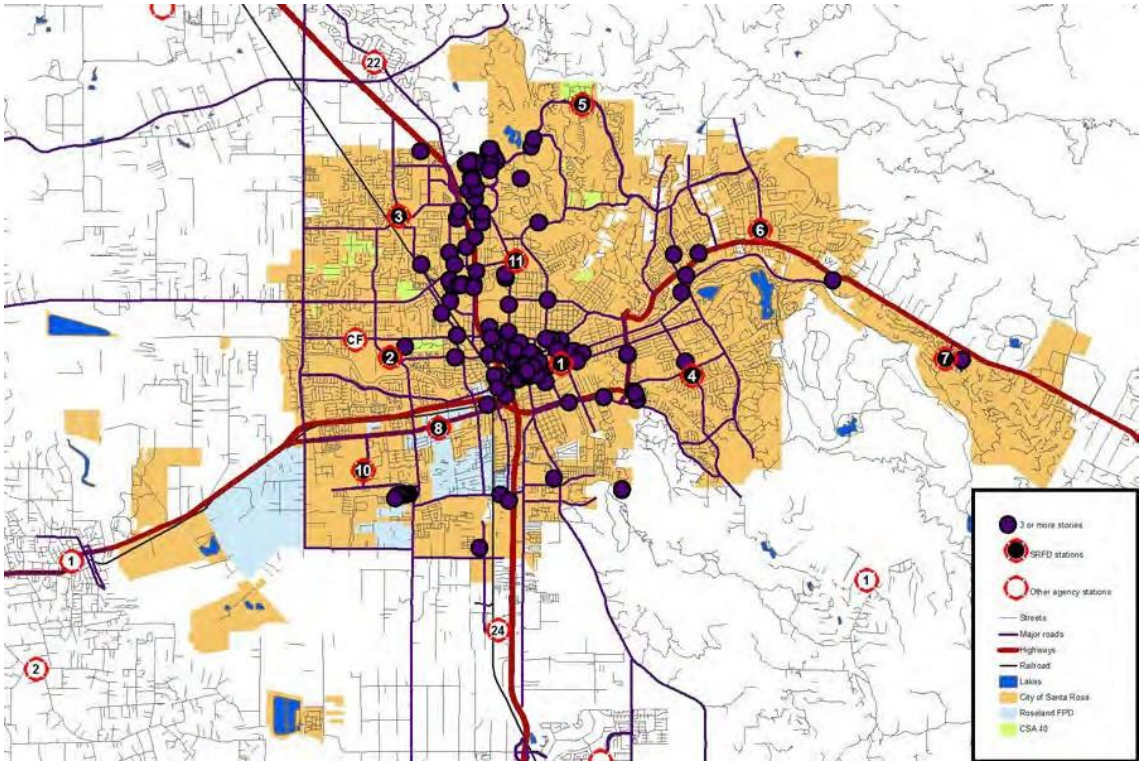
Figure 21: High Rise Buildings



Buildings Three or More Stories in Height

The Insurance Services Office calls for a ladder truck within two and one half miles of developed areas containing buildings three or more stories in height. Accessing the upper floors and roof of buildings this tall typically requires ladder truck capability as ground ladders may not provide access. The following figure shows the locations of many of buildings three or more stories in height.

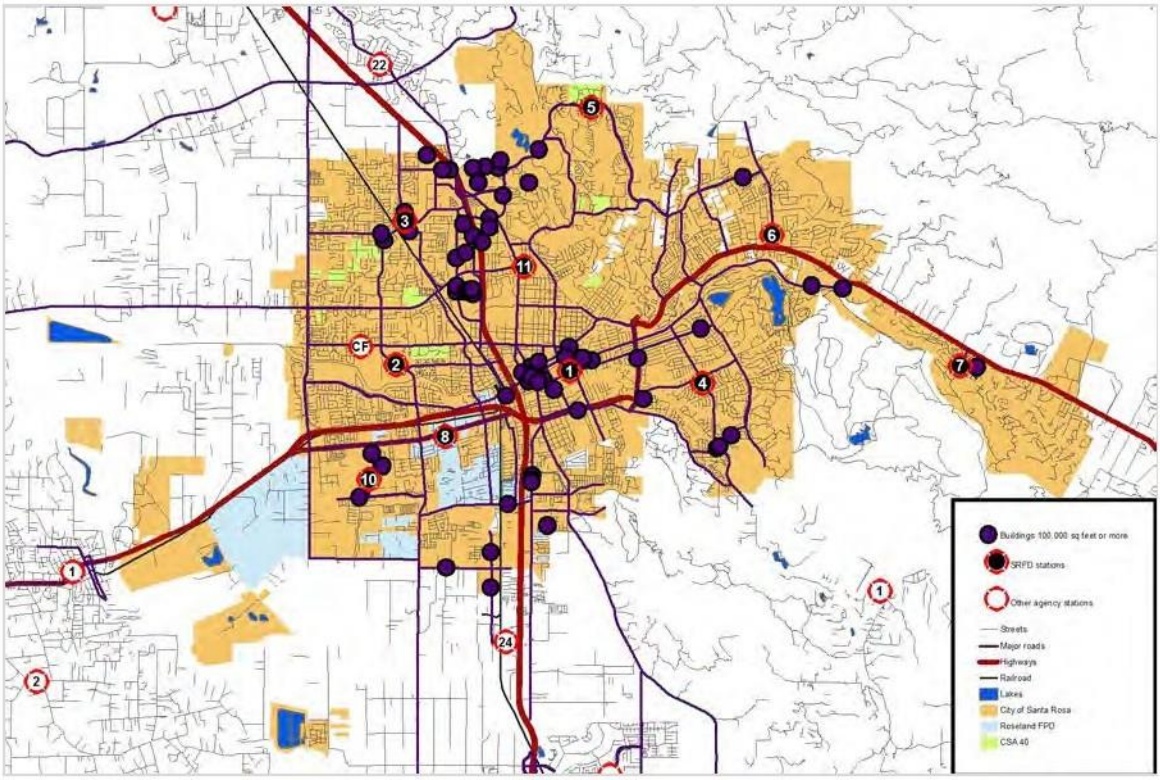
Figure 22: Buildings Three or More Stories in Height



Large Square Footage Buildings

Large buildings, such as warehouses, malls, and large "box" stores require greater volumes of water for firefighting and require more firefighters to advance hose lines long distances into the building. The following figure shows the locations for buildings 100,000 square feet and larger.

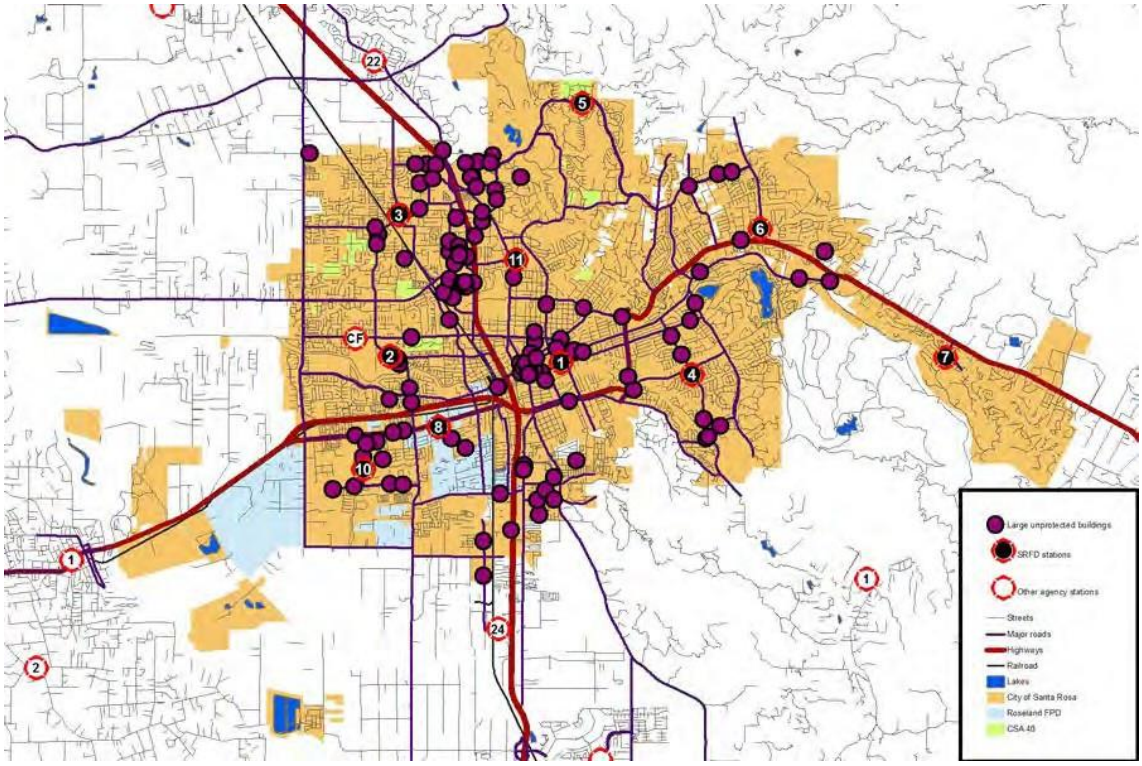
Figure 23: Buildings – 100,000 Square Feet and Larger



Large Unprotected Buildings

Current building codes require that larger buildings be equipped with built-in fire suppression equipment such as fire sprinkler systems. However, many buildings in Santa Rosa were built prior to these codes. The following figure shows the locations of buildings 50,000 square feet and larger that are not protected by fire sprinkler or other automatic extinguishing systems.

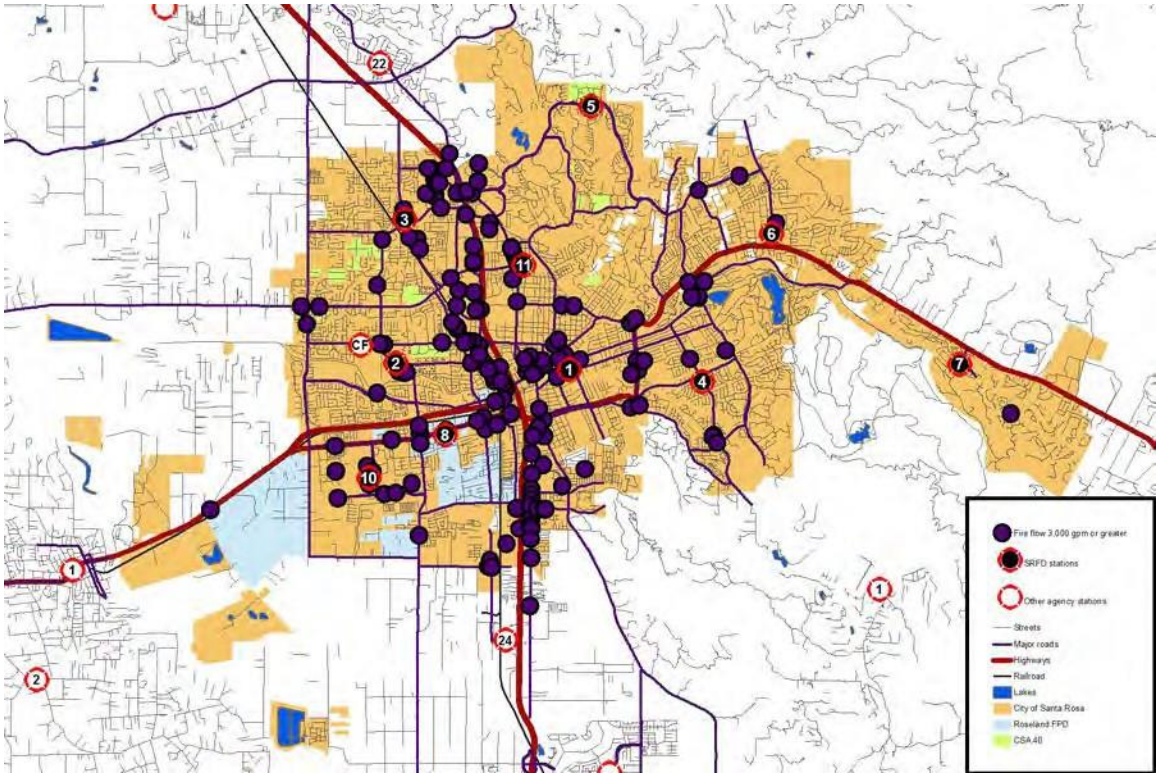
Figure 24: Large Unprotected Buildings



High Fire Flow Buildings

Fire departments must deliver sufficient resources to a fire to apply an adequate amount of water to extinguish a fire. Larger buildings and buildings constructed of combustible construction require more water (in gallons per minute) that smaller, fire resistive buildings with automatic extinguishing systems. The following figure shows the locations of buildings with a needed fire flow of 3,000 gallons per minute or more.

Figure 25: High Fire Flow Buildings



Terrorism

Santa Rosa is a potential target for terrorism. Most of the previous categorized risks in the community are targets for such activity. In addition, the city hosts numerous large public gathering events during the year. The larger of these events, all potential terrorism targets, include:

- Annadel Half Marathon
- Cezar Chavez March
- Cinco de Mayo Festival
- South Park Day & Night Festival
- Levi's Grand Fondo Bike Race
- Tour of California Bike Race
- May Day Immigration March
- Ranger Relay
- Rose Parade
- Santa Rosa Marathon
- Sonoma County Fair
- Harvest Festival
- St. Patrick's 5K

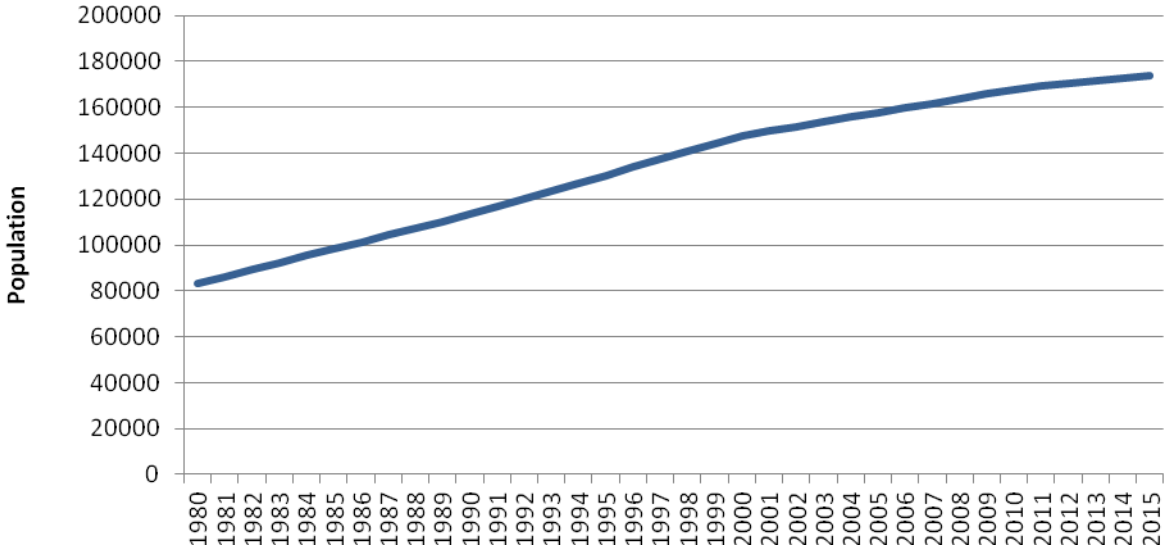
Santa Rosa is near San Francisco, which also has a terrorism risk. SRFD may either be impacted by the consequence of a terrorist act in San Francisco or be asked to support San Francisco in the aftermath of such an event. The fire department needs to be vigilant in its training and preparedness in the event one or more coordinated acts of terror occur in the region.

DEVELOPMENT AND POPULATION GROWTH

Current Population Information

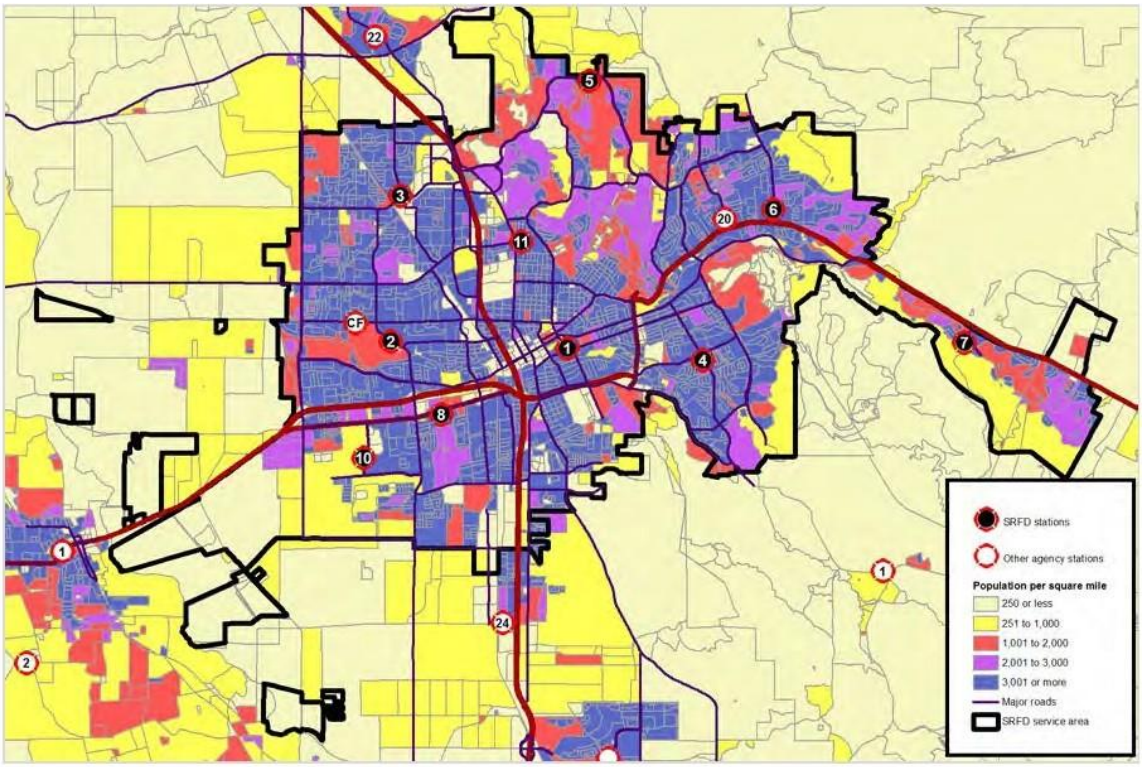
SRFD's population has grown moderately, with an average annual growth rate of 3 percent between 1980 and 2015. At the time of this study, the current service area population is estimated at 181,900. Population change due to commuting is not accurately known. The following figure illustrates resident population growth over the past 35 years.

Figure 26: Population History, 1980 - 2015



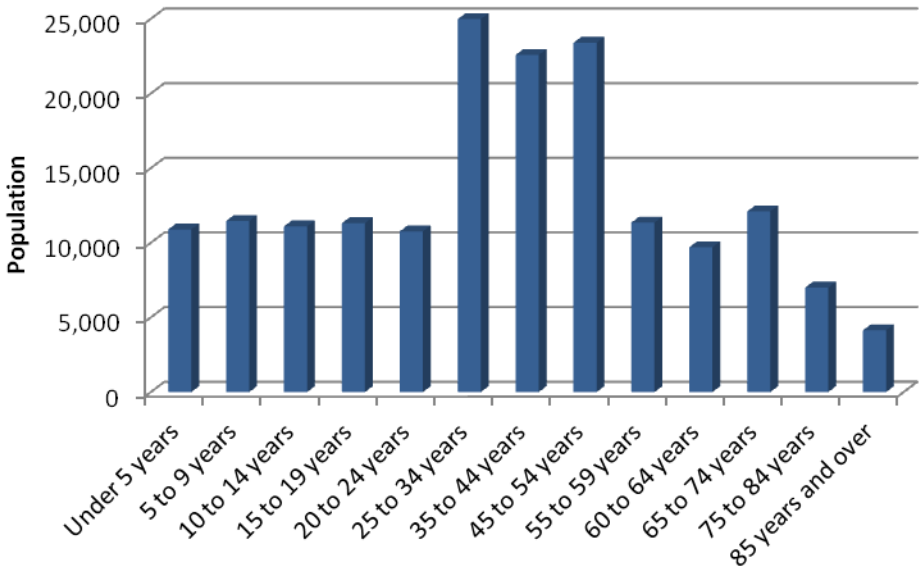
There is a direct correlation between population density and service demand. The following figure displays the population density of the SRFD service area based on 2010 Census data. Census data only includes people who live full-time in the community. It does not include people who visit or reside temporarily in a community.

Figure 27: Population Density, 2010



One of the factors that can influence emergency service demand, particularly emergency medical services, is the population's age. The following figure examines Santa Rosa's population segmented by age groups. This data is based on 2014 American Community Survey estimates.

Figure 28: Estimated Population by Age



Based on the preceding figure, 13.6 percent of the population is 65 years of age or older and 6.4 percent of the population is under five years of age. This places a total of 20 percent of the area's population within the age groups that are at highest risk in residential fire incidents and account for some of the highest use of emergency medical services. Senior citizens can have difficulty escaping from fire due to physical limitations. Seniors also tend to use emergency medical services more frequently than younger persons. As the population ages, this will create an increase in service demand for emergency medical services.

The very young also represent a vulnerable population, both in regard to their ability to escape a structure fire as well as their susceptibility to serious medical ailments such as asthma, traumatic events, choking, or injury from vehicular accidents.

RISK CLASSIFICATION

Areas of higher fire and life risk require greater numbers of personnel and apparatus to effectively mitigate emergencies. Areas with a higher incident activity require additional response units to ensure reliable response. Staffing and deployment decisions for different regions of the city should be made in consideration of the level of risk in each.

Most communities contain areas with different population densities and property risk allowing the community's policy makers to specify different response performance objectives by geographic area. The classifications are identified as:[2]

- **Metropolitan**—Geography with populations of over 200,000 people in total and a population density predominately over 3,000 people per square mile. These areas are distinguished by inner city neighborhoods, numerous mid-rise and high-rise buildings, often interspersed with smaller structures.
- **Urban**—Geography with a population of over 30,000 people and/or a population density predominately over 2,000 people per square mile. These areas are characterized by significant commercial and industrial development, dense neighborhoods, and some mid-rise or high-rise buildings.
- **Suburban**—Geography with a population of 10,000 to 29,999 and/or a population density predominately between 1,000 and 2,000 people per square mile. These areas are characterized by single and multifamily neighborhoods, and smaller commercial developments
- **Rural**—Geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile. These areas are characterized by low density residential, little commercial development, and significant farm or open space uses.
- **Wilderness/Frontier/Undeveloped**—Geography that is both rural and not readily accessible by a publicly or privately maintained road.

SRFD's service area, based on population density, is of two classifications: urban and suburban. The community's risk classifications should influence how response resources are distributed now and in the future. Since suburban areas are anticipated to grow in population densities, response performance objectives have been established that are uniform across the entire developable service area.

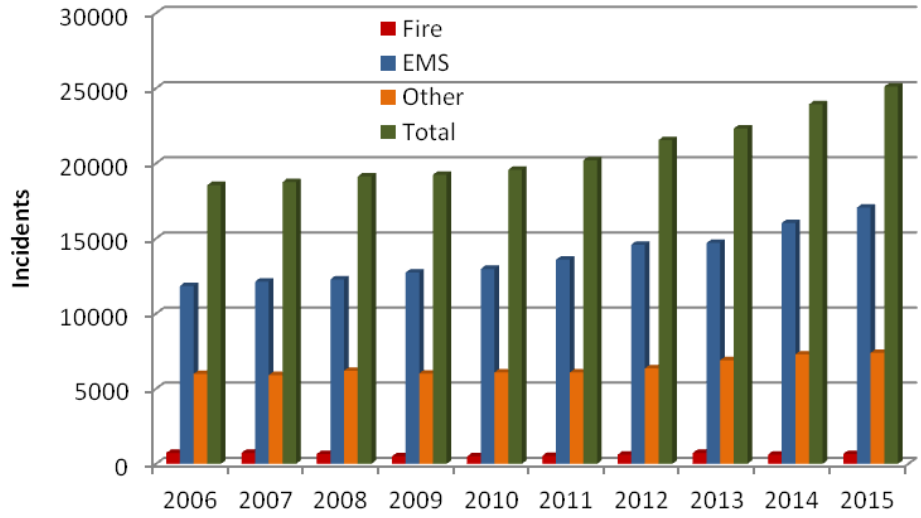
[2] CFAI *Standards of Cover, 5th edition*

HISTORIC SYSTEM RESPONSE WORKLOAD

Before a full response time analysis is conducted, it is important to first examine the level of workload (service demand) that a fire department experiences. Higher service demands can strain the resources of a department and may result in a negative effect on response time performance.

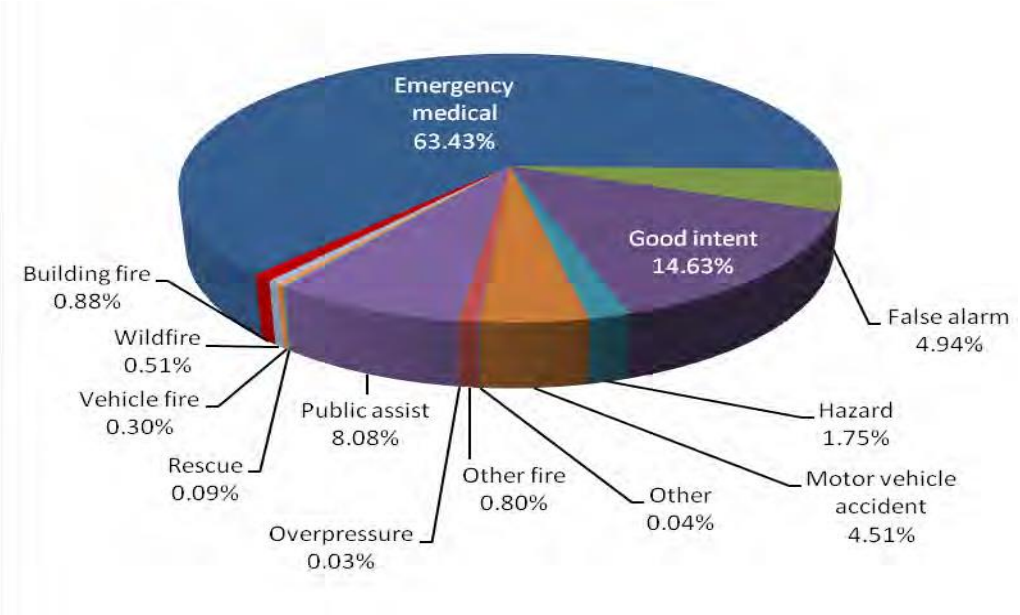
The following figure shows response workload for ten years. Total response workload has increased 35.3 percent over the ten years, primarily driven by the increase in emergency medical responses.

Figure 29: Response Workload History, 2006 – 2015



Incident data used for the evaluation of current performance was all responses made during 2015. During the year SRFD responded to 25,109 incidents. The next figure shows responses by type of incident for the study period. Emergency medical type responses (EMS and motor vehicle accidents) are the most common at 67.9 percent of total responses.

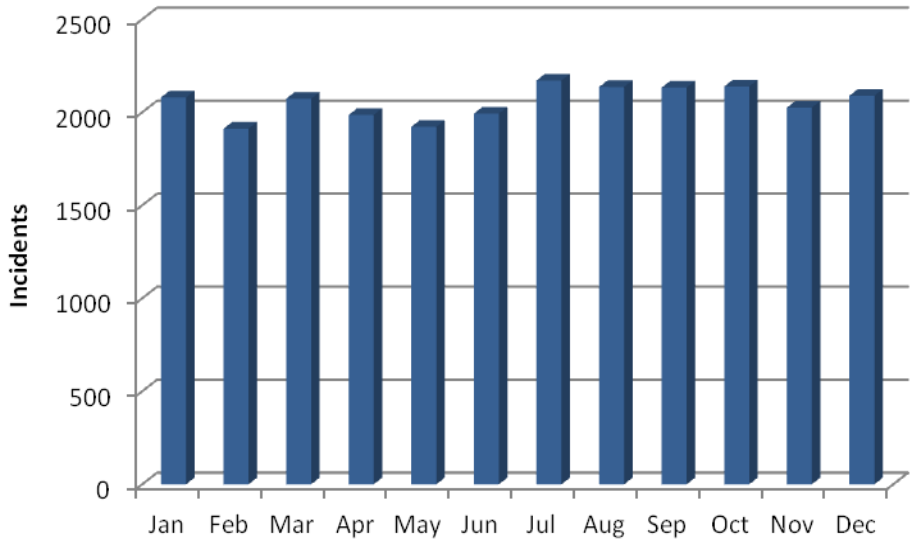
Figure 30: Responses by Type of Incident



Temporal Analysis

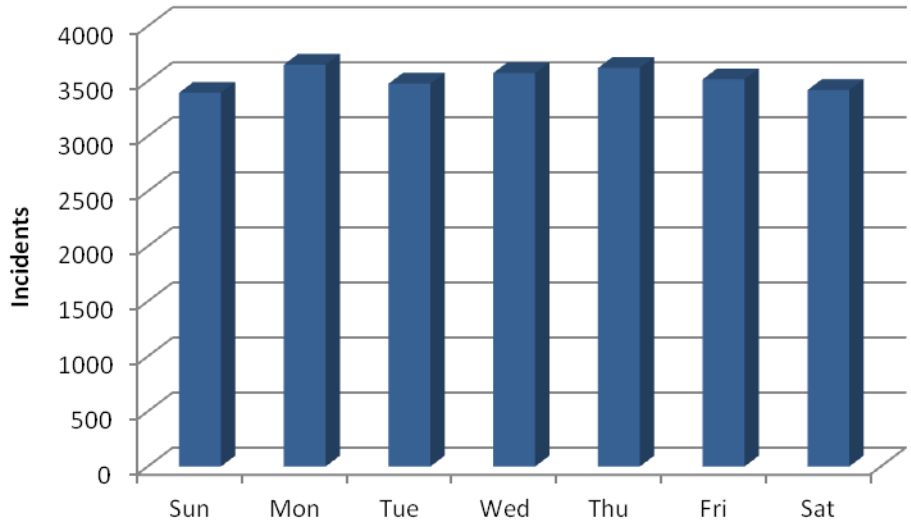
A review of incidents by time of occurrence also reveals when the greatest response demand is occurring. The following figures show how activity and demand changes for SRFD based on various measures of time. The following figure shows response activity during the study period by month. There is little variation by month.

Figure 31: Monthly Response Workload



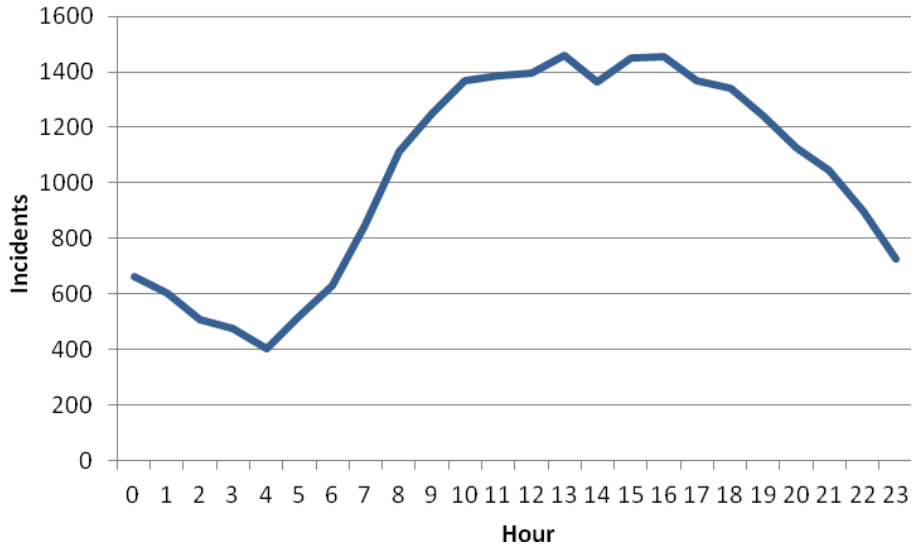
Next, response workload is compared by day of week. Again, there is little variation in response workload by weekday.

Figure 32: Daily Response Workload



The time analysis that always shows significant variation is response activity by hour of day. Response workload directly correlates with the activity of people, with workload increasing during daytime hours and decreasing during nighttime hours as shown in the following figure. Incident activity is at its highest between 9:00 AM and 8:00 PM.

Figure 33: Hourly Response Workload

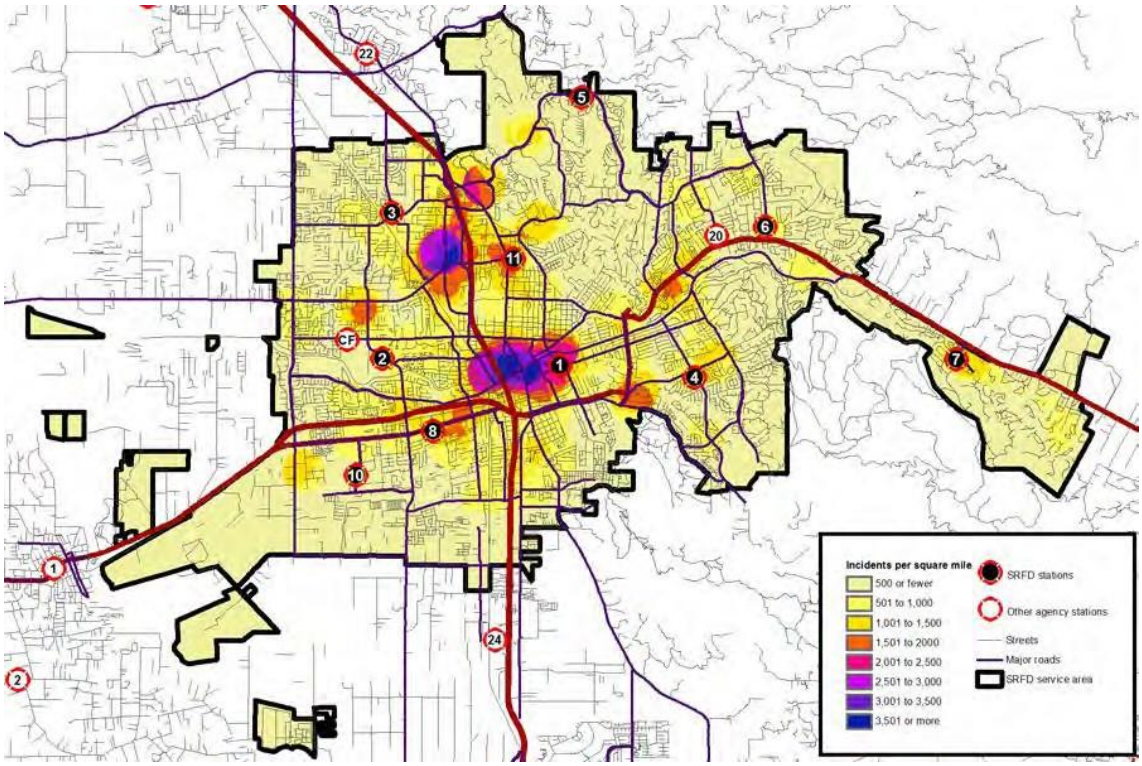


Spatial Analysis

In addition to the temporal analysis of the current service demand, it is useful to examine geographic distribution of service demand. The following figures indicate the distribution of emergency incidents in SRFD during 2015.

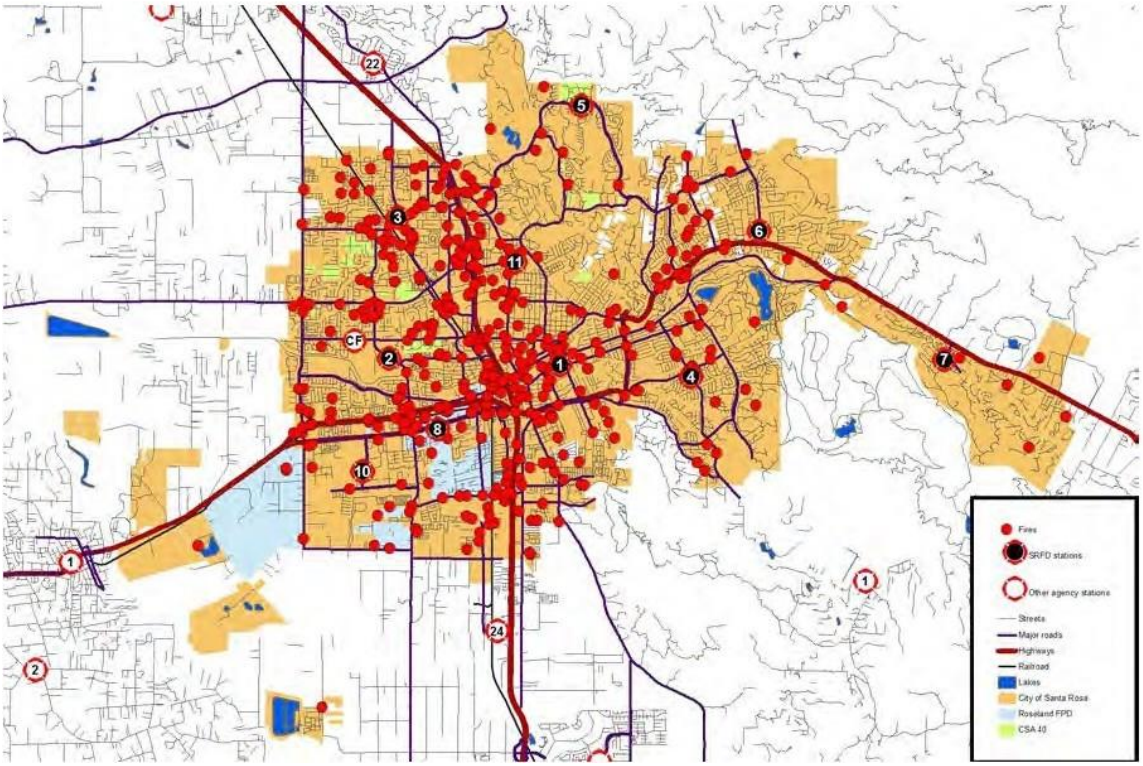
The first figure displays the number of incidents per square mile within various parts of the city. The area of greatest service demand is the city's southern half.

Figure 34: Service Demand Density



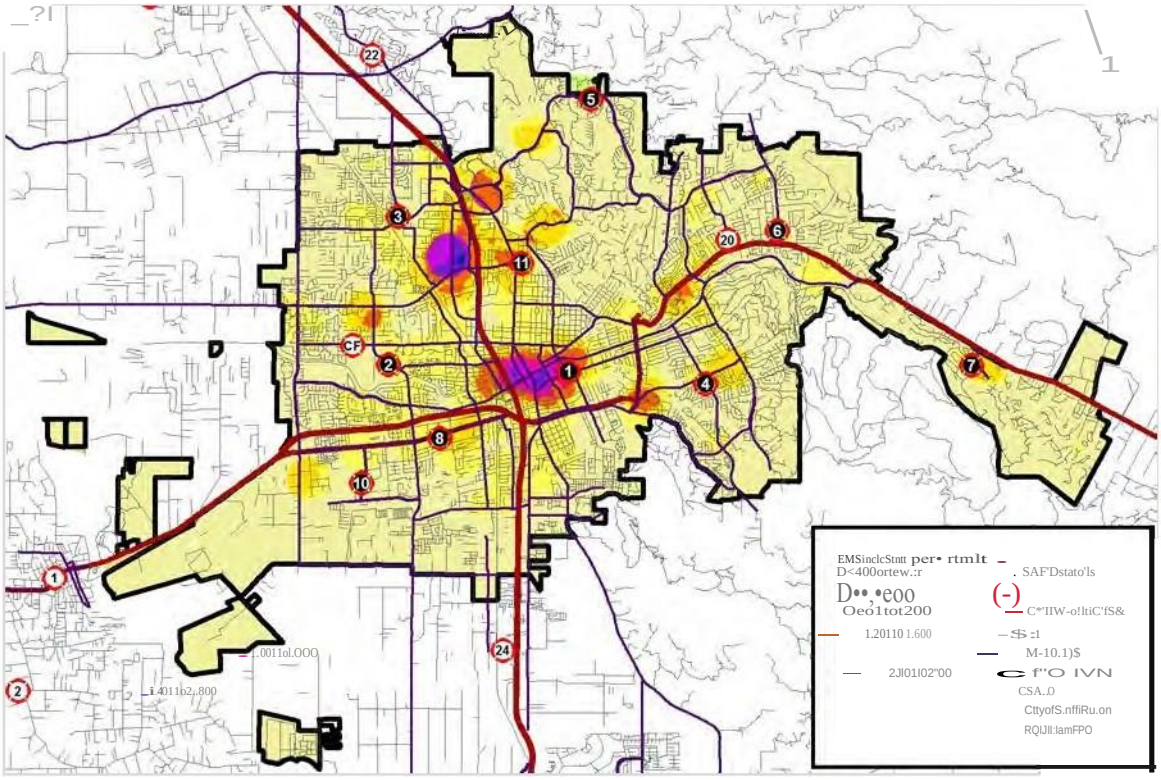
The preceding figure reflects all calls served by SRFD. Service demand can vary by area based on incident type. The following figure displays the location of fires occurring within the SRFD service area during 2015. This illustrates that fire incidents are distributed mostly in the service area's western half.

Figure 35: Fires



Similarly, emergency medical incidents also occur in greater concentration in areas of higher population density. The following figure displays ernergency medical incidents per square mile during 2015.

Figure 36:Emergency MedicalIncidents per Square Mile



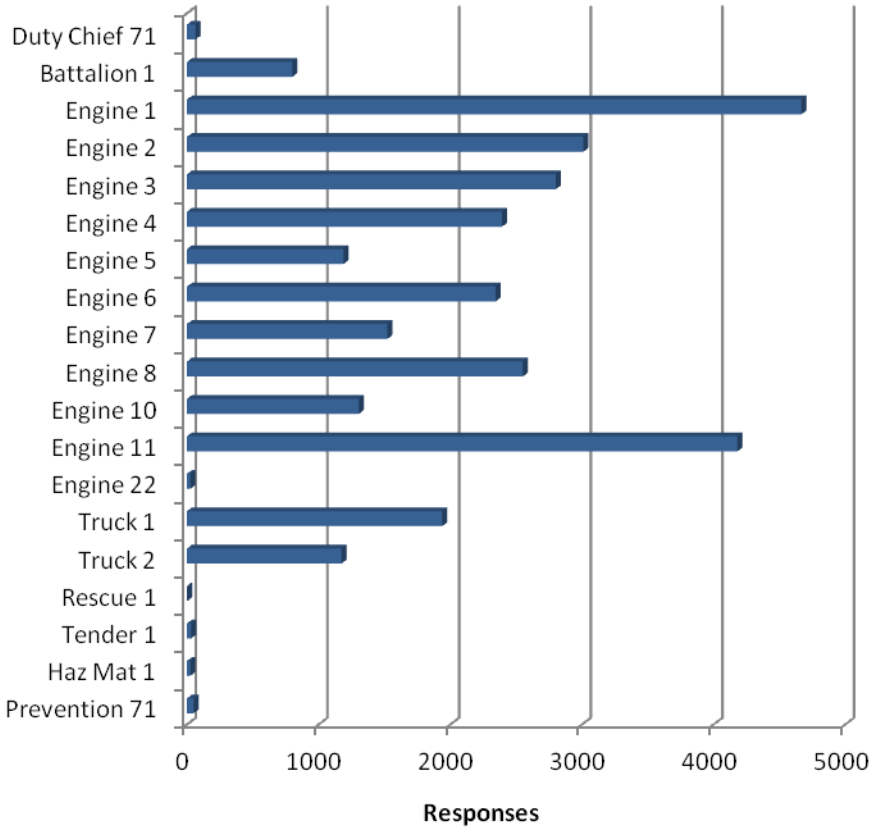
UNIT WORKLOAD ANALYSIS

A review of workload by response unit can reveal much about response time performance. Although fire stations and response units may be distributed in a manner to provide quick response, that level of performance can only be obtained when the response unit is available in its primary service area. If a response unit is already on an incident and a concurrent request for service is received, a more distant response unit will need to be dispatched. This will increase response times.

Response Unit Workload

The workload on individual response units during the study period is shown in the following figure. Individual response unit workload can be greater than the workload in its home station area. Many incidents, such as structure fires, require more than one response unit.

Figure 37: Response Unit Workload



The amount of time a given unit is committed to an incident is also an important workload factor. The following table illustrates the average time each unit was committed to an incident, from initial dispatch until it was available for another incident. Chief officers are also included in this list. Several were involved in out-of-town wildland fire incidents accounting for the long average minutes per response.

Figure 38: Average Time Committed to an Incident by Unit

Unit	Responses	Average Minutes per Response
Duty Chief 71	65	20.3
Battalion 1	742	20.0
Battalion 2	4	4.6
Engine 1	4620	14.6
Engine 2	2987	16.4
Engine 3	2758	18.7
Engine 4	2357	16.4
Engine 5	1188	19.3
Engine 6	2308	19.4
Engine 7	1491	19.5
Engine 8	2528	15.6
Engine 10	1295	17.6
Engine 11	4125	15.9
Engine 22	20	68.5
Truck 1	1939	12.1
Truck 2	1174	12.5
Rescue 1	2	89.5
Tender 1	25	37.8
Haz Mat 1	25	116.5
Prevention 71	50	121.4
7100	4	43.0
7101	4	12,308.7
7103	2	2,186.1
7104	6	5,144.1
7105	1	18,253.1
7107	1	8,401.8
7108	1	138.1

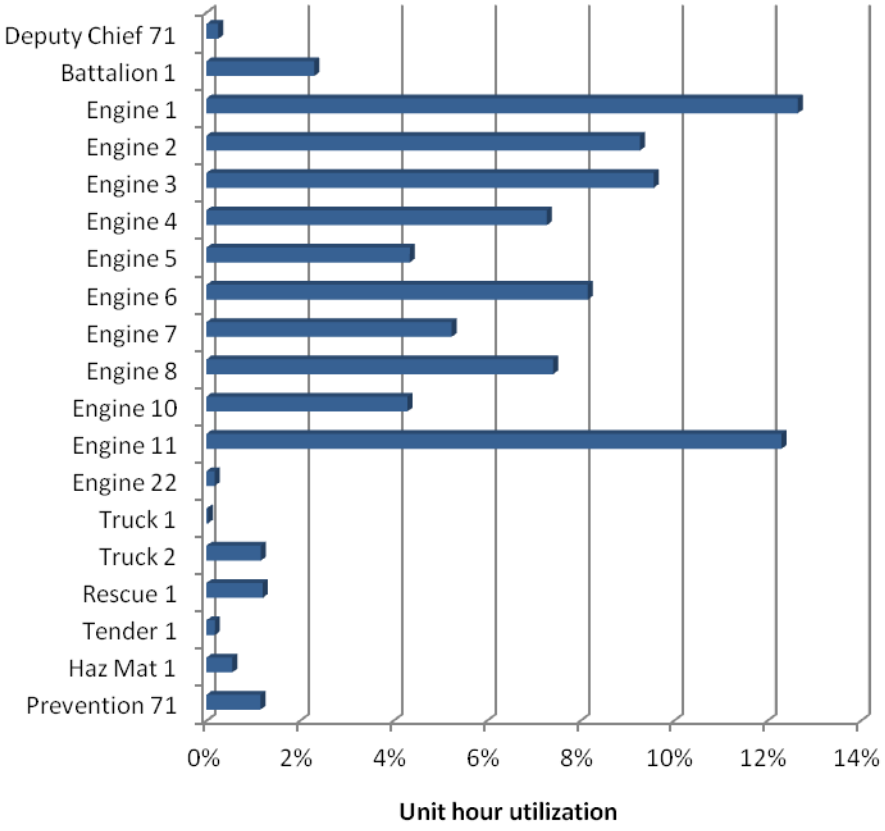
Unit hour utilization is an important workload indicator. It is calculated by dividing the total time a unit is committed to all incidents during a year divided by the total time in a year. Expressed as a percentage, it describes the amount of time a unit is not available for response since it is already committed to an incident. The larger the percentage, the greater a unit's utilization and the less available it is for assignment to an incident.

Unit hour utilization is an important statistic to monitor for those fire agencies using percentile-based performance standards, as does SRFD. In SRFD's case, where performance is measured at the 90th

percentile, unit hour utilization greater than 10 percent means that the response unit will not be able to provide on-time response to its 90 percent target even if response is its only activity.

Engines 1 and 11 already exceed 10 percent unit hour utilization. Engine 3 is approaching that level of workload.

Figure 39: Unit Hour Utilization



POPULATION FORECAST

A population forecast was provided by the city. Population growth for Santa Rosa is forecast to average 0.79 percent per year through 2050. Using this estimate, the city's population could reach 222,228 by 2050.

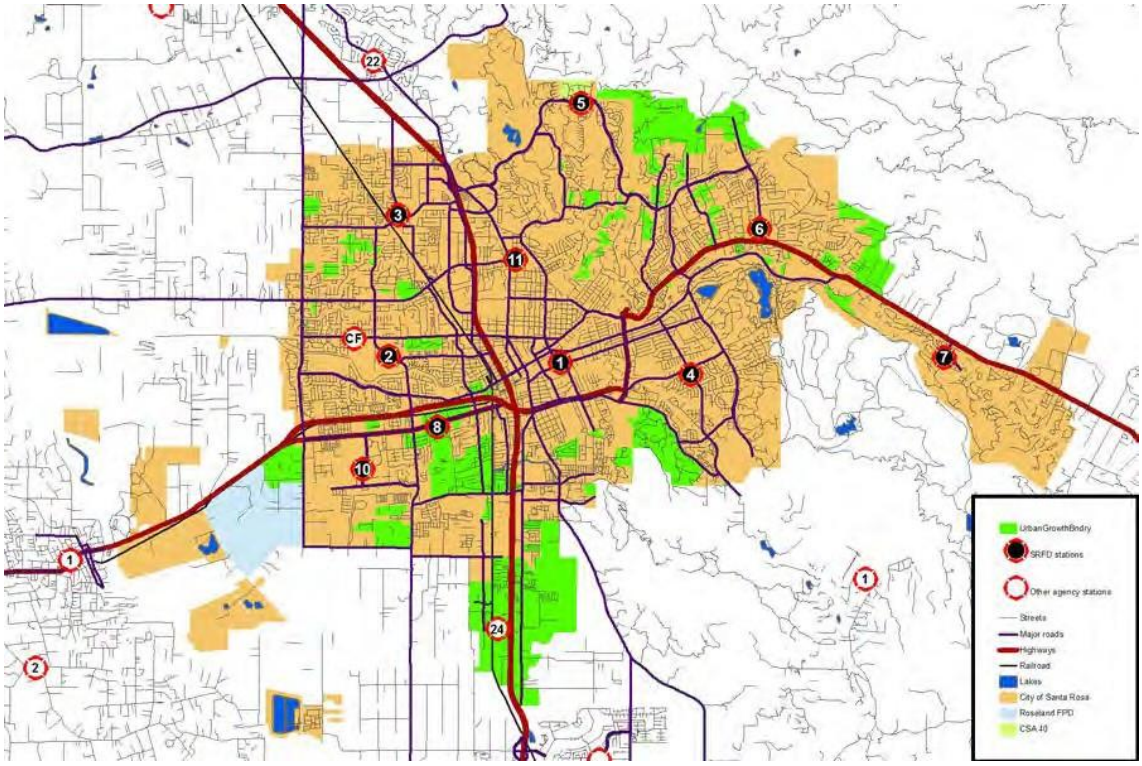
Development activity has increased as a result of the recovery from the 2008 recession. Development projects stalled due to lack of demand are beginning to be implemented and new projects proposed.

There are numerous vacant land pockets throughout the city. Though some, particularly in the city's southwest area are constrained by environmental concerns there is a fair amount of vacant land available for development. In-fill and redevelopment opportunities exist as well.

There is a proposal for a 2,500 unit senior community and golf course proposed on the city's east side. This will have an impact on fire department workload.

The city has additional territory both within and outside its current boundary that it could annex in the future. An area south of Station 8 is currently being considered for annexation. The city's urban growth boundary is shown in the following figure.

Figure 40: Urban Growth Boundary



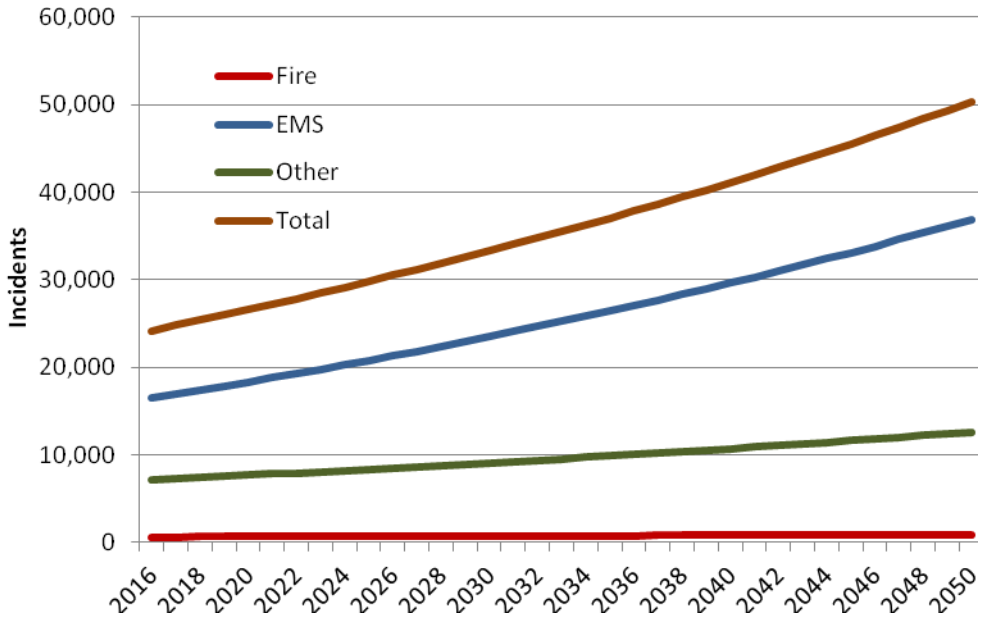
INCIDENT WORKLOAD PROJECTION

The most significant predictor of future incident workload is population; 100 percent of requests for emergency medical service are people-driven. The National Fire Protection Association reports that approximately 70 percent of all fires are the result of people either doing something they should not have (i.e., misuse of ignition source) or not doing something they should have (i.e., failure to maintain equipment). It is reasonable to use forecast population growth to predict future fire department response workload.

The current fire department services utilization rate is 144 incidents per 1,000 population. This is higher than typical for similar sized communities and is reflective of the tourism influence on fire department workload and other factors that are not yet fully understood.

The utilization of fire department services is expected to grow modestly over time at a rate of about 2 percent per year. This, plus expected population growth, will increase the SRFD's workload as shown in the following figure. Response workload could reach 50,358 responses per year by 2050 driven primarily by requests for emergency medical care.

Figure 41: Response Forecast 2016 - 2050



Component E – Critical Tasking and Alarm Assignments

The SRFD service area has a densely populated urban environment and, as such, contains an elevated number, density, and distribution of risk. Further, its suburban and rural areas present unique challenges such as wildland fires. The fire department should have the resources needed to effectively mitigate the incidents that have the highest potential to negatively impact the community. As the actual or potential risk increases, the need for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished and certain numbers and types of apparatus should be dispatched. This section considers the community's identified risks and illustrates the number of personnel that are necessary to accomplish the critical tasks at an emergency.

Tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants, and their location, status, and ability to take self-preservation action. Life safety related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Backup/rapid intervention

Critical task analysis also applies to non-fire type emergencies including medical, technical rescue, and hazardous materials emergencies. Numerous simultaneous tasks must be completed to effectively control an emergency. The department's ability to muster needed numbers of trained personnel quickly enough to make a difference is critical to successful incident outcomes.

The following figure illustrates the minimum emergency incident staffing recommendations of the Commission on Fire Accreditation, International. The following definitions apply to the figure:

> **Low Risk**—Minor incidents involving small fires (fire flow less than 250 gallons per minute), single patient non-life threatening medical incidents, minor rescues, small fuel spills, and small wildland fires without unusual weather or fire behavior.
>
> **Moderate Risk**—Moderate risk incidents involving fires in single-family dwellings and equivalently sized commercial office properties (fire flow between 250 gallons per minute to 1,000 gallons per minute), life threatening medical emergencies, hazardous materials emergencies requiring specialized skills and equipment, rescues involving specialized skills and equipment, and larger wildland fires.

High Risk—High risk incidents involving fires in larger commercial properties with sustained attack (fire flows more than 1,000 gallons per minute), multiple patient medical incidents, major releases of hazardous materials, high risk rescues, and wildland fires with extreme weather or fire behavior.

Figure 42: Staffing Recommendations Based on Risk

Incident Type	High Risk	Moderate Risk	Low Risk
Structure Fire	29	15	6
Emergency Medical Service	12	4	2
Rescue	15	8	3
Hazardous Materials	39	20	3
Wildland Fire	41 (Red Flag level)	20	7

The SRFD has developed the following Critical Task analyses using the risk matrices included in the Critical Task section for various incident types. Further, it has defined, based on current unit staffing levels, the number and type of apparatus needed to deliver sufficient numbers of personnel to meet the critical tasking identified. ESCI's review of the Critical Task analysis concludes that all are generally in keeping with industry standards and provide the minimum number of personnel needed for effective incident operations.

Establishing resource levels needed for various types of emergencies is a uniquely local decision. Factors influencing local decisions for incident staffing include the type of equipment operated, training levels of responders, operating procedures, geography, traffic, and the nature of building and other risks being protected.

CRITICAL TASKING

Critical tasks are those activities that must be conducted early on and in a timely manner by firefighters at emergency incidents in order to control the situation, stop loss, and to perform necessary tasks required for a medical emergency. SRFD is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner. These are the minimum number of personnel needed by incident type. More personnel will be needed for incidents of increased complexity or size.

Structure Fire (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIT	3
Other (Hydrant)	1
Total	**14**

Structure Fire (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	2
Attack Line	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIT	3
Tender Operator	2
Total	**16**

Wildland Fire – High Risk

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Structure Protection	2
Water Supply	1
Total	**7**

Wildland Fire – Low Risk

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Structure Protection	2
Tender Operator	1
Total	**7**

Aircraft Emergency

Task	Number of Personnel
Command/Safety	1
Aircraft Fire Suppression	2
Pump Operations	2
Attack Line	2
Back-up Line	2
Rescue	2
Emergency Medical Care	2
Water Supply	1
Total	**14**

Hazardous Materials – High Risk

Task	Number of Personnel
Command	2
Liaison	1
Decontamination	4
Research Support	2
Team Leader, Safety, Entry Team, and Backup Team	6
Total	**15**

Hazardous Materials – Low Risk

Task	Number of Personnel
Command	2
Liaison	1
Decontamination	4
Research/Support	2
Entry team, and Backup Team	6
Total	**15**

Emergency Medical Aid

Task	Number of Personnel
Patient Management	1
Patient Care	1
Documentation	1
Total	**3**

Major Medical Response (10+ Patients)

Task	Number of Personnel
Incident Command/Safety	1
Triage	1
Treatment Manager	1
Patient Care	8
Transportation Manager	1
Total	**12**

Motor Vehicle Accident (Non Trapped)

Task	Number of Personnel
Scene Management/Documentation	1
Patient Care/Extrication	2
Total	**3**

Motor Vehicle Accident (Trapped)

Task	Number of Personnel
Command/Safety	1
Scene Management	1
Patient Care	2
Extrication	3
Pump Operator/Suppression Line	2
Extrication/Vehicle Stabilization	2
Total	**11**

Technical Rescue – Water

Task	Number of Personnel
Command/Safety	1
Rescue Team	3
Backup Team	2
Patient Care	2
Rope Tender	2
Upstream Spotter	2
Downstream Safety	2
Total	**14**

Technical Rescue – Rope

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup/Support Team	2
Patient Care	2
Rigger	1
Attendant	1
Ground Support	4
Edge Person	1
Total	**14**

Technical Rescue – Confined Space

Task	Number of Personnel
Command/Safety	2
Rescue Team	2
Backup/Support Team	2
Patient Care	2
Attendant	1
Rigger	1
Ground Support	4
Total	**14**

Technical Rescue – Trench

Task	Number of Personnel
Rescue Team	2
Backup/Support Team	2
Patient Care	3
Shoring	5
Total	**14**

ALARM ASSIGNMENTS

In order to ensure sufficient personnel and apparatus are dispatched to an emergency event the following first alarm response assignments have been established. "Total Staffing Needed" is the number identified in the Critical Tasking analysis above. The number of personnel and apparatus required to mitigate an active and complex working incident will require additional resources above and beyond the numbers listed below.

Structure Fire (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Structure Fire (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	9
Tender	1	2
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**15**
Total Staffing Needed		**16**

Wildland Fire – High Risk

Unit Type	Number of Units	Total Personnel
Engine	2	6
Battalion Chief	1	1
Total Staffing Provided		**7**
Total Staffing Needed		**7**

Wildland Fire – Low Risk

Battalion Chief	1	1
Total Staffing Provided		**7**
Total Staffing Needed		**7**

Aircraft Emergency

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
ARRF	0	0
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Hazardous Materials – High Risk

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
Battalion Chief	2	2
Hazardous Materials Unit	1	0
Total Staffing Provided		**15**
Total Staffing Needed		**15**

Hazardous Materials – Low Risk

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
Battalion Chief	2	2
Hazardous Materials Unit	1	0
Total Staffing Provided		**15**
Total Staffing Needed		**15**

Emergency Medical Service

Unit Type	Number of Units	Total Personnel
Engine or Truck	1	3-4
Total Staffing Provided		**3-4**
Total Staffing Needed		**3**

Major Medical Response (10+ Patients)

Unit Type	Number of Units	Total Personnel
Engine	2	6
Truck	1	4
Battalion Chief	2	2
Total Staffing Provided		**12**
Total Staffing Needed		**12**

Motor Vehicle Accident (Non-Trapped)

Unit Type	Number of Units	Total Personnel
Engine or Truck	1	3-4
Total Staffing Provided		**3-4**
Total Staffing Needed		**3**

Motor Vehicle Accident (Trapped)

Unit Type	Number of Units	Total Personnel
Engine	2	6
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**11**
Total Staffing Needed		**11**

Technical Rescue – Water

Unit Type	Number of Units	Total Personnel
Engine with Boat	3	9
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Technical Rescue – Rope

Unit Type	Number of Units	Total Personnel
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Technical Rescue – Confined Space

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Technical Rescue – Trench

Unit Type	Number of Units	Total Personnel
Engine	3	9
Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Component F – Review of Historical System Performance

Incident data for the period between January 1 and December 31, 2015, was evaluated in detail to determine SRFD's current performance. Data was obtained from SRFD incident reports and the dispatch center's computer-aided dispatch system.

Only incidents occurring within the SRFD service area that were dispatched as a "priority" are included in the analysis. Priority incidents involve emergencies to which the fire department initiated a "code 3" (using warning lights and sirens) response (18,744 incidents during 2015). Incidents initially dispatched as non-emergency responses were excluded. Performance is reported based on the final outcome of the incident, which may be different than how it was initially dispatched. For example, a person may report smoke coming from a building that turns out to be only steam. It may have been dispatched as a structure fire but its final type would be reported as "good intent." The initial dispatch type codes used by the dispatch center do not provide sufficient definition to fully understand how the incident was classified by the call taker.

Each phase of the incident response sequence was evaluated to determine current performance. This allows an analysis of each individual phase to determine where opportunities might exist for improvement.

The total incident response time continuum consists of several steps, beginning with initiation of the incident and concluding with the appropriate mitigation of the incident. The time required for each of the components varies. The policies and practices of the fire department directly influence some of the steps.

SRFD's response performance was compared to its performance goals. In most cases these goals compare to the national consensus standard for response performance found in the *National Fire Protection Association Standard 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2010 Edition. The various primary answer points and REDCOM's performance were compared to the SRFD's goals as well as standards found in *National Fire Protection Association Standard 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2013 Edition.

The following figure summarizes the performance standards found in SRFD's performance goals, and if not addressed by those, the National Fire Protection Association (NFPA) documents.

Figure 43: Summary of SRFD Performance Standards

Incident Interval	Performance Goal
9-1 1 call answer time (time from first ring to answer)	Within 15 seconds 95% of the time Within 40 seconds 99% of the time
Call transfer time (time from answer to acceptance at the secondary dispatch center)	Within 30 seconds 95% of the time
Call process time (time from acceptance at the dispatch center until notification of response units)	Within 70 seconds 90% of the time
Turnout time (time from notification of response personnel until the initiation of movement towards the incident)	Within 60 seconds 90% of the time
First unit travel time (time from initiation of response until arrival of the first unit at the incident)	Within 4 minutes 90% of the time
First unit response time (time from dispatch until arrival of the first unit at the incident)	Within 5 minutes 90% of the time
Full effective response force travel time (Time from dispatch until all units initially dispatched arrive at the incident. Response resources needed for a moderate risk building fire are used for the evaluation.)	Within 8 minutes 90% of the time

In keeping with *NFPA Standards 1710* and *1221* along with SRFD's performance goals, all response time elements are reported at a given percentile. Percentile reporting is a methodology by which response times are sorted from least to greatest, and a "line" is drawn at a certain percentage of the calls to determine the percentile. The point at which the "line" crosses the 90th percentile, for example, is the percentile time performance. Thus, 90 percent of times were at or less than the result. Only 10 percent were longer.

Percentile differs greatly from average. Averaging calculates response times by adding all response times together and then dividing the total number of minutes by the total number of responses (mean average). Measuring and reporting average response times is not recommended. Using averages does not give a clear picture of response performance because it does not clearly identify the number and extent of events with times beyond the stated performance goal.

What follows is a detailed description and review of each phase of the response time continuum. All phases will be compared to SRFD's performance goals.

Detection

The detection of a fire (or medical incident) may occur immediately if someone happens to be present or if an automatic system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period. The time period for this phase begins with the inception of the emergency and ends when the emergency is detected. It is largely outside the control of the fire department and not a part of the event sequence that is reliably measurable.

Call Processing

Most emergency incidents are reported by telephone to the 9-1-1 center. Call takers must quickly elicit accurate information about the nature and location of the incident from persons who are apt to be excited. A citizen well-trained in how to report emergencies can reduce the time required for this phase. The dispatcher must identify the correct units based on incident type and location, dispatch them to the emergency, and continue to update information about the emergency while the units respond. This phase begins when the 9-1-1 call is answered at the primary public safety answer point (PSAP) and ends when response personnel are notified of the emergency. This phase, which has two parts, is labeled "call processing time."

There are a number of PSAPs in Sonoma County that receive and transfer 9-1-1 calls to REDCOM. Santa Rosa Police Department (SRPD) dispatch center is the PSAP for the city of Santa Rosa. Those callers initially answered at a PSAP who are requesting fire department services are transferred to REDCOM, the regional public safety dispatch center providing dispatch services to SRFD. This first part of call processing time is known as "answer/transfer time."

National Fire Protection Association Standard 1221 recommends that 9-1-1 calls be answered within 15 seconds 95 percent of the time (within 40 seconds 99 percent of the time) and then be transferred to the dispatch center within 30 seconds 95 percent of the time (within 40 seconds 99 percent of the time). None of the PSAPs are able to quantify current performance at this time. REDCOM answers a call transferred to it within 15 seconds 99.42 percent of the time and within 40 seconds 100 percent of the time.

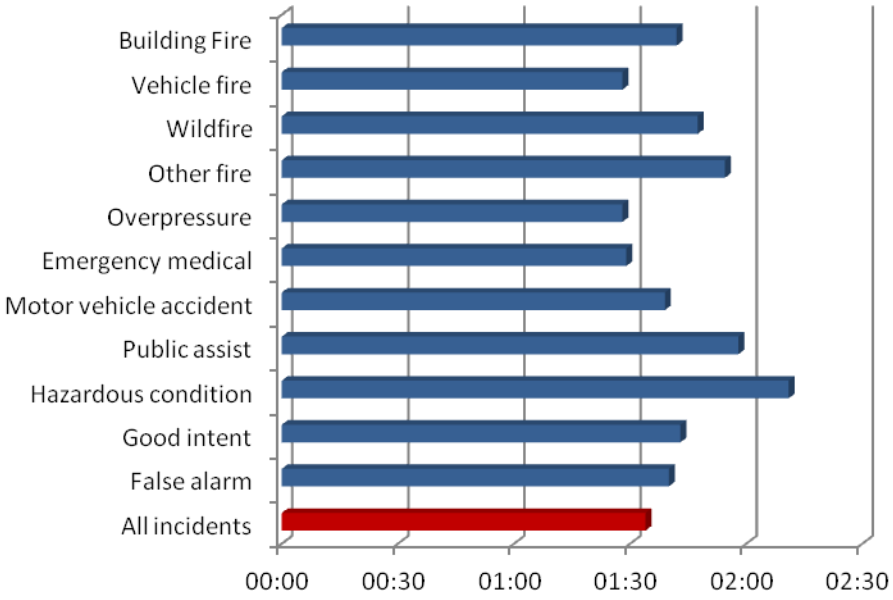
The second part of call processing time, dispatch time, begins when the call is received at the dispatch center (REDCOM) and ends when response units are notified of the incident. SRFD's goal prescribes that this phase should occur within 70 seconds 90 percent of the time.

Several PSAPs that transfer calls to REDCOM use the same computer aided dispatch system as REDCOM. Those agencies can and do create incidents in CAD prior to transfer of the caller to REDCOM. An example would be an automobile accident. SRPD would create the incident in CAD, query the caller for law enforcement related information and then transfer that caller to REDCOM for processing of the fire department and ambulance response.

An accurate analysis of current performance for both answer/transfer time and dispatch time is not possible given current data limitations. Although the time of 9-1-1 call answer is captured in the computer aided dispatch system (CAD) when a call is created by an agency other than REDCOM, that answer time is not captured if REDCOM creates the call. REDCOM does capture data that accurately describes the time REDCOM first received the transferred call.

The following figure illustrates performance by REDCOM from the time it receives the call until it notifies response units. Overall performance was within 1 minute 34 seconds, 90% of the time.

Figure 44: REDCOM Dispatch Time Performance



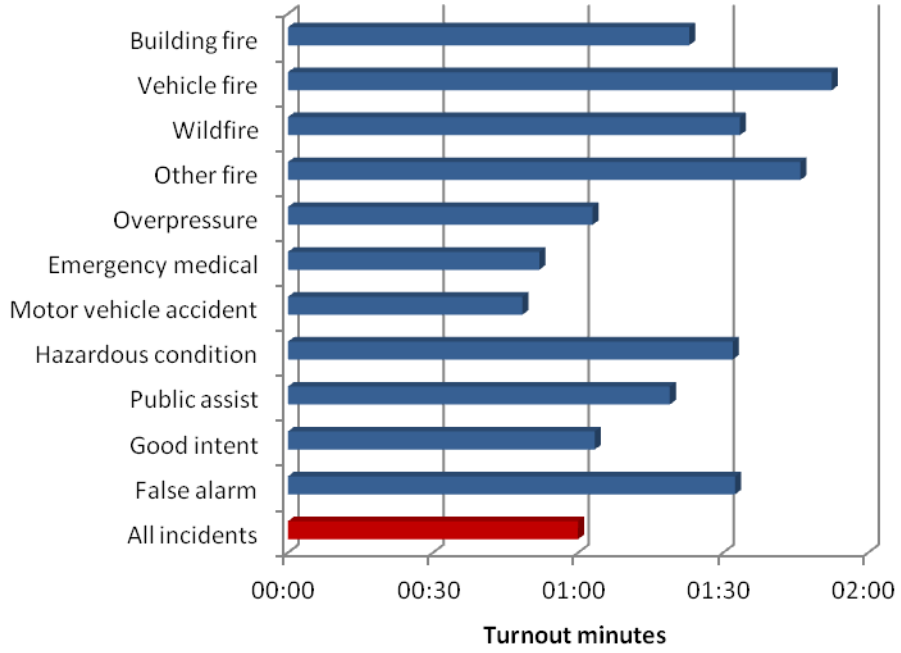
Turnout Time

Turnout time is a response phase controllable by the fire department. This phase begins at notification of an emergency in progress by the dispatch center and ends when personnel and apparatus begin movement towards the incident location. Personnel must don appropriate equipment, assemble on the response vehicle, and begin travel to the incident. Good training and proper fire station design can minimize the time required for this step.

The SRFD performance goal for turnout time is within 60 seconds 90 percent of the time. The following figure lists turnout time for all incidents as well as specific incident types. Turnout time for all incidents is within 60 seconds 90 percent of the time meeting SRFD's performance goal. As can be seen in the figure below, turnout time for fire and other hazardous incidents is longer because of the need to don personal protective equipment prior to initiating response.

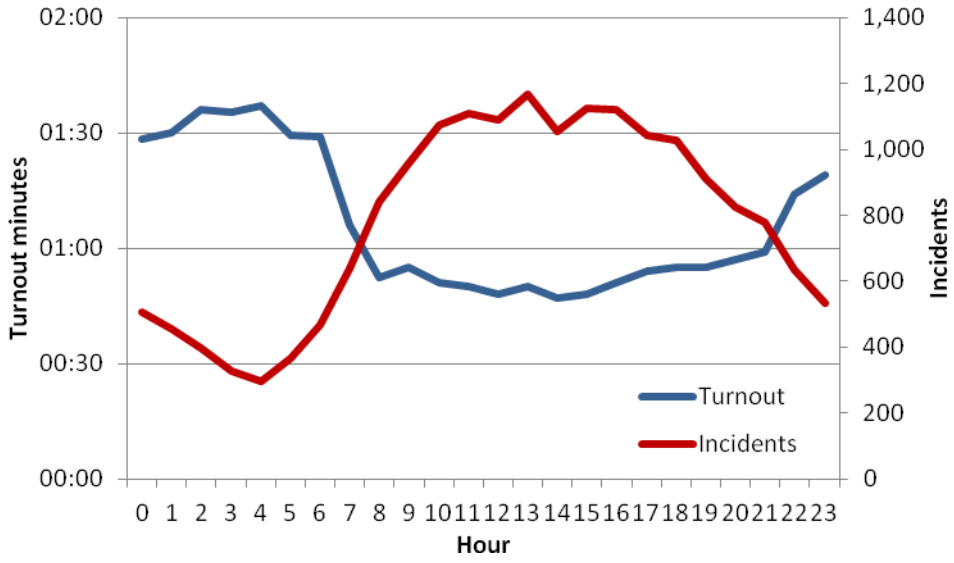
The above reflects the first unit enroute to incidents. Ambulances tend to have faster turnout times than fire apparatus since their crews are typically in the vehicle waiting for the next call. Overall, ambulance turnout times are within 1 minute 1 second, 90 percent of the time. SRFD unit turnout times are within 1 minute 35 seconds, 90 percent of the time.

Figure 45: Turnout Time Performance



Turnout time can vary by hour of day. In this case turnout time varies by 49 seconds between the early morning hours and daytime hours.

Figure 46: Turnout Time by Hour of Day



Distribution and Initial Arriving Unit Travel Time

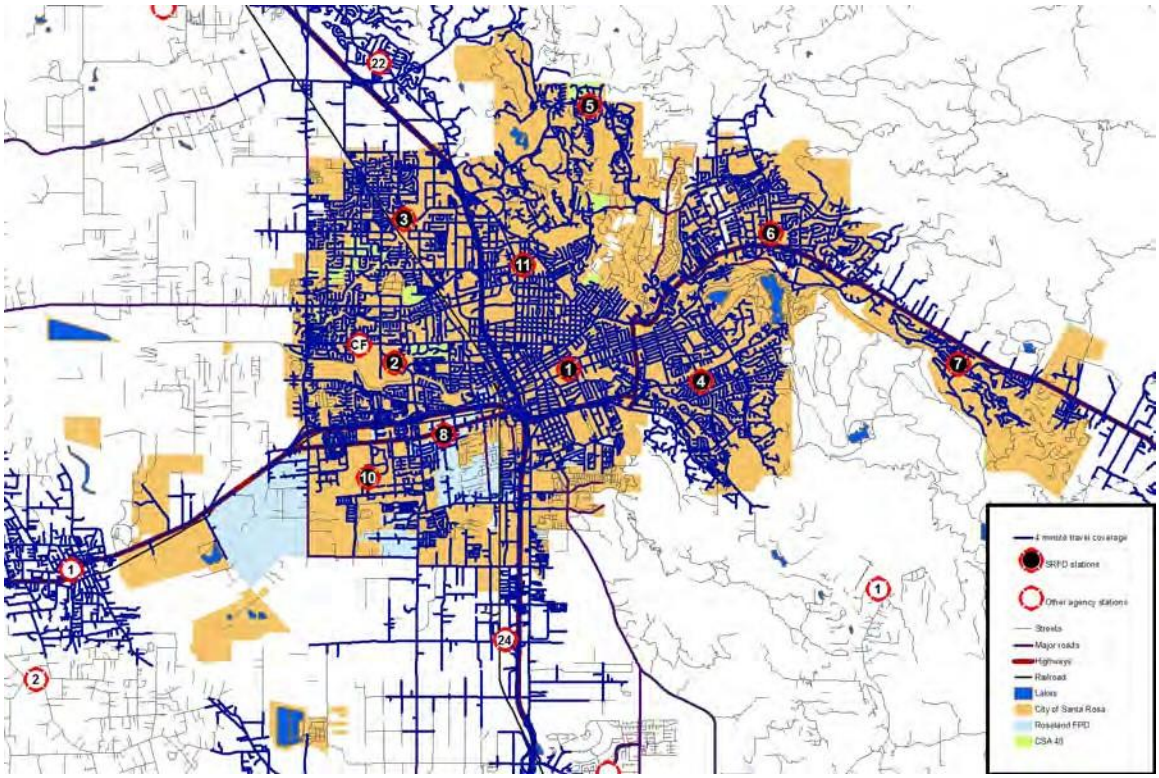
Travel time is potentially the longest of the response phases. The distance between the fire station and the location of the emergency influences response time the most. The quality and connectivity of streets, traffic, driver training, geography, and environmental conditions are also factors. This phase begins with initial apparatus movement towards the incident location and ends when response personnel and apparatus arrive at the emergency's location. Within the SRFD goal, four minutes is allowed for the first response unit to arrive at an incident.

SRFD units are selected for response to an incident based on a calculation by the dispatch computer system to determine the unit that will have the shortest travel time. This method ensures the shortest possible travel times.

Since response units are in their home stations most of the time, SRFD's coverage is described in the following discussion based on fire station location.

The following figure illustrates the street sections that can be reached from all SRFD fire stations and adjacent agency stations providing automatic aid in four minutes of travel time. It is based on posted road speeds modified to account for turning, stops, and acceleration.

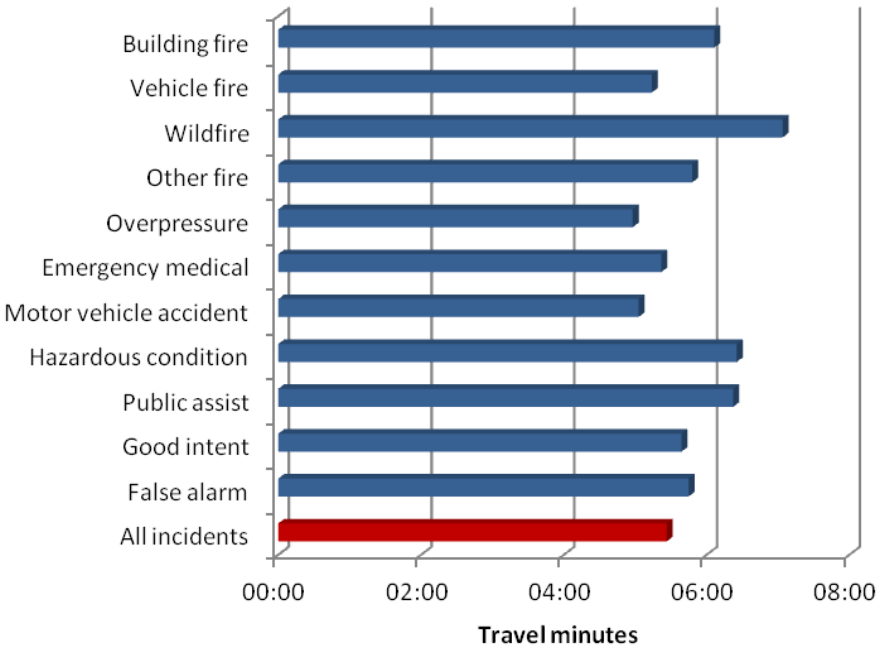
Figure 47: Initial Unit Travel Time Capability – SRFD and Automatic Aid Resources



Portions of Santa Rosa are beyond four travel minutes of a fire station. Automatic aid agencies provide limited four-minute travel coverage within the city.

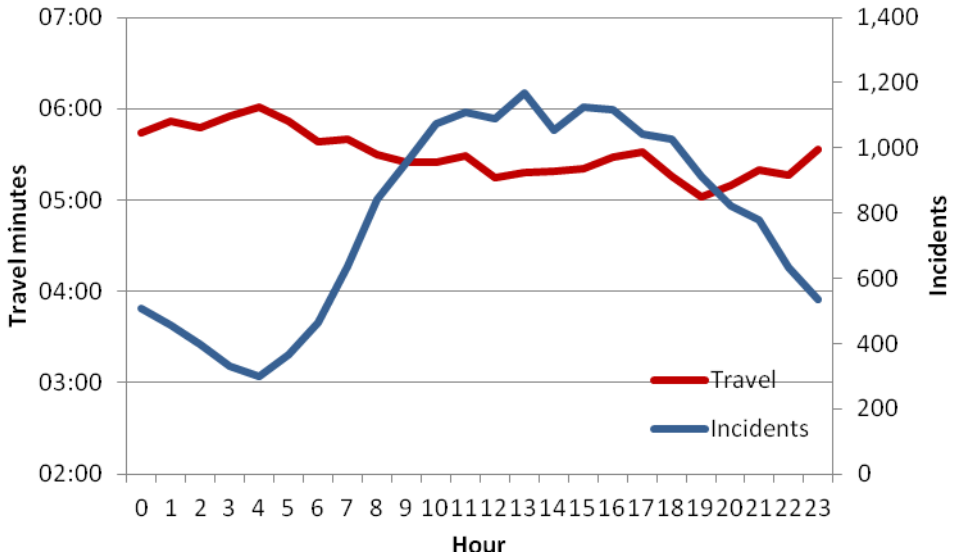
The following figure lists travel time for all priority incidents as well as specific incident types. Overall, travel time for all incidents within the city is within 5 minutes 26 seconds, 90 percent of the time. SRFD met its four-minute goal 66 percent of the time. However, since turnout times are artificially low because of early reporting of the response unit beginning movement towards the incident, travel time is artificially longer than actual performance. Time that should be captured in turnout time by default is added to travel time.

Figure 48: Travel Time Performance – First Arriving Unit



Travel time can vary considerably by time of day. Heavy traffic at morning and evening rush hours can slow fire department response. Concurrent incidents can also increase travel time since units from more distant stations would need to respond. None of those appear to be factors here as daytime travel was generally shorter than nighttime travel. Travel time varied by 59 seconds during the course of the day.

Figure 49: Overall Travel Time and Incidents by Hour of Day – First Arriving Unit



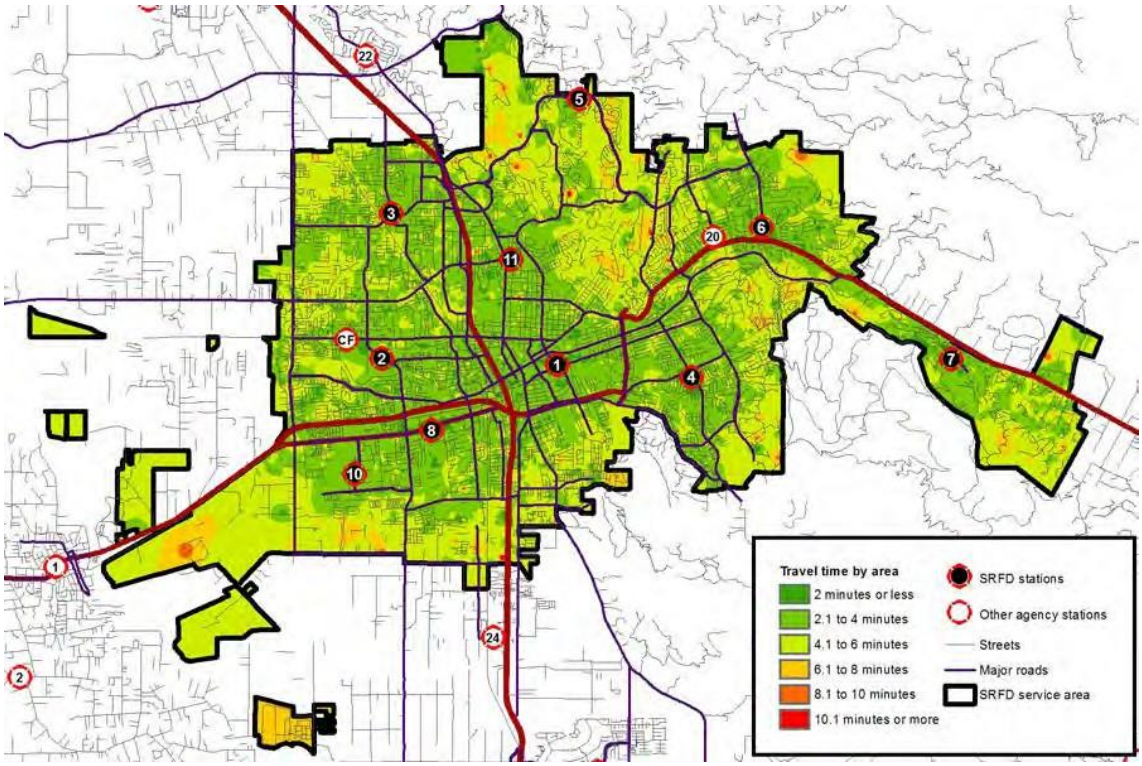
In order to provide on-time response, a response unit must be within four travel minutes of the incident. Incidents were reviewed to identify how many were within four travel minutes of a fire station. During the study period 17,433 of the 18,744 priority incidents (93 percent) occurred within four travel minutes of a fire station.

Travel Time Performance by Region

Travel time performance by region is variable and influenced by a number of factors including individual station area workload and the number of times a station must cover another station's area. Additional factors include the size of the station area and the street system serving it. More highly connected, grid patterned, street systems contribute to faster response times than do areas with meandering streets with numerous dead-ends.

The following figure evaluates travel time performance by sub-area using inverse distance weighting analysis (IDW). This process uses travel time for known points (actual incidents) to predict travel time for the area surrounding the actual incident. Better performance is generally noted near fire stations with progressively longer response times for those incidents more distant from the stations.

Figure 50: Travel Time Performance by Region

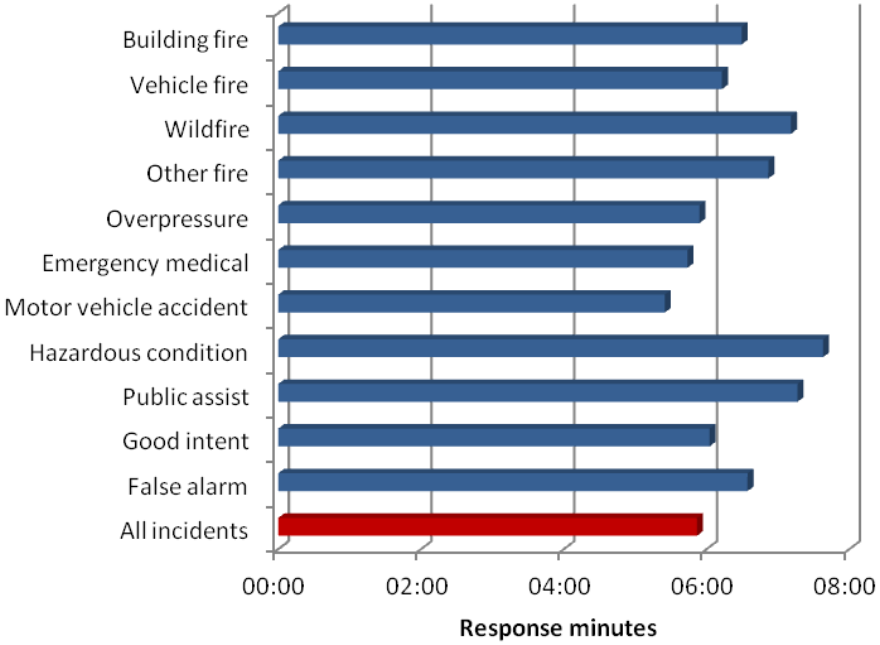


First Arriving Unit Response Time

Response time is defined as that period between the notification of response personnel by the dispatch center that an emergency is in progress until arrival of the first fire department response unit at the emergency. When turnout time and travel time are combined, the SRFD performance goal for response time is within five minutes 90 percent of the time.

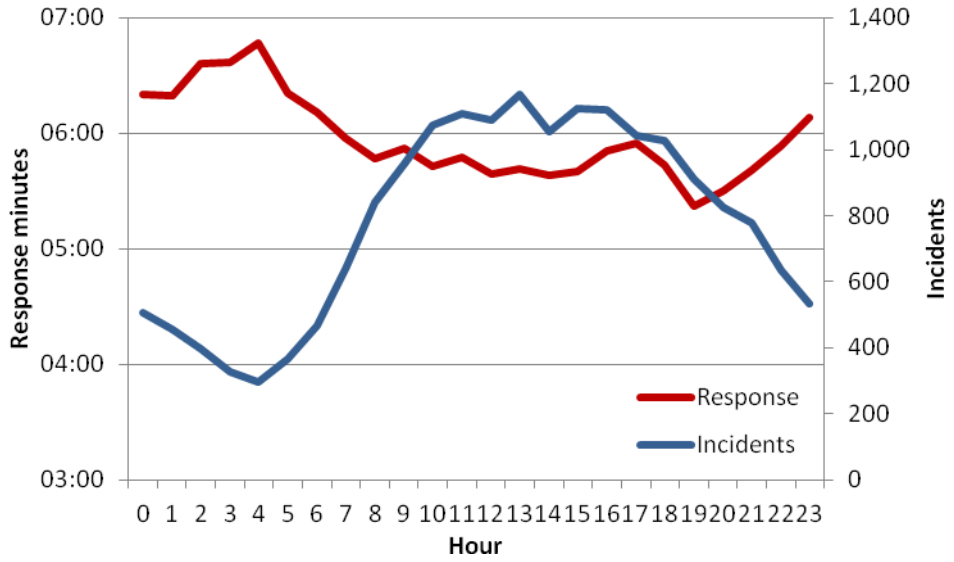
The following figure illustrates response time for all priority incidents as well as specific incident types during 2015. Overall, response time for all priority incidents was within 5 minutes 52 seconds, 90 percent of the time. SRFD met its response time goal for 78 percent of the time.

Figure 51: Response Time Performance – First Arriving Unit



The next figure shows response time and number of incidents by hour of day for all incidents. Response time is slowest during the nighttime hours and fastest during the day. Generally, SRFD's best response times occur during the period of the day when response activity is at its highest.

Figure 52: Hourly Response Time Performance

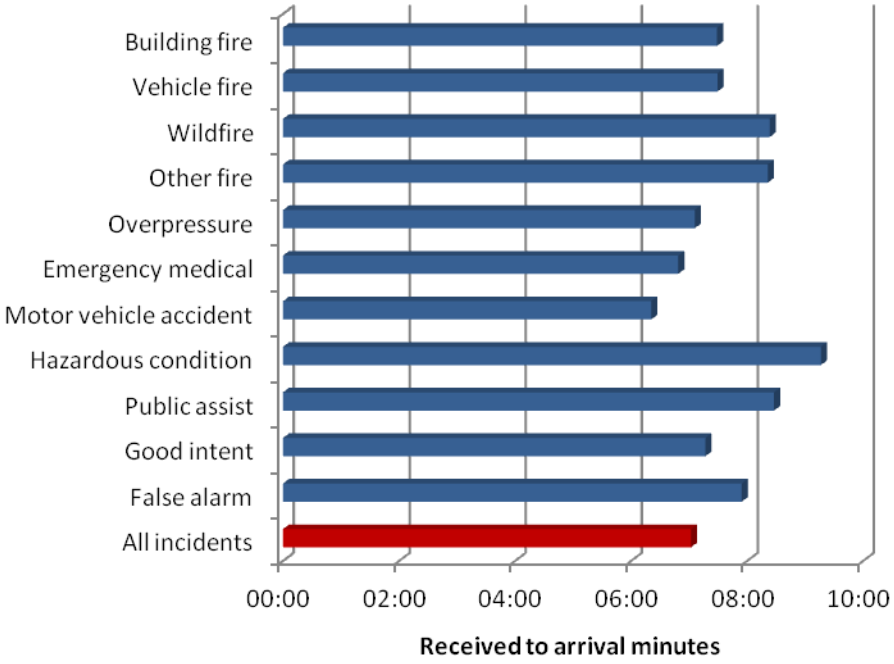


First Arriving Unit Received to Arrival Time

From the customer's standpoint, response time begins when the emergency occurs. Their first contact with emergency services is when they call for help, usually by dialing 9-1-1. Received to arrival time combines answer/transfer, call processing, turnout, and travel time. As described in the "Call Processing" discussion in this section, reliable data for call answer and transfer time is not available. The time the call was "received" will either be the actual answer time for calls created by PSAPs other than REDCOM or the time REDCOM received the call transferred by another agency. When the SRFD performance goals are combined, received to arrival time should be within six minutes 90 percent of the time.

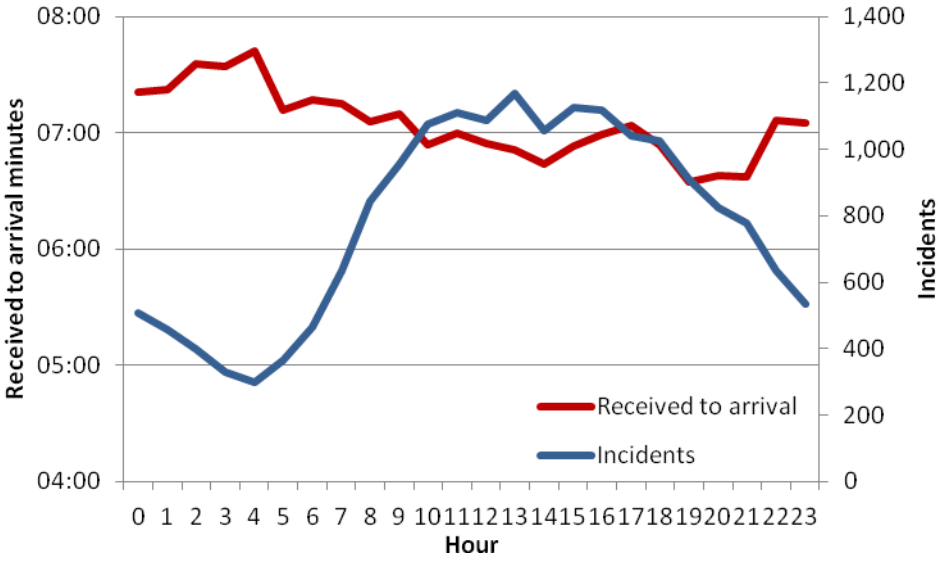
The next figure shows received to arrival performance during 2015 at the 90th percentile for priority incidents within the SRFD service area. Overall, received to arrival time is within 7 minutes 2 seconds, 90 percent of the time. SRFD met the combined goal 77 percent of the time.

Figure 53: Received to Arrival Time – First Arriving Unit



The next figure shows received to arrival performance by time of day also compared to incident activity by time of day. Received to arrival, from the customer's standpoint, is quickest during the day and slowest during the early morning hours.

Figure 54: Hourly Received to Arrival Performance



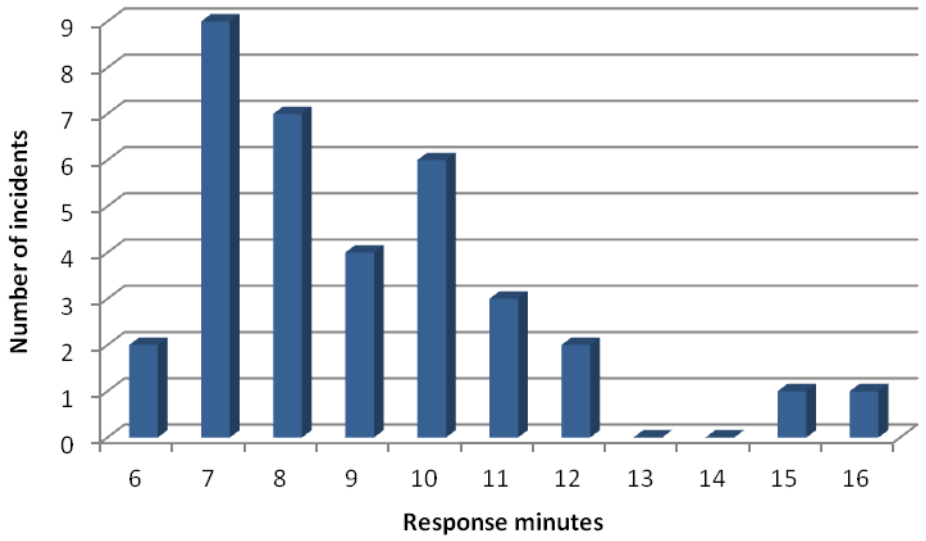
Concentration and Effective Response Force Capability Analysis

Effective Response Force (ERF) is the number of personnel and apparatus required to be present on the scene of an emergency incident to perform the critical tasks in such a manner to effectively mitigate the incident without unnecessary loss of life and/or property. The ERF is specific to each individual type of incident, and is based on the critical tasks that must be performed. In accordance with NFPA 1710, a moderate risk building fire is modeled for this analysis.

The SRFD response time goal for the delivery of the full ERF to a moderate risk building fire is within eight minutes 90 percent of the time. SRFD has defined the minimum full effective response force for moderate risk building fires as three fire engines, one truck, and one battalion chief with a total of 14 firefighters.

The minimum full effective response force arrived at 35 building fires during 2015. SRFD delivered the full ERF to these building fires within 11 minutes 1 second **response time**, 90 percent of the time. The following figure illustrates the frequency distribution of the travel times experienced during the study period.

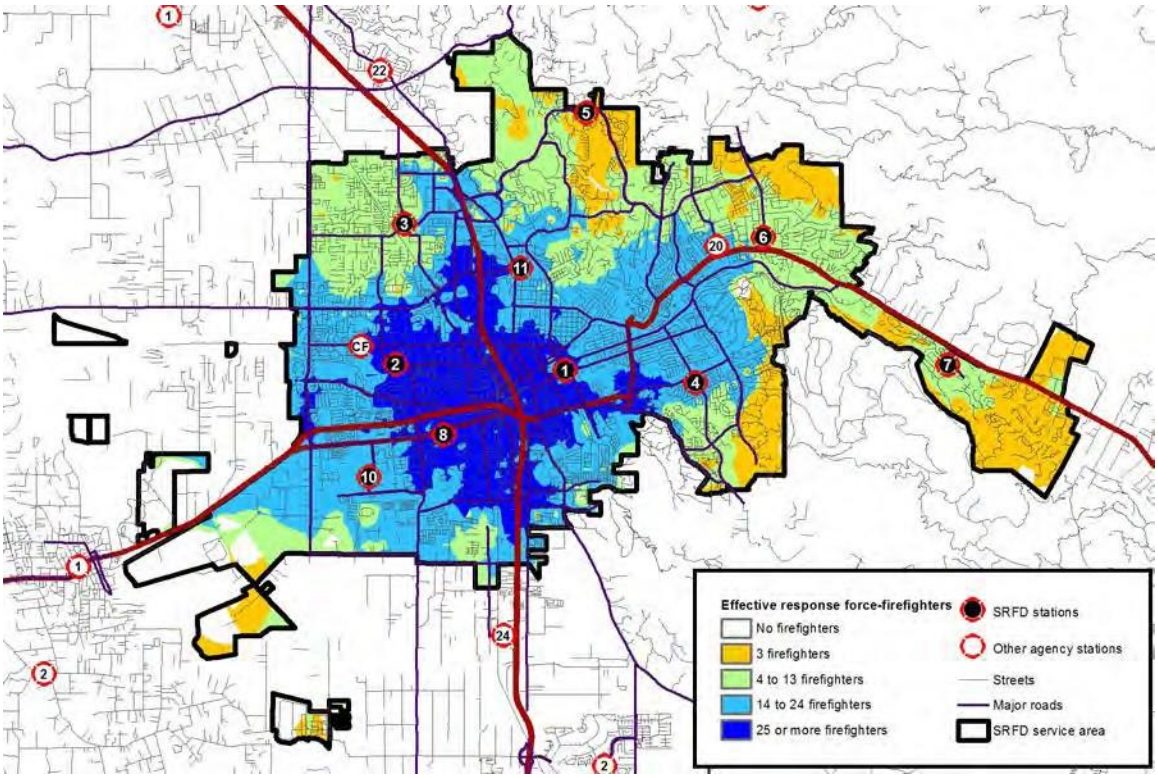
Figure 55: Frequency Distribution of Travel Time for Full ERF Arrival



Concentration analysis reviews the physical capability of SRFD's resources to achieve its target ERF travel time to its service area. The following figures depict the physical capability of SRFD to assemble apparatus and firefighters by area within seven minutes travel time. The modeled analysis shown assumes that all response units are available.

The first figure shows the area that can be reached by the number of firefighters that make up the target ERF of 14 based on the SRFD performance goal. Seven minutes of travel time is allowed to assemble the defined full effective response force on scene. This figure includes the resources of three adjacent automatic aid stations.

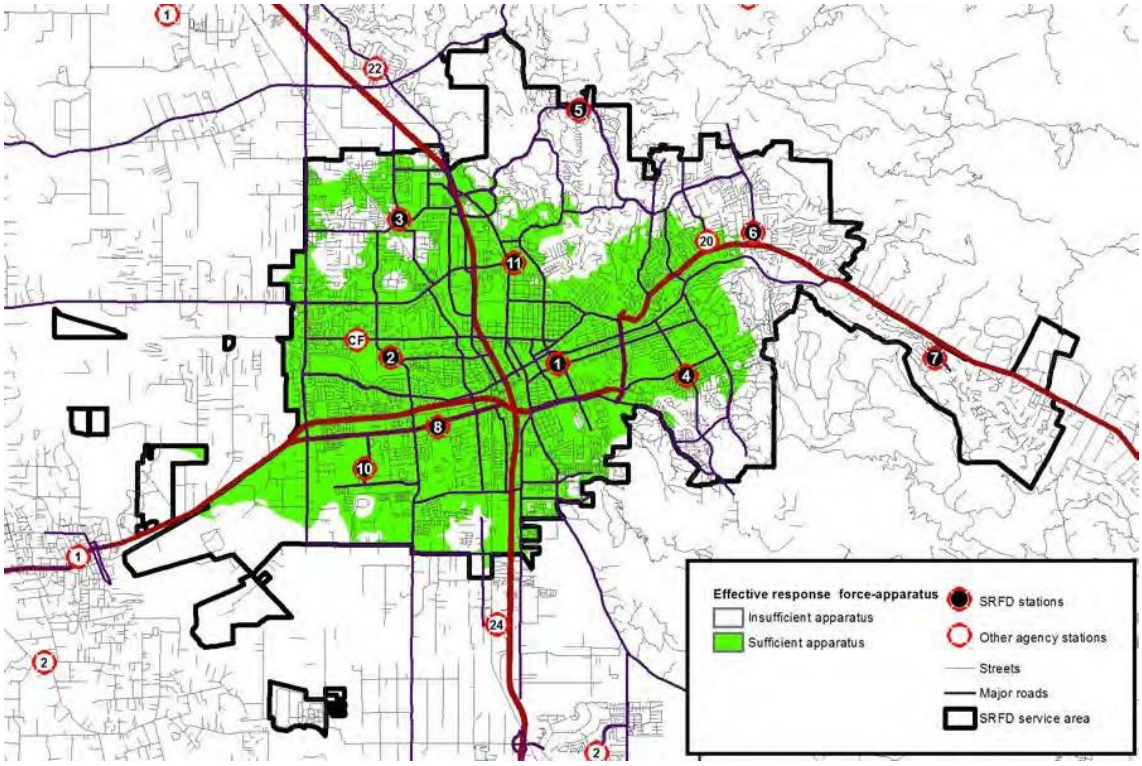
Figure 56: Effective Response Force – Firefighters



Much of the SRFD service area can be served with the minimum 14 firefighters needed for a moderate risk building fire within the target response time. Areas to the north, west and east lie beyond this capability.

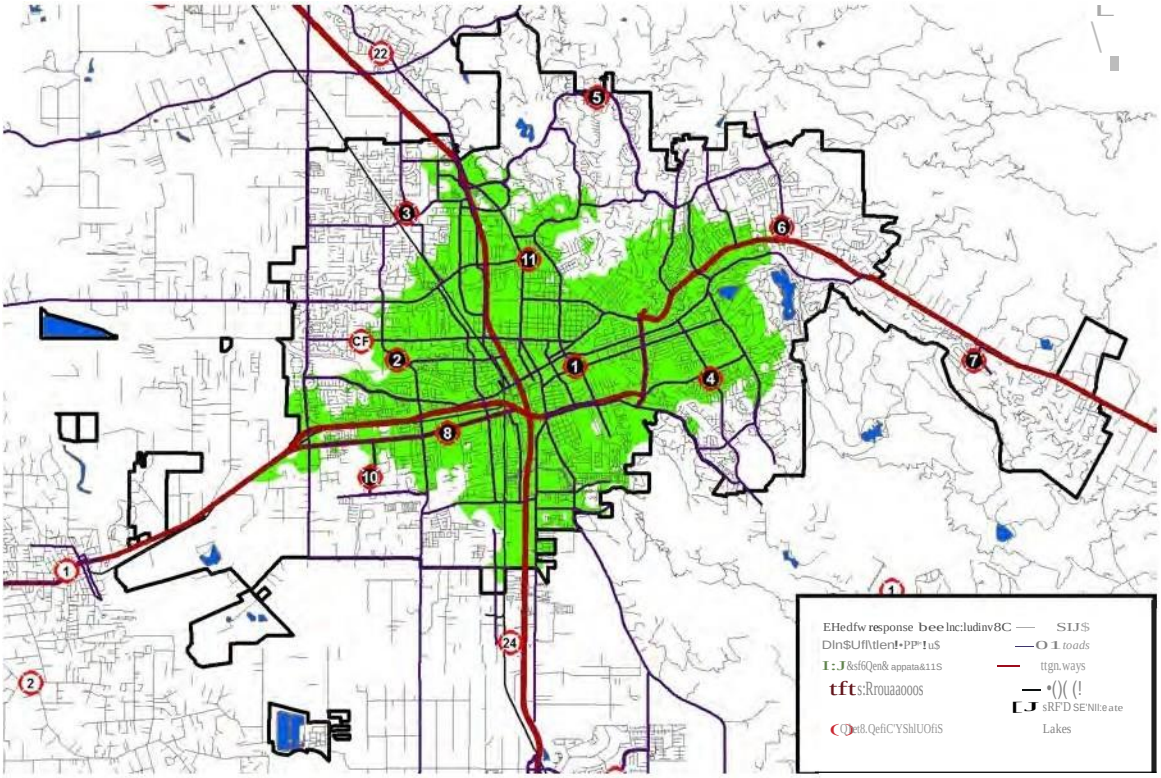
The next figure shows the area to which three fire engines and one ladder truck can respond within the seven minutes travel time allowed by the SRFD performance goal. The battalion chief was excluded from this analysis since there is only one available in the system. The model indicates these resources can be delivered within seven minutes travel only to the central area. The greatest limitation is ladder trucks since only two are available.

Figure 57: Effective Response Force – Apparatus



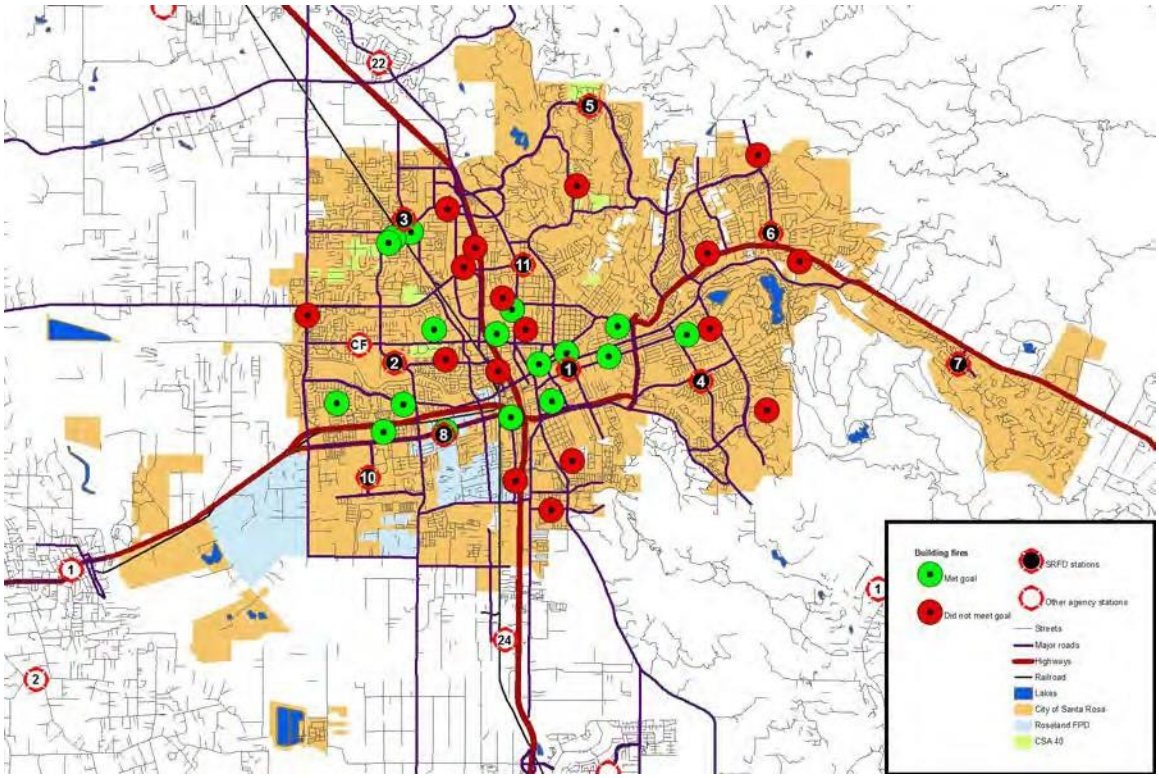
When the battalion chief is also included, coverage is reduced primarily in the city's west side. The following figure illustrates this reduction.

Figure 58: Effective Response Force - Apparatus Including the Battalion Chief



The following figure illustrates the location of those building fires to which ERF was provided within eight minutes response time and those for which response time was longer than eight minutes. During the study period only 18 of the 35 building fires that received the full ERF had response times of eight minutes or less.

Figure 59: Building Fires Meeting and Not Meeting the Response Time Goal



Second Unit Arrival Time

SRFD fire engines are staffed with three personnel. Ladder trucks are staffed with four personnel. Safety regulations require that at least four firefighters be on scene before firefighters can enter a burning building. The only exception is if it is known that a person is inside the building and needs rescue. Current staffing levels on engines require the arrival of a second response unit before non-rescue interior firefighting activities can be initiated.

Incident data for building fires during the study period was reviewed to determine the time the second response unit arrived on the scene. According to the data the second unit arrived on scene of a structure fire within 2 minutes 50 seconds, 90 percent of the time after the arrival of the first unit.

Emergency Medical Services

SRFD provides first response emergency medical service normally at the advanced life support level. Private ambulance companies provide patient transportation and enroute care to a medical facility. All SRFD engines and ladders are usually advanced life support capable.

SRFD units arrive at an emergency medical incident within 5 minutes 44 seconds, 90 percent of the time from time of dispatch. The private ambulance arrives within 10 minutes 11 seconds, 90 percent of the time from the time of dispatch.

A review of EMS incidents was conducted to determine the number of times each entity arrived first at an EMS incident. SRFD arrived first 64 percent of the time and the ambulance arrived first 36 percent of the time.

Incident Concurrency and Reliability

When evaluating the effectiveness of any resource deployment plan, it is necessary to evaluate the workload of the individual response units to determine to what extent their availability for dispatch is affecting the response time performance. In simplest terms, a response unit cannot make it to an incident across the street from its own station in four minutes if it is unavailable to be dispatched to that incident because it is committed to another call.

Concurrency

One way to look at resource workload is to examine the number of times multiple incidents happen within the same time frame in each station area. Incidents during the study period were examined to determine the frequency of concurrent incidents. This is important because concurrent incidents can stretch available resources and extend response times.

The following figure shows the number times during the study period that one or more incidents occurred concurrently. This shows that in most cases (10,925) only one incident was in progress at a time. However, 8,606 times there were two incidents in progress at the same time; 3,689 times there were three incidents in progress at the same time; and once there were nine incidents in progress at the same time.

Figure 60: Incident Concurrency

Concurrent Incidents	Count
1	10,925
2	8,606
3	3,689
4	1,112
5	221
6	50
7	9
8	2
9	1

It is also useful to review the number of times one or more response units are committed to incidents at the same time. The following figure shows the number of times one or more SRFD response units were committed to incidents. It is more common than not for multiple response units to be simultaneously committed to incidents.

Figure 61: Response Unit Concurrency

Concurrent Units	Count
1	10410
2	9213
3	5050
4	2412
5	1170
6	604
7	293
8	126
9	54
10	29
11	22
12	9
13	2

Reliability

The ability of a fire station's first-due unit(s) to respond to an incident within its assigned response area is known as unit *reliability*. The reliability analysis is normally done by measuring the number of times response units assigned to a given fire station were available to respond to a request for service within that fire station's primary service area.

SRFD does not dispatch response units based on a particular geographic service area. Instead, the computer aided dispatch system assigns the closest unit to an incident based on calculated travel time. This is a far superior way to select response units for an incident.

To determine reliability under this system, data should be collected to determine the number of times any response unit was available for an incident within the target travel time, in this case four minutes. Data is not currently available to make that calculation.

Component G – Performance Objectives and Performance Measures

DYNAMICS OF FIRE IN BUILDINGS

Most fires within buildings develop in a predictable fashion unless influenced by highly flammable material. Ignition, or the beginning of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be generated during this phase.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heat and ignite, which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and highly toxic.

The spread of the fire from this point continues quickly. Soon the flammable gases at the ceiling as well as other combustible material in the room of origin reach ignition temperature. At that point, an event termed "flashover" occurs; the gases and other material ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant and the environment within the room can no longer support human life.

Flashover usually occurs about five to eight minutes from the appearance of flame in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water to a fire before flashover occurs.

Although modern codes tend to make fires in newer structures more infrequent, today's energy-efficient construction (designed to hold heat during the winter) also tends to confine the heat of a hostile fire. In addition, research has shown that modern furnishings generally ignite more quickly and burn hotter (due to synthetics).

In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes.[3] The necessity of effective early warning (smoke alarms), early suppression (fire sprinklers), and firefighters arriving on the scene of a fire in the shortest span of time is more critical now than ever.

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. "Light weight" roof

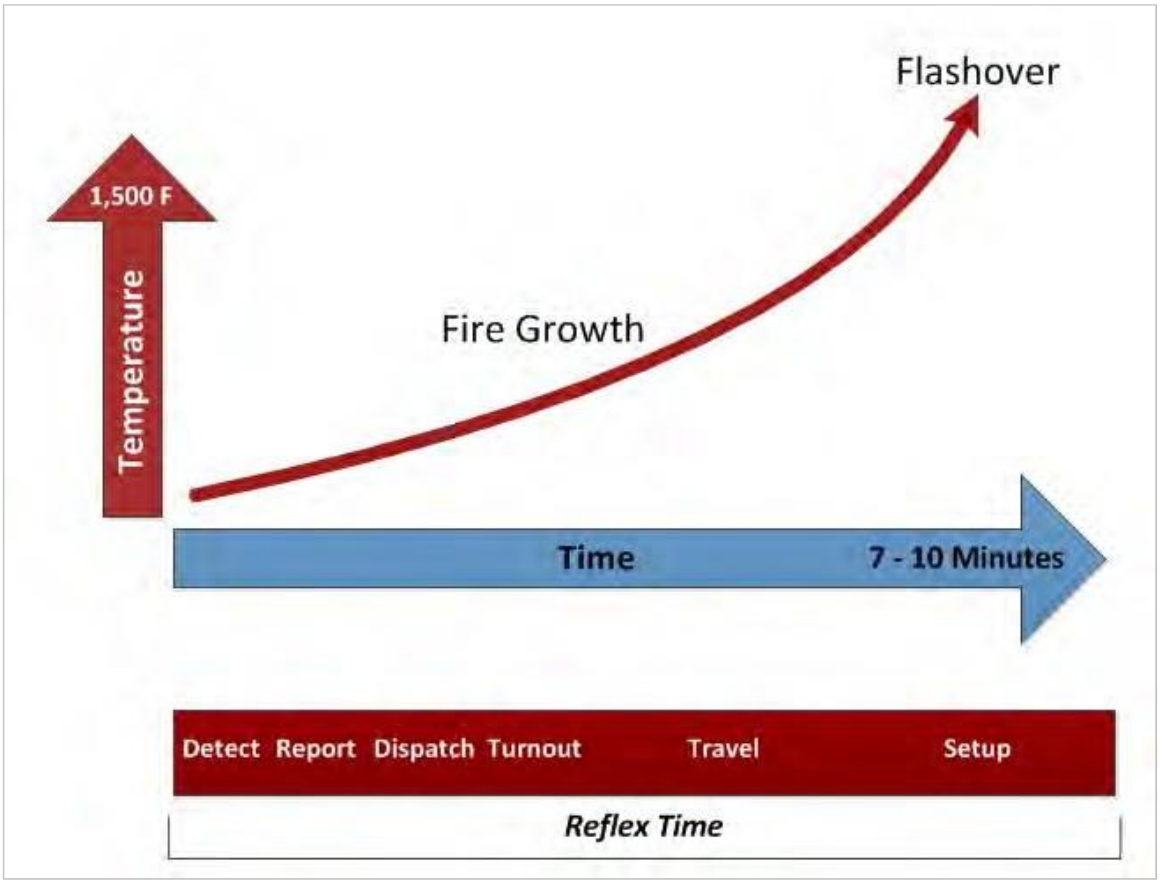
[3] National Institute of Standards and Technology, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings,* Bukowski, Richard, et al.

trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a dangerous environment for firefighters.

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for early application of water essential to a successful fire outcome.

A number of events must take place quickly to make it possible to achieve fire suppression prior to flashover. Figure 62 illustrates the sequence of events.

Figure 62: Fire Growth vs. Reflex Time



As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire losses can demonstrate.

The National Fire Protection Association found that fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). As evidenced in the following figure, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 63: Fire Extension in Residential Structures – United States

Consequence of Fire Extension In Residential Structures 2003 – 2007			
Extension	Rates per 1,000 Fires		
	Civilian Deaths	Civilian Injuries	Average Dollar Loss Per Fire
Confined to room of origin or smaller	2.44	25.67	$5,317
Confined to floor of origin	16.18	72.79	$34,852
Confined to building of origin or larger	27.54	54.26	$60,064

Source: National Fire Protection Association "Home Structure Fires," March 2010

EMERGENCY MEDICAL EVENT SEQUENCE

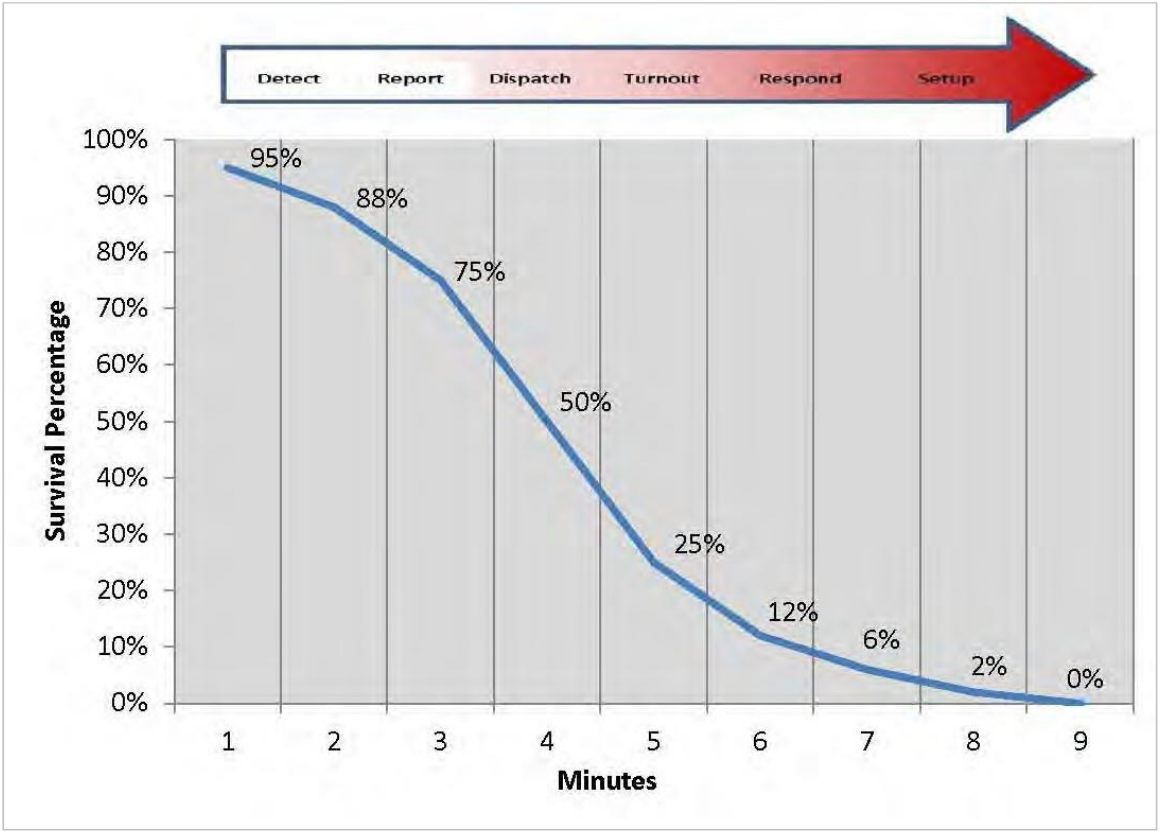
Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

The American Heart Association (AHA) issued a set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include goals for the application of cardiac defibrillation to cardiac arrest victims.

Cardiac arrest survival chances fall by 7 to 10 percent for every minute between collapse and defibrillation. Consequently, the AHA recommends cardiac defibrillation within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be graphically illustrated, as in the following figure.

Figure 64: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain medications as a means of improving the opportunity for successful resuscitation and survival.

PEOPLE, TOOLS, AND TIME

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, is not the only factor. Delivering sufficient numbers of properly trained, appropriately equipped personnel within the critical time period completes the equation.

For medical emergencies this can vary based on the nature of the emergency. Many medical emergencies are not time critical. However, for serious trauma, cardiac arrest, or conditions that may lead to cardiac arrest, a rapid response is essential.

Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest, this can be up to six personnel; two to perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care.

Thus, for a medical emergency, the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient's condition, not necessarily the time it takes for the first person to arrive.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate application of water to a fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as "arrival" by the fire department.

Component H – Overall Evaluation, Conclusions, and Recommendations

OVERALL EVALUATION

This Standards of Coverage and Deployment Plan, based on the *CFAI Standards of Cover 5th Edition,* required the completion of an intensive analysis on all aspects of the SRFD deployment policies. The analysis used various tools to review historical performance, evaluate risk, validate response coverage, and define critical tasking and alarm assignments. The analysis relied on the experience of staff officers and their historical perspective combined with historical incident data captured by both the dispatch center and SRFD's in-house records management system.

The Description of Community Served section provided a general overview of the organization, including governance, lines of authority, finance, and capital and human resources, as well as an overview of the service area including population and geography served. The Review of Services Provided section detailed the core services the organization provides based on general resource/asset capability and basic staffing complements. During the Review of Community Expectations it was learned the community values SRFD and the services it provides.

An overview of community risk was provided to identify the risks and challenges faced by the fire department. Geospatial characteristics, topographic and weather risks, transportation network risks, physical assets, and critical infrastructure were reviewed and which then identified medical incidents, structure fires, and rescues as the primary risks within the community. As a factor of risk, community populations and demographics are evaluated against historic and projected service demand. Population and service demand has increased over the past decade and will continue to increase in the future.

Evaluating risk using advanced geographic information systems (GIS) provided an increased understanding of community risk factors and led to an improved deployment policy.

During the analysis of service level objectives, critical tasking assignments were completed for incident types ranging from a basic medical emergency to a high rise structure fire. Critical tasking required a review of on-scene staffing requirements to mitigate the effects of an emergency. These tasks ultimately determine the resource allocation necessary to achieve a successful operation. The results of the analysis indicate that a moderate risk structure fire required a minimum of 14 personnel.

The review of historical system performance evaluated each component of the emergency incident sequence. These included call processing, turnout, and travel time. Beyond the response time of the initial arriving units, the additional components of concentration and effective response force, reliability, and call concurrency were evaluated.

Based on the analysis and considering community expectations, recommendations are offered to improve the delivery of fire and emergency services to the community service by SRFD. It is not expected that all will be implemented in the short-term. Some may wait until economic conditions allow their implementation. However, all the recommendations offered chart a course to improved capability and service.

RECOMMENDATIONS

During the course of this study a number of issues, concerns, and opportunities were identified. The following recommendations are intended to accomplish four primary objectives:

1. Define clearly the expected and actual level of performance provided by Santa Rosa Fire Department.
2. Improve service delivery with no, or minimal, expenditure of funds.
3. Identify service level improvement opportunities that can be implemented as funding becomes available.
4. Manage current response workload and reduce future response workload growth rates.

The recommendations are described as improvement goals and should be implemented as funding allows. Each will improve SRFD's ability to provide effective service to the community.

Improvement Goal A: Reduce dispatch time through earlier pre-alerting of response personnel

In the dispatch process used by REDCOM, the caller is questioned to determine the nature and location of the emergency. Once gathered, that information is transferred to a dispatcher who notifies response personnel. The call taker often continues to question the caller to gather information useful to responders.

In the process, a pre-alert is broadcast to notify responders that an incident is occurring. That pre-alert is followed by the full dispatch broadcast. There is normally a very short amount of time between the two broadcasts

Many high performance dispatch centers are not waiting for as much information to be gathered but instead are dispatching the closest response unit once the location and general nature (medical, fire, other) is known. This early dispatch, or pre-alert, can shave valuable seconds off total response time. There is computer technology available that alerts response personnel via simultaneous pager, radio, station alerting system, and computer-generated voice incident information. SRFD and REDCOM should explore the opportunity to notify response personnel earlier in the call processing sequence.

Cost to Implement: Implementation costs will depend on computer hardware and software modifications required to be able to provide earlier pre-alert. Similar systems report costs ranging from $20,000 to $30,000.

Improvement Goal B: Create a more efficient emergency medical response system

There are several opportunities to better manage response to emergency medical incidents. These incident types constitute the majority of SRFD response workload. As discussed earlier this type of response will increase at the fastest rate in the future.

Utilize emergency medical dispatch protocols to better define the response to EMS incidents

When a request for emergency medical service is received at REDCOM, call takers ask a series of questions to determine the nature and severity of the medical emergency. These questions are designed to quickly determine if the incident is potentially life-threatening or not. The primary purpose

of this questioning process is to identify the most appropriate response. Life-threatening incidents require more resources (personnel and equipment) than non-life threatening incidents.

Although REDCOM is using this process for emergency medical incidents within Santa Rosa, it does not normally result in the dispatch of differing amounts or types of resources. All incidents receive at least one fire engine or ladder truck staffed with a paramedic and a paramedic staffed ambulance for patient transport. It may modify whether the ambulance responds emergency or non-emergency.

The caller questioning process should be used to determine if both fire and ambulance resources are dispatched to an incident. Some EMS incidents may only require a fire department response to provide patient evaluation. Some, particularly at skilled care facilities may only require an ambulance to transport the patient to a medical facility. Use of tiered EMS response can reduce the number of units sent to EMS incidents.

If the caller questioning process used at REDCOM does not result in a differentiation of response then it should not result in a delay in dispatch. REDCOM should only question the caller sufficiently to determine location and basic nature before it dispatches the incident to SRFD. The caller questioning process adds to overall response time. If it does not change the response then the time taken is not warranted.

In the next and a later recommendation, smaller response units with fewer personnel, including one staffed by a single paramedic, are proposed. These smaller units could be used for response to non-life threatening medical incidents rather than fire engines or ladder trucks. Should the use of smaller units be implemented, use of tiered EMS response should also follow.

Cost to implement: None

Work with frequent users of EMS services to reduce utilization

Most fire service agencies have patients and facilities who routinely call multiple times for a response from the local fire department. While some of these patients are undoubtedly having acute medical challenges that require a response and assessment, many others have chronic illnesses that have become reliant upon first responders as their primary care provider. Still others are living alone but struggling to live independently, relying instead on first responders to address their routine challenges. A smaller subset may be relying upon first responders for social needs or may have mental health challenges that cause them to call inappropriately for first responders.

Fire agencies can also have significant response workload at single facilities such as nursing homes, assisted living and mobility-impaired resident facilities. Many calls for service are legitimate medical emergencies, while some are lift-assists where a mobility-impaired resident falls from bed and needs assistance getting back into bed. First responders in these cases perform a quick assessment of the latter group and place them back into bed. While this may seem to be an appropriate service to provide to the residents of such facilities, in many cases it is a liability shift and/or a staffing shift from a fee-for-service facility to the taxpayer-provided emergency responders. Further, it misuses critical emergency response resources to address decidedly non-emergent problems.

There are different approaches available to fire departments that experience the high frequency individual and the high frequency facility. These approaches are explained more fully in the two following subsections.

Responses to High Frequency Patients

A growing concept nationally is the community para-medicine program. The concept of this approach is to better support high frequency EMS system users. Community para-medicine is intended to decrease 9-1-1 over-users or abusers, decrease on-scene time for response units, and provide a higher level of service to customers.

There are a variety of models in use throughout the country. Some employ a single paramedic in a vehicle who conducts follow-up visits of patients recently released from the hospital. The purpose is to ensure the patient is taking appropriate medications, following up with their primary care physician, and to check the patients overall well-being. These single paramedic units can also be dispatched to incidents known to be non-life threatening.

Other models team a paramedic with community social service workers who can also address other needs such as food, housing, mental health care, and the like.

Agencies which have successfully implemented a community para-medicine type program include Mesa, Arizona, which developed the concept; Spokane, Washington, Tualatin Valley Fire and Rescue, Oregon, and Bellevue, Washington. In the latter case, Bellevue has reduced its frequent 9-1-1 user calls by 50 percent since starting the program in 2012.

Responses to High Frequency Facilities

There are a number of care facilities within Santa Rosa that generate frequent requests for emergency medical assistance. Some of these facilities have medical professionals on site. Others may not.

For facilities with qualified medical professionals the dispatch center does have the ability to send only an ambulance when all that is needed is transportation of the patient to a medical facility. SRFD should review this practice to ensure it is working as effectively as it should be.

For facilities without qualified medical professionals a full response is typically sent to a request for emergency medical assistance. However, many of these requests turn out to be lift-assists, or other minor problems.

SRFD should work with managers of high frequency facilities to ensure fire department resources are not being overused. This may involve providing training to facility staff, modifying EMS system regulations to allow alternative response practices, and the like.

Cost to implement: $280,000 for 1.3 FTE for the community para-medicine program plus vehicle and equipment. Staff time for work with frequent facilities.

Improvement Goal C: Improve the capture and utilization of incident data

The acquisition and utilization of accurate and complete data can greatly aid decision making. Choices about station and resource deployment, public education programs, and others all benefit from complete and accurate data. SRFD collects much information currently but more would be of value.

Create the ability to capture 9-1-1 call answer and transfer time

The incident dispatch system does not have the ability to accurately describe the amount of time taken from the initial 9-1-1 call to the PSAP to the point in time when response personnel are notified of the incident. This limits the system's ability to fully evaluate performance.

Steps should be taken to develop the ability to capture several data points. These include:

- Time the 9-1-1 call first rang at the PSAP
- Time the 9-1-1 call was answered at the PSAP
- Time the 9-1-1 call was transferred to REDCOM
- Time the 9-1-1 call was answered at REDCOM

Once this information is reliably available, an analysis should be conducted to evaluate the amount of time taken by the dispatch system to answer, process, and dispatch an incident.

Cost to implement: Dependent on programming changes required in the computer aided dispatch system and telephone system. Cost estimated at $50,000.

Accurately report enroute time

Accurate reporting of unit status changes (enroute, arrive, clear) is required in order to properly evaluate the emergency response system's performance. At present, many response crews are reporting enroute to an incident prior to the time the vehicle is actually moving. This invalidates both the turnout time and travel time analysis. Since travel time is a significant consideration in fire station location analysis, accurate information is very important.

SRFD response personnel should report enroute to incidents only at the time the response vehicle has initiated movement towards the incident.

Cost to implement: None

Utilize data to reduce community risk

An emerging trend in the fire service nationally is a concept called Integrated Community Risk Reduction (CRR). CRR is an integrated approach to risk management that combines emergency operations and prevention strategies into a more comprehensive approach to reducing risks within the community.

The concept starts with the fire department evaluating its data to quantify community risk. These risks are not limited to structures. Risks can include high frequency emergency medical incidents, areas with significant wildland/urban interface exposure, or any risk that could generate a fire department response.

Once the community risks have been identified, each are prioritized based on frequency of emergency service demand, consequence to the victim, to the community, or to the local economy. Once risks are prioritized, strategies can be developed to mitigate the risks. These strategies are incorporated into a CRR plan that can integrate the resources of the fire department, partner agencies, and the community to implement the various strategies. After plan implementation, the results are reviewed to determine its impact on the risks. Adjustments are made as necessary based on the results and the process is refined and continuously re-implemented.

Risk can also be identified by station area. Station staff, in collaboration with fire prevention staff and community groups, can develop and manage a station area-specific CRR plan as a subset of the fire department's plan. CRR lends itself well to a volunteer supported effort, led by professional leadership.

For example, a review of EMS incident records might reveal that in one particular area of the community senior citizens are experienced a large number of slip and fall injuries. The fire department could partner with senior citizen organizations to conduct in-home safety checks to identify and help correct trip hazards.

SRFD has identified that homeless shelters generate a significant number of EMS responses. Over the past several years EMS responses to shelters has increased at a rate far faster than the overall incident growth rate.

SRFD could work with each shelter to improve their level of first aid training, help identify the types of medical conditions that generate an EMS response to identify strategies to mitigate those conditions, and work with individuals using the shelters to help improve their healthy living practices.

Implementing the CRR approach will not only improve the quality of life in the community but could also help reduce the fire department's response workload.

Cost to implement: Staff time and some material resources dependent on risks identified

Improvement Goal D: Enhance fire prevention and public education programs

Providing strong, comprehensive fire prevention and public fire and life safety education can help manage growing response workloads and provide for better outcomes of emergencies that occur. There are several initiatives that should be explored.

Initiate an aggressive wildland fuels modification program

As noted earlier there is a substantial wildland/urban interface area in the city's north and east that could contribute to significant fires. There are numerous homes in close proximity to highly combustible wildland fuels. This condition can and does contribute to rapid fire growth and the loss of homes.

In order to manage this risk, SRFD should initiate a wildland fuels modification program. This would involve property inspections to identify necessary mitigations, working with property owners to ensure fuel modification efforts are completed, and providing public education to reinforce the reasons why such efforts are important.

Because the risk is significant, this effort should be backed by enforcement authority provided to fire officials.

Cost to implement: $135,000 for one community outreach specialist and program materials

Provide CPR and AED training to the public

In sudden cardiac arrest, the time taken to initiate CPR is critical. It's unlikely the victim of a sudden cardiac arrest will survive unless CPR is initiated immediately. Even better is the application of electric shock through the use of an automatic external defibrillator (AED).

SRFD provides some CPR training to the public now. This is a valuable program that should be expanded. In addition, SRFD should work with the community to locate as many AEDs in public places as possible. Ready access to an AED in a cardiac arrest event will save lives.

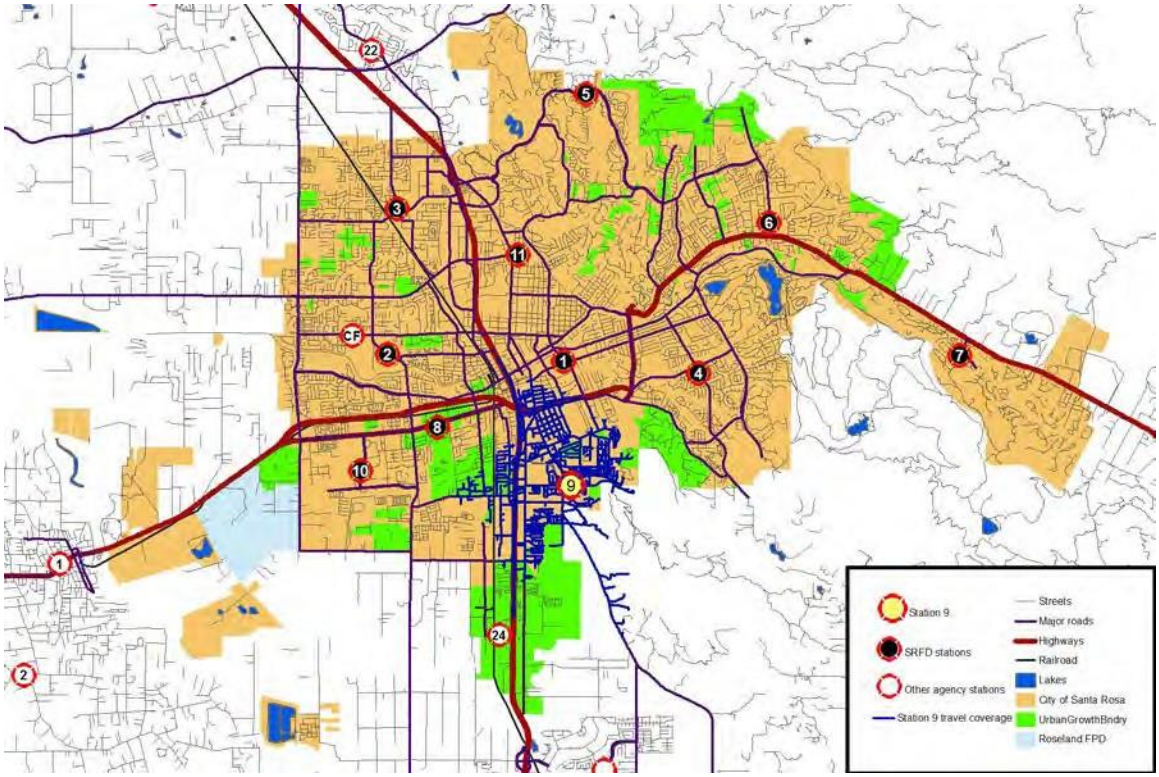
Finally, SRFD should initiate use of the "Pulse Point™" smart phone application. This application notifies subscribing members of the public that a cardiac emergency is occurring in their immediate vicinity allowing a nearby trained member of the public to help if possible. It can also identify the location of the closest AED.

Cost to implement: $50,000 for staff time to teach CPR/AED classes and the annual subscription cost for Pulse Point.

Improvement Goad E: Improve first-due coverage of the city's south central area

SRFD has plans to locate a new fire station and response unit in the city's south central area as shown on the following figure. This location would improve coverage to this underserved area. The four minute travel coverage from this new station is also shown.

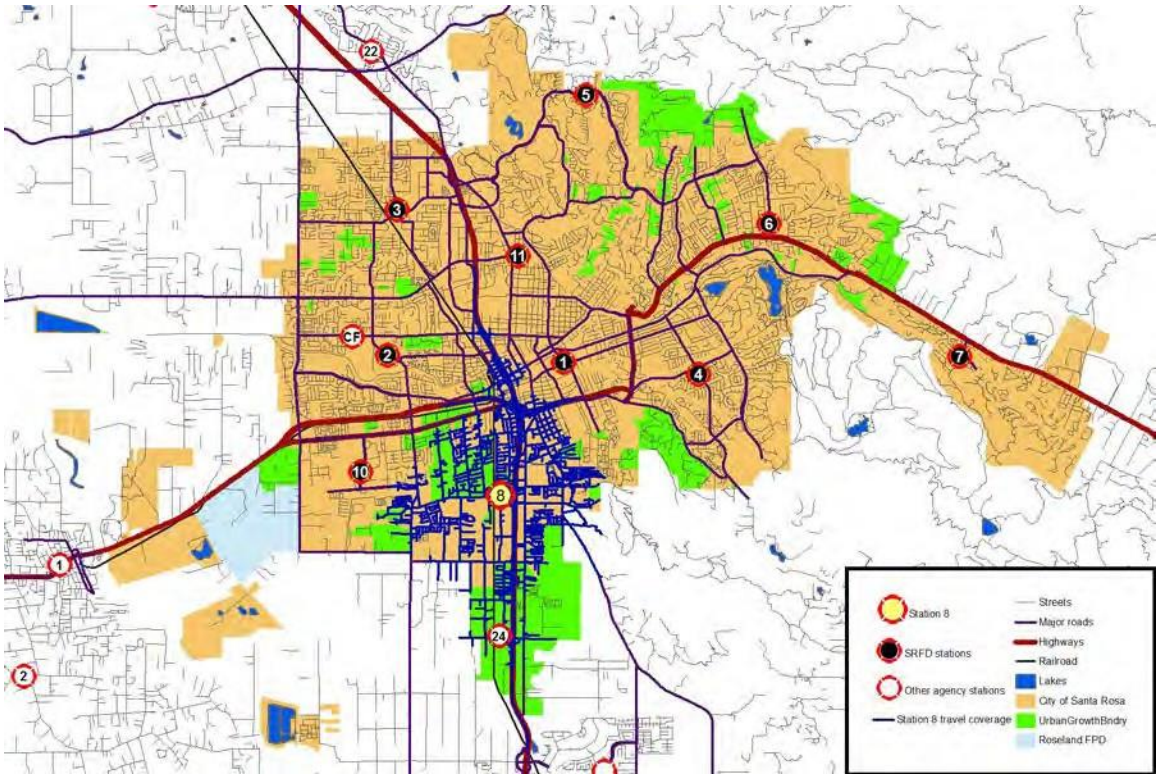
Figure 65: Location for Fire Station 9



An alternative is available that would also improve coverage of this area without the need for an additional fire station and response unit.

Fire Station 8 is located in close proximity to two other existing stations, 2 and 10. Relocating Station 8 to the area of Hearn Ave. between Whitewood Dr. and Highway 101 would provide substantially better coverage of this area and the urban growth area to the south. This proposed location and its four minute travel coverage is shown in the following figure.

Figure 66: Proposed Relocation of Station 8



As noted earlier, 93.0 percent of incidents that occurred in 2015 were within 4 travel minutes of a fire station. Adding Station 9 to the existing deployment system would improve that coverage to 94.5 percent. Relocating Station 8 instead of adding Station 9 improves coverage to 94.4 percent without the cost of an additional response unit. This option also does not affect current effective response force coverage.

Cost to implement: $5,000,000 for land acquisition and station construction.

Improvement Goal F: Add a peak period response unit at Station 11

Response workload in the Station 1 and Station 11 areas is quite high. Engine 11 is currently exceeding 10 percent utilization. Adding a two person quick response unit to Station 11 is recommended. This unit is not needed the entire 24 hour period of each day. It should be staffed and operational during the peak response workload period of 9:00 am to 9:00 pm.

This unit can be a smaller vehicle such as a Type 6 wildland unit or similar staffed with at least one paramedic and equipped to handle emergency medical incidents and other minor type incidents. From Station 11 it can easily respond into the city's busiest areas. In addition, it can be used to fill in stations vacated for training and other non-response activities.

This type of response unit should also be considered in the future as response workload increases. Monitoring unit hour utilization rates for SRFD response units will give a clear indication of when an additional response unit is needed. Unit hour utilization over 10 percent should be avoided. When a

response unit approaches 10 percent utilization, a quick response unit can be added to that station during peak workload periods to maintain or improve response reliability.

Cost to implement: $843,750 for 4 FTE and an equipped vehicle.

Improvement Goal G: Improve response resource management and incident command

SRFD currently staffs each operational shift with one battalion chief. The battalion chief's duties include coordination of all on-shift response personnel, supervision of response crews, ensuring coverage is balanced across the city, and assuming command of larger incidents. Typically agencies staff with one battalion chief for every five response units. The SRFD's single on-shift battalion chief is managing twelve.

Adding a second battalion chief will improve overall shift management. Greater attention can be given to the needs of response crews including training, communications, and the like. In addition, a second battalion chief will improve effective response force coverage.

Cost to implement: $750,000 for 3 FTE and an equipped vehicle.

Improvement Goal H: Utilize in-station video conferencing systems

It is often necessary for fire department personnel to meet collectively for training, meetings, and other purposes. SRFD will often assemble several of its available response units at a station for such purposes. Unfortunately this occurs during the times of the day when response activity is at its highest.

Many of these gatherings can be done as effectively via video-conferencing rather than in person. Classroom training sessions, meetings, and other face-to-face conversations can take place "on-line" with equal result.

The benefit is that response units and personnel can stay within their primary service area while participating in the training or meeting. This will reduce incident travel times since the response unit will not have to travel the extra distance to return to its primary service area to handle an emergency.

Cost to implement: $20,000 to $40,000 depending on the system selected

Appendix: Fire Station Descriptions

Figure 67: Santa Rosa Fire Department Station 1
955 Sonoma Avenue

Santa Rosa Fire Department's Station 1 formerly served as the agency's main station and administrative offices. Today it continues to be used as a fire station and houses the offices of the Santa Rosa Police Department.

The station consists of four back-in apparatus bays that are single depth, housing one engine, a ladder truck, a reserve ladder truck, a water tender, one heavy rescue vehicle and several other vehicles.

The station dates back to 1980 and is in fair condition but showing signs of aging.

Structure	
Construction type	Mixed masonry and wood frame walls. Steel clad, wood frame roof structure.
Date Built	1980
Seismic protection/energy audits	None known.
Auxiliary power	Automatic starting generator is in place.
Condition	Fair but aging
Facilities Available	
Exercise/workout	A large exercise room is in the police department portion of the station.
Kitchen/dormitory	A good-sized kitchen and day room area is present. Sleeping for up to 12 is available in a large dormitory room with separate quarters for a captain and battalion chief.
Lockers/showers	Lockers are provided as are showers in on large bath/shower room and one smaller single room.
Training/meetings	There is no classroom. Kitchen table is available for training and meetings.
Washer/dryer	Provided in the apparatus area.
Protection Systems	
Sprinkler system	The station is fully protected by a fire sprinkler system.
Smoke detection	The station is fully protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 68: Santa Rosa Fire Department Station 2
65 Stony Point Road

Station 2 houses an engine, a ladder truck and a wildland unit, along with several other vehicles in two double depth back-in, apparatus bays. The building was constructed in 1983 and underwent a substantial remodelling in 2003.

The station is in good condition overall and no significant repair or maintenance concerns were reported.

Structure	
Construction type	A combination of steel frame and wood frame with metal siding.
Date Built	1983, remodeled in 2003.
Seismic protection/energy audits	None known.
Auxiliary power	An automatically starting generator is present.
Condition	Fair but aging
Facilities Available	
Exercise/workout	Space is provided in a large exercise room
Kitchen/dormitory	A good-sized kitchen is adjacent to a day room area. Sleeping accommodations are provided in seven individual rooms.
Lockers/showers	Five showers and some separate restrooms.
Training/meetings	A large training/meeting room is present.
Washer/dryer	Present
Protection Systems	
Sprinkler system	Station is protected by a fire sprinkler system.
Smoke detection	Appropriate smoke detection is installed.
Security	Combination and key locks on all doors.
Apparatus exhaust system	Provided on all apparatus.

Figure 69: Santa Rosa Fire Department Station 3
3311 Coffey Lane

Station 3 is a somewhat older facility, dating from 1982, but is in generally good condition and has maintained positive appearance but is aging.

The two apparatus bays, one of which is configured for drive-through access, provide storage for one engine and a reserve engine; residential quarters for crews are adequate for current use. Station 3 is one that should be considered due for replacement or remodelling in future planning.

Structure	
Construction type	Wood frame walls with steel and stucco siding
Date Built	1982
Seismic protection/energy audits	None known
Auxiliary power	Automatic starting generator is in place
Condition	Fair but aging
Facilities Available	
Exercise/workout	No exercise room present. Some workout equipment is in apparatus bays.
Kitchen/dormitory	A small kitchen and day room are present. Sleeping is available in one shared dorm room with a separate quarters for the station captain.
Lockers/showers	Three individual bathrooms each have a single shower.
Training/meetings	There is no classroom. Kitchen table is available for training and meetings.
Washer/dryer	Provided in the apparatus area.
Protection Systems	
Sprinkler system	The station is not protected by a fire sprinkler system.
Smoke detection	Individual smoke detectors only.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all apparatus.

Figure 70: Santa Rosa Fire Department Station 4
1775 Yulupa Avenue

Santa Rosa's Station 4 is an older facility, constructed in 1975, consisting of two apparatus bays and sleeping quarters for the crews and that staff one structural fire engine. In addition, the station houses an engine owned by the Office of Emergency Services (OES), which the crew may cross-staff when requested for wildland fire responses.

The station is in fair condition but is aging and will be due for replacement or reconditioning if its use is to be continued in the long term.

Structure	
Construction type	Mixed masonry and wood frame walls. Steel clad, wood frame roof structure.
Date Built	1975
Seismic protection/energy audits	None known.
Auxiliary power	Automatic starting generator is in place.
Condition	Fair but aging.
Facilities Available	
Exercise/workout	Exercise equipment is in the apparatus bays.
Kitchen/dormitory	An adequate kitchen is present along with a day room. There is a dormitory room that sleeps up to seven along with a separate captain's quarters.
Lockers/showers	Lockers are in the living area. There are two single bath/shower rooms.
Training/meetings	There is no classroom. Only the kitchen table is available for training and meetings.
Washer/dryer	Provided in the apparatus area.
Protection Systems	
Sprinkler system	The station is not protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 71: Santa Rosa Fire Department Station 5
2201 Newgate Court

Station 5 is a new fire station completed in 2015. This floor plan is intended for future fire station design throughout the City of Santa Rosa.

Structure	
Construction type	Masonry structure with wood frame, composition shingled roof structure.
Date Built	2014
Seismic protection/energy audits	Completed when designed.
Auxiliary power	Automatic starting generator is in place.
Condition	Excellent, new.
Facilities Available	
Exercise/workout	A good sized exercise room is present but not yet equipped.
Kitchen/dormitory	A large kitchen and day room area are in place and three single bedrooms provide accommodations for crew members.
Lockers/showers	Lockers are in the dormitory area, along with two single bath/shower rooms
Training/meetings	There is no classroom but room for a large table in the kitchen/day room area that will likely be used for training.
Washer/dryer	Provided in the apparatus area.
Protection Systems	
Sprinkler system	The station is fully protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided for the apparatus.

Figure 72: Santa Rosa Fire Department Station 6
205 Calistoga Road

Station 6 is of the same design as Station 4. It is also an older facility of 1975 vintage, staffed by one engine company crew, and housing two engines. There are two single depth apparatus bays and sleeping quarters are available with a one-bed dorm room and another dorm room with three beds.

The facility is in fair condition but is aging and will be due for replacement or reconditioning to sustain long-term use.

The station is situated on a very busy street, with a short front apron for maneuvering of apparatus, which can present safety concerns.

Structure	
Construction type	Poured concrete and wood frame walls. Wood frame roof structure with composition covering.
Date Built	1975
Seismic protection/energy audits	Asbestos abatement only.
Auxiliary power	Automatic starting generator is in place.
Condition	Poor but aging.
Facilities Available	
Exercise/workout	None
Kitchen/dormitory	An adequate kitchen is present along with a day room. A dormitory room sleeps up to six along with a separate captain's quarters.
Lockers/showers	Lockers are in the dorm area. There is a single bath/shower room.
Training/meetings	There is no classroom. Only the kitchen table is available for training and meetings.
Washer/dryer	Present
Protection Systems	
Sprinkler system	The station is not protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 73: Santa Rosa Fire Department Station 7
6590 Stone Bridge Road

Station 7 is a smaller facility constructed in 1976 and consists of a wood frame structure with two back-in apparatus bays.

It is also an older facility staffed by one engine company crew and housing one engine, consisting of two apparatus bays and sleeping quarters.

Like Station 4, the facility is in fair condition but is aging and will be due for replacement or reconditioning if its use is to be continued in the long term.

Structure	
Construction type	Wood frame structure with plywood siding and a wood frame, composition roof.
Date Built	1976
Seismic protection/energy audits	None known.
Auxiliary power	Automatic starting generator is in place.
Condition	Fair but aging
Facilities Available	
Exercise/workout	Exercise area is present.
Kitchen/dormitory	A very small kitchen is present along with a day room. There is a dormitory room that sleeps five along with a separate captain's quarters.
Lockers/showers	There are lockers are in the dorm rooms and two single bath/shower rooms.
Training/meetings	There is no classroom. Only the kitchen table is available for training and meetings.
Washer/dryer	Present
Protection Systems	
Sprinkler system	The station is not protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 74: Santa Rosa Fire Department Station 8
830 Burbank Avenue

Station 8 is an older, masonry block constructed building that served the Roseland Fire District and is currently operated by Santa Rosa Fire Department via contract with the district, which still owns the building. The station is aging and will need to be replaced in the near future.

Two very small apparatus bays are present and barely able to accommodate the size of today's fire apparatus. The station houses one engine. Crew accommodations are limited.

Structure	
Construction type	Masonry block and wood frame roof structure.
Date Built	Unknown
Seismic protection/energy audits	None known.
Auxiliary power	Automatic starting generator is in place.
Condition	Poor and aging.
Facilities Available	
Exercise/workout	An exercise area is present.
Kitchen/dormitory	A small kitchen is present, along with a small sleeping room with three beds and a separate captain's quarters.
Lockers/showers	Lockers are in the dorm area. There is a single bath/shower room.
Training/meetings	There is no classroom. Only the kitchen table is available for training and meetings.
Washer/dryer	Provided in the apparatus area.
Protection Systems	
Sprinkler system	The station is not protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 75: Santa Rosa Fire Department Station 10
1345 Corporate Center Parkway

Station 10 occupies a portion of the same building that holds the Santa Rosa Fire Department administrative offices. The building previously served as commercial office space and was modified for use as a fire station in 2006. Today it consists of three back-in apparatus bays, which hold an engine, the department's hazardous materials response vehicle, and a command post vehicle belonging to the police department.

Currently one engine crew is stationed in the facility.

Structure	
Construction type	Mixed masonry and steel frame walls with a wood frame roof structure.
Date Built	Extensively remodeled from a former office space in 2006.
Seismic protection/energy audits	None known.
Auxiliary power	Automatic starting generator is in place.
Condition	Good
Facilities Available	
Exercise/workout	Exercise equipment is in a large, dedicated workout room
Kitchen/dormitory	A good-sized kitchen is present along with a day room. Sleeping accommodations consist of four individual bedrooms.
Lockers/showers	There are five individual restrooms, as well as three single shower rooms.
Training/meetings	There is no classroom. Training is held in the day room.
Washer/dryer	Present
Protection Systems	
Sprinkler system	The station is fully protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Figure 76: Santa Rosa Fire Department Station 11
550 Lewis Road

Station 11 was originally constructed as a temporary station with a limited life expectancy. It consists of two buildings. One is a steel frame; steel clad apparatus building with two bays. The other is a manufactured home that provides residential quarters for the single engine company assigned to this station.

The station was constructed in 2009 and is in good condition overall with significant maintenance concerns reported including sagging floors

Structure	
Construction type	Steel frame, steel clad apparatus building. Wood frame manufactured home.
Date Built	2009
Seismic protection/energy audits	When originally constructed.
Auxiliary power	Automatic starting generator is in place.
Condition	Good
Facilities Available	
Exercise/workout	Exercise equipment is present in the back of the apparatus bays.
Kitchen/dormitory	A good-sized kitchen is present along with a day room area. Sleeping accommodations consist of three bedrooms, two with two beds and the other with a single bed.
Lockers/showers	There are two individual restrooms as well as three single shower rooms.
Training/meetings	There is no classroom. Training is held in the kitchen.
Washer/dryer	Present
Protection Systems	
Sprinkler system	The station is fully protected by a fire sprinkler system.
Smoke detection	The station is protected by a smoke detection system.
Security	Facility is secured from entry with combination door locks.
Apparatus exhaust system	Exhaust removal is provided on all front line apparatus.

Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

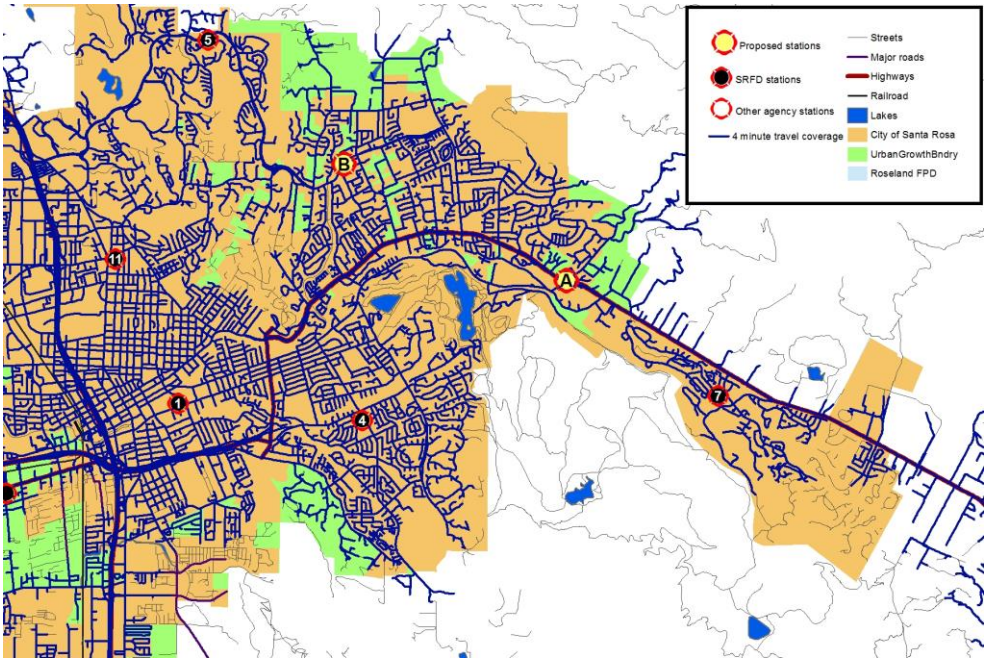
May 19, 2017

Anthony Gossner, Fire Chief
Santa Rosa Fire Department
2373 Circadian Way
Santa Rosa, CA 95407

Dear Chief Gossner,

As a follow-up to the recently completed Standards of Coverage and Deployment Plan prepared by ESCI, you asked me to review of two additional deployment options. I have completed that review.

As shown on the map below, you are proposing to relocate Fire Station 6 to the location shown as Proposed Station A (at or near Sonoma Highway 12 and Fairway Dr.). In addition, you propose adding a new station at the location shown as Proposed Station B (at or near Montecito Blvd. and Benicia Dr.).



This proposal has merit. First-due coverage improves in this region, particularly in the area south of Station 5 and east of Station 11. In addition, there is a strong benefit to improvement of effective response force coverage in the Station 7 area because of the additional response resource.

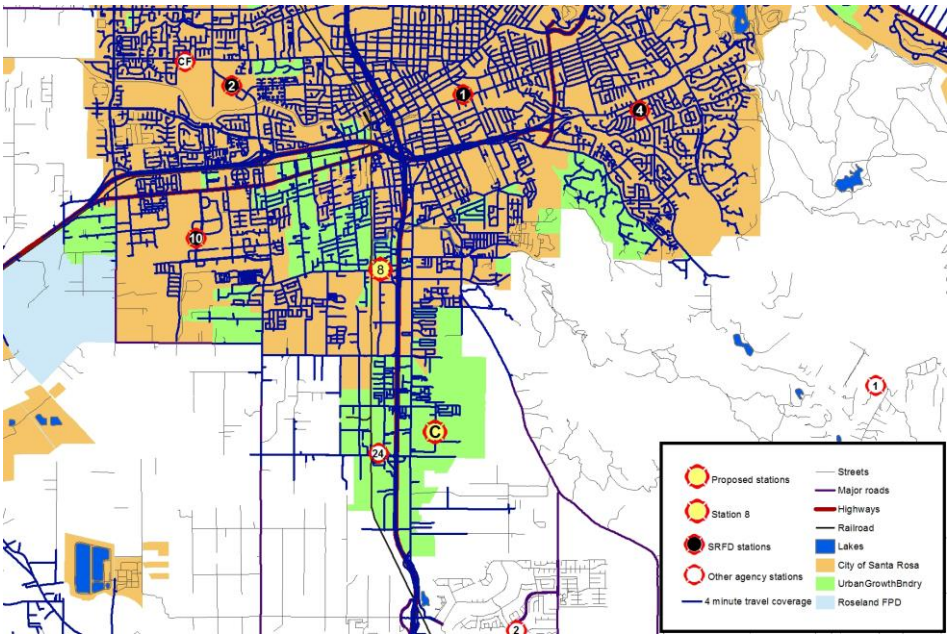
The map above illustrates first-due coverage of the new configuration based on a four-minute travel time, in keeping with your response performance goals.

HEADQUARTERS
25030 SW Parkway Avenue
Suite 330
Wilsonville, Oregon 97070
503.570.7778
800.757.3724
info@esci.us
www.esci.us

SOUTHERN REGION
PO Box 641
Argyle, Texas 76226-9998
800.757.3724

NATIONAL CAPITOL REGION
4025 Fair Ridge Drive
Fairfax, Virginia 22033
703.273.0911

Your second proposal is to plan for the addition of a fire station south of the existing city limits but within the city's urban growth area. The map below illustrates the proposal. I have included the original plan's recommendation to relocate Fire Station 8 on this map as well.



The proposed station, identified as Station C (at or near Santa Rosa Ave. and East Robles Ave.) would serve the urban growth area well. First-due coverage is shown based on the four-minute travel time.

My understanding is that the existing Station 24 is a sub-standard facility that would not serve the needs of your agency. Thus, it is appropriate to consider a new facility at a more appropriate location such as the site you propose.

You could also consider moving the proposed relocation of Station 8 several blocks east (such as Kawanda Springs Rd. and Santa Rosa Ave.) to enhance first-due coverage of the area currently being considered for additional residential development.

Please let me know if you have any questions or need additional information.

Sincerely,

Joe Parrott

Joe Parrott
ESCI