2011

Standards of Cover

Salem Fire Department

City of Salem

Fire Department

Oregon

Standards of Cover

2011

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Introduction

The following report serves as the Salem Fire Department "Standards of Cover" document. The Center for Fire Public Safety Excellence (CPSE) defines the process, known as "deployment analysis," as written procedures that determine the distribution and concentration of fixed and mobile resources of an organization. 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 in addition to homeland security issues.

Creating a Standards of Cover document requires that a number of areas be researched, studied, and evaluated. The following report will begin with an overview of both the community and the agency. Following this overview, the plan will discuss areas such as risk assessment, critical task analysis, agency service level objectives, and distribution and concentration measures. The report will provide documentation of reliability studies and historical performance through charts and graphs. The report will conclude with policy recommendations.

Endorsement by City Manager

This standards of cover and deployment plan provides a comprehensive analysis of the City of Salem Fire Department's operations and capabilities. Community risk is fully assessed within this plan. Based on the community risk assessment, demographic and geographic analysis, and performance measures and objectives the standards of cover document provides the Salem Fire Department with a tool to effectively and efficiently deploy resources where the need is greatest throughout the community. The goal of this plan is to assist in ensuring a safe and effective response force is delivered for fire suppression, emergency medical services, and specialty response situations such as water rescue, hazardous materials mitigation and events affecting homeland security. This plan is consistent with the course, direction and philosophy of the City of Salem and the City Council.

Linda Norris, City Manager

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Executive Summary

This document identifies Salem Fire Department's Standards of Cover (SOC) for the City of Salem, Oregon. Response resources, deployment strategies, operational elements, and overall community risks have been evaluated in this document. It establishes response time objectives and standards for measuring the effectiveness of resources within the department and the deployment of those resources. The document is segregated into components generally based on the format recommended by the Center for Public Safety Excellence, *Standards of Cover 5th Edition*.

The Salem Fire Department (SFD) is a direct operating department of City of Salem and provides fire protection, rescue, and advanced life support (ALS) emergency medical services to the community. The department's service area encompasses all of the area within the governmental boundaries of the City of Salem and the Salem Suburban Fire District (a contractual service area). This document will only address the area within the city limits of Salem.

The City of Salem has a resident population of 157,460.[1] Population in the Salem Suburban Fire District is estimated to be 7,000, for a total resident population of 164,460. It is estimated that employment brings an additional 23,199 people into the city, raising the SFD's daytime service population to approximately 187,659.

The department serves an area of approximately 48 square miles within the City of Salem and an additional 30 square miles for the Salem Suburban Fire District. The department operates 11 fire stations and 54 apparatus. The Salem Police Department through the Willamette Valley Communications Center provides emergency call receipt and dispatch service.

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

[1] Portland State University Center for Population Research, July 2010.

the highest level of protection and 10 being unprotected or nearly so. As of the latest rating, ISO gave the service area a rating of Class 2 for properties within 1,000 feet of a fire hydrant and Class 8b for all other areas. This rating was conducted in 2003.

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

- **Metropolitan** - geography with populations of over 200,000 people in total and/or a population density of over 3,000 people per square mile. These areas are distinguished by 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 of over 2,000 people per square mile.
- **Suburban** - geography with a population of 10,000 to 29,999 and/or a population density of between 1,000 and 2,000 people per square mile.
- **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.
- **Wilderness/Frontier/Undeveloped** - geography that is both rural and not readily accessible by a publicly or privately maintained road.

An analysis of the City of Salem's population density reveals that it is primarily of two classifications: urban, and suburban. The Salem City Council, however, has determined that its response performance objectives should be uniform across the entire city, thus the city will be evaluated as one designation: urban.

A Performance Statement and Objectives for the services provided by the Salem Fire Department to the City of Salem have been developed. These further define the quality and quantity of service expected by the community and consistently pursued by the Salem Fire Department.

Overall Performance Statement

As a result of the analysis in this report and consideration of community input, the following performance statements and objectives are established.

Performance Statement (Mission Statement)

Protecting lives, property, and the environment placing safety and service above all

In addition to the overall performance statement, the following response-specific performance objectives are established.

First-Due Response Performance Objective:

1. *The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 6 minutes 18 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

Concentration Performance Objective:

1. *For moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 12 minutes 22 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

The Salem City Council has adopted a response performance goal describing its desired level of response performance. This is a goal to be achieved in the future as funding is available to provide the necessary resources.

1. *The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 5 minutes 30 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

The Salem Fire Department has adopted a response performance goal describing its desired level of performance for the full Effective Response Force. This, also, is a goal to be achieved in the future as funding is available to provide the necessary resources.

1. *For moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time.*

The analysis conducted during the evaluation phase of this process identified a number of opportunities to improve service (performance goals). The following performance improvement goals are offered for consideration.

1. *Performance Improvement Goal A: Improve turnout times so that initiation of response occurs within 1 minute 30 seconds from time of dispatch 85 percent of the time.*
2. *Performance Improvement Goal B: Reduce incident travel time.*
3. *Performance Improvement Goal C: Plan for future fire station locations to accommodate the city's growth and development.*

Component A – Description of Community Served

Organization Overview

Governance and Lines of Authority

The City of Salem is a municipal corporation and operates as a charter city that is provided the authority to levy taxes for operating a fire protection system. The City operates under a Council-Manager form of governance and the City Council is provided with necessary power and authority to govern the provision of fire protection and emergency services. The City Council maintains strictly policy-level involvement, avoiding direct management and hands-on task assignment—an arrangement established within written policy.

Extraterritorial services to the Salem Suburban Fire District are provided through contractual agreements between the city and the district. The terms of that agreement do not specify response be provided to any defined standard.

Organizational Finance

Financial oversight of Salem Fire Department is the responsibility of an elected City Council and City Manager. The Fire Chief is appointed by the City Manager and is tasked with responsibility for fire and life safety emergency services within the city.

The city uses a one-year budget cycle to prepare the annual operating budget and capital improvement plan based on a July through June fiscal year. The total fire department budget for fiscal year 2010-2011 is $25,280,710, including both the General Fund and Emergency Medical Services Fund.

Revenue for fire and rescue (EMS) for the fire department is received through the general revenue of the city. A large segment of the municipal revenue is property tax receipts and, to a lesser degree, fees for service and other revenues. The total revenue generated by the fire department for fiscal year 2010-2011 is expected to be $1,912,370. This leaves a net cost for fire services to Salem taxpayers for the fiscal year 2010-2011 of $23,368,340.

Figure 1 lists the source and amount of non-tax revenue for Salem Fire Department for fiscal year 2010-2011.

Figure 1: Generated Revenue

Revenue Source	FY 2010-2011
Service Contracts	$973,980
Service Fees	$581,390
Fire Permit Fees	$357,000
Total	**$1,912,379**

Figure 2 shows the expenditure history for the previous three fiscal years and the current year. Actual expenditures were used for fiscal years 2007-2008 and 2008-2009, the estimated amount was used for 2009-2010, and the budgeted amount was used for 2010-2011. Three major divisions of the budget are shown.

Figure 2: Budget/Expenditures by Year and Category, FY 07-08 – FY 10-11

Year	Salaries and Benefits	Services and Supplies	Capital Outlay	Internal Allocated Charges	Total
FY 07-08	$19,014,300	$4,600,320	$436,690	$73,850	$24,125,160
FY 08-09	$19,648,930	$5,086,700	$90,460	$77,300	$24,903,390
FY 09-10	$20,769,400	$4,229,790	$111,100	$550,000	$25,660,290
FY 10-11	$20,921,720	$4,210,200	$48,790	$100,000	$25,280,710

During the four-year period, the department's overall budget increased 4.8 percent.

A comprehensive capital improvement and replacement program is important to the long-term financial 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. Items usually included in capital improvement and replacement programs are facilities, apparatus, land acquisition, and other major capital projects.

The City of Salem has an adopted "Capital Improvement Plan 2008/09-2012/13". This document describes capital facility and other improvement needs for the five-year timeframe and schedules those improvements based on available funding. The Salem Fire Department has a number of projects addressed in this plan, including apparatus replacement and fire station construction. Most have been completed.

Service Area Overview

The Salem Fire Department (SFD) is a direct operating department of City of Salem and provides fire protection, rescue, and emergency medical services to the community. The department's jurisdiction encompasses all of the governmental boundaries of the city along with the Salem Suburban Fire District (SSFD), a contractual service area).

SFD provides emergency services to a city with a resident population of 157,460.[2] Salem Suburban Fire District has an estimated population of 7,000, for a total service area resident population of 164,460. It is estimated that employment brings an additional 23,199[3] people into the city, raising the SFD's daytime service population to approximately 187,659.

The department serves an area of approximately 78 square miles; 48 within the city limits and 30 within the SSFD. The department's services are provided from 11 fire stations.

The department maintains a fleet of 54 apparatus, including engines, ladder trucks, brush engines, and specialty vehicles. The Willamette Valley Communications Center provides emergency call receipt and dispatch service.

There are 174 individuals involved in delivering services to the jurisdiction. Staffing coverage for emergency response is through the use of career firefighters on 24-hour shifts. For immediate response and at full staffing, no less than 43 personnel would be on duty at all times.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating. The rating system evaluates three primary areas: the emergency communication system, the fire department, and the community's pressurized hydrant or tanker-based water supply. The overall rating is 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 rating, ISO gave the service area a rating of Class 2 for properties within 1,000 feet of a fire hydrant and Class 8b for all other areas. This rating was conducted in 2003.

[2] Portland State University Center for Population Research, July 2010.
[3] Source: city-data.com.

Component B – Review of Services Provided

Services Provided

The Salem Fire Department provides a variety of services, including fire suppression, intermediate level emergency medical service, entrapment extrication, high-angle rescue, trench, confined space, and hazardous materials emergency response (Level A).

The following chart 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. Additional detail on service capabilities will also be provided throughout this document.

Figure 3: Core Services Summary

Service	General Resource/ Asset Capability	Basic Staffing Capability per Shift
Fire Suppression	11 staffed engines 2 staffed ladder trucks 2 command vehicles Additional automatic and mutual aid engines, aerials, and support units as available	43 suppression-trained personnel per shift Additional automatic and mutual aid firefighters as available
Emergency Medical Services	11 engines - ALS equipped 2 ladder trucks - ALS equipped	26 certified emergency medical technicians basic 128 certified emergency medical technicians paramedic
Vehicle Extrication	2 ladder trucks equipped with hydraulic rescue tools, hand tools, air bags, cutting torch, stabilization cribbing, and combination cutter-spreader hydraulic rescue tool	All firefighters vehicle extrication and rescue trained
High-Angle Rescue	1 cross-staffed heavy rescue equipped with rescue-rated rope, harnesses, and technical rescue equipment	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in high-angle rope rescue.
Trench and Collapse Rescue	1 cross-staffed heavy rescue equipped with pneumatic shores, cribbing, limited lumber and hand tools for initial stabilization	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in trench and collapse rescue.

Service	General Resource/ Asset Capability	Basic Staffing Capability per Shift
Swift-Water Rescue	All engines and ladder trucks equipped with rescue throw bags, PFD's, and helmets. 2 cross-staffed water rescue vehicles with light watercraft and one aluminum hull rescue boat	All personnel trained to the operations level. 6 personnel per shift trained to the technician level in swift-water rescue.
Confined Space Rescue	1 cross-staffed heavy rescue equipped with tripod, cribbing, pneumatic shores, air monitoring equipment, basket stretchers, rescue-rated rope	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in confined space rescue.
Hazardous Materials Response	Hazardous materials response vehicle equipped with Level A&B PPE, multi-gas and radiation monitors, spill containment supplies, spectrometer, and non-sparking tools	All personnel trained to the operations level. 8 personnel per shift trained to the technician level in hazardous materials.

Assets and Resources

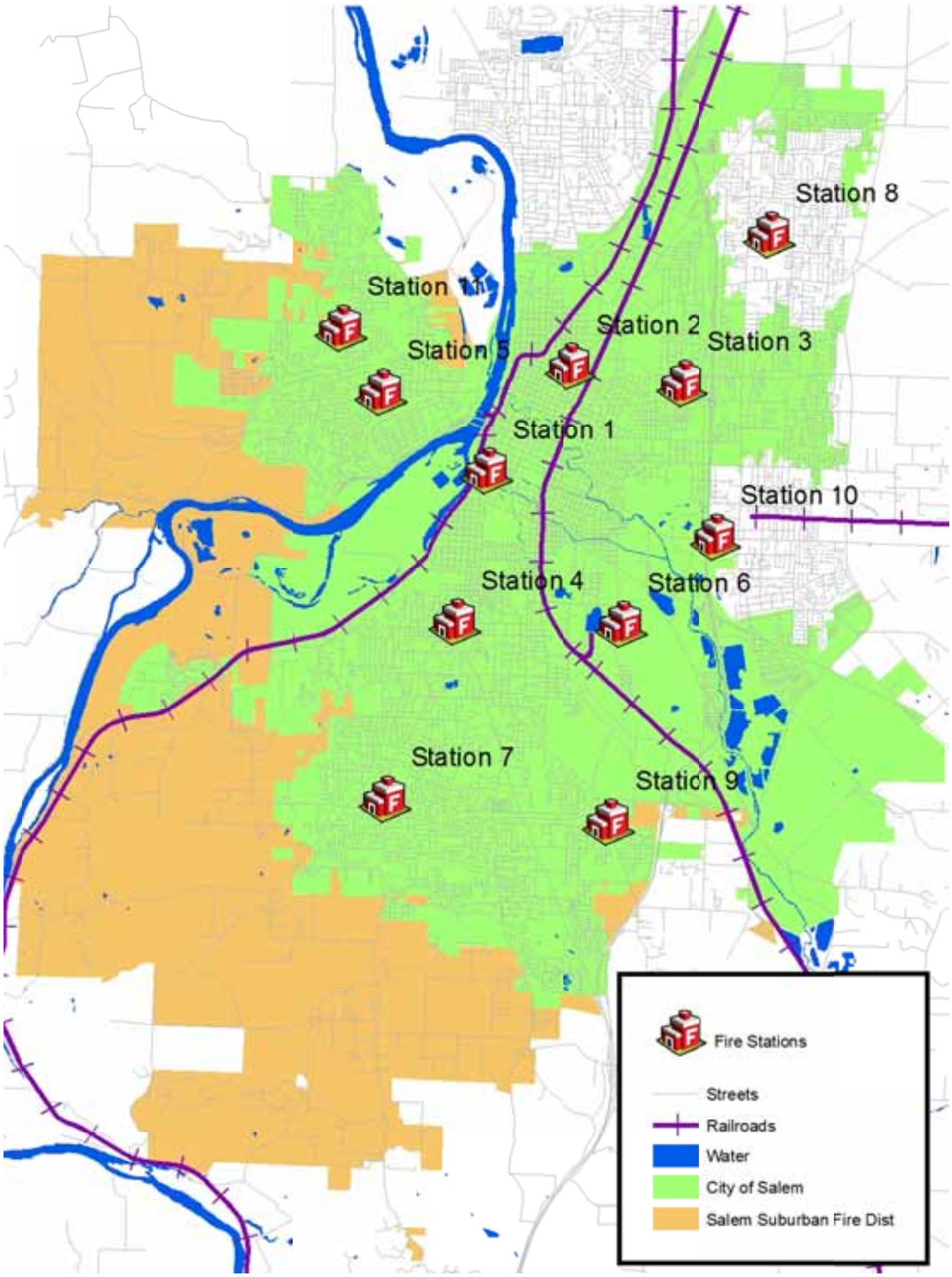
Fire Stations

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. Appendix D contains more detailed descriptions of each Salem fire station.

Station Location and Deployment

The SFD delivers fire and EMS response from 11 city-owned fire stations located throughout the city. The following map shows the city boundaries, Salem Suburban Fire District boundaries, and fire station locations.

Figure 4: Current Facility Deployment



Apparatus

Other than the firefighters assigned to stations, response vehicles are probably the next most important resource of the emergency response system. SFD recently completed a replacement of nearly all its fleet. The following lists apparatus assigned to each of the stations.

Figure 5: Apparatus Assigned to Salem Fire Stations

Station	Apparatus	Year Built	Condition
Station 1	Engine 1	2007	Excellent
	Tender 1	2008	Excellent
	Air 1	2009	Excellent
	BC 1	2000	Good
	Engine 14	2009	Excellent
Station 2	Engine 2	2007	Excellent
	Ladder 2	2009	Excellent
	Medic 2	2002	Good
	BC 2	2009	Excellent
Station 3	Engine 3	2010	Excellent
	Medic 13	2002	Good
Station 4	Engine 4	2007	Excellent
	Ladder 4	2009	Excellent
	Rescue 4	2005	Good
	BC 4	2009	Excellent
Station 5	Engine 5	2007	Excellent
	Engine 15	2007	Excellent
	Medic 15	2002	Good
	Boat 5/Tow	2005/1992	Good
	Tender 5	2008	Excellent
	Grass 5	2008	Excellent
Station 6	Engine 6	2007	Excellent
	Foam 6	2007	Excellent
	Foam 16	1988	Good
Station 7	Engine 7	2007	Excellent
	Tender 7	2008	Excellent
	Grass 7	2008	Excellent
	MCI/Tow	2004/1992	Good
Station 8	Engine 8	2007	Excellent
Station 9	Engine 9	2007	Excellent
	Medic 19	2002	Good
Station 10	Engine 10	2007	Excellent
	Engine 13	2007	Excellent
	Deployment/Tow	2004/1992	Good
	State USAR Trailer	Unknown	Good
Station 11	Engine 11	2007	Excellent
	Hazmat 13	2010	Excellent
	Decon 13/Tow	2007	Excellent
	Ladder 11	1992	Good

SFD uses several types of apparatus as shown in the previous table. Some are further described as follows:

- Engine – Primary response unit from each station for most types of service requests. Each is equipped with a 1,500-gallon-per-minute pump and carries between 500 and 750 gallons of water.
- Ladder Truck – A specialized apparatus equipped with long ladders, salvage and overhaul equipment, and rescue tools. Used for structure fires, rescues, and other service requests.
- Tender – A truck that carries a large quantity of water for firefighting purposes and used in areas without fire hydrants.
- Grass – Smaller fire engine with a 100 gallon-per-minute pump and 250 gallons of water. Used for wildland fires and for protecting structures from an approaching wildland fire.
- HazMat – Specialized response unit for containment and control of hazardous materials releases. It is accompanied by the Decon unit, which specializes in cleanup of decontaminated persons and equipment.
- Air – Incident support unit with breathing air bottle refill capability.

The department's apparatus are generally in very good condition, properly equipped, and well maintained.

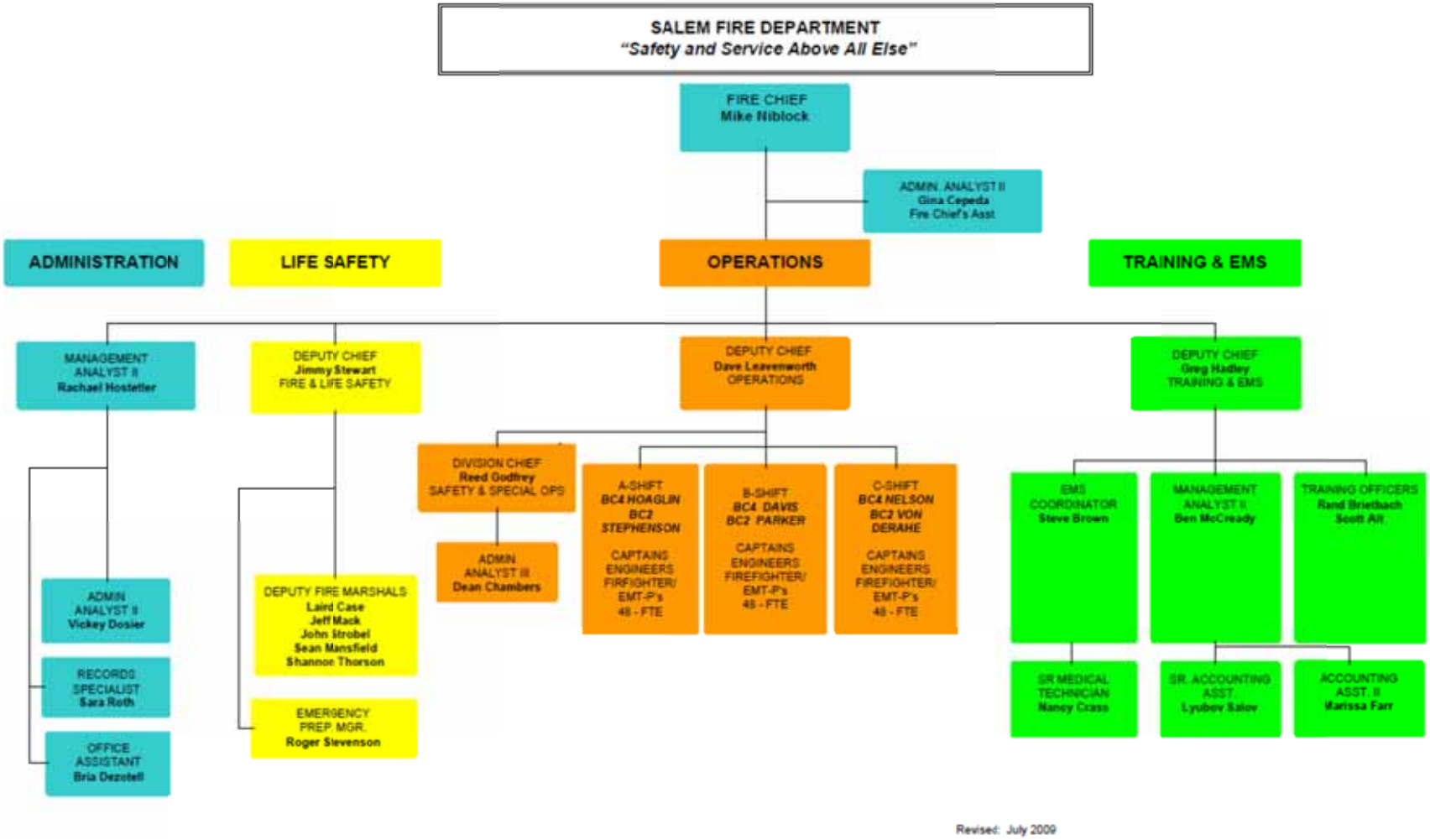
Staffing Information

Fire and emergency medical service organizations must provide adequate staffing in four key areas: emergency services, administration, risk mitigation (prevention), and support.

Organizational Structure

SFD is organized in the typical top-down hierarchy. The chain of command is identified with common roles for a department of this size. SFD has 11 stations that house emergency response resources. The department's administrative office is located at Fire Station 1. 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 department's organizational chart is functional and primary roles are well identified.

Figure 6: Organizational Structure



Administration and Support Staff

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

There are 174 individuals involved in delivering services to the combined City of Salem/Salem Suburban Fire District service area. The department's primary management team includes a Chief, two Deputy Chiefs, two Division Chiefs and two Management Analysts. Additional support personnel include office staff, training officers, and deputy fire marshals. SFD has 22 total administration and support staff.

Figure 7: Administration and Support Personnel by Position

Position	Number
Deputy Chief/Fire Marshal	1
Deputy Chief/Training-EMS	1
EMS Coordinator	1
Training Officers	2
Deputy Fire Marshals	5
Emergency Preparedness Manager	1
Management Analysts	2
Administrative Analyst	1
Administrative Assistants	4
EMS Billing and Support Staff	3
Total	**21**

Statistically, the department maintains a ratio of 12.1 percent of administration and support staff to total personnel (21 out of 174 total personnel).

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 operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved.

SFD uses career staffing to carry out its functions. All administrative, support, and response staff are career personnel. The following figure shows the distribution of emergency personnel by rank.

Figure 8: Emergency Response Personnel by Rank

Position	Number
Deputy Chiefs	1
Division Chief	1
Battalion Chief	6
Fire Captain	39
Fire Apparatus Operator	39
Firefighter	67
Total	**153**

As shown in the previous figure, SFD employs 153 emergency response personnel for EMS, rescue, and fire suppression activities. The estimated resident population of the Salem Fire Department service area (City of Salem and SSFD) is 164,460. SFD provides its service area with 0.93 career firefighters per 1,000 population. Including employment populations, this ratio drops to 0.81.

Regardless of the raw numbers of personnel available to a department, what matters most is actual numbers of emergency responders the agency is able to produce at an emergency scene. This almost always relates to the actual number of emergency responders available for immediate deployment. SFD provides no less than 43 personnel on duty at full staffing.

Methodology for Incident Staffing

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

It is also true that for larger incidents this fire department is typically acting 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 high, and during periods of high incident activity. Therefore, the document will go on to provide an overall view of aggregate staffing in this department and the neighboring agencies.

The prompt arrival of at least four personnel is critical for structure fires. Oregon Occupational Safety and Health Division (OR-OSHA) regulations 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 departments rely on more than one unit arriving to initiate interior fire attack. The Salem Fire Department 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 this department 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.

SFD fire engine staffing is constant at three personnel per shift. Ladder truck staffing varies between three and four personnel per shift. The following table lists each station, staffed unit, and the staffing assigned to each. Cross-staffed means that firefighters assigned to another response unit in the station may transfer to the cross-staffed unit as needed.

Figure 9: Minimum Staffing Complement

Station	Apparatus	Minimum Staffing
Station One	Engine 1	3
	Air 1 (scene support)	Cross-staffed
Station Two	Engine 2	3
	Ladder 2	3-4
	Medic 12	Cross-staffed
	Battalion Chief 2	1
Station Three	Engine 3	3
	Medic 13	Cross-staffed
Station Four	Engine 4	3
	Ladder 4	3-4
	Battalion Chief 4	1
	Rescue 4	Cross-staffed
Station Five	Engine 5	3
	Medic 15	Cross-staffed
	Grass 5	Cross-staffed
	Tender 5	Cross-staffed
	Boat 5	Cross-staffed
Station Six	Engine 6	3
	Foam 6	Cross-staffed
	Foam 16	Cross-staffed
Station Seven	Engine 7	3
	Grass 7	Cross-staffed
	Tender 7	Cross-staffed
	Mass Casualty Incident Trailer	Cross-staffed
Station Eight	Engine 8	3
Station Nine	Engine 9	3
	Medic 19	Cross-staffed
Station Ten	Engine 10	3
	USAR truck and trailer	Cross-staffed
Station Eleven	Engine 11	3
	Haz Mat 13	Cross-staffed
	Decon 13	Cross-staffed
	Total	**41-43**

The Salem Fire Department relies on regional mutual and automatic aid agreements for major structure fires and other higher risk incidents, as well as during periods of high incident activity. The following figure represents the apparatus and staffing for fire stations in reasonable proximity to the city and available for immediate dispatch. This is useful for reviewing the aggregate firefighter staffing capacity available in the immediate region.

Figure 10: Immediate Region Automatic Aid

Department	Engines	Ladders Trucks	Other Units	Total Available Staffing
Marion County Fire District 1	8	0	Rescue. Tender, Brush unit, Medic unit	15
Keizer Fire District	3	1	Rescue, Brush unit, Medic unit, Rehab unit	9
Turner Fire District	2	0	Rescue, Tender, Brush unit Medic unit	Varies by availability
Jefferson Fire District	4	0	Rescue, Tender, Brush unit, Medic unit, Rescue boat	Varies by availability
Polk County Fire District 1	2	1	Rescue, Tender, Brush unit, Medic unit	Varies by availability

There are additional resources available for the rare major fire emergency. The State of Oregon Conflagration Act system provides resources from around the State of Oregon as requested and available. This can include one or more "strike teams" (groups of five similar resources) or "task forces" (groups of five dissimilar resources) staffed and equipped for the specific emergency. Wildland fires bring the firefighting resources of other cooperating agencies such as the Oregon Department of Forestry, Bureau of Land Management, and United States Forest Service. In addition, the State of Oregon sponsors a state-wide Urban Search and Rescue Team capability.

Current Service Delivery Objectives

The Salem Fire Department has established response performance objectives based on its current capabilities and resources. The objectives are:

1. The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 6 minutes 18 seconds from receipt of the call at the dispatch center, 85 percent of the time.
2. For moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 12 minutes 22 seconds from receipt of the call at the dispatch center, 85 percent of the time.

On October 2, 1995, based on a unanimous recommendation from the Fire Service Sub-Committee, the Salem City Council adopted an emergency response time goal. This goal, identified for planning purposes, calls for arrival at the scene of a priority emergency by the first response unit capable of initiating effective incident intervention within 5 minutes 30 seconds of the receipt of the call at the dispatch center, at least 85 percent of the time. Achievement of this goal is subject to the availability of funding for needed resources.

Component C – Review of the Community Expectations and Performance Goals

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. SFD is committed to incorporating the needs and expectations of residents and policy makers in the service delivery planning process.

Stakeholder Input Processes

As reported earlier in this report, the Salem City Council has adopted a response time goal calling for the arrival calls at the scene of an emergency by the first response unit within 5 minutes 30 seconds of the receipt of the call for help at the dispatch center, at least 85 percent of the time. This goal was recommended by a Council-appointed sub-committee made up of community representatives, including some City Council members.

Additional community outreach occurred during 2004 and 2005 through a series of community conversations regarding a potential general obligation bond election. These conversations included service expectations, fire station locations, apparatus needs, and level of service. These conversations affirmed the Council response time goal and provided guidance to the final version of the general obligation bond proposal.

Ultimately, the City Council authorized placement of the bond issue on the ballot. The measure passed with a 73 percent affirmative vote.

Community Outcome Goals

From these conversations general statements of outcome have been developed regarding the community's expectations of its fire department.

Figure 11: Community Outcome Goals

Service	Community Outcome Goal
Fire Suppression	*For all fire incidents, SFD shall arrive in a timely manner with sufficient resources to stop the escalation of the fire and keep the fire to the area of involvement. An effective concentration of resources shall arrive within time to be capable of containing the fire, rescuing at-risk victims, and performing salvage operations, while providing for the safety of the responders and general public*
Emergency Medical Services	*For priority emergency medical incidents, SFD shall arrive in a timely manner with sufficient trained and equipped personnel to provide medical services that will stabilize the situation, provide care and support to the victim and reduce, reverse, or eliminate the conditions that have caused the emergency while providing for the safety of the responders. When warranted, timely transportation of victim(s) to appropriate medical facilities shall be accomplished by the private provider in an effective and efficient manner.*
Vehicle Extrication	*For all vehicle accidents where rescue of victims is required, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and extricate the victim(s) from the emergency situation or location without causing further harm to the victim, responders, public, and the environment.*
High-Angle Rescue	*For all high-angle rescue incidents, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, SFD will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.*
Trench and Collapse Rescue	*For all trench or collapse rescue incidents, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, SFD will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.*
Swift-Water Rescue	*For all swift-water rescue incidents, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, SFD will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.*

Service	Community Outcome Goal
Confined Space Rescue	*For all confined space rescue incidents, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, SFD will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.*
Hazardous Materials Response	*For all hazardous materials incidents, SFD shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. For those incidents requiring only operations-level containment, SFD will perform the necessary functions while providing for the safety and security of the responders, public and the environment. For those incidents requiring more extensive technician-level functions, SFD will call for and support additional specially trained and organized regional resources to perform the necessary containment, stabilization, and/or clean-up functions while providing for the safety and security of the responders, public, and the environment.*

Component D – Overview of Community Risk Assessment

This section analyzes certain categorical risks that are present within the City of Salem that potentially threaten the persons and businesses within the community and that can create response workload for the SFD. These risks are identified to assist the Salem Fire Department in identifying where to locate response resources in the types and numbers needed to effectively respond to likely emergencies.

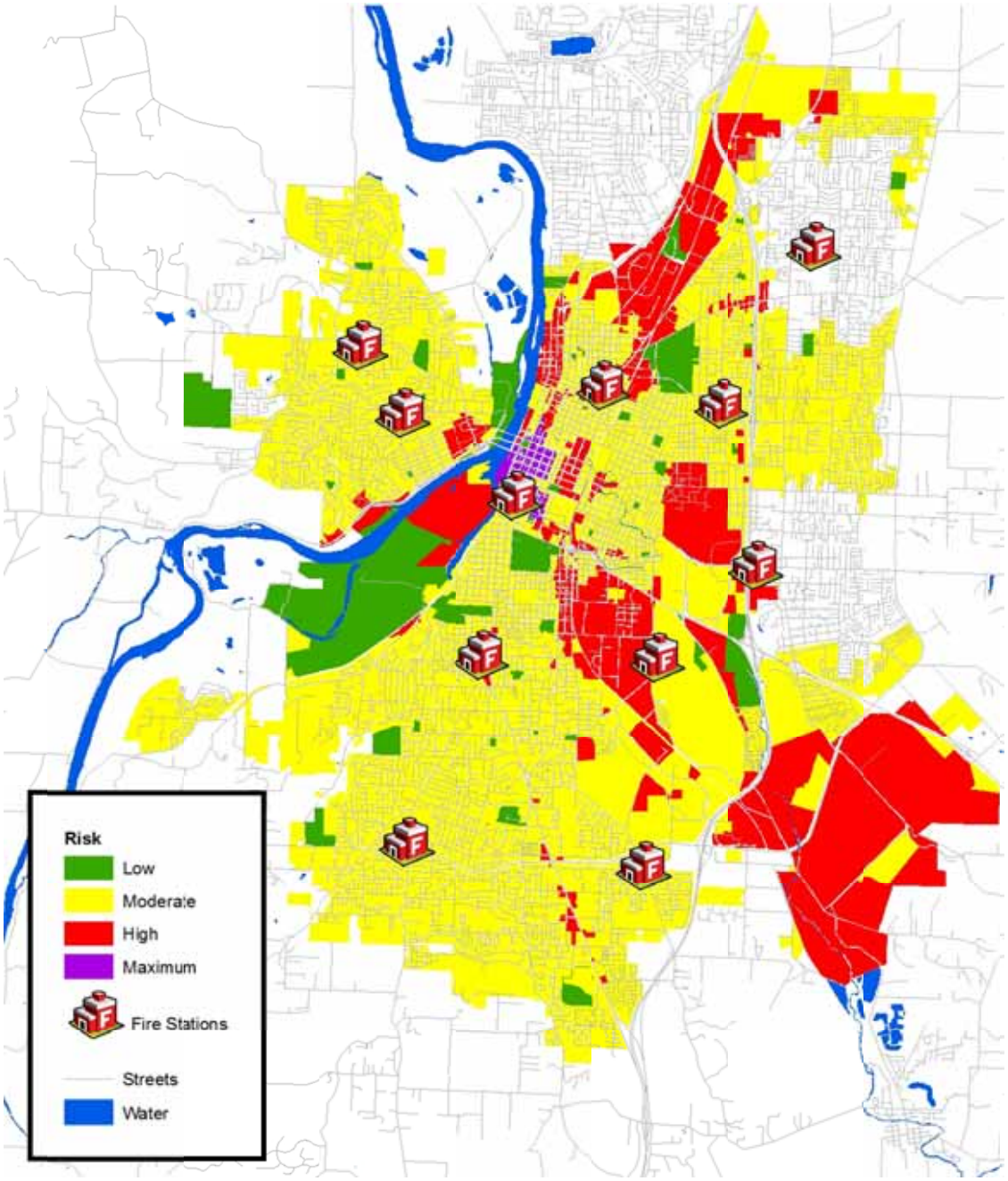
Overall Geospatial Characteristics

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 of the level of risk within geographic sub-areas of a community.

The community's risk assessment has been developed based on current land use within jurisdictional boundaries. These uses are found in the area's geographic parcel data. The following map translates land use to categories of relative fire and life risk.

- Low risk–Areas zoned and used for agricultural purposes, open space, low-density residential, and other low intensity 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.
- Maximum risk – Primarily the downtown area characterized by older high-rise buildings typically without built-in fire protection systems.

Figure 12: Community Risk Assessment



This map accurately depicts current development. The color-coding depicts current development as follows:

- Green - Open space, parks, golf courses, etc.
- Yellow - Single family neighborhoods, small office, and small neighborhood commercial
- Red - Large commercial properties, larger multi-family buildings, and industrial development
- Purple - Downtown mid and high-rise structures

The downtown area is dominated by mid and high-rise structures. The state capitol campus lies on the downtown's east end. Commercial and light industrial uses border the downtown area along with single family and multi-family properties.

To the south, development is largely single-family homes, multi-family properties, and neighborhood commercial centers. To the extreme southeast is a yet largely undeveloped industrial site.

To the north, single-family and multi-family properties dominate. Along arterial streets, neighborhood commercial uses and some industrial uses are found. The most significant industrial area in the city is located to the extreme north end between Salem Parkway and Portland Road.

West Salem, other than the area just west of the Marion Street bridges, is pre-dominantly single-family neighborhoods. This area is quite hilly, contributing to slower response speeds and to less than ideal street interconnectivity, both of which affect response time performance.

Geographic and Weather-Related Risks

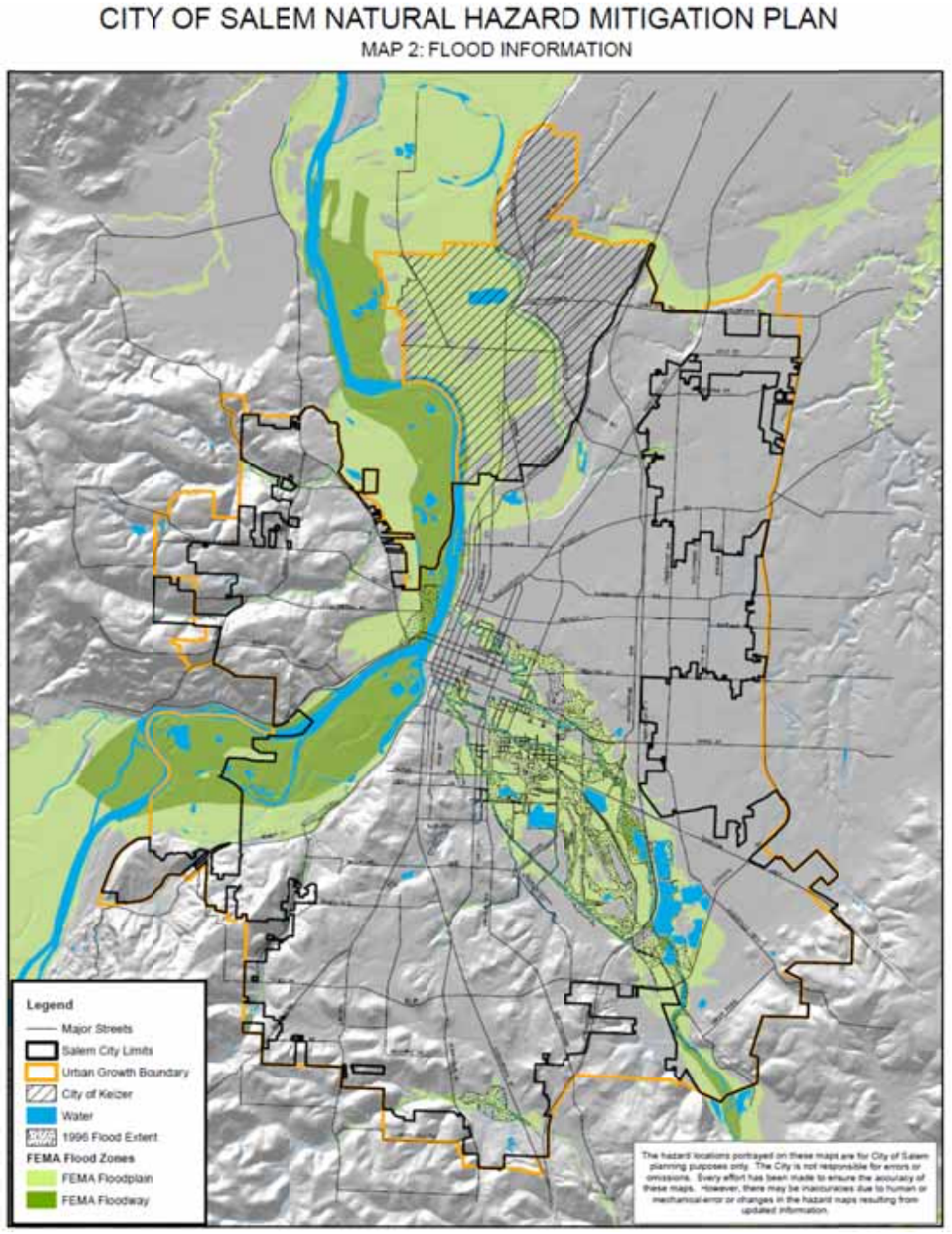
Weather Risk

Salem's climate is influenced by the currents of the Pacific Ocean, producing cool, wet winters and warm, dry summers. Rainfall averages about 40 inches per year. In the winter, Salem can get light to moderate snowfall averaging about five to ten inches per year.

Mean high temperatures range from the low 80s in the summer to about 40° F in the winter. Extreme temperatures are rare. 90° F or more temperatures occur only five to 15 times per year. Temperatures below 0° F occur only once every 25 years or so.

Extreme weather, though rare, does occur. Thunderstorms, high wind storms, and significant rain events happen infrequently. Recently a tornado passed through the town of Aumsville, just to the east of Salem, causing significant damage. During fall and winter rain events local streams can flood. The last significant flood event was in 1996, the result of a tropical rain system causing a rapid melt of the Cascades snowpack.

Figure 13: Flood Area Map

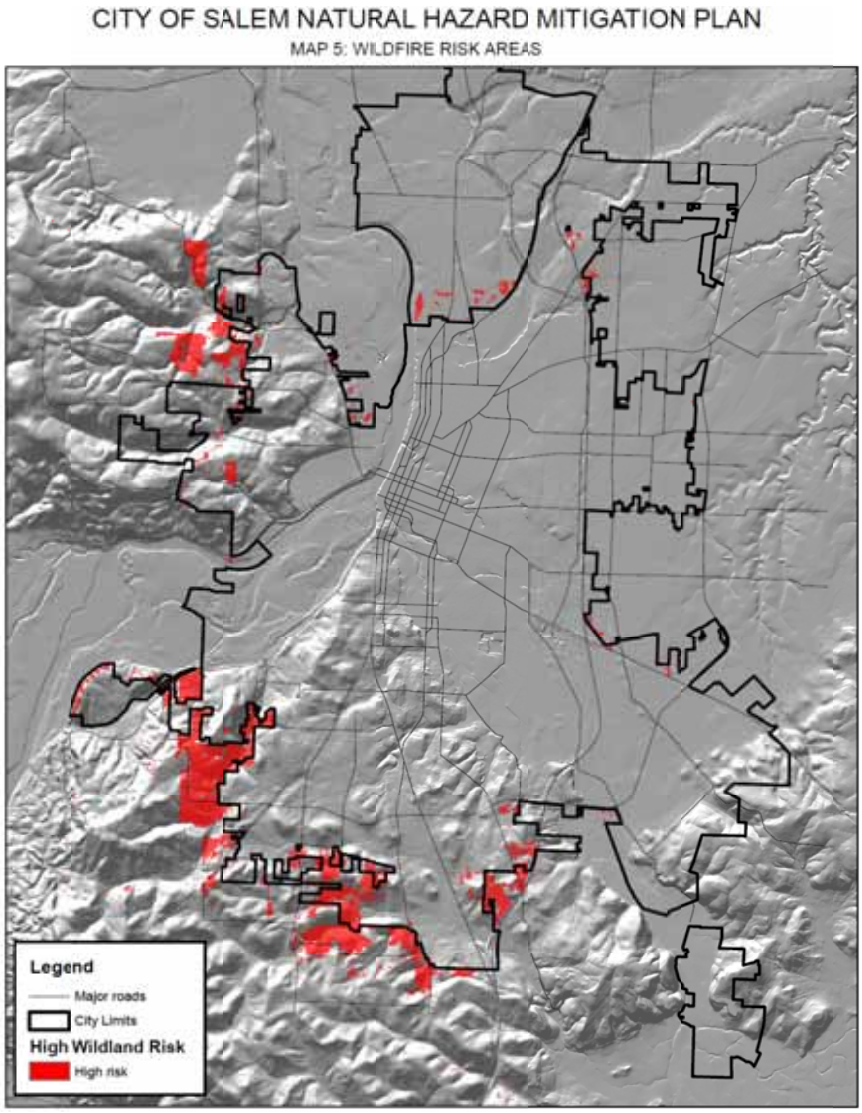


Wildfire Risk

Salem's climate, vegetation, and topography make wildland fire a rare but real risk to the community. Parts of the city have homes interspersed with large areas of natural vegetation. Many of these homes are located at the top of moderate to steep slopes, increasing the risk.

Historically, Salem experiences small, slow moving, wildland fires on a regular basis. Warm summer temperatures and strong winds can carry wildland fires into homes. However, fuel types found in this region do not support aggressive fire behavior. The following map illustrates higher risk areas in and near the city. This information was developed from the Oregon Department of Forestry wildfire risk classification data.

Figure 14: Wildland Fire Risk Areas



Geographic/Geological Risk

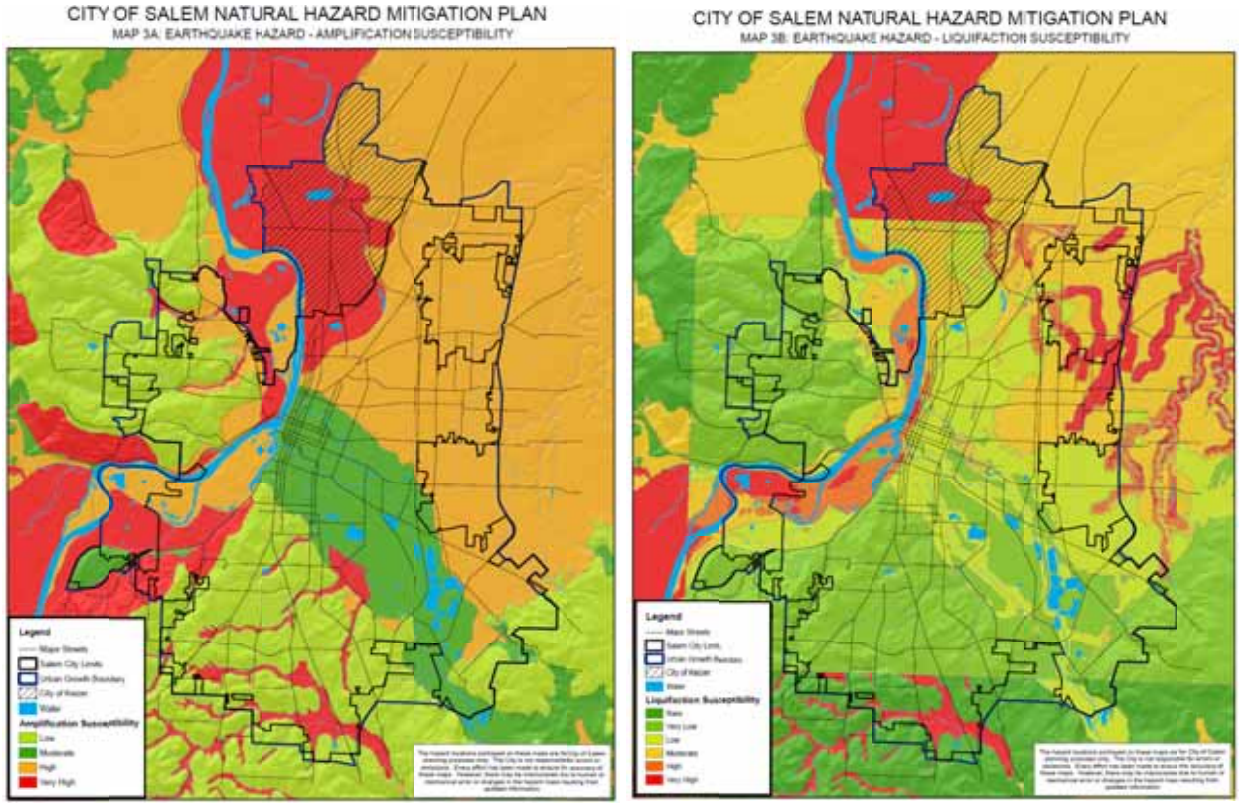
Certain geographic and geologic risks create situations that threaten the community or are physical barriers to street connectivity for emergency service response. Steep slopes, water barriers such as rivers, and other geographic features can impede rapid response.

Salem's urban area is relatively flat and does not present unusual risk. However, areas in the city's south and west do have moderate grades that can slow fire apparatus. The Willamette River traverses the city's center from north to south. There is only one bridge crossing in each direction, complicating the river's obstructive effect on emergency response.

Of further concern is the limited seismic strength of the two Willamette River bridges. The Marion Street Bridge is reported by the Oregon Department of Transportation to be able to withstand up to a magnitude 6.0 earthquake. The Center Street Bridge is able to withstand up to a 5.0 earthquake.

The Salem region is geologically active. Small to moderate earthquakes occur with regularity. Active fault lines exist in the near vicinity. The City of Salem has an active earthquake and disaster preparedness program. All city-owned fire stations have been seismically reinforced to current standards for emergency service facilities. The following maps illustrate the city's relative seismic risk.

Figure 15: Relative Earthquake Hazard Maps



Transportation Risks

Transportation corridors provide necessary access and egress for the city. These take the forms of roads, airports, and railways. These can also affect the response capability of emergency services. Unless elevated, limited access freeways and rail lines can interrupt street connectivity, forcing apparatus to negotiate a circuitous route to reach an emergency scene. Street-level rail lines can impede traffic at crossings when the trains traverse through the city.

Roads

Salem is located in the center of the Willamette Valley. Situated just 60 miles east of the Pacific Ocean and 60 miles west of the Cascade Mountains, Salem enjoys ready access to the entire west coast via Interstate Highway 5 (I-5). The Portland metropolitan area is located 47 miles to the north, close enough to create employment opportunities and facilitate international freight shipment through the Port of Portland, Portland International Airport, and two transcontinental railroads.

The cities of Albany and Eugene are located 24 and 64 miles, respectively, to the south along I-5. Highway 22 is the major east-west freeway through Salem and connects the Marion County side of the city to the Polk County side via two one-way bridges (Center Street and Marion Street).

Roadways have played an important role in the growth and development of Salem. The two systems of most significance were the radial system of market roads connecting the city with farming areas, and the major highways that joined Salem with regional and national centers.

The initial regional route through the area was U.S. Highway 99E. This highway was constructed more than 85 years ago and was the major north-south route between Seattle and California until 1956, when I-5 was completed through the Salem area. Radial market roads such as Commercial Street, Liberty Road, Wallace Road, and Silverton Road have become major arterials in the city.

One challenge to SFD's response performance lies with the transportation network throughout the city. In many parts of the city, this network is underdeveloped for population density and increasingly burdened by heavy traffic. Periods of "rush hour" congestion are steadily increasing in length, and in some areas, particularly Highway 22, Wallace Road, Commercial Street, Lancaster Drive, and Market Street, the traffic is heavy throughout daytime hours.

Efforts to expand streets and improve traffic flow are limited by constraints on government finances, topography (Willamette River), and infrastructure (number of and width of current bridges, etc.), and the continued reliance of most of the working population on using private motor vehicles as the transportation mode of choice. Within the city's suburban and rural areas, limited road networks; terrain; bridges that will not bear the weight of traditional fire apparatus; and long, narrow, winding private driveways further confound response performance efforts.

The capacity and number of bridges connecting Salem with West Salem are of particular concern to the fire department. This is largely the reason a second fire station was recently constructed and staffed on the Polk County side of Salem. The next closest fire stations on the west side of the Willamette River are located at Zena Road and Highway 226 (three miles from the north city limits) and in Rickreall (a very distant 15 miles away). Both are staffed exclusively with volunteer firefighters.

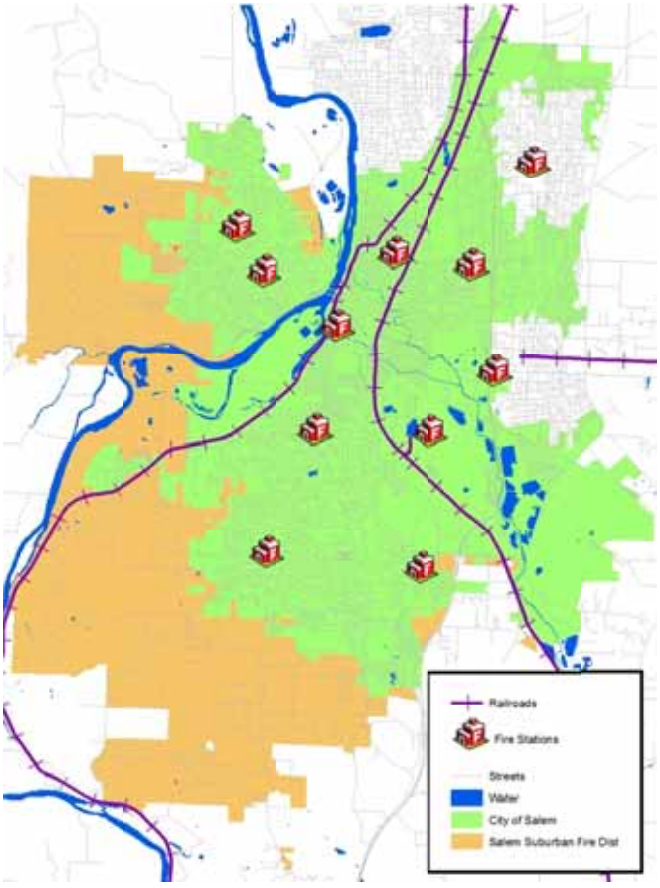
Traffic signals within the service area are equipped with signal pre-emption equipment. This provides a significant response time performance advantage as well as improved safety to motorists.

Rail

The Union Pacific Railroad operates on lines that traverse the city north to south in the city's eastern area. The Willamette and Pacific Railroad operates on a line that also traverses the city north to south in the city's western area. Both can cause delays in emergency vehicle response when trains are passing through. Neither line is predominately grade-separated throughout the city.

Also of concern with active rail lines is the amount of hazardous cargo carried by freight trains. The Union Pacific Railroad, for example, carries approximately 20,000 railcars of hazardous materials through the city each year. Though rare, railroad accidents involving the release of hazardous materials can occur.

Figure 16: Railroad System



Airport

McNary Field is owned and operated by the City of Salem. It lies in the central area of the city and hosts numerous private and commercial flight activities. Approach and departure paths take aircraft over populated areas.

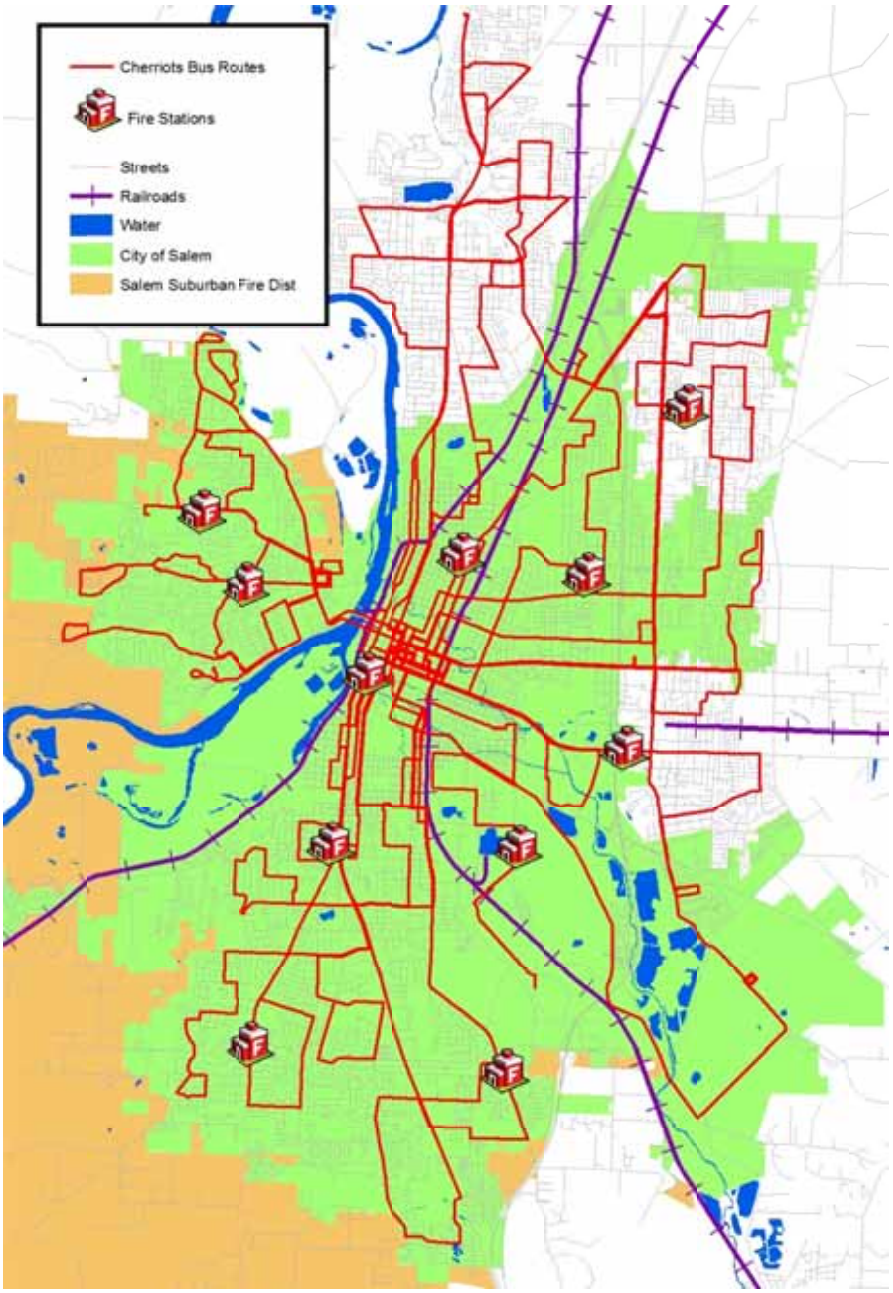
Aircraft crash rescue and firefighting (ARFF) services are provided by the Salem Fire Department. When flight operations requiring standby ARFF services are conducted, the Salem Fire Department also provides this service. Fire Station 6 is the ARFF station.

Figure 17: McNary Airport

Bus

Salem-Keizer Transit (Cherriots) operates mass transit services in the Salem region. Local bus service as well as commuter service between Salem and elsewhere in the region is available. More than five million passenger trips are logged by Cherriots each year. The following map shows bus routes in the Salem area.

Figure 18: Salem Area Bus Routes

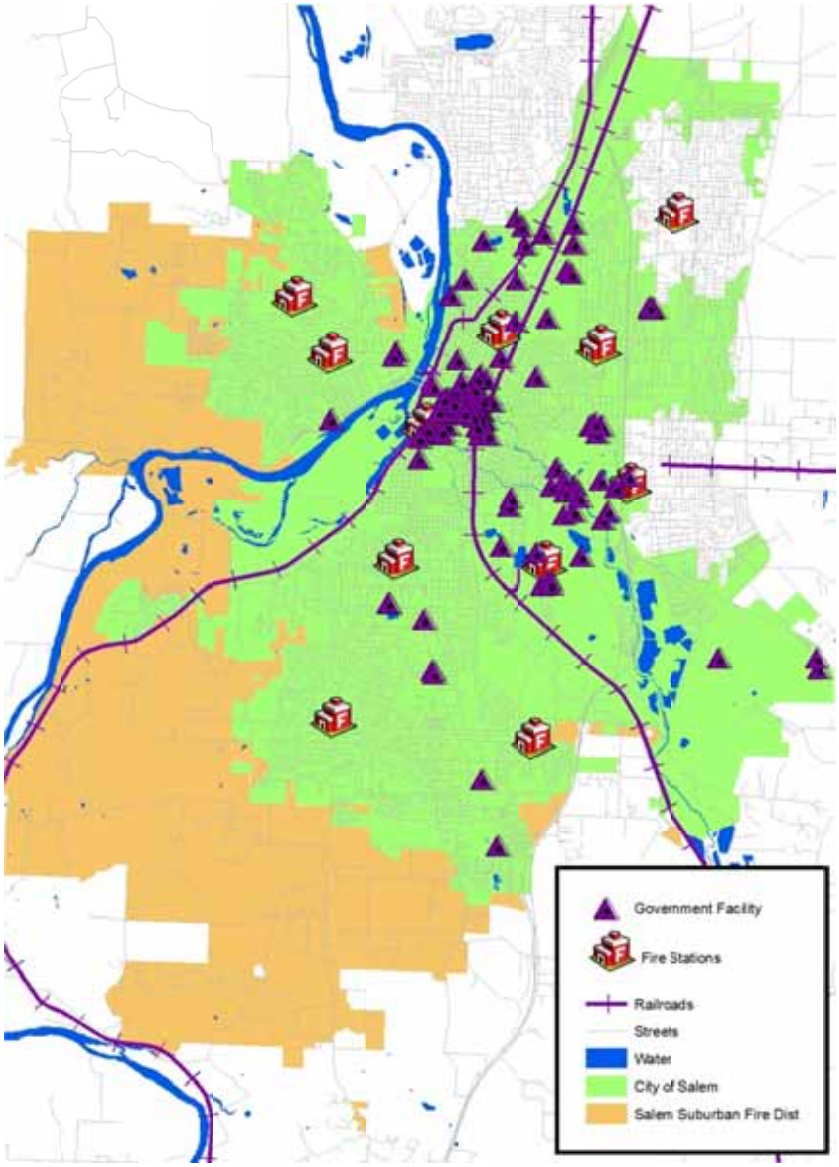


Physical Assets Protected

Government Buildings

There is a variety of government buildings in Salem considered important to providing critical services to the community in times of disaster. Salem is the Marion County seat and Oregon's capital city. Buildings such as city hall, fire stations, federal, state, and county offices, police stations, and the like provide important services to the community. The following map shows the locations of government buildings within the city.

Figure 19: Government Buildings

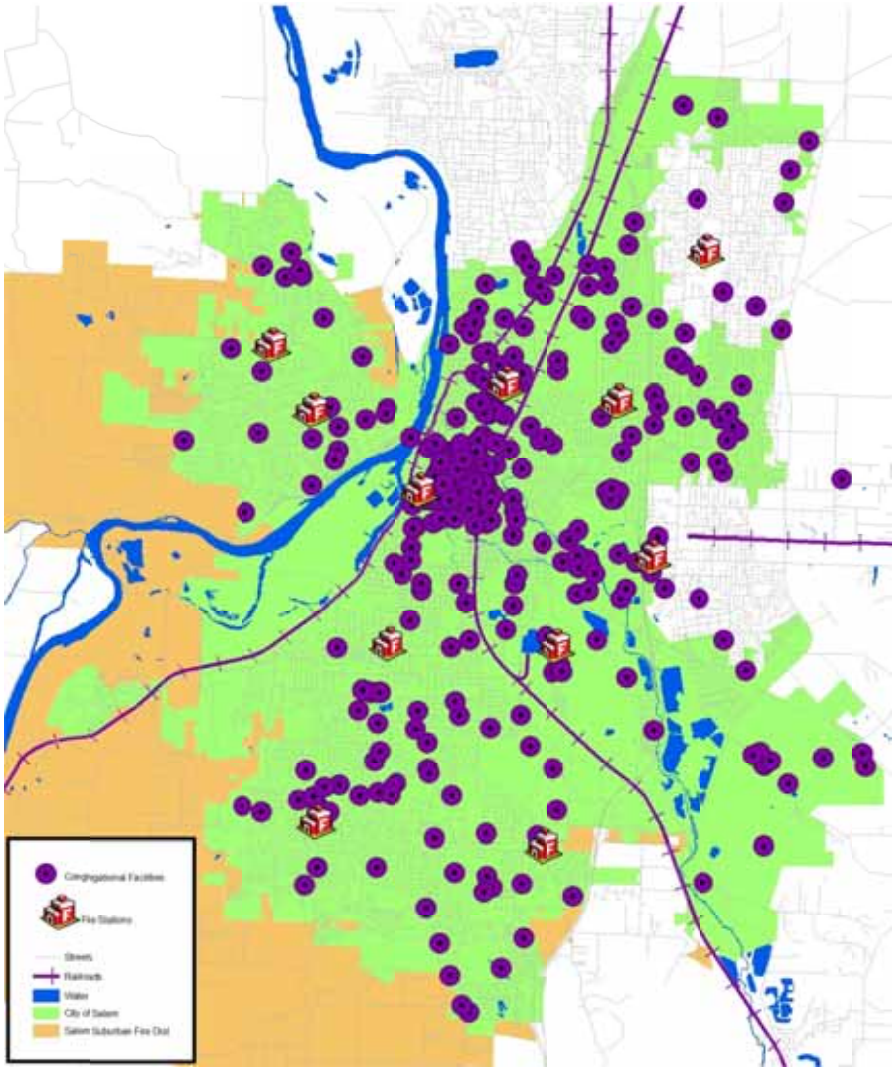


Congregational

Numerous buildings lie within Salem in which large numbers of people gather for entertainment, worship, and such. A variety of nightclubs, theaters, and other entertainment venues exist in the downtown area. Facilities such as the Salem Conference Center and others regularly hold events that draw large crowds of people. Other events, such as Summer in the City, The Bite of Salem, Salem Art Fair, and the World Beat Festival, draw large outdoor crowds.

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 map shows the locations of congregational facilities.

Figure 20: Congregational Facilities



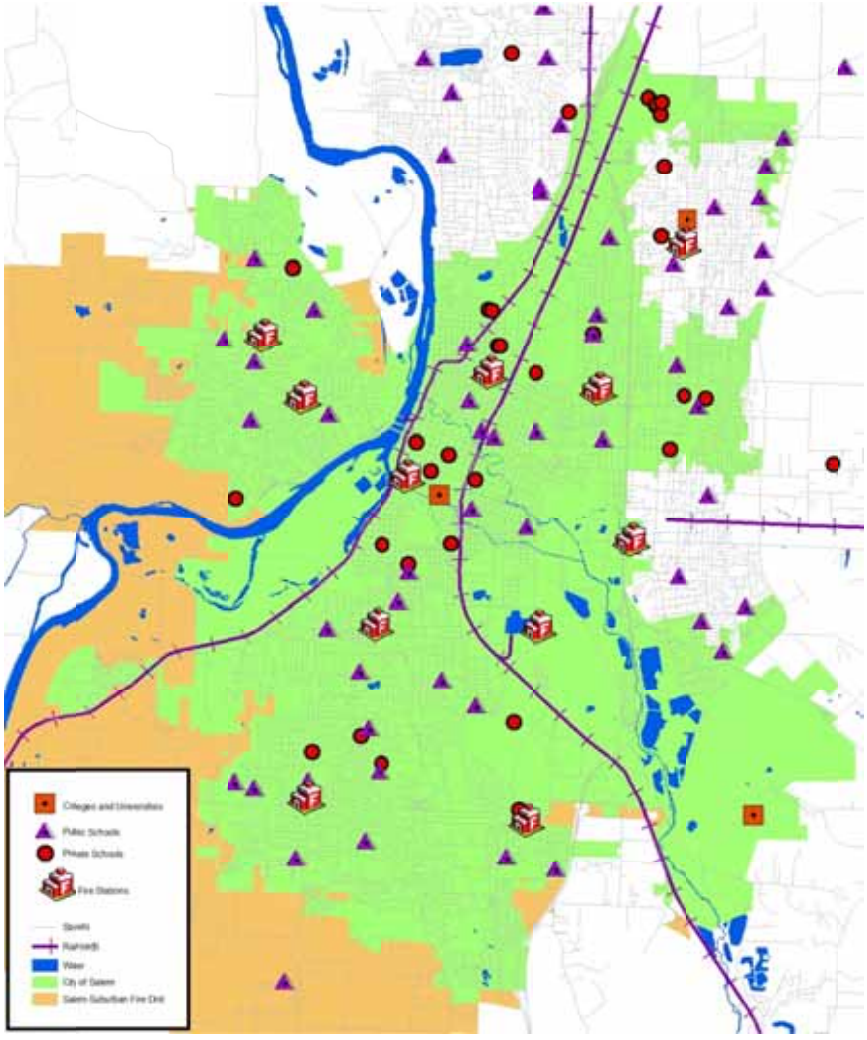
Schools/Universities

The Salem-Keizer School District is the second largest school district in Oregon. It operates 45 elementary schools, 10 middle schools, 8 high schools, 4 charter schools, and 7 support facilities within the district. Forty of these schools are within the City of Salem. Total enrollment as of October 2010 was 40,638.

There are also 51 private schools within the SFD service area. These schools offer education from kindergarten through the 12th grade.

Lastly, Willamette University and Corban University have campuses in the City of Salem. A number of other colleges and universities have satellite campus in Salem as well. The following map shows the locations of most public and private schools in the SFD service area.

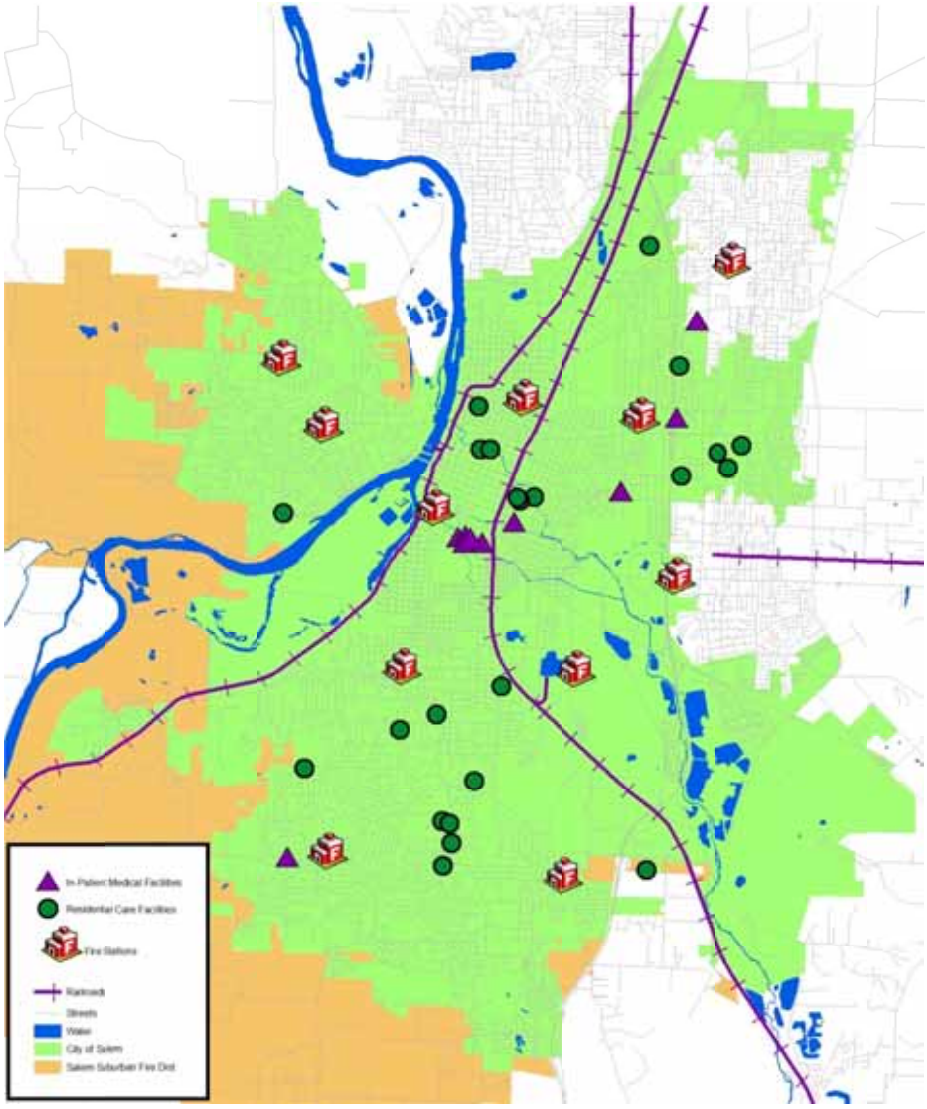
Figure 21: Salem Area Schools, Colleges, and Universities



Medical Facilities

The city is home to a number of important medical care facilities, including the Salem Hospital and the Oregon State Hospital. Additional facilities include skilled nursing facilities and other in-patient care facilities. The following map shows the location of many of these important community resources.

Figure 22: Medical and Care Facilities



Other Critical Infrastructure

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

Water Distribution

The most obvious element of this infrastructure of concern to the fire department is the 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.

Firefighting water service from fire hydrants is available to nearly every developed property within the city. Fire flows are generally acceptable for risks protected. Some areas in and around the downtown area have old, smaller diameter water mains. The Salem Public Works Department is addressing these deficiencies through its capital improvement planning process.

The city's primary water source is the Santiam River. A water treatment plant on the river cleans and distributes water through large mains to the city. Water is pumped into water reservoirs at a number of locations. Water service to distribution mains is nearly exclusively gravity fed. The city has a number of sub-surface wells that serve as an emergency reserve source.

The last Insurance Services Office (ISO) review of the city's water system was in 2003. At that time ISO gave the city's water system a relative classification of "1" indicating that the system provides very good delivery of firefighting water supply.

Communications

Emergency communication centers and the transmitting and receiving equipment are essential facilities for emergency response. The Salem Police Department manages the Willamette Valley Communications Center (WVCC). This center provides for the receipt 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 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.

The city is well supplied by energy sources. The SFD is managing a project currently to develop an Energy Assurance Plan. This project, funded through a federal Department of Energy grant, will catalogue energy sources, identify essential energy needs, and develop contingency plans in the event of the loss of energy sources.

Bridges

These structures provide essential crossings and unimpeded travel across physical and man-made barriers. In the event of an emergency, these are crucial as evacuation routes as well as for aid supplies to be brought into the area. Given the level of earthquake risk in this region, reinforcement of bridges is essential to preserve routes of transportation for emergency relief supplies. The Salem community has numerous bridges mostly associated with freeway, river, and rail line crossings.

As mentioned earlier in this report, the seismic strength of bridges is of concern. The two bridges crossing the Willamette River are not sufficiently reinforced to withstand the level of earthquake possible for this region. The Oregon Department of Transportation (ODOT), working with the Oregon Department of Geological and Mineral Industries (DOGAMI), has also identified concerns with freeway overpasses exposed to the earthquake magnitude possible for this region.

Commercial Food & Cargo Distributors

These suppliers and their storehouses are critical not only during an emergency for aid but to the everyday distribution of needed goods and food products to sustain a community. Salem's proximity to agricultural operations makes it an important hub for services to this industry. A

number of food processing facilities are located in Salem. Other food distribution facilities are located in and near the city.

Structural

The protection of property in most cases refers to a building and its contents. This has been the basic mission of the fire department since its inception. Certain buildings, their contents, functions, and size present a greater firefighting challenge and require special equipment, operations, and training.

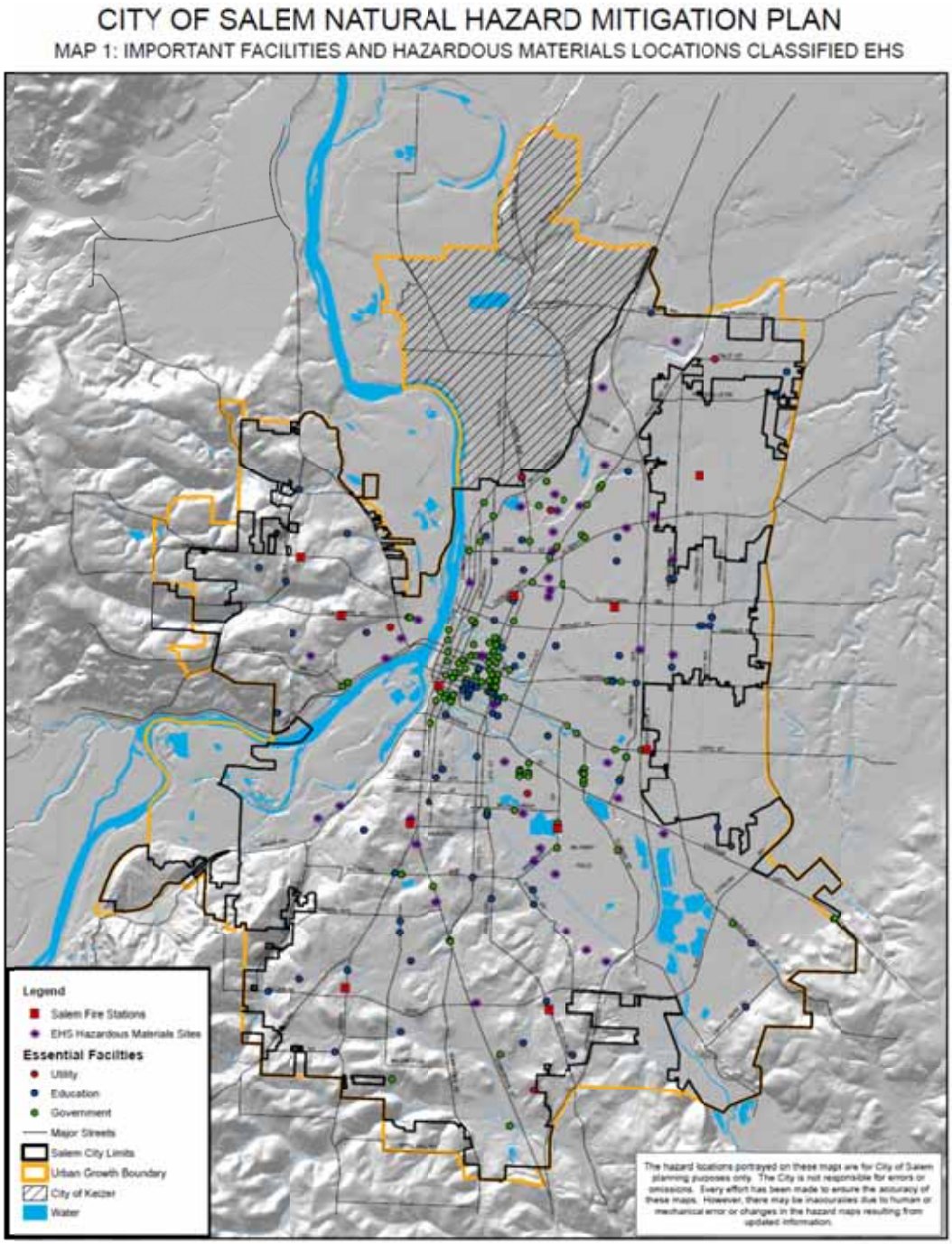
Hazardous Materials

Buildings that have been identified as containing hazardous materials can create a dangerous environment during a spill, rupture, or fire to the community as well as the firefighters. Special equipment such as protective clothing and sensors, along with specialized training, is necessary to successfully mitigate a hazardous materials incident.

The Salem Fire Department operates a hazardous materials response team capable of conducting “A” level intervention (typically the highest level of emergency response service).

The following map shows the locations of facilities classified as using more than small quantities of hazardous materials along with other important facilities within the city. The hazardous material site information comes from the Oregon State Fire Marshal’s data base.

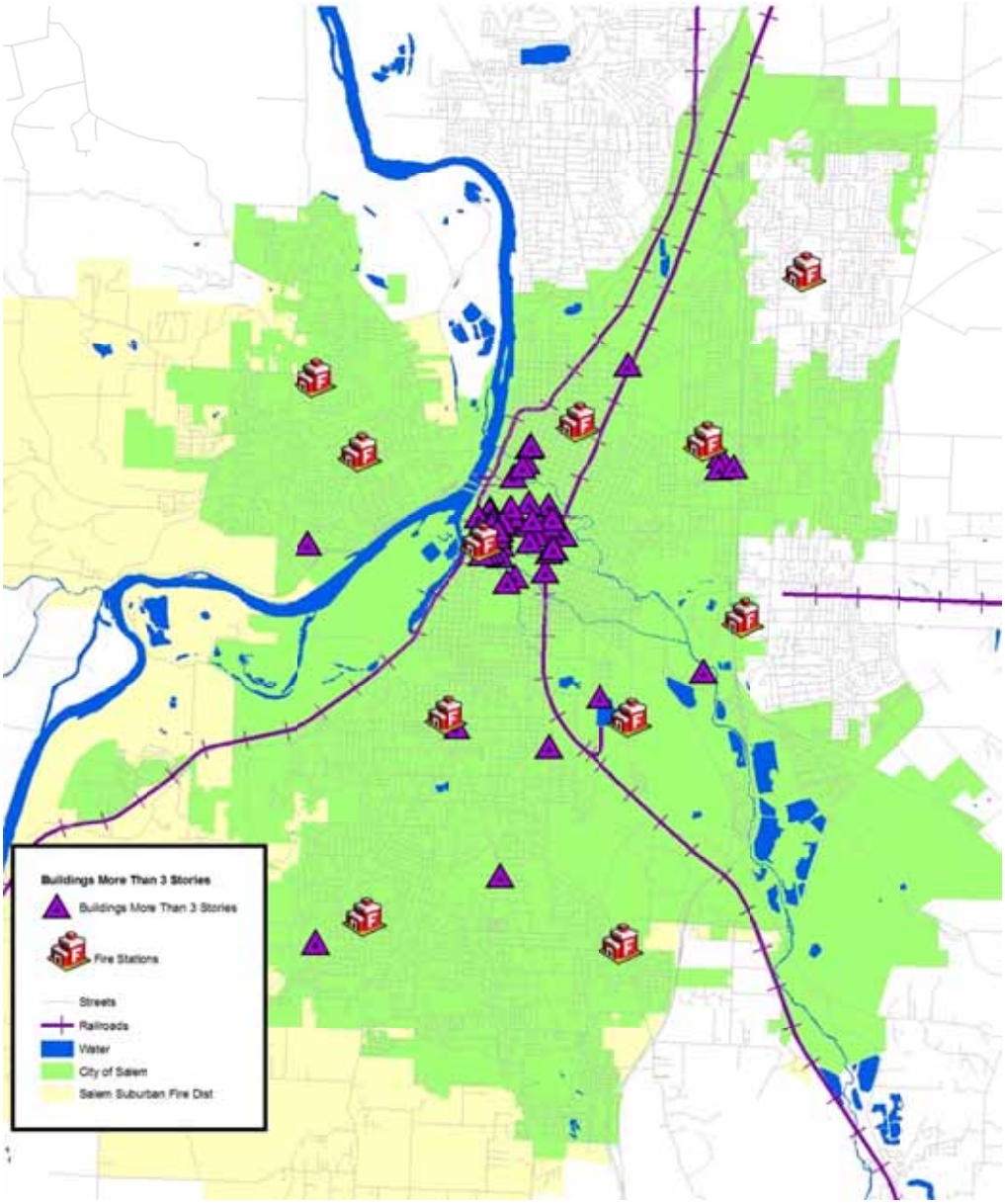
Figure 23: Hazardous Material and Other Important Facility Locations



Multi-Storied Buildings

Buildings that are more than three floors in height pose a special risk in an emergency. Fire on higher floors may require a ladder truck to be able to deliver water into a building that does not have standpipe systems. For victims trapped on higher floors, a ladder truck may be their only option for escape. The following map shows the locations for buildings more than three stories in height according to the ISO database. Most are clustered in the downtown.

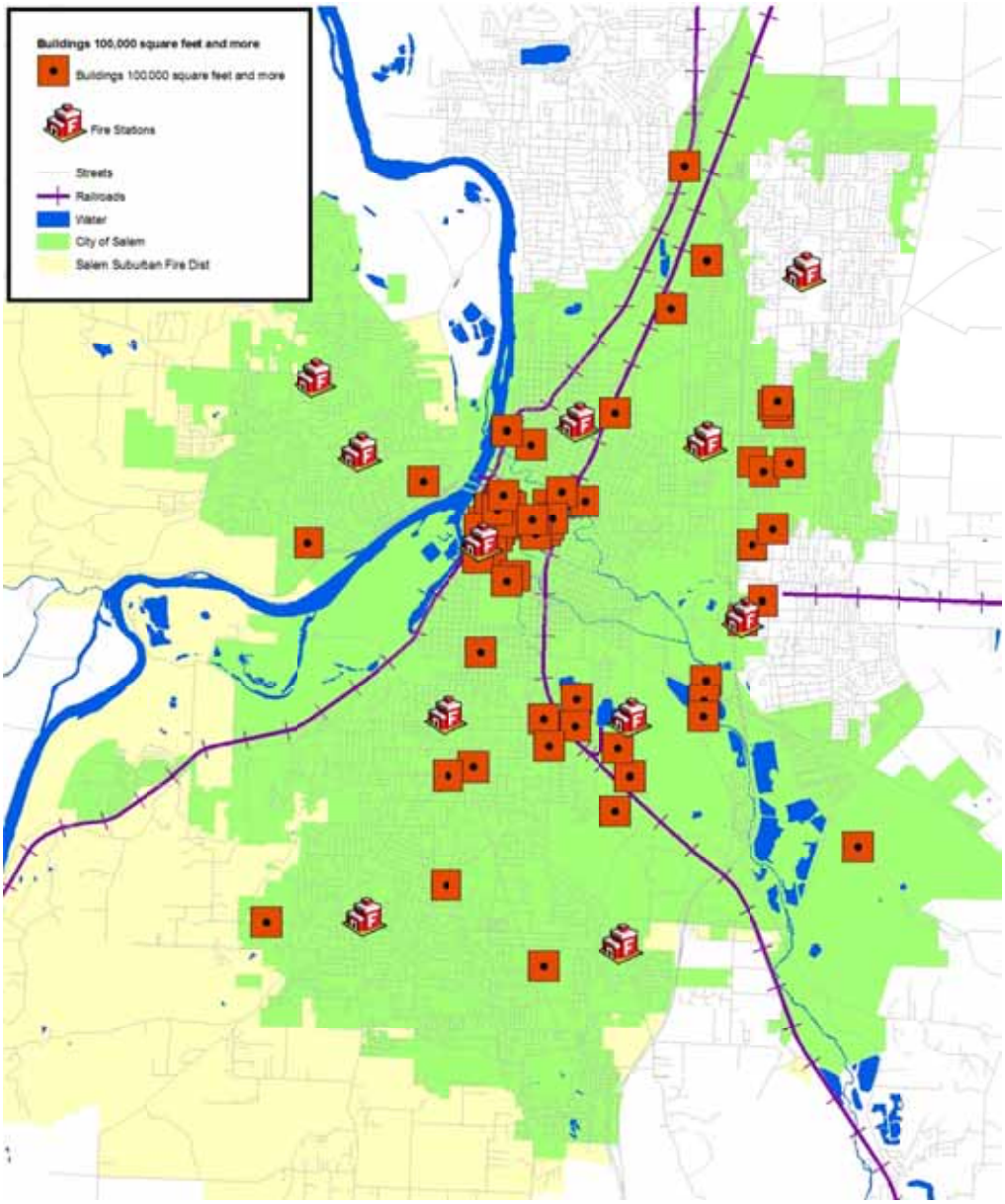
Figure 24: Buildings – More Than Three Stories in Height



Large Square Footage Buildings

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

Figure 25: Buildings – 100,000 Square Feet and Larger

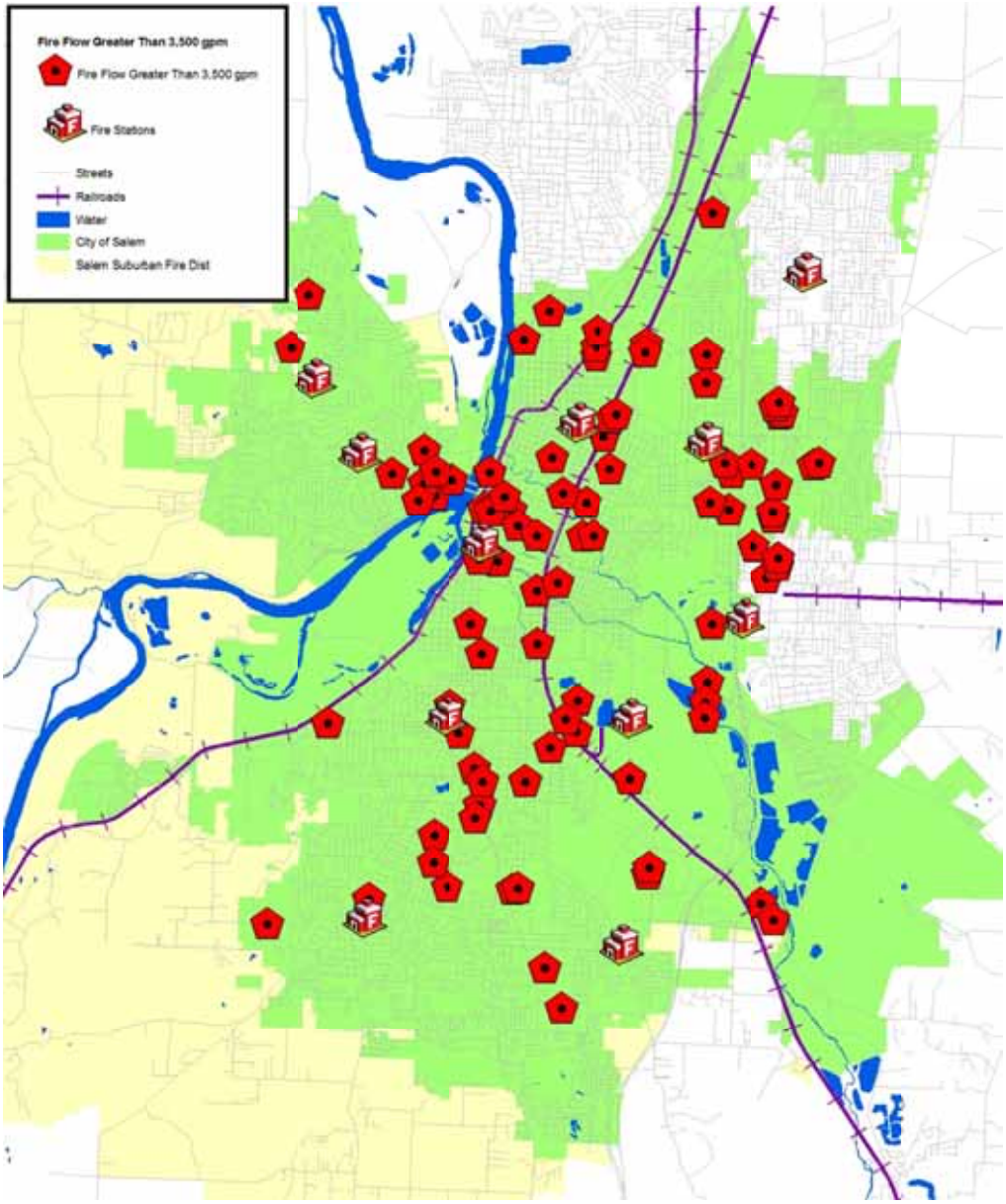


Needed Fire Flow

The Insurance Services Office (ISO) inspects buildings within a community to develop an estimate of "needed fire flow" (NFF) or the amount of water flow (in gallons per minute [gpm]) that a fire department would need to produce in order to suppress the fire in a building based on its height, square footage, construction material, and roof type, among other factors.

The following map shows the locations of buildings identified by the ISO as having a needed fire flow in excess of 3,500 gallons per minute.

Figure 26: Buildings – NFF Greater Than 3,500 Gallons Per Minute



Terrorism

Salem's size and its role as Oregon's capital city raises the level of concern of possible terrorist activity compared to other areas of the country. Most of the previous categorized risks in the community are potential targets for such activity. 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.

Hazard Vulnerability Analysis

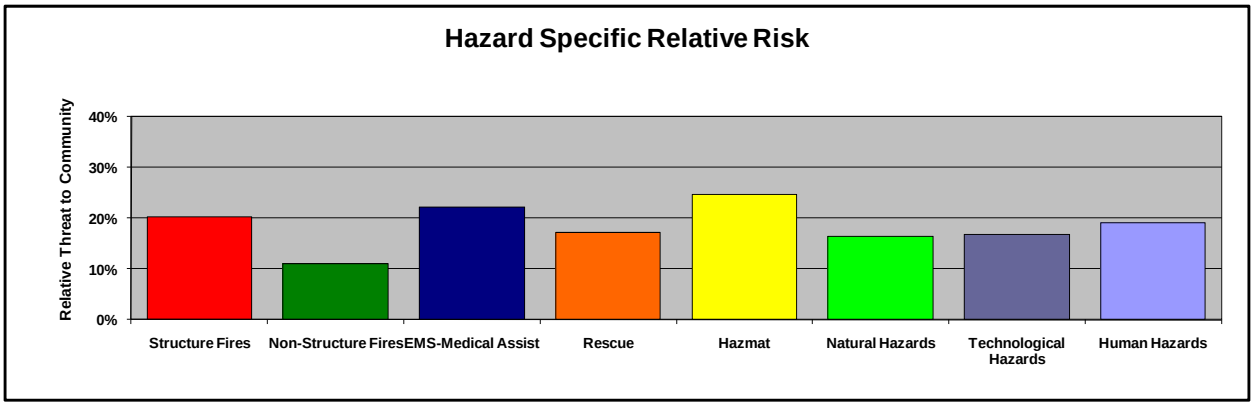
Based on the narrative descriptions of the various hazards commonly found throughout the Salem Fire Department's primary response area, a numerical ranking of community hazards has been developed. Historical incident data as well an assessment of the community and its vulnerabilities was used to numerically rate each potential hazard. Community hazards were segregated into broad categories as follows:

- Structure Fires
- Non-Structure Fires
- EMS-Medical Assist
- Rescue
- Hazardous Materials
- Natural Hazards
- Technological Hazards
- Human Hazards

Within each of the aforementioned categories, more specific hazards were identified and a probability score between zero (representing "Not Applicable") and three (representing "High") was assigned to each. A severity score was then developed for each of the sub-categories using the same scale for impact and a reverse scale for preparedness and response. The overall scores were then used to generate a relative risk score based on what percentage of each risk applied to Salem. Complete documentation of categorical scoring can be found in the appendix of this document.

Based on the completed hazard vulnerability analysis, the following representation of relative community risk was developed.

Figure 27: Hazard Specific Relative Risk



Hazardous materials incidents represent the highest level of relative risk within Salem, followed by EMS-medical assist and structure fires.

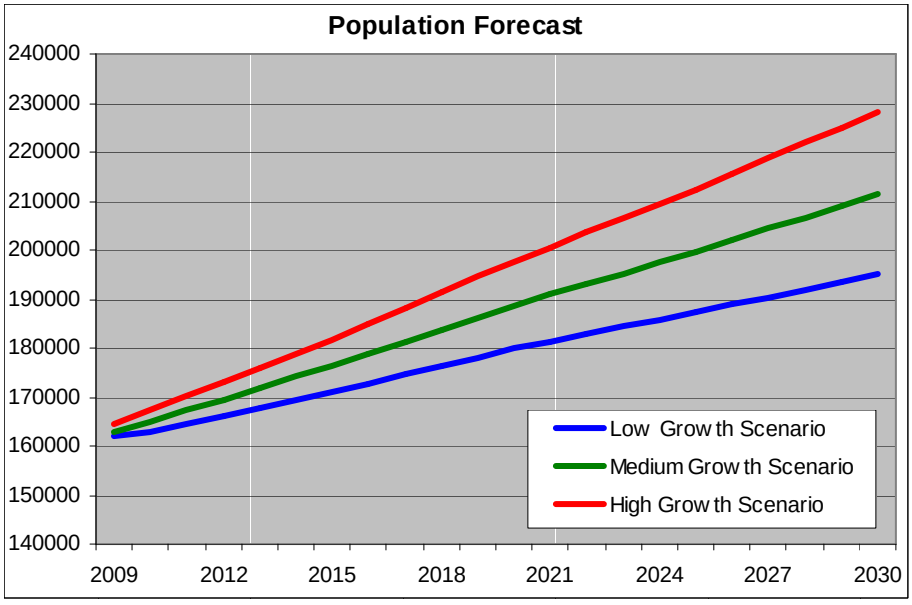
Development and Population Growth

Current Population Information

Salem's population has grown steadily, with an average annual growth rate of 2.2 percent between 1990 and 1995, and between 1.4 and 2.0 percent annually from 1995 to present. The current city population (2010), according to the Portland State Center for Population Studies, is 157,460.

A population forecast for the Salem area was published in September 2008 by the Population Research Center, College of Urban and Public Affairs, Portland State University. Population growth for Salem area is forecast to range between 0.8 percent and 2.2 percent per year depending on the growth scenario selected (low, medium, or high growth). The population for Salem is forecast to increase by 49,900 people between 2008 and 2030 under the most likely scenario (medium growth). The chart below illustrates all three growth scenarios and includes both the city's and Salem Suburban Fire District's population[4].

Figure 28: Current and Projected Population

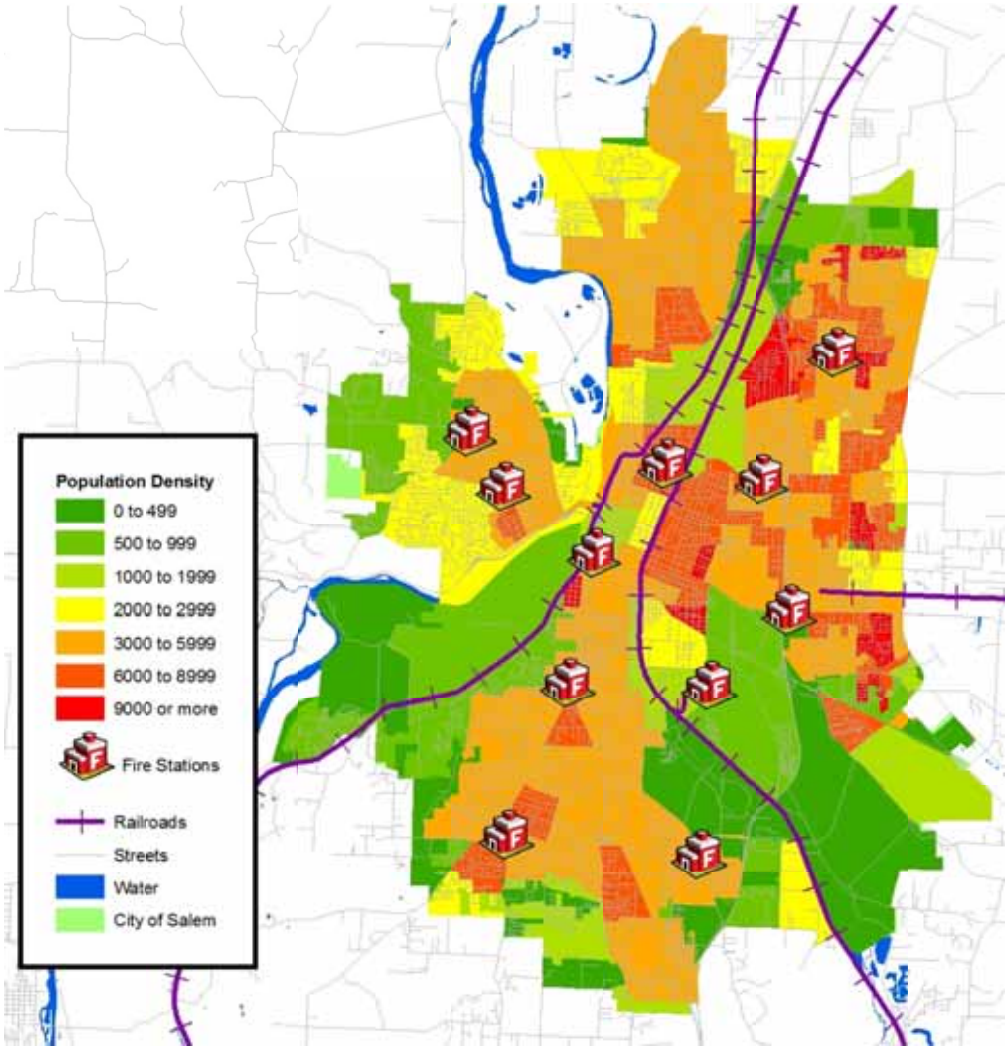


[4] Salem Suburban Fire District has been estimated at 7,000 people for the entire period. Some population growth is expected but will likely be offset by annexation of district territory to Salem.

The Salem Area Comprehensive Plan predicts the areas of highest growth to be in west, south, and southeast Salem. The more developed areas of the city will increase in population as in-fill development occurs and housing density increases.

It is useful to assess the distribution of the population within the region, since there is a direct correlation between population density and service demand. The following map displays the population density of the City of Salem based on Census 2000 data (the most current information available).

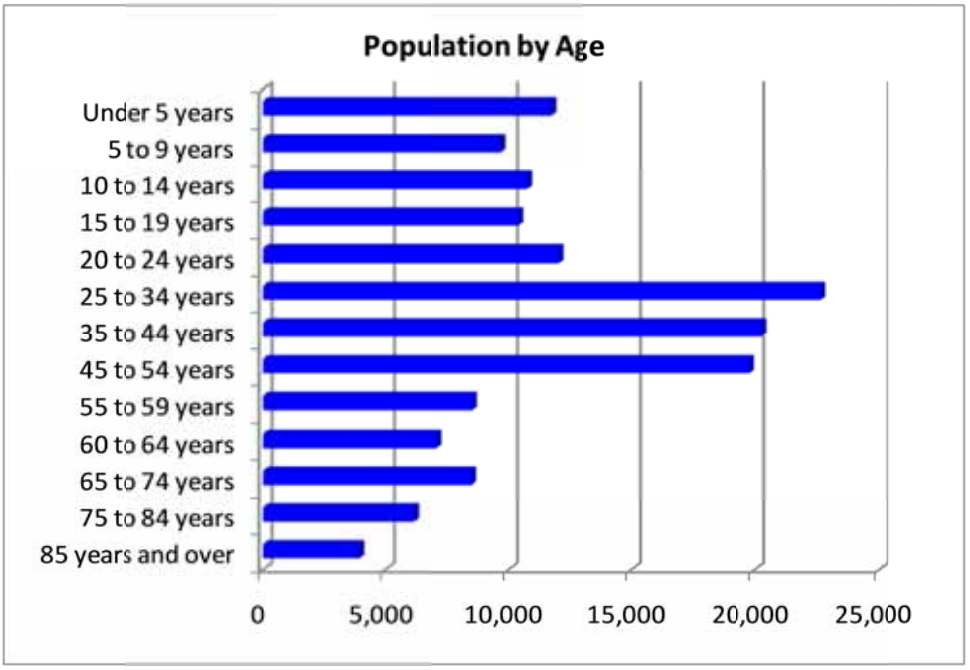
Figure 29: Population Density - 2000



Higher concentrations of population are located within downtown and east-central areas, with less dense population elsewhere.

One of the factors that can influence emergency service demand, particularly emergency medical services, is the population's age. The following chart examines Salem's population segmented by age groups.

Figure 30: Estimated Population by Age



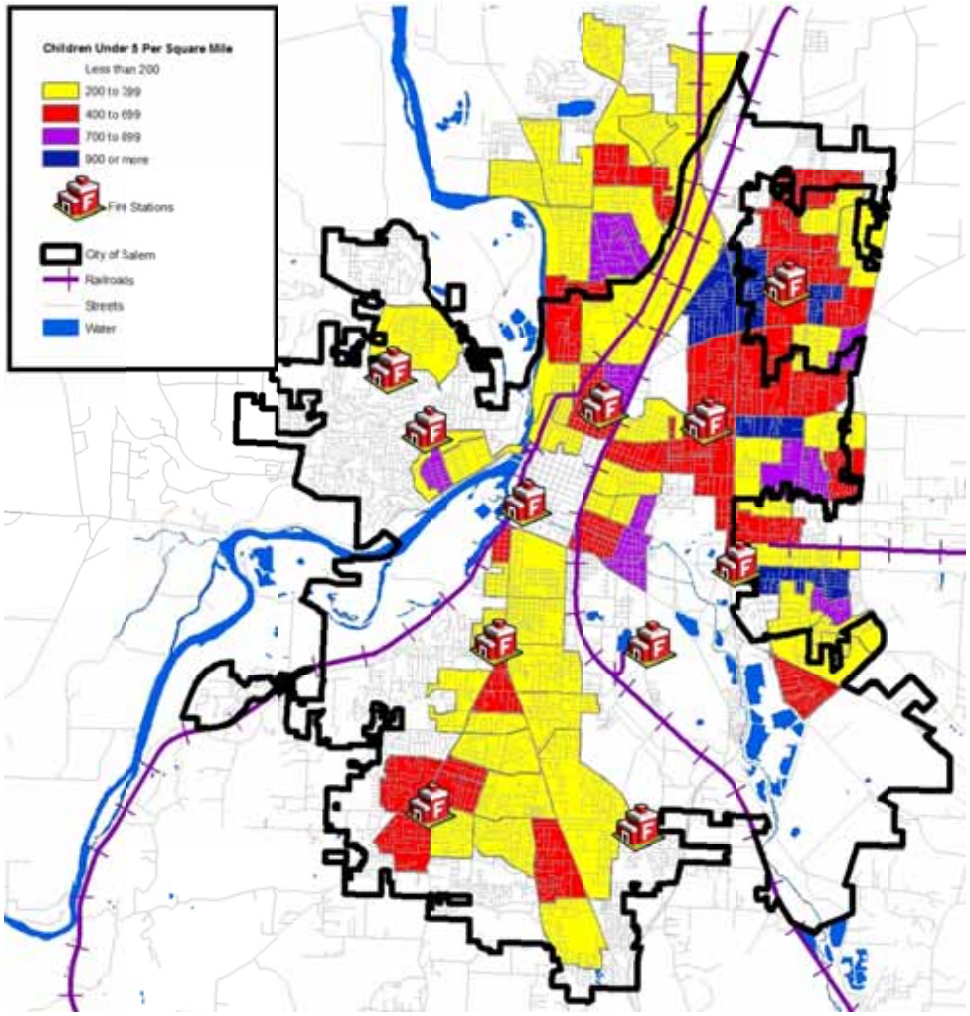
Source: American Community Survey

Based on the preceding figure, 12.3 percent of the population is 65 years of age or older and 7.7 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 a significant 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 vehicular accidents.

Determining where the higher amounts of these target risk populations tend to live within the region can help in the deployment of apparatus, especially rescue units. This map is based on 2000 Census data.

Figure 31: Pediatric Population Density



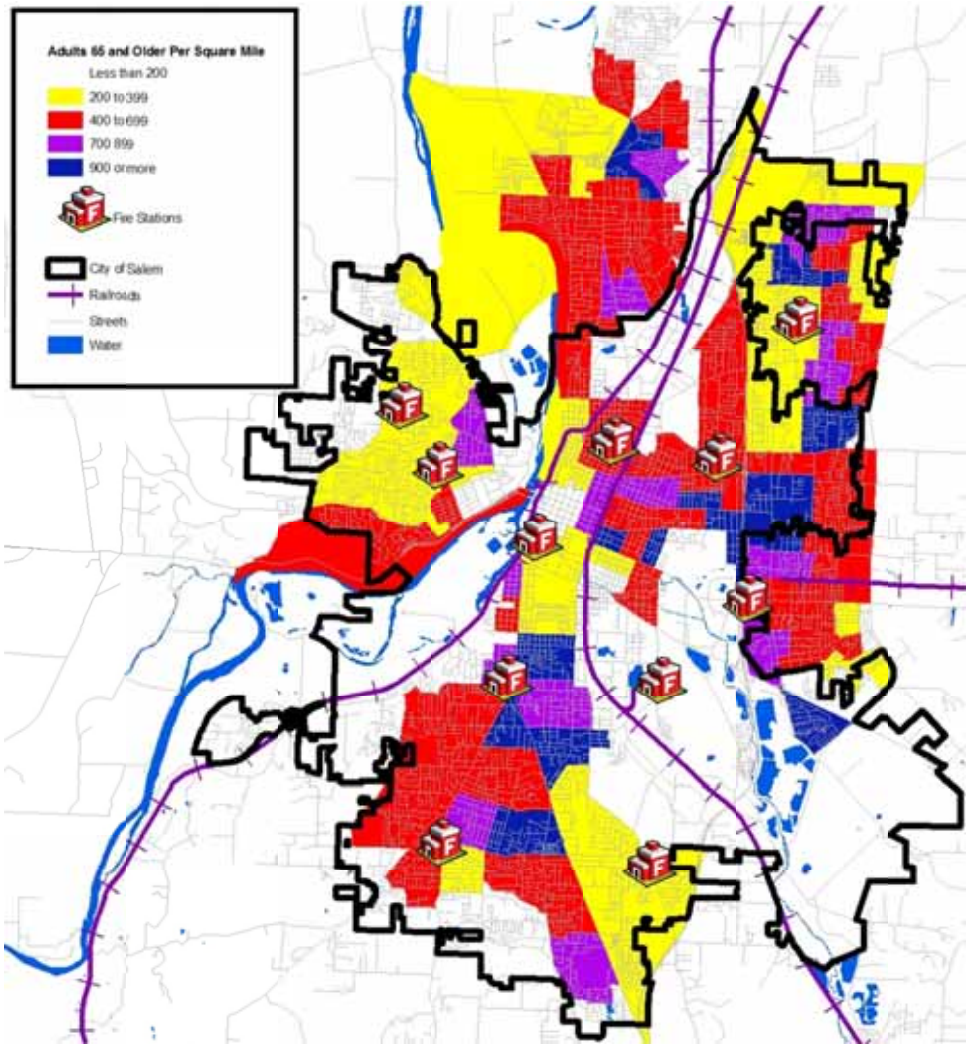
The highest concentrations of pediatric populations reside primarily the city's northeast area.

The impact of the elderly population on emergency medical services has been extensively studied. The high utilization rate of emergency departments and the associated need for ambulance transportation by the elderly is in part due to challenges in the access to primary care physicians by the elderly at home and in nursing homes. The elderly can account for approximately one-third of emergency ambulance use and two-thirds of non-urgent ambulance use.

The “Baby-Boom” generation includes those individuals born between 1946 and 1964. In 2009, the oldest member was 62 years of age and the youngest was 46 years of age. This is the largest segment of the population in the United States. The growth of the elderly population (65 years and older) is expected to increase dramatically over the next 30 years across the country. As this cohort ages, the demand on emergency medical services is expected to increase

The following map illustrates the density of the elderly population by geographic area. This map is also based on 2000 Census data.

Figure 32: Senior Population Density



Higher concentrations of elderly populations reside in several areas of the city.

Future Geographic Growth Potential

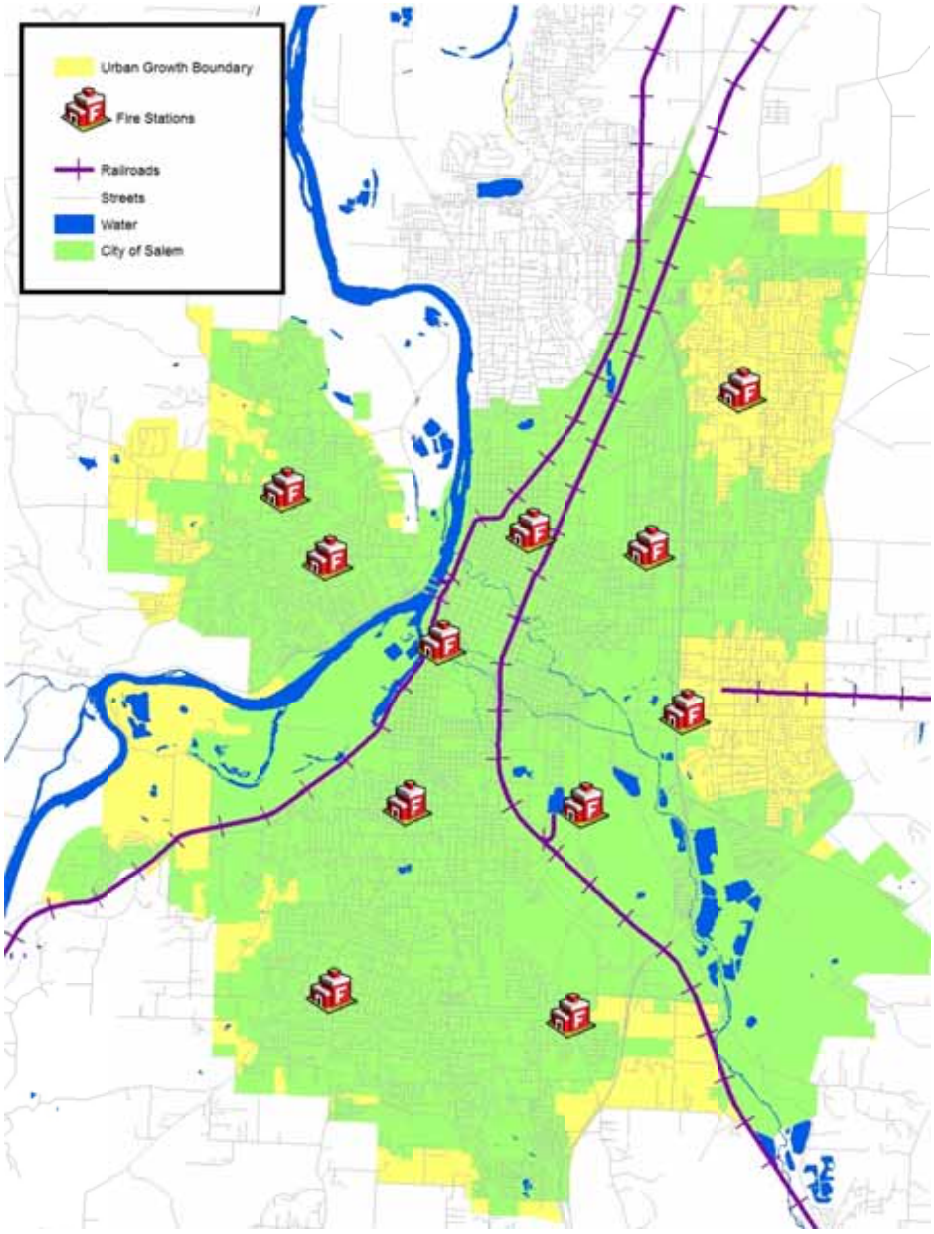
Annexation of unincorporated territory into the city limits occurs sporadically, usually when a property owner wishes to develop his or her land in a manner that requires urban services. The city's electorate must approve all requests for annexation to Salem.

The Salem Area Comprehensive Plan (SACP) was first adopted in 1973. Objectives of the SACP are to promote a desirable balance and location of land uses in the Salem community, and relate these uses to the location of public facilities and infrastructure. Additionally, the SACP identifies the geographical limits of future urban development within which basic urban services can be most efficiently and economically provided. The Urban Growth Boundary (UGB) is the outer limit of land that may ultimately be annexed into the city.

The city and counties have agreed through their respective comprehensive plan policies that no new service districts will be created inside the UGB to provide sewer, water, or fire protection facilities and services.

While some of the area inside the UGB is presently suburban with varying densities and some of it is rural in nature, the city has determined that it is prudent to assume this area will ultimately become part of the city, developed to urban densities and be a Salem Fire Department service responsibility. The following map illustrates area intended for future city growth.

Figure 33: Urban Growth Area



Risk Classification

Areas of higher fire 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.

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 categories are identified as:[5]

- **Metropolitan**—Geography with populations of over 200,000 people in total and/or a population density of over 3,000 people per square mile. These areas are distinguished by 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 of over 2,000 people per square mile.
- **Suburban**—Geography with a population of 10,000 to 29,999 and/or a population density of between 1,000 and 2,000 people per square mile.
- **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.
- **Wilderness/Frontier/Undeveloped**—Geography that is both rural and not readily accessible by a publicly or privately maintained road.

The City of Salem currently contains urban and suburban areas. The fire department currently reports its response performance based on "Urban" areas. The community's risk designation should influence how response resources are distributed now and in the future. Many resource distribution decisions have long-term implications.

The Salem City Council, through its adoption of a single response performance goal, has determined that the entire city should be considered as one risk classification: urban. This is reasonable given that a significant portion of the city's territory, based on population density, meets the urban definition.

[5] CFAI *Standards of Cover, 5th edition*, pages 20-21.

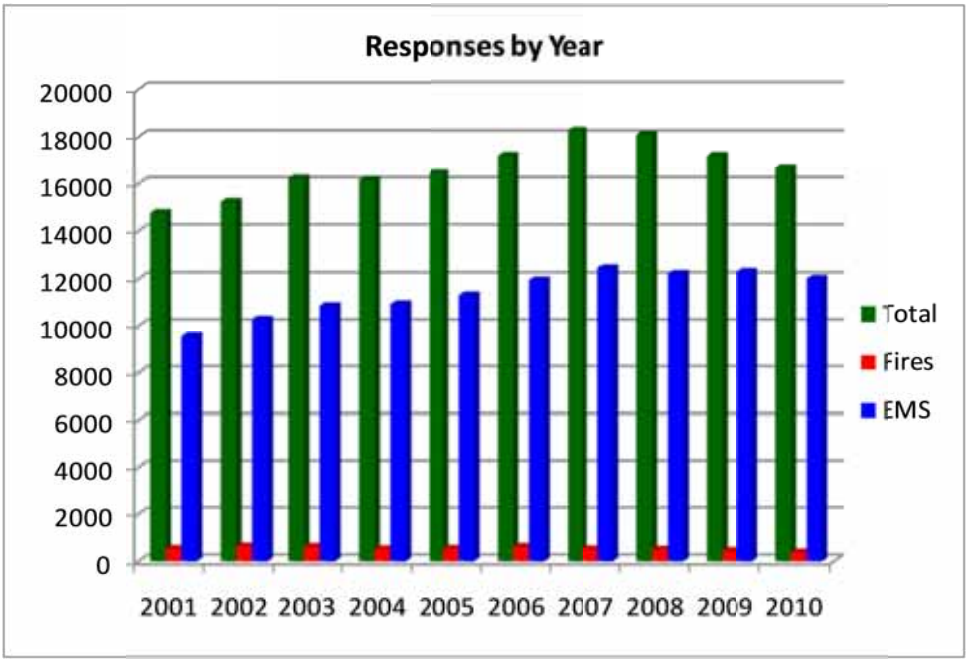
Historic System Response Workload

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 chart shows response workload for ten previous calendar years. These totals reflect incidents within the city and within the Salem Suburban Fire District.

Response workload increased by a total of 13 percent between January 1, 2001 (14,766 total responses), and December 31, 2010 (16,684 total responses), an average of 1.3 percent per year.

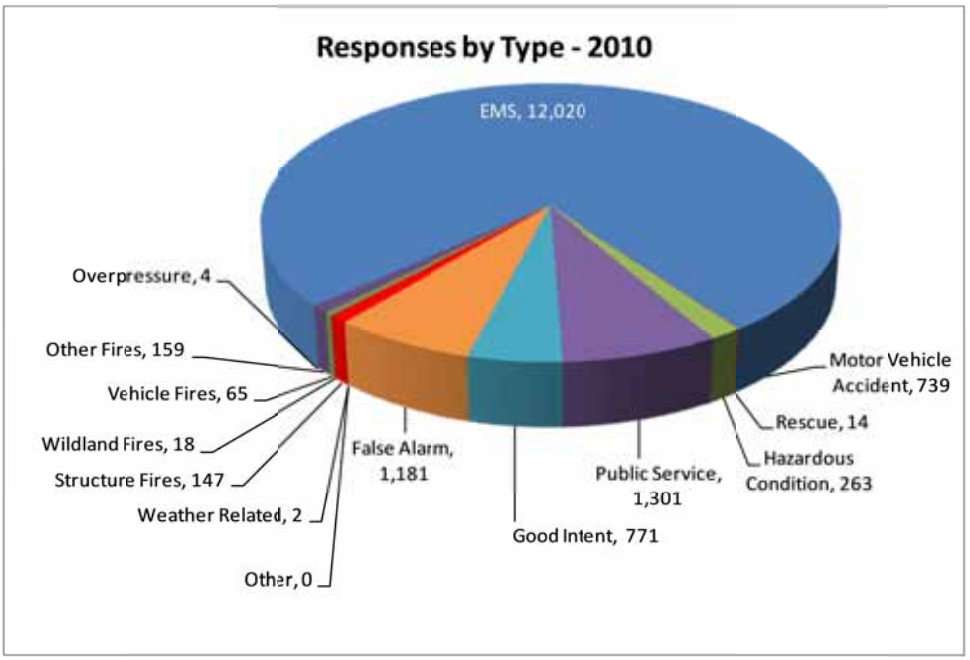
Figure 34: Workload History, 2001 – 2010



Total responses decreased over the past two years. EMS responses have declined due to the implementation of priority dispatch practices reducing the number of incident types requiring a fire department response. In addition, total responses have decreased because of the discontinuance of scheduled flight operations at McNary Field and an overall reduction in fire incidents.

The next chart shows responses by type of incident for calendar year 2010. Emergency medical responses are the most common at 72 percent of total responses.

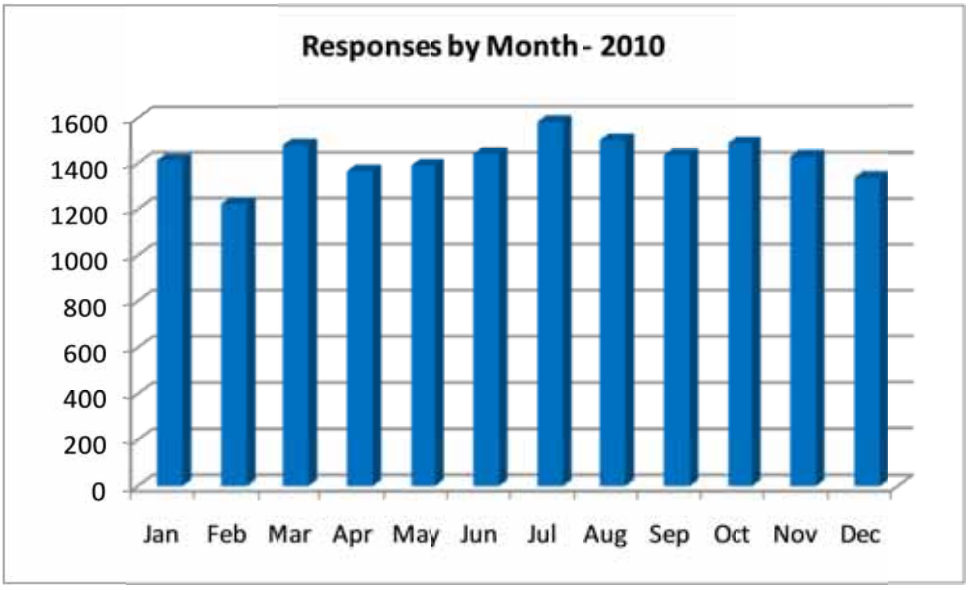
Figure 35: Responses by Type of Incident



Temporal Analysis

A review of incidents by time of occurrence also reveals when the greatest response demand is occurring. The following charts show how activity and demand changes for SFD based on various measures of time. The following chart shows response activity for calendar year 2010 by month.

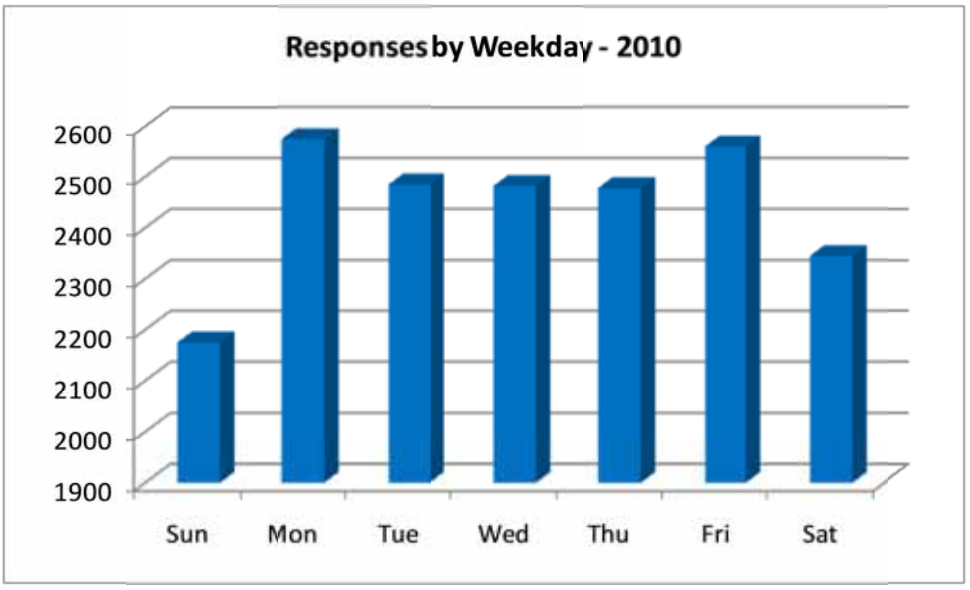
Figure 36: Monthly Workload



During the study period, there was 29 percent more incident activity in the busiest month, July, versus the slowest month, February.

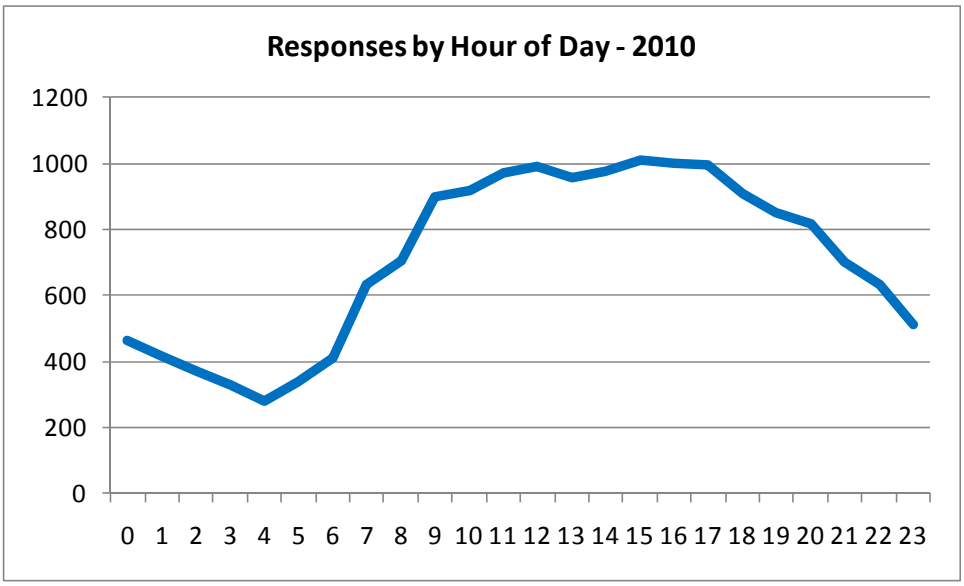
Next, response workload is compared by day of week. In this case there is 18 percent more incident activity on the busiest day, Monday, versus the slowest day, Sunday.

Figure 37: Daily 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 chart. Incident activity is at its highest between 9:00 AM and 6:00 PM.

Figure 38: Hourly Workload

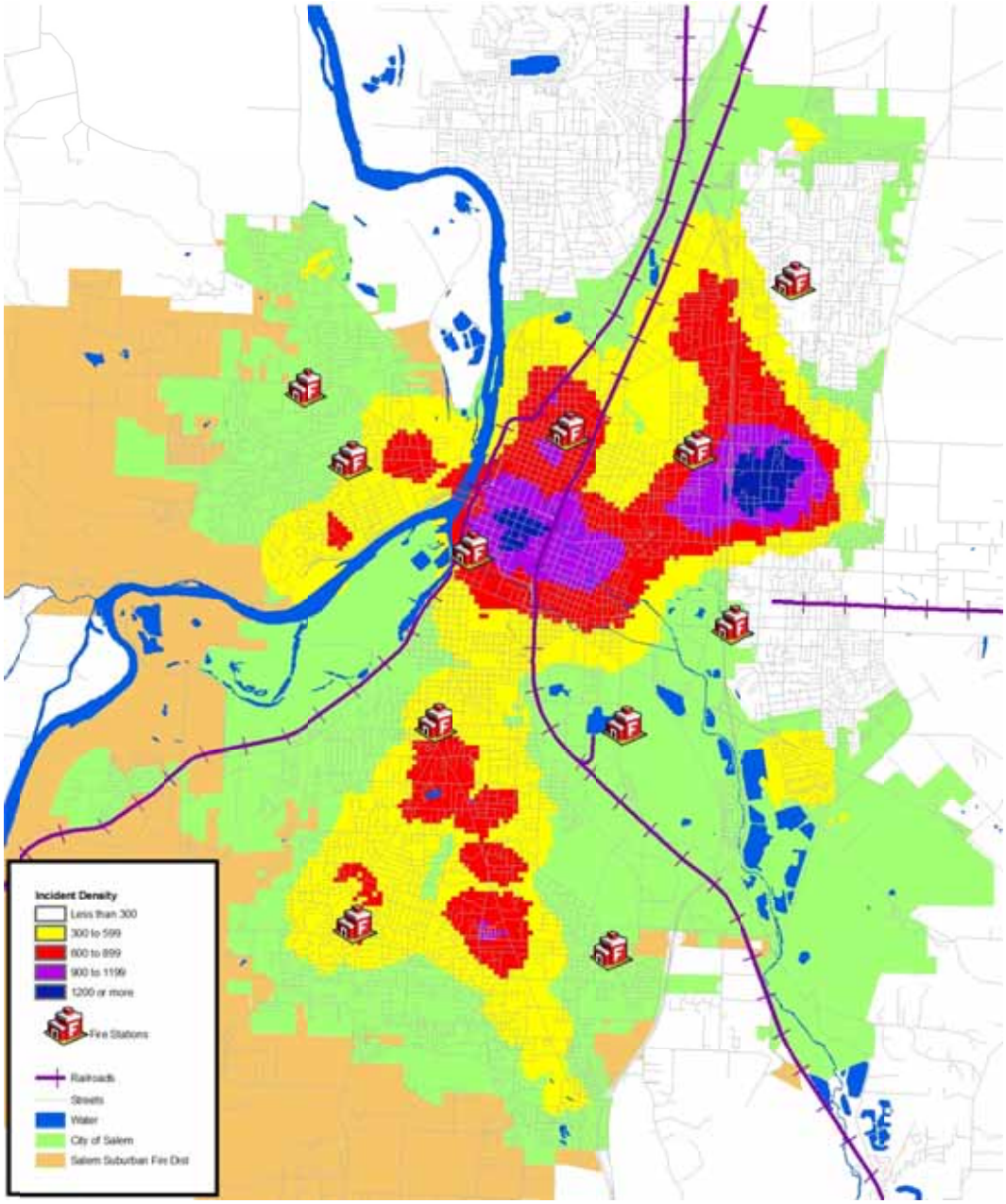


Spatial Analysis

In addition to the temporal analysis of the current service demand, it is useful to examine geographic distribution of service demand. The following map series indicates the distribution of emergency incidents in Salem during calendar year 2010.

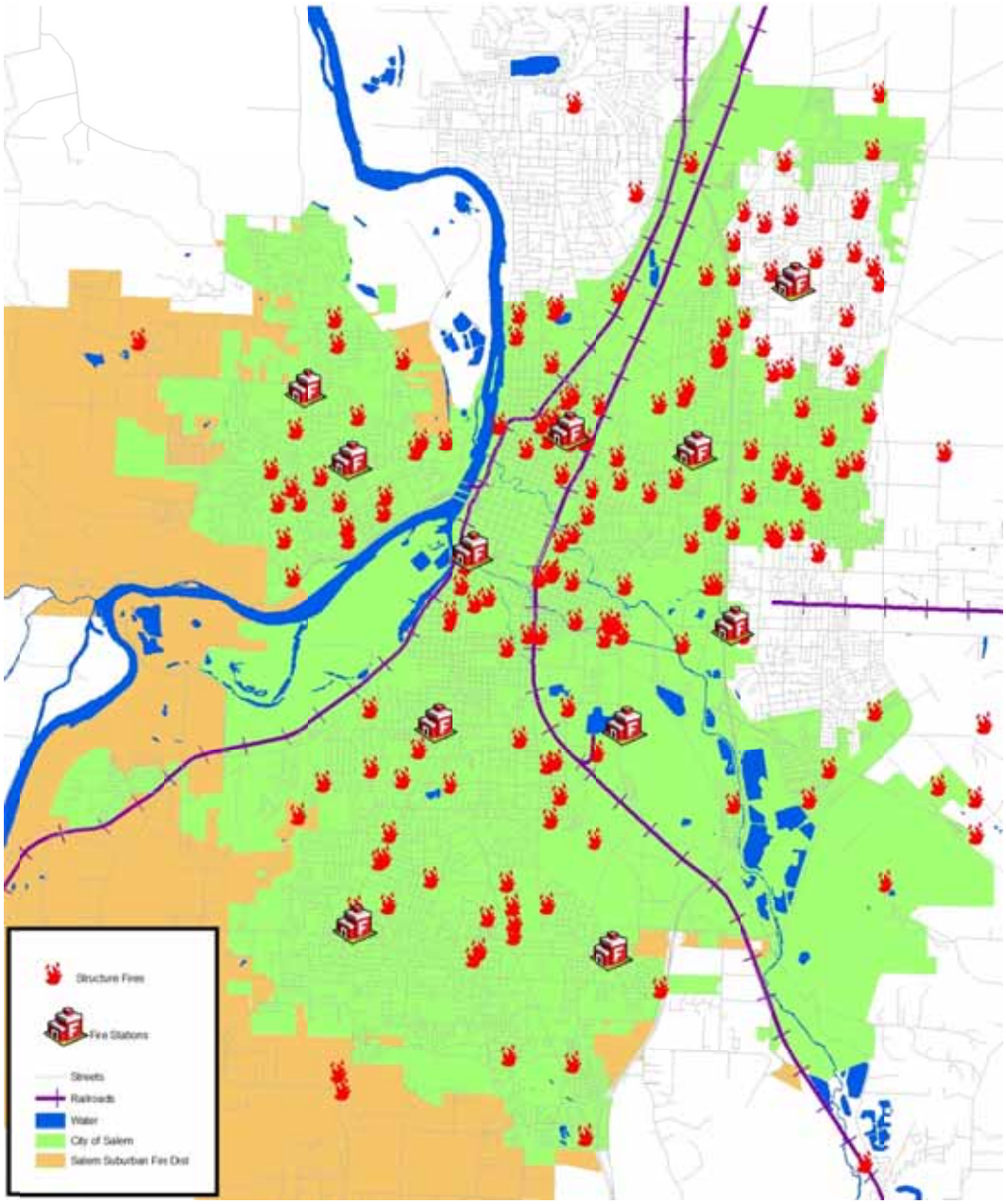
The first map displays the number of incidents per square mile within various parts of the city. The area of greatest service demand is around Fire Stations 1, 2, 3, and 4.

Figure 39: Service Demand Density



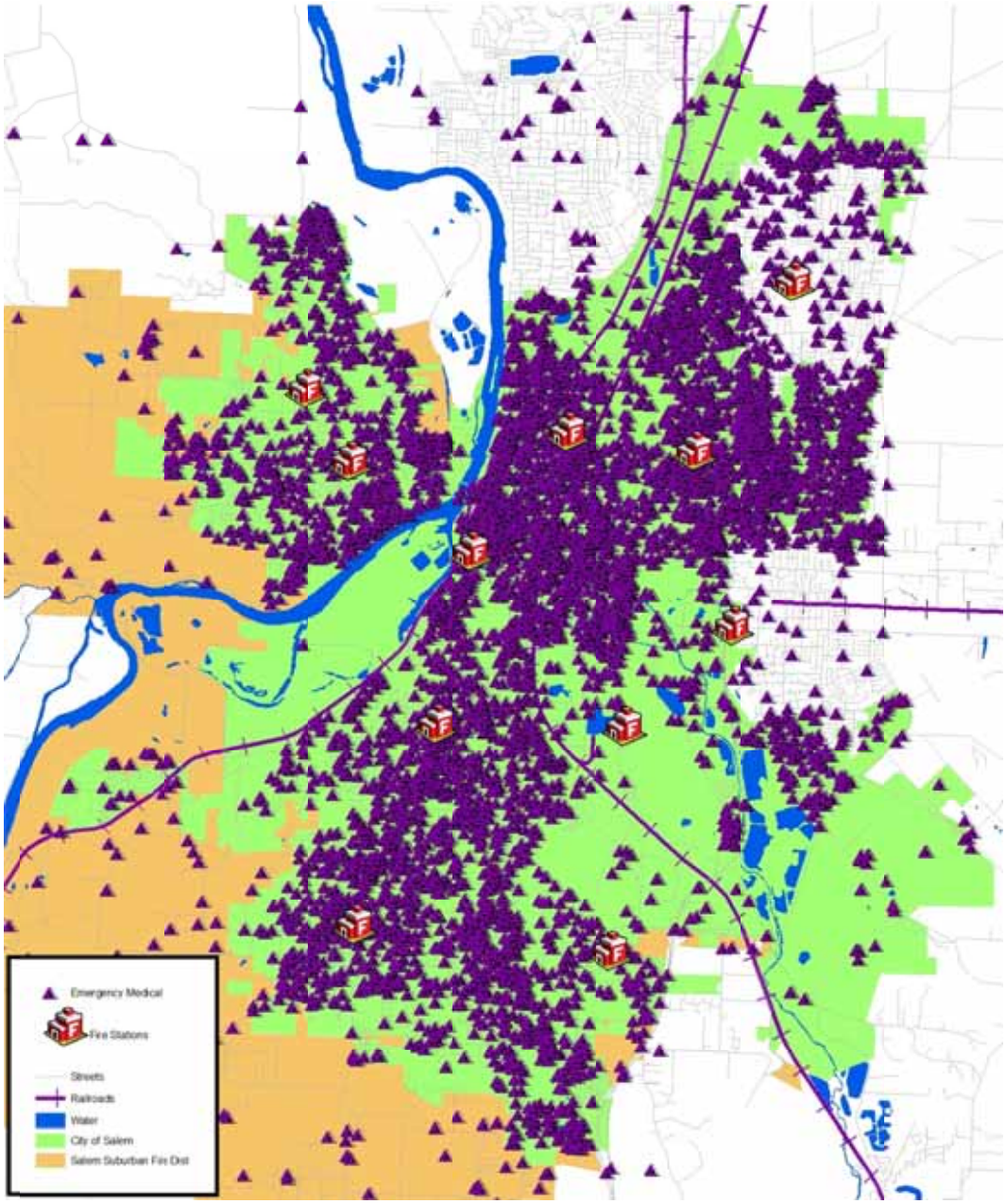
The preceding map reflects all calls served by SFD. Service demand can vary by area based on incident type. The following map displays the location of structure fires during this time period. It illustrates that actual structure fire incidents are also concentrated in the more densely populated area of Salem.

Figure 40: Structure Fires



Similarly, emergency medical incidents also occur in greater concentration in areas of higher population density. The following map displays emergency medical incidents during calendar year 2010.

Figure 41: Emergency Medical Incidents



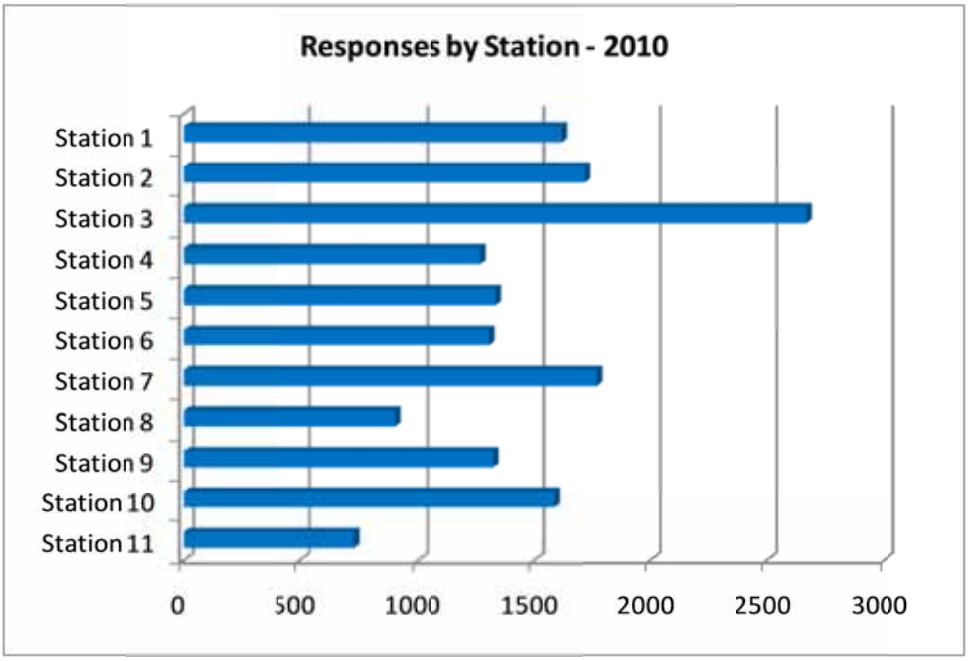
Station and Unit Workload Analysis

A review of workload by station and response unit can reveal much about why response performance may be as it is. 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.

Fire Station Workload

As noted earlier, response workload is not evenly distributed across the City of Salem. Areas of higher population typically present a greater demand for fire department services. The following table lists response activity by fire station area during calendar year 2010. Workload in the Fire Station 3 area is the highest at 2,666 calls for service.

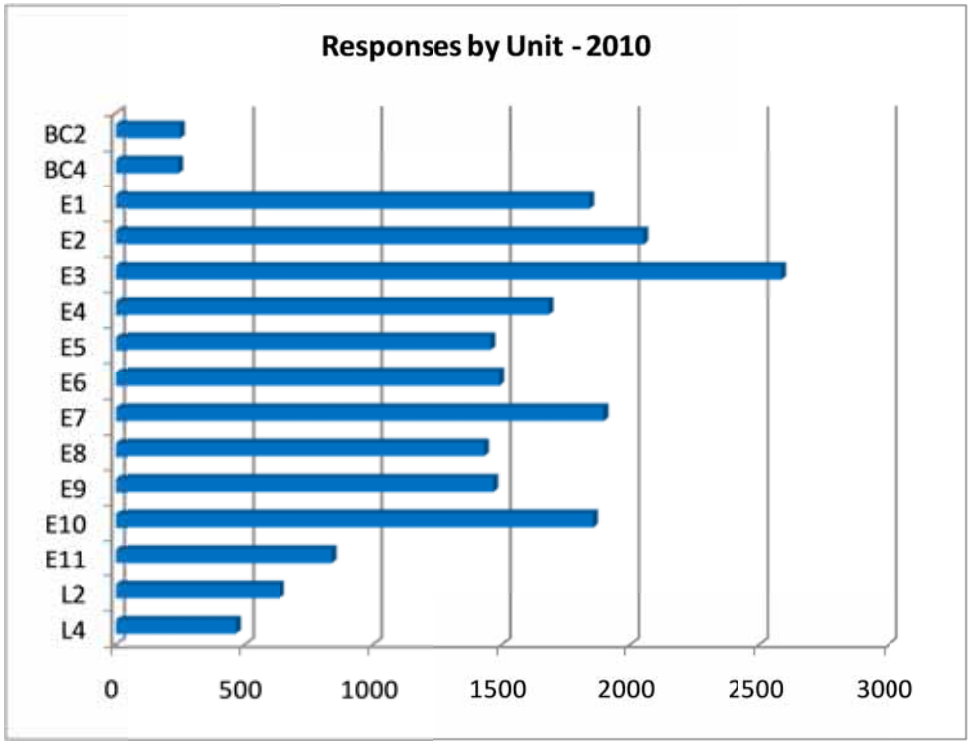
Figure 42: Responses by Fire Station Area – 2010



Response Unit Workload

The workload on individual response units during calendar year 2010 is shown in the following table. 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 43: Response Unit Workload – 2010



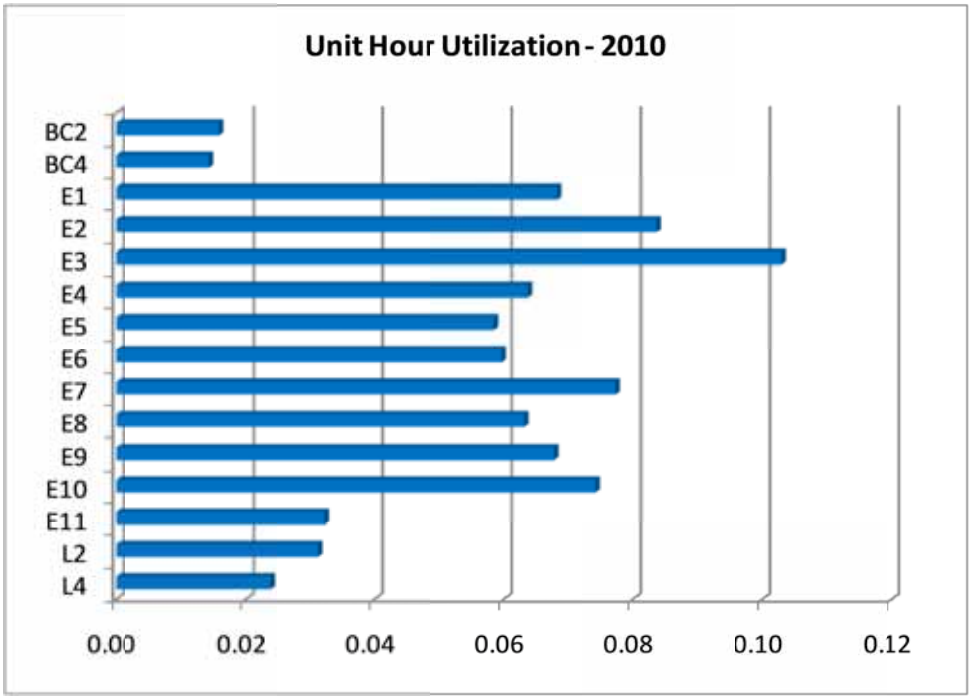
The amount of time a given unit is committed to an incident is also an important workload factor. The following table illustrates the average time each unit was committed to an incident, from initial dispatch until it cleared the scene.

Figure 44: Average Time Committed to an Incident by Unit

Unit	Responses	Average Minutes per Response
BC2	252	33.1
BC4	246	30.6
E1	1,843	19.4
E2	2,050	21.4
E3	2,584	20.9
E4	1,680	19.9
E5	1,456	21.1
E6	1,490	21.0
E7	1,897	21.4
E8	1,432	23.2
E9	1,468	24.2
E10	1,858	21.0
E11	842	20.2
L2	640	25.8
L4	465	26.8

Unit hour utilization is an important workload indicator. It describes the amount of time a unit is not available for response since it's already committed to an incident. The larger the number, the greater a unit's utilization and the less available it is for assignment to an incident.

Figure 45: Unit Hour Utilization



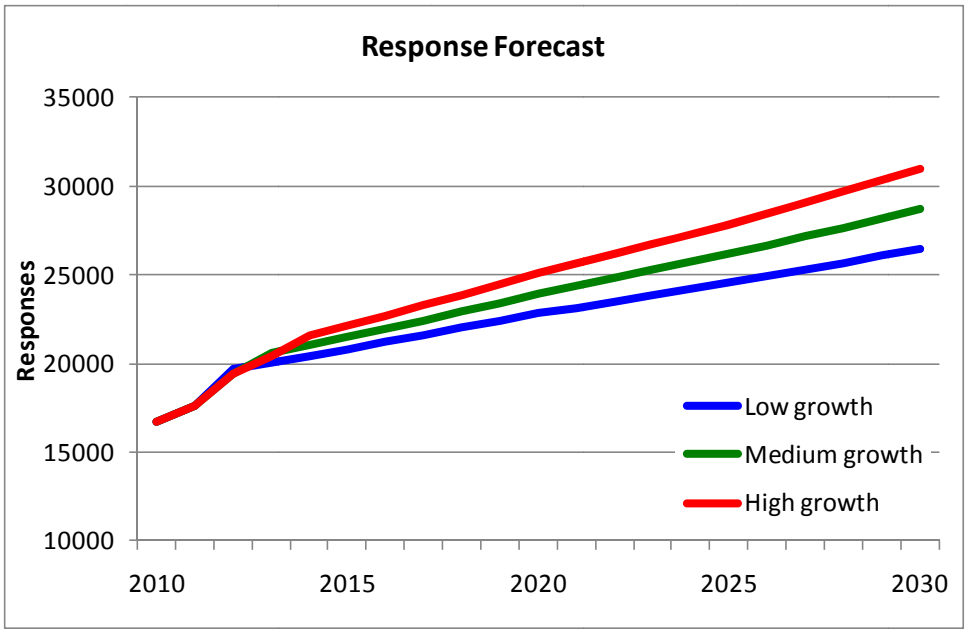
Unit hour utilization is an important statistic to monitor for those fire agencies using percentile based performance standards, as does SFD. In Salem's case, where performance is measured at the 85th percentile, unit hour utilization greater than 0.15 means that the response unit will not be able to provide on-time response to its 85 percent target even if response is its only activity. None of SFD's response units are approaching a unit hour utilization of 0.15.

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 future population growth to predict future fire department response workload.

Earlier in this report three growth scenarios, developed by Portland State University Center for Population Studies, were presented. The following chart forecast response workload for each scenario. The chart uses changes in fire department service usage rates to forecast future response activity based on population growth. The current utilization rate is 101 incidents per 1,000 population. Utilization is expected to grow at a rate of 1 percent per year. .

Figure 46: Response Forecast



Component E – Critical Tasking and Alarm Assignments

The SFD 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 chart illustrates the emergency incident staffing recommendations of the Commission on Fire Accreditation, International.

The following definitions apply to the chart:

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 47: 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 Salem Fire Department has developed the following Critical Task analyses 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 analysis of the Critical Task analysis is that all are in keeping with industry standards and provide the minimum number of personnel needed for effective incident operations.

Critical Tasking

Critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation. The fire department is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner.

Fires – Critical tasking for fire operations is the minimum number of personnel to perform the tasks required to effectively control a fire in the listed risk category. Major fires (beyond first alarm) will require additional personnel and apparatus.

Emergency Medical – Critical tasking for emergency medical incidents is the minimum number of personnel to perform the tasks required to support the identified strategy based on the department's adopted medical protocol.

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	1
Attack Line	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIT	3
Tender Operator	2
Total	**15**

Wildland Interface High Risk (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Exposure Lines	2
Structure Protection	3
Water Supply	1
Total	**10**

Wildland Interface High Risk (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Exposure Lines	2
Structure Protection	3
Tender Operator	2
Total	**11**

Non-Structure Fire High Risk (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Back-up Line	2
Hydrant-Water Supply	1
Structure Protection	3
Other	1
Total	**11**

Non-Structure Fire High Risk (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Back-up Line	2
Tender Operator	2
Structure Protection	3
Other	1
Total	**12**

Aircraft Alert II and III

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

Non-Structure Fire Low Risk (Hydranted & Non-Hydranted)

Task	**Number of Personnel**
Command/Safety	1
Pump Operations	1
Attack Line	1
Total	**3**

Odor of Smoke

Task	**Number of Personnel**
Command/Safety	1
Pump Operations	1
Interior Investigation	2
Ventilation	2
Total	**6**

Smoke In Structure (Hydranted)

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

Smoke In Structure (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line-Interior Investigation	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIT	3
Tender Operator	2
Total	**15**

Outdoor Smoke Investigation (Hydranted & Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pumper Operator	1
Investigation	1
Total	**3**

Hazardous Materials- Level III

Task	Number of Personnel
Command	1
Liaison	1
Decontamination	3
Research Support	2
Team leader, safety, entry team, and backup team provided by OFSM Haz Mat Response Team (not subject to response time performance objective)	6
Total	**13**

Hazardous Materials- Level II

Task	Number of Personnel
Command	1
Liaison	1
Decontamination	3
Research/Support	2
Entry team, and backup team provided by OFSM Haz Mat Response Team (not subject to response time performance objective)	6
Total	**13**

Hazardous Materials- Level I

Task	Number of Personnel
Command	1
Liaison	1
Decontamination	3
Research/Support	2
Entry team, and backup team provided by OFSM Haz Mat Response Team (not subject to response time performance objective)	6
Total	**13**

Emergency Medical Aid

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

Mass Casualty Incident (10+ Patients)

Task	Number of Personnel
Incident Command/Safety	1
Triage	1
Treatment Manager	1
Patient Care	9
Transportation Manager	1
Documentation	1
Total	**14**

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	4
Pump Operator/Suppression Line	2
Extrication/Vehicle Stabilization	3
Total	**13**

Technical Rescue – Water

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup Team	2
Patient Care	2
Rope Tender	2
Upstream Spotter	1
Downstream Safety	1
Boat Operator	1
Total	**12**

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	1
Rescue Team	2
Backup/Support Team	2
Patient Care	2
Attendant	1
Rigger	1
Ground Support	4
Total	**13**

Technical Rescue – Trench

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup/Support Team	2
Patient Care	3
Shoring	5
Total	**13**

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.

Structure Fire (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder 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	4	10
Tender	2	2
Ladder Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**17**
Total Staffing Needed		**15**

Wildland Interface High Risk (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	5
Grass Unit	2	4
Battalion Chief	1	1
Total Staffing Provided		**10**
Total Staffing Needed		**10**

Wildland Interface High Risk (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	6
Grass Unit	2	4
Tender	2	2
Battalion Chief	1	1
Total Staffing Provided		**13**
Total Staffing Needed		**11**

Non-Structure Fire High Risk (Hydranted)

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

Non-Structure Fire High Risk (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	8
Tender	2	2
Grass Unit	1	2
Battalion Chief	1	1
Total Staffing Provided		13
Total Staffing Needed		**12**

Aircraft Alert II and III

Unit Type	Number of Units	Total Personnel
Engine	3	3
Ladder Truck	1	4
ARRF	2	6
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Non-Structure Fire Low Risk (Hydranted & Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	1	3
Total Staffing Provided		**3**
Total Staffing Needed		**3**

Odor of Smoke

Unit Type	Number of Units	Total Personnel
Engine	1	3
Ladder Truck	1	4
Total Staffing Provided		**7**
Total Staffing Needed		**6**

Smoke In Structure (Hydranted)

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

Smoke In Structure (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	10
Ladder Truck	1	4
Tender	2	2
Battalion Chief	1	1
Total Staffing Provided		**17**
Total Staffing Needed		**15**

Outdoor Smoke Investigation (Hydranted & Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	1	3
Total Staffing Provided		**3**
Total Staffing Needed		**3**

Hazardous Materials – Level III

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
Battalion Chief	1	1
Hazardous Materials Unit	1	3
Total Staffing Provided		**14**
Total Staffing Needed		**13**

Hazardous Materials – Level II

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
Battalion Chief	1	1
Hazardous Materials Unit	1	3
Total Staffing Provided		**14**
Total Staffing Needed		**13**

Hazardous Materials – Level I

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
Battalion Chief	1	1
Hazardous Materials Unit	1	3
Total Staffing Provided		**14**
Total Staffing Needed		**13**

Emergency Medical Aid

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

Mass Casualty Incident (10+ Patients)

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
MCI Trailer	1	3
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**14**

Motor Vehicle Accident (Non-Trapped)

Unit Type	Number of Units	Total Personnel
Engine or Ladder 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	3	9
Ladder Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**13**

Technical Rescue – Water

Unit Type	Number of Units	Total Personnel
Engine w/ Boat	3	9
Ladder Truck	1	4
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**12**

Technical Rescue – Rope

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
Heavy Rescue	1	3
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	6
Ladder Truck	1	4
Heavy Rescue	1	3
Battalion Chief	1	1
Total Staffing Provided		14
Total Staffing Needed		**13**

Technical Rescue – Trench

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	4
Heavy Rescue	1	3
Battalion Chief	1	1
Total Staffing Provided		**14**
Total Staffing Needed		**13**

Component F – Review of Historical System Performance

Incident data for the calendar year 2010 was evaluated in detail to determine SFD's current performance. Data was obtained from department incident reports and the dispatch center's computer-aided dispatch system.

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.

Detection

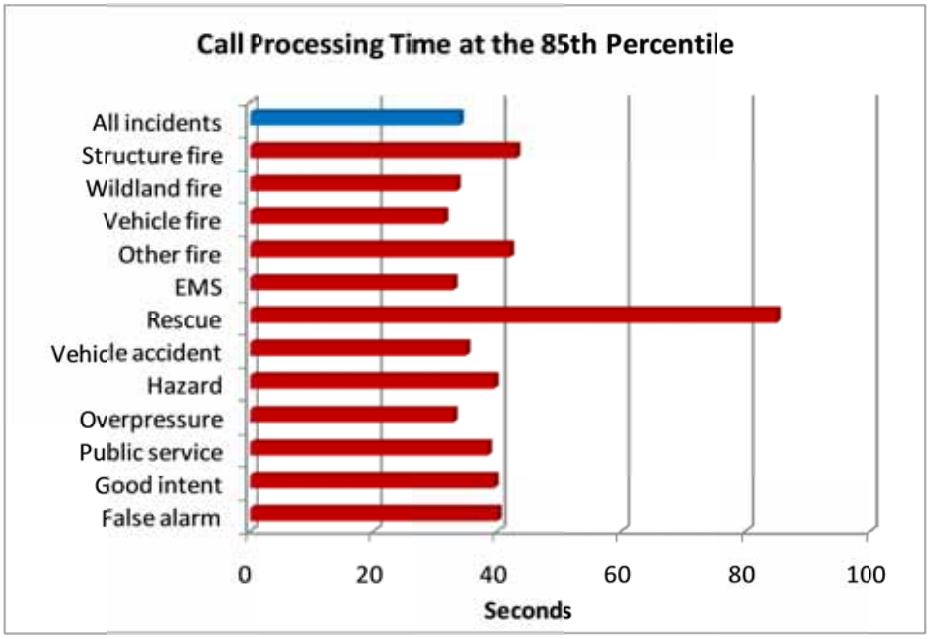
The detection of a fire (or medical incident) may occur immediately if someone happens to be present or if an automatic system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period. The time period for this phase begins with the inception of the emergency and ends when 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

Today 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 typically begins when the 9-1-1 call is answered at the dispatch center and ends when response personnel are notified of the emergency.

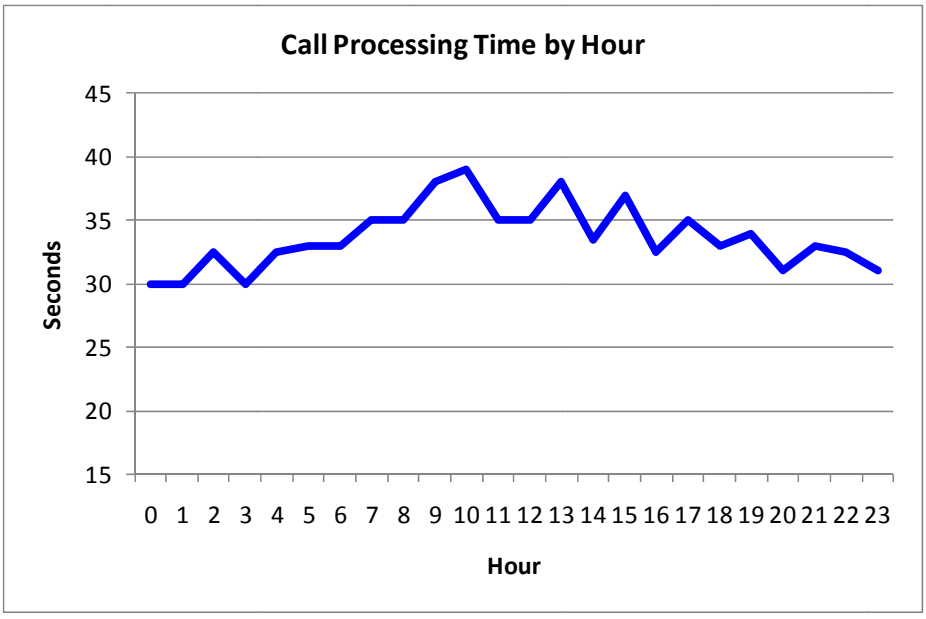
The following chart lists the call processing time for all incidents as well as specific incident types. Overall, the time from first notification to the dispatch center until notification of response personnel is within 34 seconds, 85 percent of the time.

Figure 48: Call Processing Performance



Activity levels at the dispatch center can affect the time it takes to receive, process and dispatch a request for service. The following chart shows call processing time by hour of day. Call processing time is shorter during the early morning times and longer during the day when incident activity increases.

Figure 49: Call Processing Time by Hour of Day

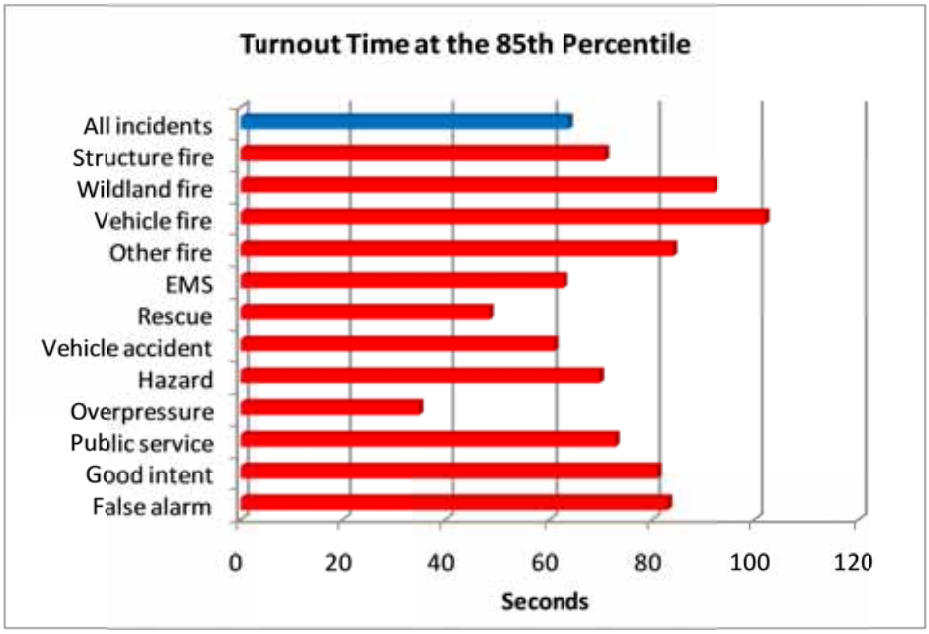


Turnout Time

Turnout time is the first of the response phases 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.

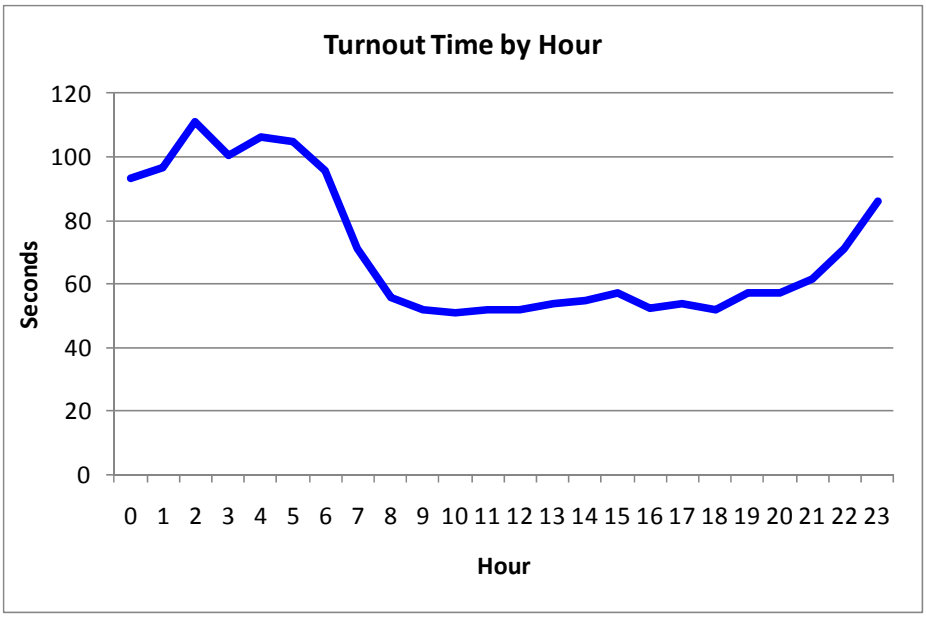
The following chart lists turnout time for all incidents as well as specific incident types. Overall, turnout time for all incidents is within 64 seconds, 85 percent of the time.

Figure 50: Turnout Time Performance



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

Figure 51: Turnout Time by Hour of Day



These turnout times include both Salem Fire Department units and Rural Metro Ambulance (RMA) units. SFD and RMA work in a partnership in the delivery of emergency medical services. RMA turnout times are expectedly short at within 69 seconds, 85 percent of the time due to its deployment configuration. RMA personnel are typically in their response units on standby at the time of incident dispatch.

Salem Fire Department unit turnout times are longer at within 101 seconds, 85 percent of the time.

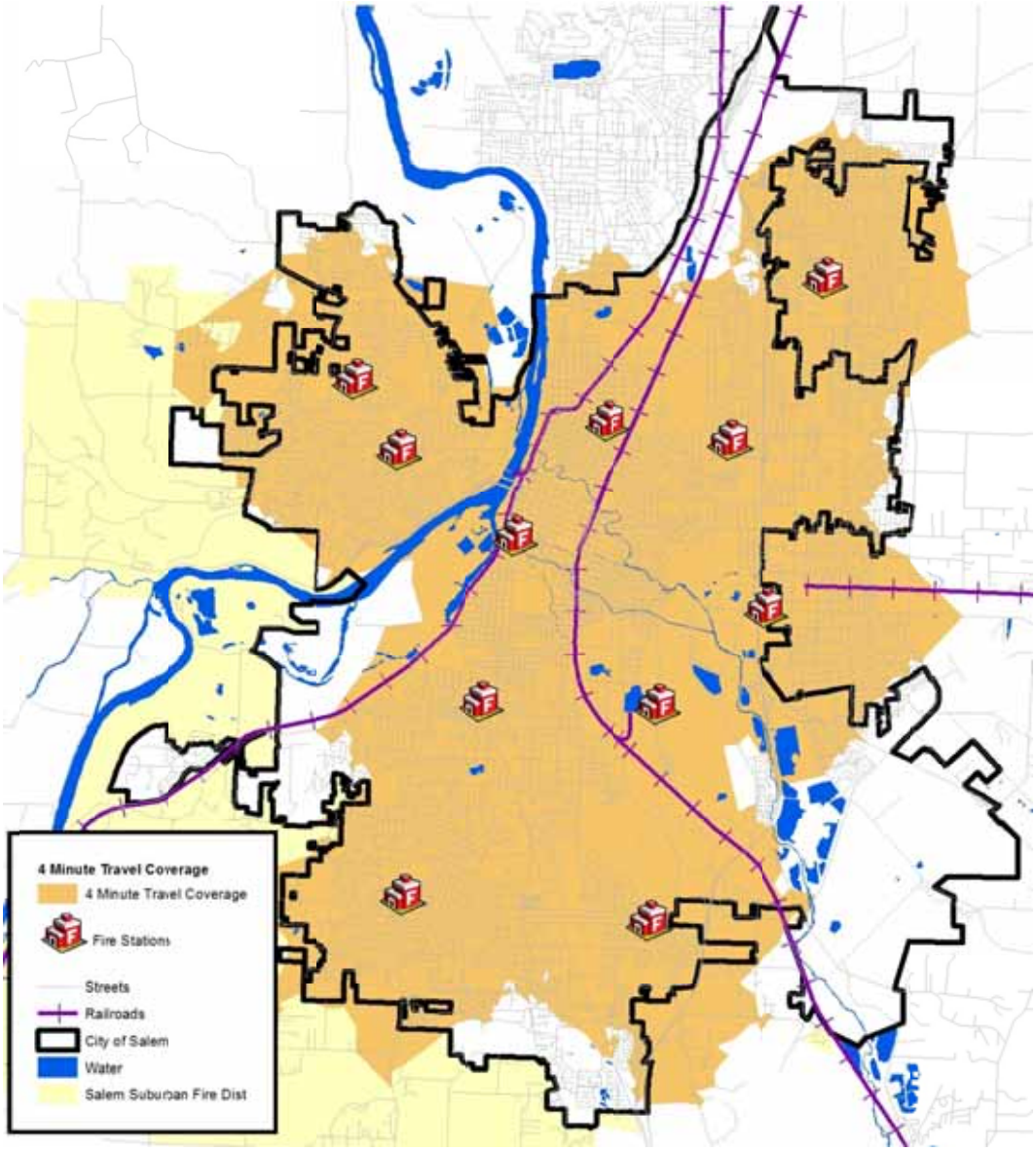
Distribution and Initial Arriving Unit Travel Time

Travel time is potentially the longest of the response phases. The distance between the fire station and the location of the emergency influences total 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.

The following map illustrates the area that can be reached from all Salem fire stations in four minutes of travel time. It assumes an average travel speed for responding apparatus of 30 miles per hour. Though apparatus travel faster than 30 mile per hour during the response, this average speed compensates slowing at intersections, slowing for turns, and the like. Four

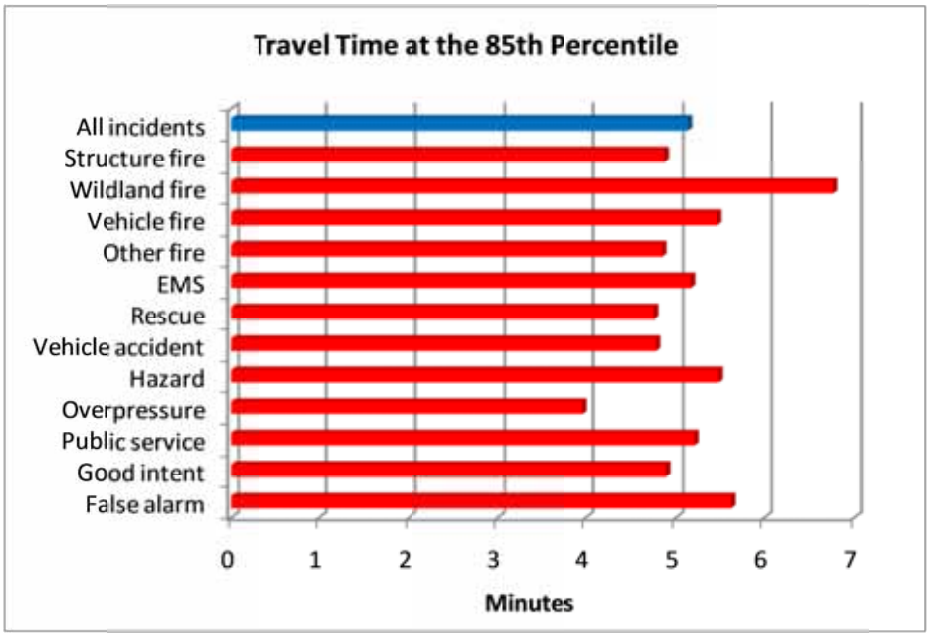
minutes was selected for the following analysis because it is the time allowed for travel within the City Council adopted first unit response time goal.

Figure 52: Initial Unit Travel Time Capability



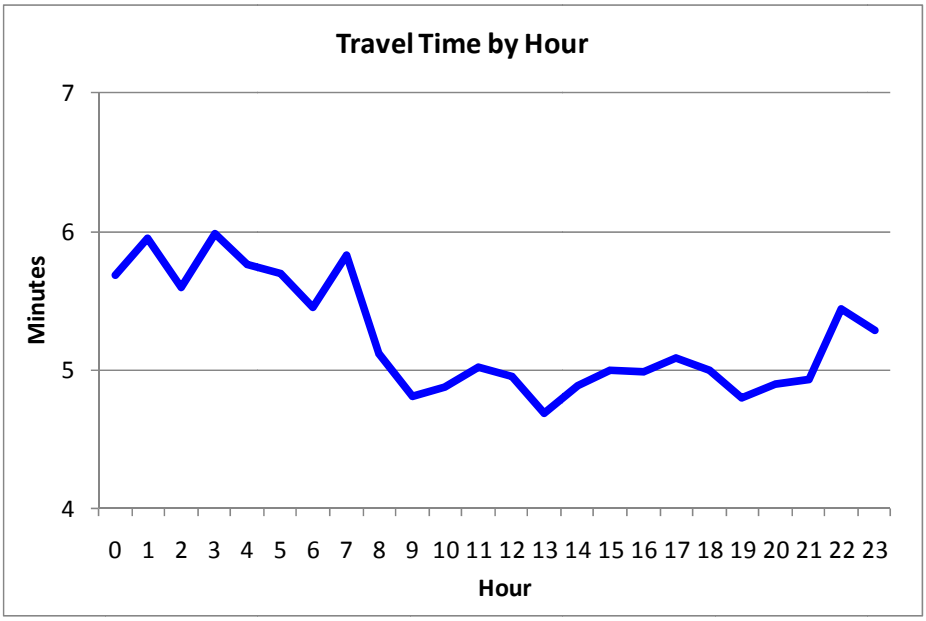
The following chart lists travel time for all incidents as well as specific incident types. Overall, travel time for all incidents is within 5 minutes 8 seconds, 85 percent of the time.

Figure 53: Overall Travel Time Performance – First Arriving Unit



Travel time can, in some situations, vary considerably by time of day. Heavy traffic at morning and evening rush hour can slow fire department response. Travel time varies by about one minute during the course of the day.

Figure 54: Overall Travel Time by Hour of Day – First Arriving Unit



GIS analysis was completed to determine how much of the city's street system was within four minutes of fire stations. The following table shows the result of this analysis.

Figure 55: Street Mile Coverage by Fire Stations

	Total	Percent of Total
Total street miles in city	656	100.0%
Total street miles within four travel minutes of a fire station	555	84.6%

Current fire stations can provide a response of four travel minutes to 84.6 percent of the existing city street system, assuming the fire engine is in its station at the time of the alarm. This also assumes that street congestion, weather, and other factors do not impede response.

The next analysis compared coverage of incidents that occurred during 2010. The following table shows the results of this analysis. The vast majority of actual responses occur within four travel minutes of fire stations.

Figure 56: Incidents Within Four-Travel Minute Coverage

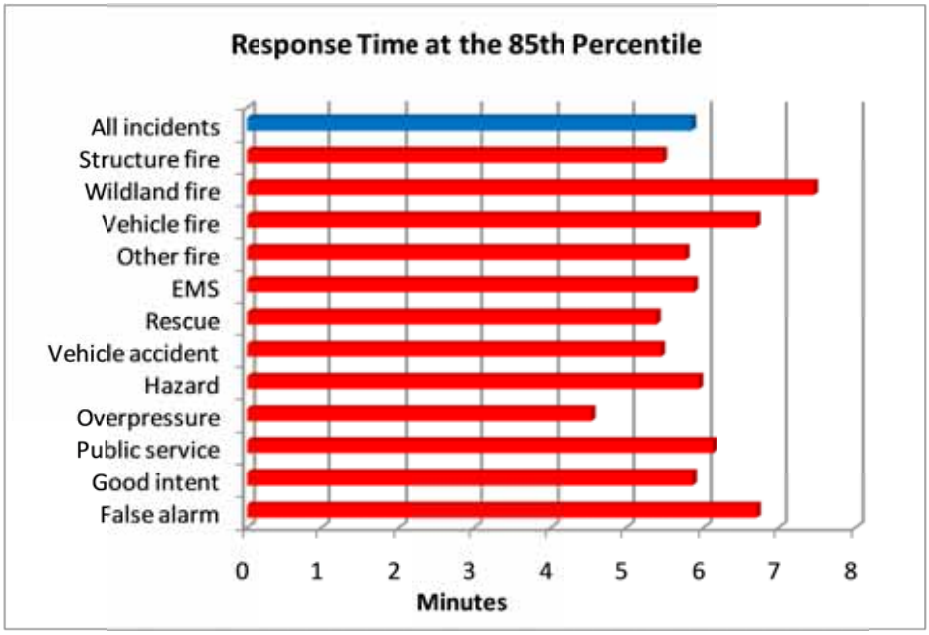
	Total	Percent of Total
Total incidents	16,266	100.0%
Total incidents inside station four-travel minute coverage	14,956	91.9%

First Arriving Unit Total Response Time

Response time is defined as that period between 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. This is the time period of the response phases most controllable by the fire department.

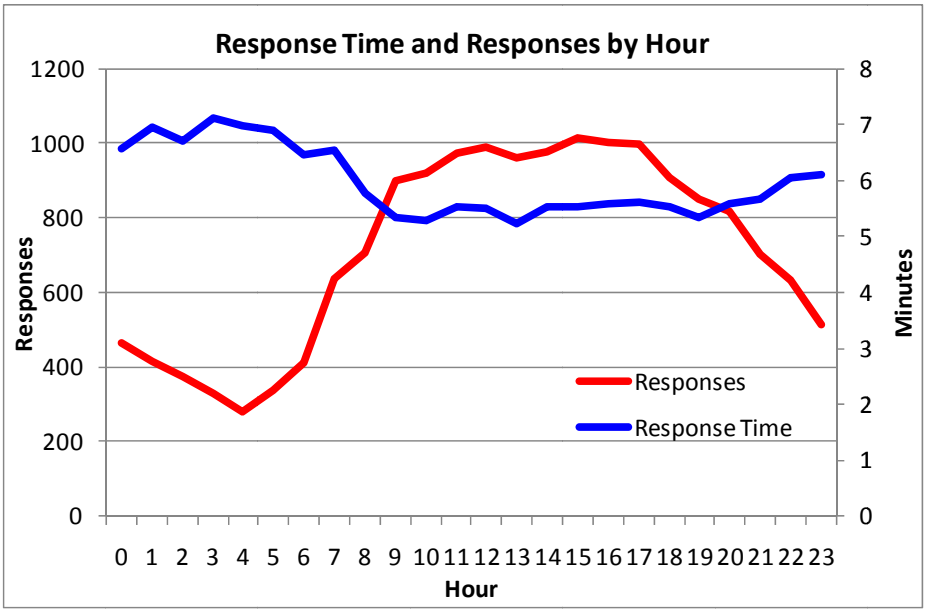
The following chart lists response time for all incidents as well as specific incident types. Overall, response time for all incidents is within 6 minutes 43 seconds, 85 percent of the time.

Figure 57: Response Time Performance – First Arriving Unit



The next chart shows response time by hour of day for all incidents. Response time is slowest during the night-time hours and fastest during the day. SFD's best response times occur during the period of the day when response activity is at its highest.

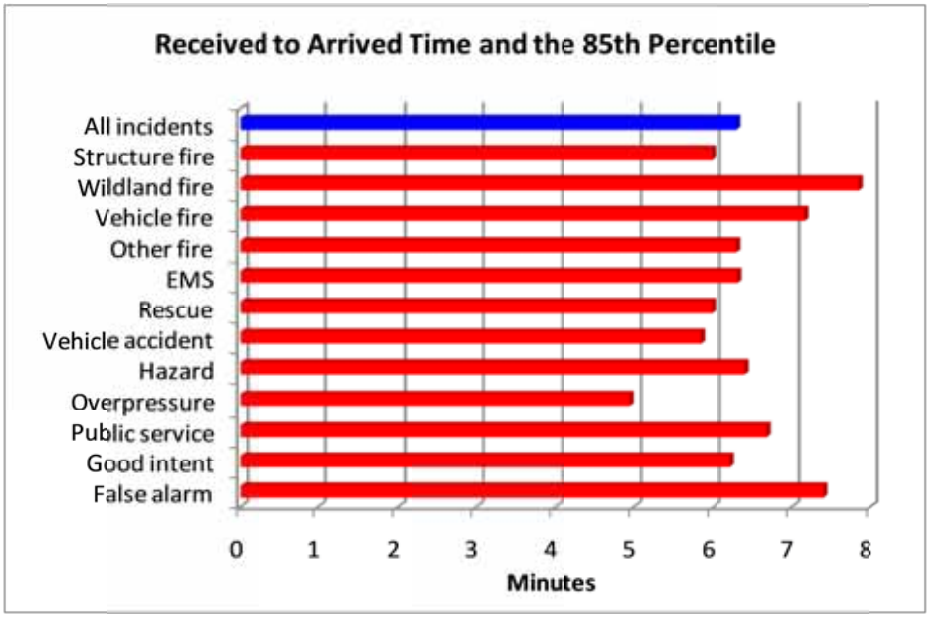
Figure 58: Hourly Response Time Performance



Received to Arrived Time

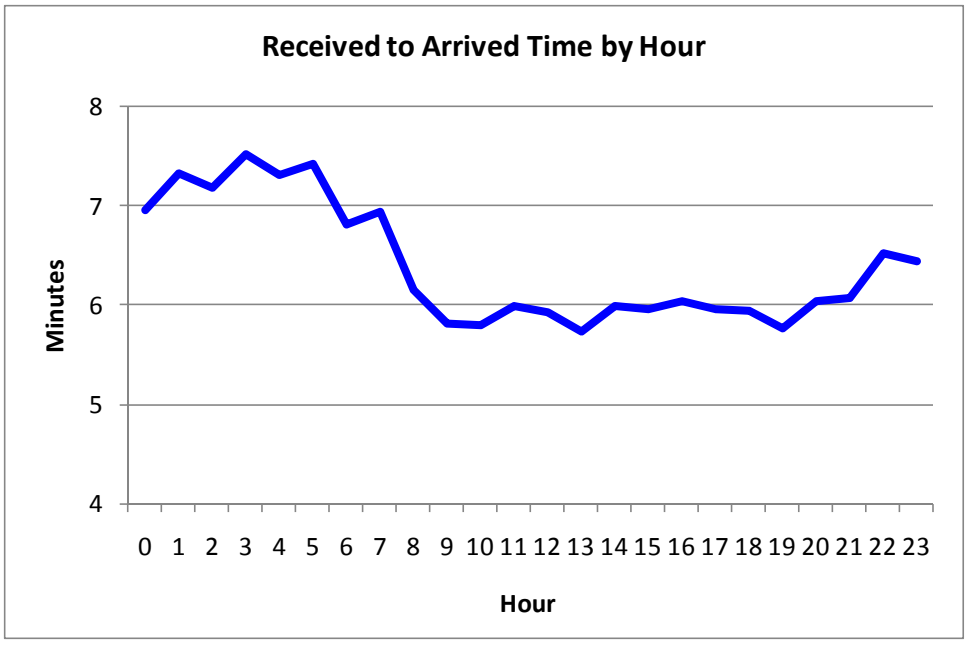
From the customers' standpoint, time begins when the emergency occurs. Their first contact with emergency services is when they call for help, usually by dialing 9-1-1. "Received to arrived" time is also the City Council's adopted performance goal. The next chart shows response time performance at the 85th percentile from the time the phone rings at the dispatch center until the first unit arrives at the incident location. This is a combination of all the time phases discussed in this section of the report. Overall, received to arrived time for all incidents is within 6 minutes 18 seconds, 85 percent of the time.

Figure 59: Received to Arrived Time



The next chart shows received to arrived performance by time of day. Again, total response time, from the customer's standpoint is quickest during the day and slowest during the early morning hours.

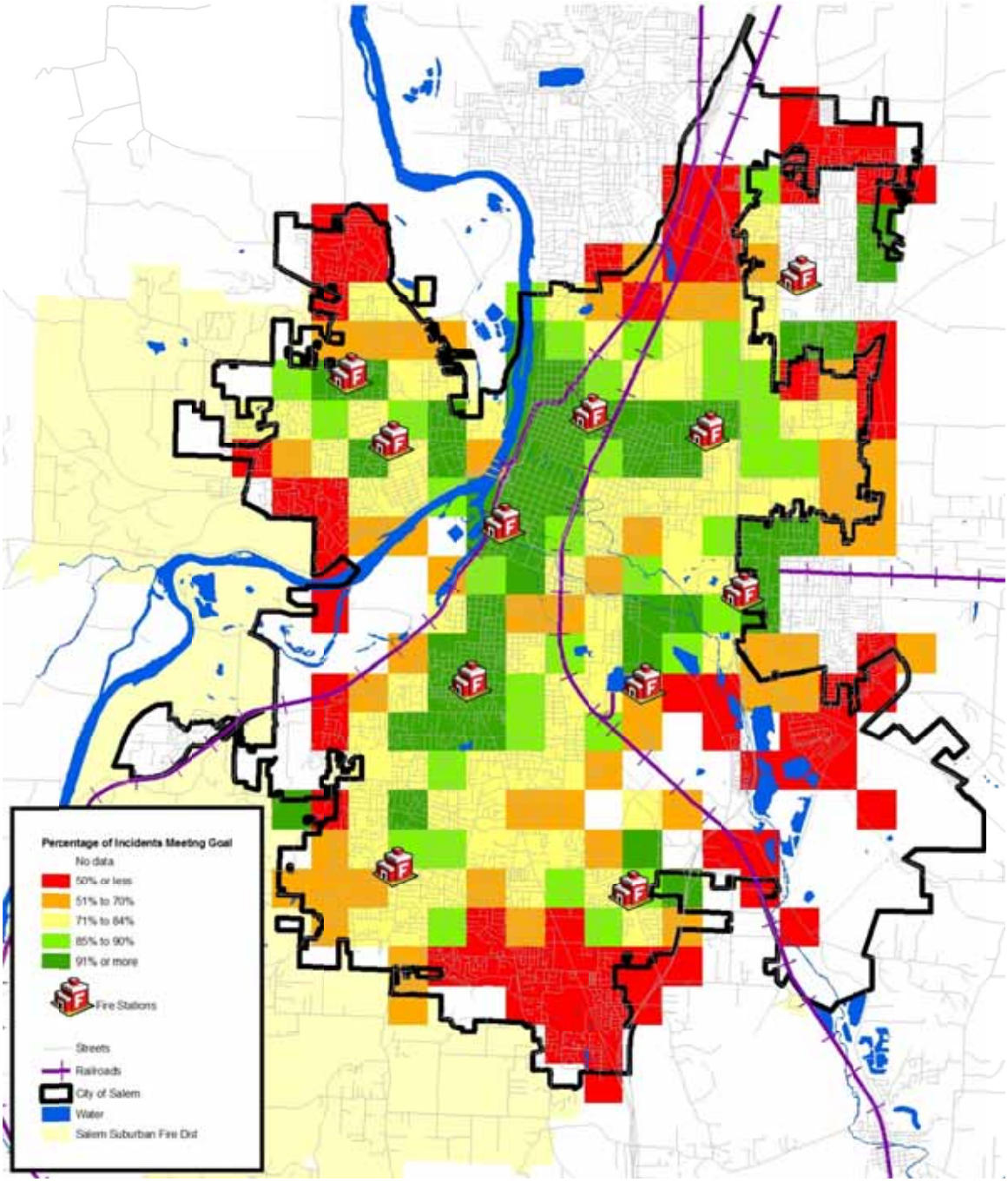
Figure 60: Received to Arrived Performance by Hour of Day



Received to Arrived Time Performance by Region

Received to arrived time performance by region is highly variable. This is 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 map shows the percentage of priority incidents meeting the City Council's received to arrived goal of within 5 minutes 30 seconds, 85 percent of the time by sub-areas of the city.

Figure 61: Received to Arrived Time Performance by Area



Concentration and Current 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, as are the critical tasks that must be performed. Moderate risk structural fires are used as the primary risk category for this analysis as these present the most frequent type of incident requiring four or more response units.

The concentration analysis begins with a review of the physical capability of SFD's resources to achieve a target ERF response time to the city. Then analysis will determine whether or not SFD's *actual* ERF assembly performance matches this physical concentration capability.

The SFD objective for ERF response time is "for moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 12 minutes 22 seconds from receipt of the call at the dispatch center, 85 percent of the time. This is the department's adopted performance objective since one has not been established by City Council.

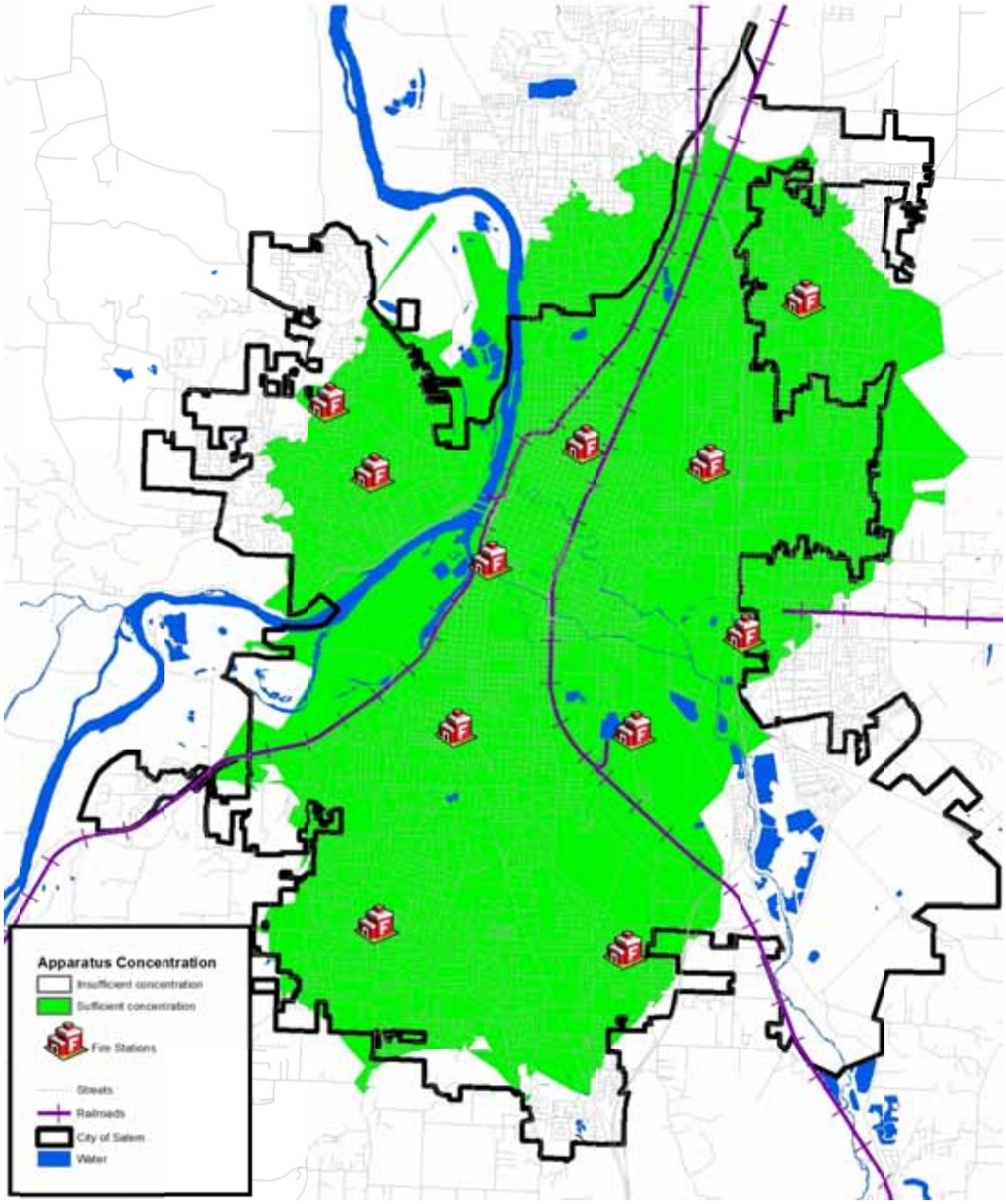
The department would like to improve this performance to provide an ERF within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time.

Historically, call processing times for structure fires is 42 seconds. Structure fire turnout time is 1 minutes 11 seconds. Thus to achieve a ten-minute ERF response time, eight minutes of travel time is available. The following maps depict the physical capability of SFD to assemble various concentrations of apparatus and firefighters within eight minutes of travel time. The modeled analysis shown assumes that all response units are available.

Finally, for the purpose of this analysis, a full effective response force to a moderate risk structure fire is three fire engines, one ladder truck and one battalion chief, with a total complement of 14 firefighters.

The following map shows the city and areas that can be reached by the apparatus that make up the target ERF. The requirement for a ladder truck and battalion chief to achieve ERF is the most significant limiter, since only two of each are available citywide.

Figure 62: Effective Response Force – Apparatus Resources

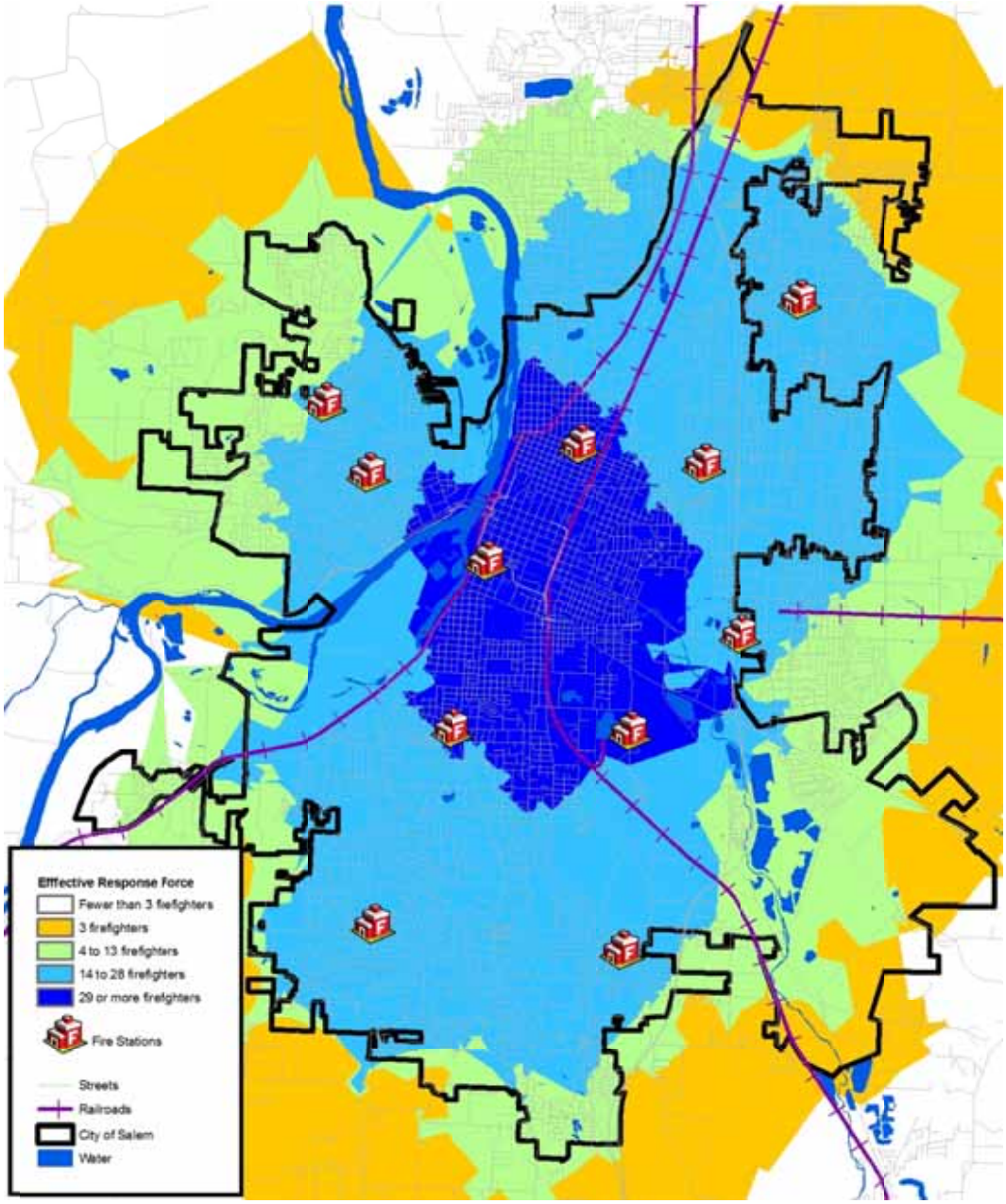


The previous figure illustrates that the city is well resourced with fire apparatus within the city's central area but not as well in the outer perimeter.

Equally important is the number of firefighters that can arrive on the fireground to make rapid use of this equipment. The following map illustrates the potential concentration of firefighters that could be achieved with the arrival of this apparatus, based upon normal staffing levels

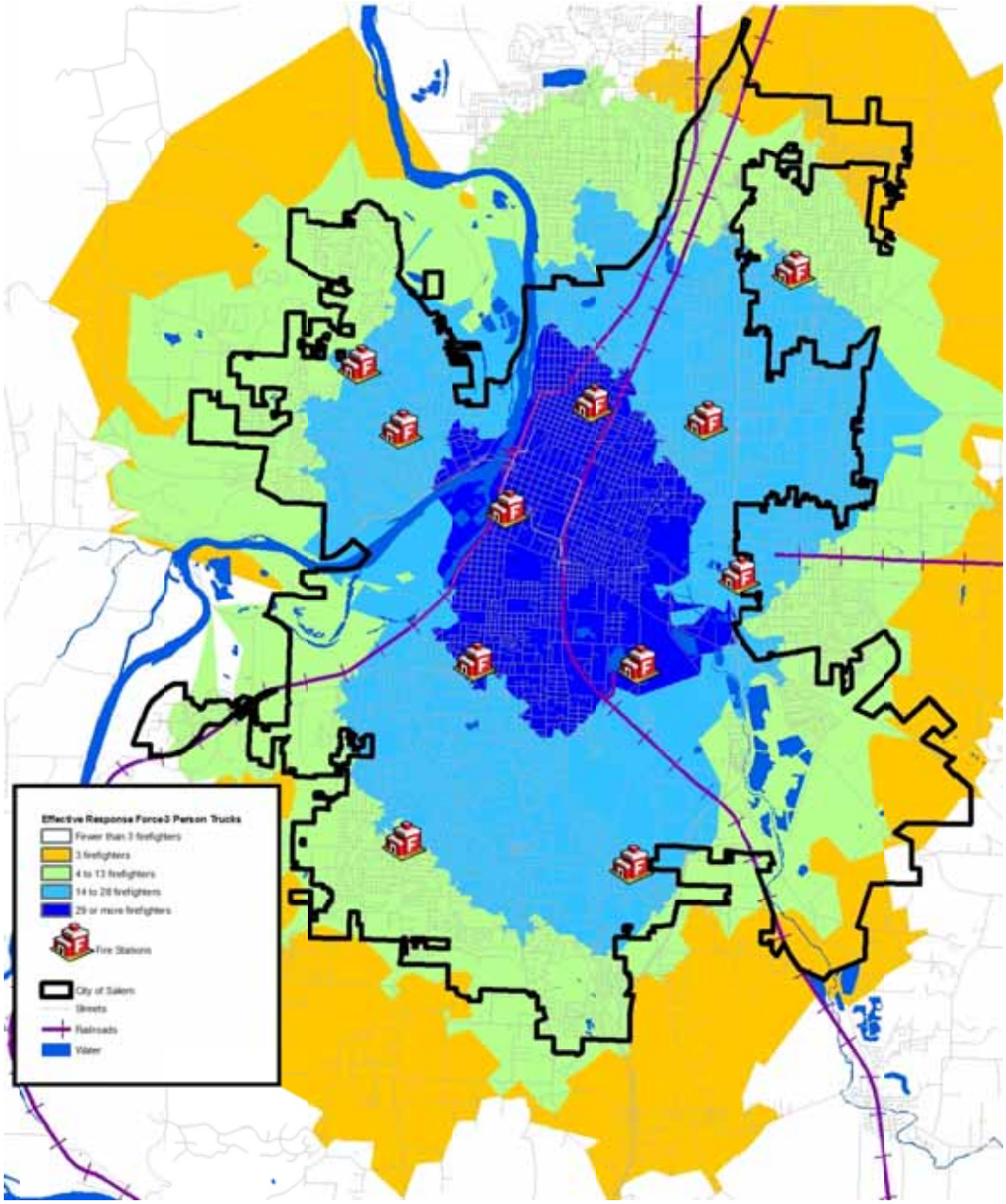
assigned to each unit. This map assumes that both ladder trucks are staffed with four personnel each.

Figure 63: Effective Firefighting Force – Staffing Resources, Fully Staffed



The next map illustrates the potential concentration of firefighters that could be achieved with the arrival of this apparatus, based upon minimum staffing levels assigned to each unit. This map assumes that both ladder trucks are staffed with three personnel each.

Figure 64: Effective Firefighting Force – Staffing Resources, Three-Person Ladder Trucks

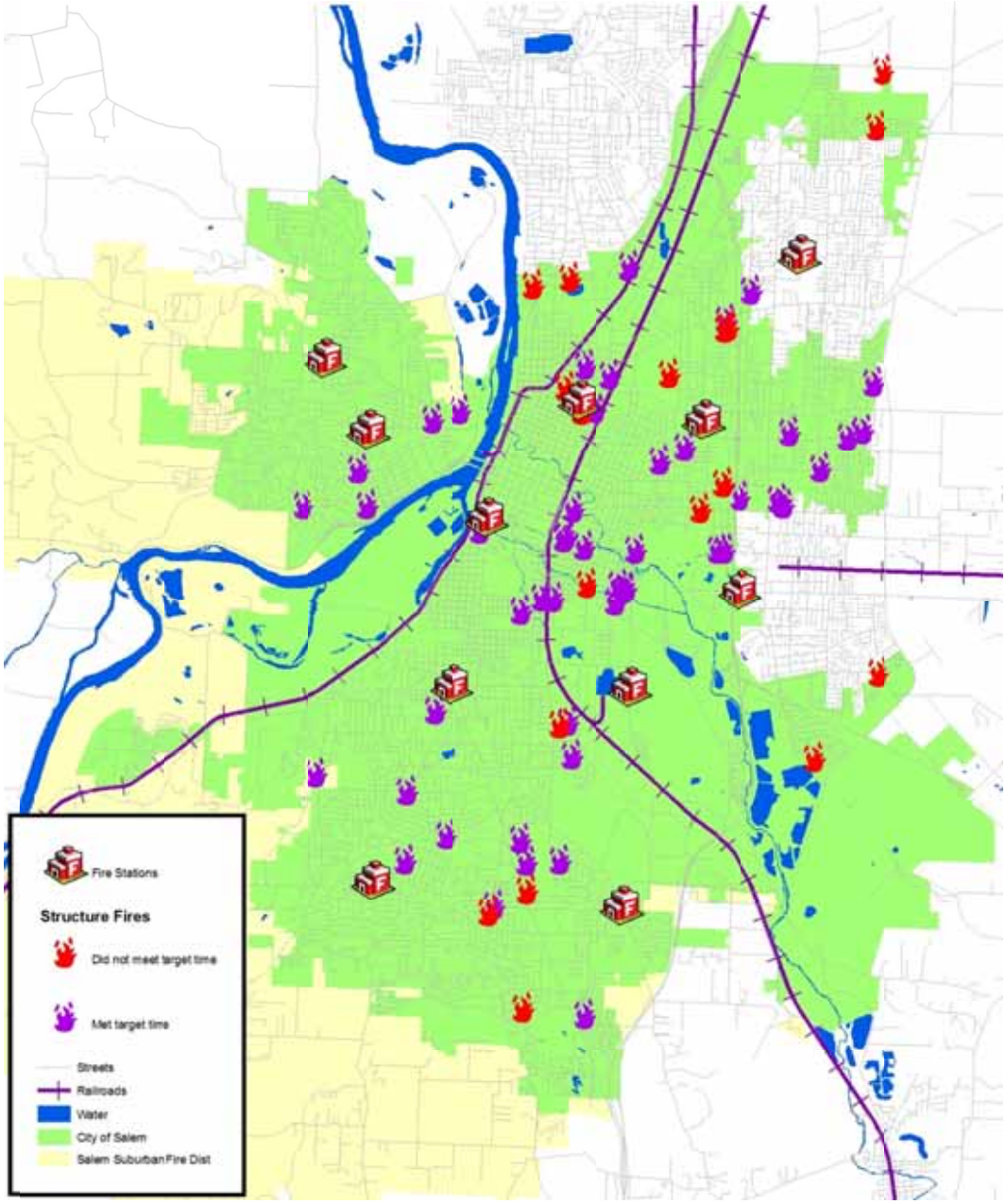


These two maps show that an adequate force of on-duty firefighters can be mustered within a reasonable timeframe in the central region but not to the city's perimeter. The impact of reduced ladder truck staffing can be seen in the city's perimeter as well. The analysis in the previous maps assumes all apparatus are in service and available for dispatch. During periods of concurrent calls, when some apparatus are already committed to other incidents, the ability to achieve this concentration of apparatus and firefighters would be affected.

Salem Fire Department's actual full effective response force performance for calendar year 2010 was within 10 minutes, 68 percent of the time.

The next map shows all structure fires to which an effective response force arrived on scene during this time period. The markers in green are those for which the 11-minute objective was achieved. The red markers are those structure fires where the objective was not achieved.

Figure 65: Structure Fires Meeting and Not Meeting Target



Second Unit Arrival Time

The same group of structure fires was reviewed to determine the time the second response unit arrived on the scene. According to the data the second unit arrived on scene within 7 minutes 25 seconds, 85 percent of the time, only 1 minute 26 seconds, 85 percent of the time after the first unit's arrival.

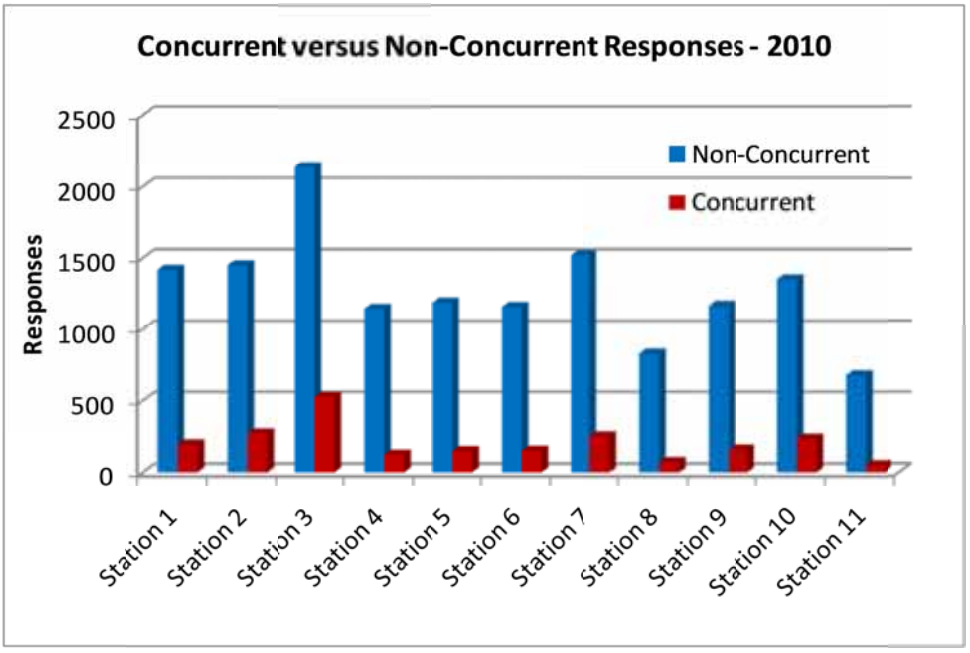
Call Concurrency, Reliability and Cancelled Responses

When evaluating the effectiveness of any resource deployment plan, it is necessary to evaluate the workload of the individual companies to determine to what extent their availability for dispatch is affecting the response time performance. In simplest terms, an engine company 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 calls happen within the same time frame on the same day in each station area. Calls during 2010, were examined to determine the percentage of times multiple calls occurred within a station's response area at one time. This is important because more calls occurring simultaneously can stretch available resources and extend response times by causing the community to rely on more distant responding apparatus.

Figure 66: Call Concurrency Rates



Note that in most cases station areas with the highest workload typically have the highest rate of concurrent calls. When the reliability of a station to respond within its prescribed territory is lower, response time performance for the back-up station/apparatus can also be negatively affected.

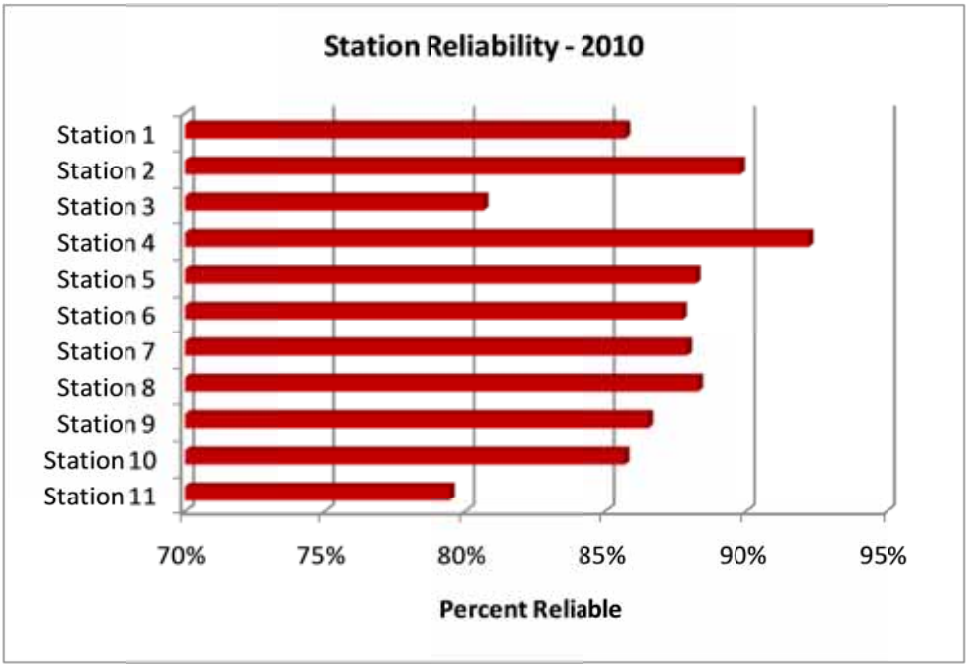
Reliability

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 done by measuring the number of times response unit(s) assigned to a given fire station in the City of Salem was available to respond to a request for service within that fire station's primary service area.

The following table illustrates the number of times the "home station" had a response unit available to respond to an incident in its primary service area.

Reliability ranges from a low of 79 percent to a high of 92 percent. Shorter travel times result as reliability increases.

Figure 67: Station Reliability Rates

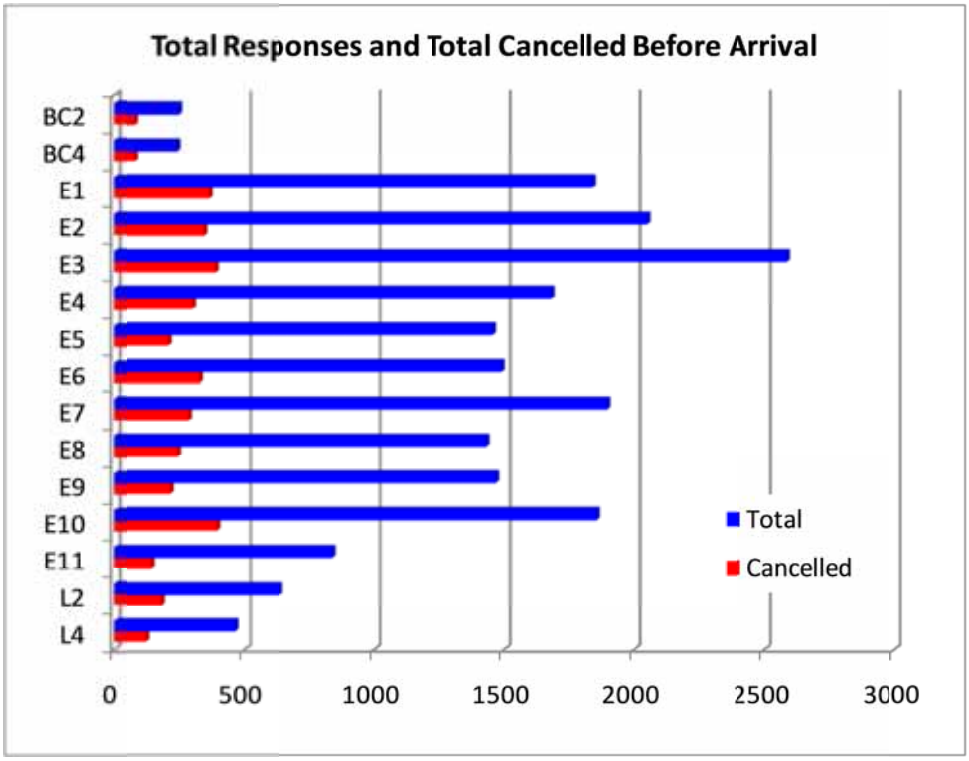


Cancelled Responses

Sometimes response units are cancelled prior to arrival at the incident. This can occur when the person reporting the emergency calls back to the dispatch center that no real emergency existed. More often it's when another response unit arrives and determines no additional response units are needed. While cancelled responses are unavoidable, minimizing them helps improve unit reliability. An unnecessary response makes the unit unavailable for a concurrent request for service.

Salem Fire Department units respond frequently to calls for service that end up as cancelled responses.

Figure 68: Unit Responses and the Number Cancelled Before Arrival



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 burn hotter (due to synthetics).

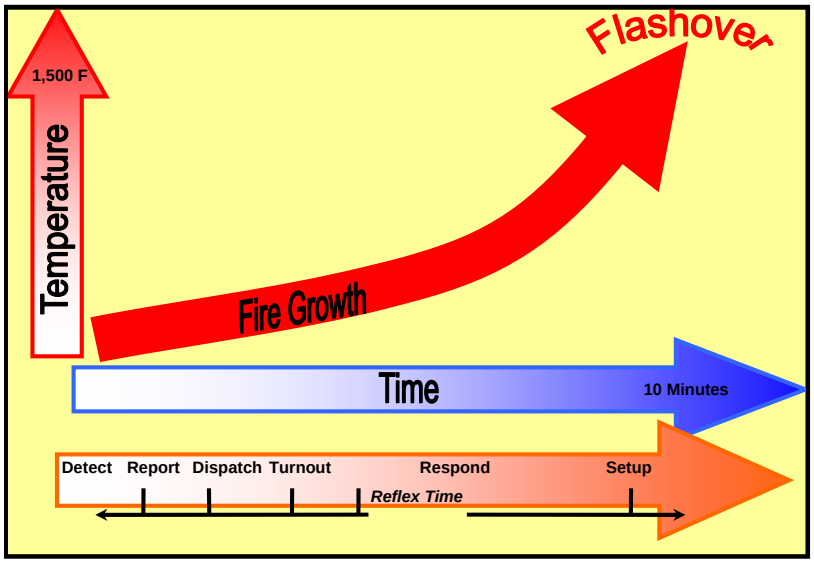
In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by

heat and smoke. Today, that estimate is as short as three minutes.[6] 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 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 69 illustrates the sequence of events.

Figure 69: Fire Growth vs. Reflex Time



[6] 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.

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 table, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 70: Fire Extension in Residential Structures

Consequence of Fire Extension In Residential Structures 2003 - 2007			
	Rates per 1,000 Fires		
Extension	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

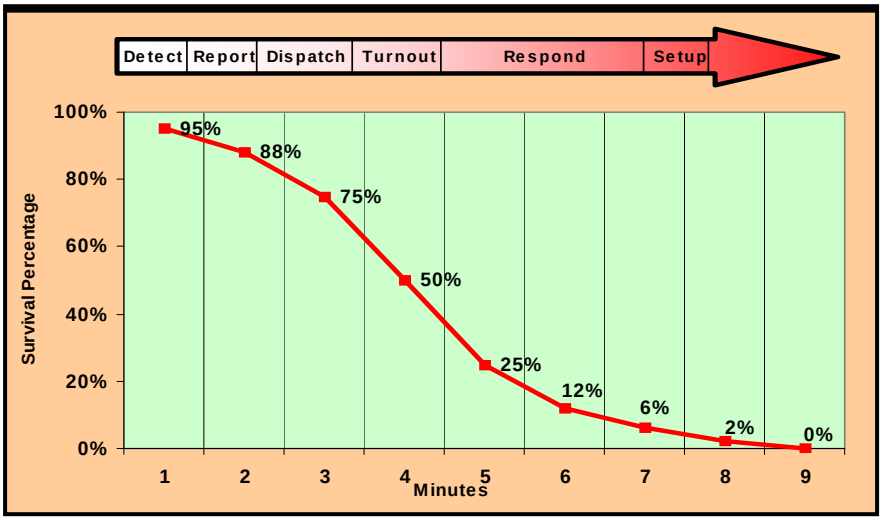
Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

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 71: 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.

Performance Statement and Goals

The following section describes the emergency response performance levels that are reasonable and achievable for the City of Salem. Where desired performance is not currently met, actual current performance is described.

A community's desired level of service is a uniquely individual decision. No two communities are exactly alike. Performance goals must be tailored to match community expectations, community conditions, and the ability to pay for the resources necessary to attain the desired level of service.

Levels of service and resource allocation decisions are the responsibility of the elected City Council. The policy making body must carefully balance the needs and expectations of its citizenry when deciding how much money to allocate to all of the services the city provides. For Salem this is further complicated by current economic conditions.

With this in mind, the following are recommended as the City of Salem fire and life safety response performance goals. These are not levels of service that must be achieved immediately but instead are targets for achievement when resources are available to do so. Later in this report are recommendations that will help to accomplish these goals.

Overall Performance Statement

Protecting lives, property, and the environment placing safety and service above all.

Call-Processing Performance Goal

In many areas of the country, call handling or call processing are not functions under direct control of the fire department. This is the case in Salem. SFD is provided communications and dispatch services by the Willamette Valley Communications Center, managed by the Salem Police Department (WVCC). The dispatch center is the primary Public Safety Answering Point and dispatch center for Salem fire and police, Rural Metro Ambulance, the Marion County Sheriff's Office, and the Polk County Sheriff's Office, along with several other fire agencies in Marion and Polk counties.

WVCC is managed by a communications manager, along with shift supervisors who are on duty with each shift in the center. The center uses cross-trained dispatcher/call-taker positions and dedicates at least one communications position to the dispatch function for fire and EMS.

WVCC has established the following performance objectives:

1. 9-1-1 calls will be answered within 12 second, 85 percent of the time.
2. Calls will be dispatched within 30 seconds, 85 percent of the time.

WVCC is meeting its dispatch time performance objective for the SFD 80 percent of the time.

Turnout Time Performance Goal

Turnout time is one area that the fire department has total control over and is not affected by outside influences. Turnout time, or the time between when the call is received by the response units (dispatched) and when the unit is actually en route to the scene (responding), can have dramatic effects on overall response times. Reducing this single response time component reduces total response time.

A national standard[7] recommends turnout time performance objectives of 80 seconds or less for structure fire response and 60 seconds or less for all other priority responses. SFD is meeting the turnout time objective for structure fires but not for other incidents. Given that turnout time is

[7] National Fire Protection Association *Standard 1710*.

one area in which field personnel can improve overall response time, an aggressive objective is recommended.

With this in mind, the following Turnout Time Performance Objective is recommended:

1. *For 85 percent of all priority responses, the Salem Fire Department will be en route to the incident in 60 seconds or less, regardless of incident risk type.*

Distribution Performance Statement (First-Due Unit Arrival)

A fire department's *distribution* is essentially the location of resources to assure an initial intervention within the specific time frame identified in the community's performance goals. The SFD's first due response performance provides the first unit on scene within 6 minutes 18 seconds, 85 percent of the time.

Improving the timeliness of first unit arrival will provide clear benefits. The following first due performance goal is recommended and is in accordance with the goal adopted by the Salem City Council.

1. *The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 5 minutes 30 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

Achieving this first due response goal will require a significant infusion of resources not currently available and/or expected in the near term.

Concentration Performance Goal

A fire department's *concentration* is the spacing of multiple resources close enough together so that an initial "Effective Response Force" (ERF) for a given risk can be assembled on the scene of an emergency within the specific time frame identified in the community's performance goals for that risk type. An initial effective response force is defined as that which will be most likely to stop the escalation of the emergency.

The ERF for moderate risk structure fires in Salem is identified as the arrival of at least three fire engines, one ladder truck, and one battalion chief (14 firefighters total). This initial ERF does not necessarily represent the entire alarm assignment, as additional units may be assigned based on long-term incident needs and risks. Additional engines, ladder truck, or other

specialty companies are assigned to higher risk responses in order to accomplish additional critical tasks that are necessary beyond the initial attack and containment.

Current performance provides this initial ERF within 12 minutes 22 seconds, 85 percent of the time. Improving the timeliness of the ERF response is very desirable given structure fire growth rates and the consequences of significant fires.

The following Concentration Performance Goal is recommended.

1. *For moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time.*

Component H – Overview of Compliance Methodology

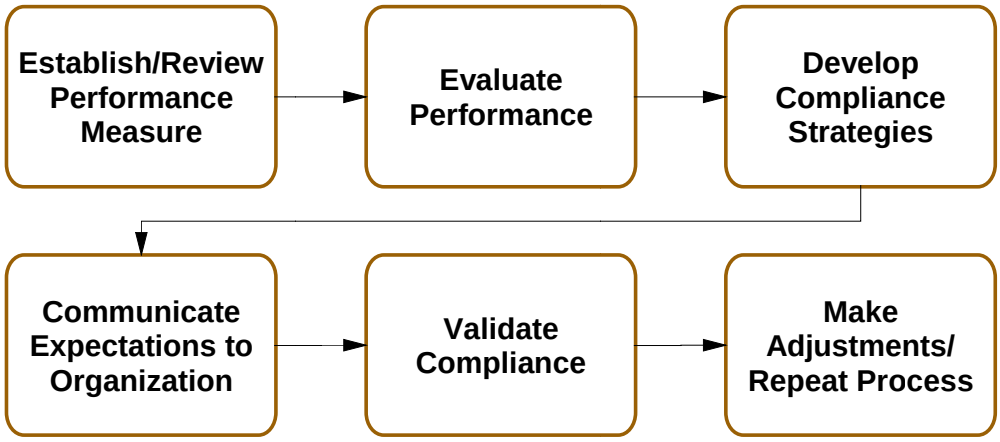
The preceding sections of this report provide a detailed analysis of the historical performance of the Salem Fire Department. In order for this analysis to prove beneficial to department and city policy makers, continued analysis should be performed on a routine basis. The data provided to the project team for analysis proved to be difficult to analyze from the standpoint of being consistent and complete. Future efforts to measure performance will also be hindered by these issues without significant improvement in the data collection process.

SFD is committed to a continual process of analyzing and evaluating actual performance against the adopted standards of cover and will enhance the data collection procedures of field operations personnel. Periodic review of the department's records management system reports will be necessary to ensure compliance and reliability of data.

Compliance Model

Compliance is best achieved through a systematic approach. Salem Fire Department has identified the following six-step compliance model.

Figure 72: Maintenance of Effort Compliance Model



Step 1: Establish/Review Performance Measures

Complete the initial Standards of Cover process. Conduct a full review of the performance measures every five years. This process is risk-based and evaluates whether:

- Services provided are identified
- Levels of service are defined
- Levels of risk are categorized
- Performance Objectives and Measures developed:
    - Distribution Measures
    - Concentration Measures

Step 2: Evaluate Performance

Performance measures are applied to actual services provided:

- System level
- First Due Area level
- Unit level

Step 3: Develop Compliance Strategies

Determine issues and opportunities:

- Determine what needs to be done to close identified gaps
- Determine if resources can or should be reallocated
- Seek alternative methods to provide service at desired levels
- Develop budget estimates as necessary
- Seek additional funding commitment as necessary

Step 4: Communicate Expectations to Organization and Stakeholders

Communicate expectations:

- Explain method of measuring compliance to personnel who are expected to perform the services
- Provide feedback mechanisms
- Define consequences of noncompliance

Train Personnel:

- Provide appropriate levels of training/direction for all affected personnel
- Communicate consequences of noncompliance

- Modify (remediate) internal processes, application systems, and technical infrastructure as necessary to comply

Step 5: Validate Compliance

Develop and deploy verification tools and/or techniques that can be used by divisions of the organization on an ongoing basis to verify that they are meeting the requirements:

- Monthly evaluation:
  - Performance by Unit
  - Overall Performance
  - Review of performance by Division
- Quarterly evaluation:
  - Performance by Unit
  - Performance by First Due
  - Overall Performance
  - Review of performance by Executive Management

Determine whether independent validation and verification techniques will be used to measure the performance, and solicit external assistance as necessary.

Step 6: Make Adjustments/Repeat Process

Review changes to ensure that service levels have been maintained or improved. Develop and implement a review program to ensure ongoing compliance:

- Annual Review and Evaluation
  - Performance by Unit
  - Performance by First Due
  - Overall Performance
  - Review of performance by Governing Body
  - Adjustment of performance standards by Governing Body as necessary
- Five-Year Update of Standards
  - Performance by Unit
  - Performance by First Due
  - Overall Performance
  - Adoption of performance measures by Governing Body

Establish management processes to deal with future changes in the SFD service area.

Component I – Overall Evaluation, Conclusions, and Recommendations

Overall Evaluation

The standards of cover process based on the *CFAI Standards of Cover 5th Edition* required the completion of an intensive analysis on all aspects of the SFD deployment policies. The analysis used various tools to review historical performance, evaluate risk, validate response coverage, and define critical tasking. 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 the department'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 a brief overview of the core services the organization provides based on general resource/asset capability and basic staffing complements. During the Review of Community Expectations and Performance Goals, it was determined that the community had high expectations of the department, felt generally positive about its services, and shared certain areas of concern particularly as it has to do with emergency medical services.

An overview of community risk was provided to form the basis for the department's development of mitigation plans. Geospatial characteristics, topographic and weather risks, transportation network risks, physical assets, and critical infrastructure were reviewed and developed into a hazard vulnerability assessment that identified medical incident non-structure fires, 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. Except for the past two years, population has increased. Service demand has increased over time.

Evaluating risk using advanced geographic information systems (GIS) provided an increased understanding of community risk factors, which can lead 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 risk structure fire. Critical tasking required a review of on-scene staffing capability 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 14 personnel, including command and assistants.

The Review of Historical System Performance evaluated each component of the emergency incident sequence. Total response time included a number of components such as call processing, turnout, and travel. Beyond the response time of the initial arriving units, the additional components of concentration and effective response force, reliability, call concurrency, and resource drawdown were evaluated.

Call processing time at 34 seconds, 85 percent of the time is excellent. Turnout time is good at within 64 seconds, 85 percent of the time. Decreasing nighttime turnout times is an opportunity to reduce overall incident time.

Travel times to actual incidents are currently within 5 minutes 8 seconds, 85 percent of the time. Distance from existing fire stations is not the issue impeding performance. Other factors are in play, keeping response units from providing timely response such as unit availability, traffic, and units being away from their home areas.

Travel time modeling was conducted, using computer modeling, to evaluate engine and truck responses using four minutes as the maximum travel time for the first arriving engine. The modeling indicated that the station locations regularly staffed provide coverage of 91.9 percent of requests for service within a four-minute travel time.

Overall response time (received to arrival) at the 85th percentile is within 6 minutes 43 seconds, 85 percent of the time. This exceeds the department's performance goal of within 5 minutes 30 seconds, 85 percent of the time.

Concentration is measured by the ability of the department to assemble a certain number of apparatus and personnel within a pre-determined amount of time. Historical data indicate that

the department has been able to assemble three engines, one ladder truck, and one battalion chief (14 firefighters) within 12 minutes 22 seconds, 85 percent of the time.

Historical reliability is defined as the probability that the required amount of staffing and apparatus will be available when an emergency call is received. Analysis indicates that as calls for service increase, overlapping calls become increasingly frequent. The SFD is already experiencing numerous concurrent responses.

Recommendations

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

1. Improve service delivery with no or minimal expenditure of funds.
2. Identify service level improvement opportunities that can be implemented as funding becomes available.

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

Performance Improvement Goal A

Improve turnout times so that initiation of response occurs within 1 minute 30 seconds from time of dispatch, 85 percent of the time.

National guidance sets a target of within 60 seconds or less, 90 percent of the time to initiate response (turnout time). This is the time period between when dispatchers notify response personnel of the incident and when response crews begin travel towards the location. SFD's current turnout time performance is 52 seconds longer.

The SFD should explore opportunities to shorten turnout times. This could include station layout modifications, training, and others.

Response personnel performance must also be addressed. Fire department management should regularly prepare information indicating current performance by response crews. Performance expectations should be reinforced and periodic monitoring conducted to determine if improvements are being made and sustained. Response personnel must make serious efforts to improve their turnout time performance for the benefit of the community.

Performance Improvement Goal B

Reduce incident travel time

There are several opportunities to improve travel times, the longest phase of the overall response continuum. Implementation will not be easy but should be given strong consideration as a service delivery improvement opportunity.

Responses Cancelled En Route

Salem Fire Department response units experience an high number of responses that are cancelled prior to the response unit's arrival. While some level of cancelled responses is expected, the number experienced by SFD is contributing to reduced unit reliability.

Once a response unit is assigned to an incident it is not available for a subsequent request for service. If the first incident results in a cancelled response, the second incident experiences a longer than necessary travel time from a more distant station.

A complete review of cancelled response history should be undertaken to determine if the number of cancelled responses can be reduced.

Closest Unit Dispatch Technology

Many departments across the country have implemented technology that ensures the closest available response unit is sent to an emergency. This technology incorporates global positioning systems on fire apparatus linked to the dispatch center's computer-aided dispatch system. When a call is received at the dispatch center, the incident's location is instantly compared to the actual location of every available response unit. Travel times are computer calculated and the closest unit selected for dispatch. Implementation of this system requires:

- Dispatch center computer software capable of this function.
- Street information for use in the system that includes data points required to conduct "closest unit analysis".
- Global positioning equipment installed on fire apparatus (SFD has already installed this equipment).

Communities that have implemented this technology have realized significant improvements in response times and emergency event outcomes. Shift commanders are able to better

redistribute response resources to ensure effective city-wide response coverage. The Salem Fire Department is working to implement this technology.

Performance Improvement Goal C

Plan for future fire station locations to accommodate the city's growth and development.

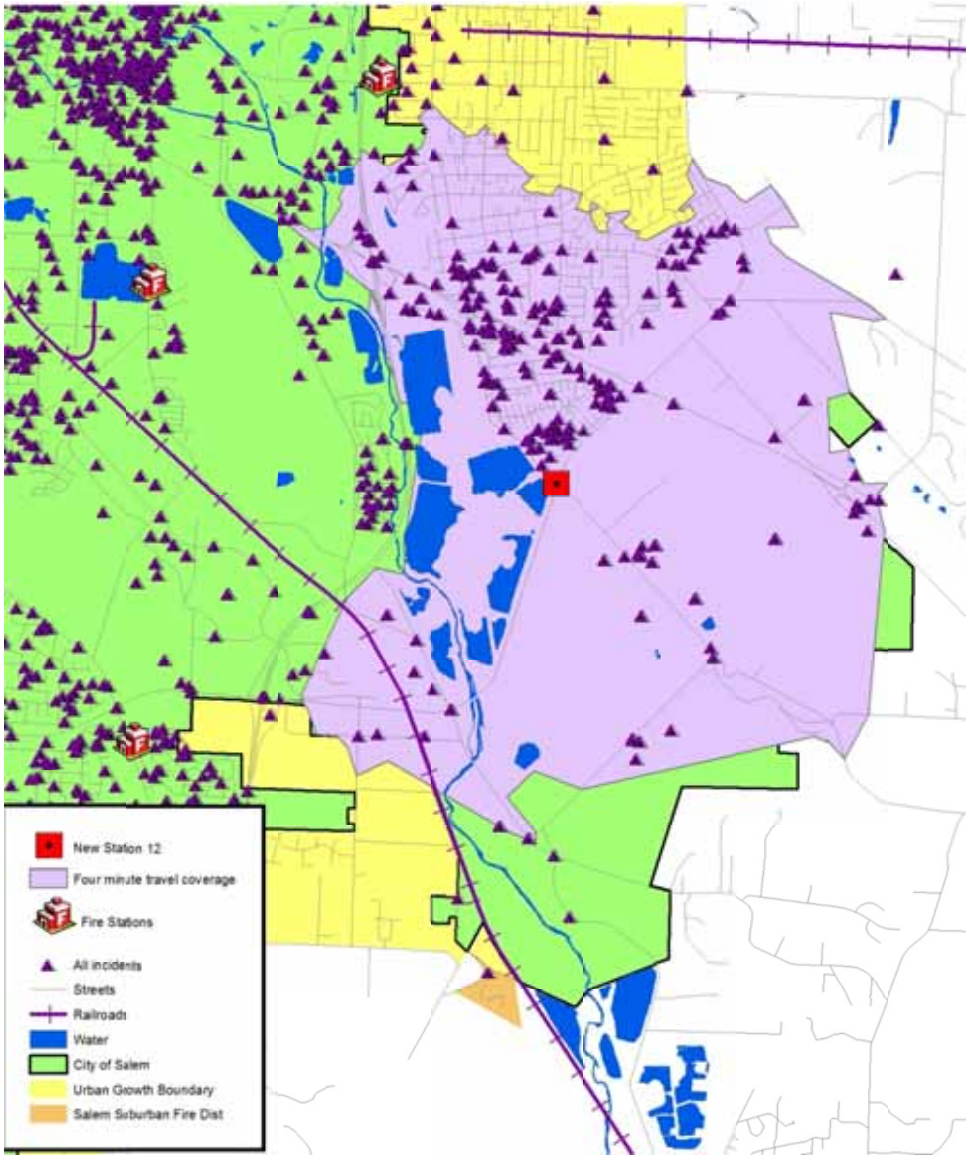
As noted in previous sections, response workload will continue to increase within the current service area boundaries. To compound the issue, the city's boundaries are intended to change in the coming years. This will increase the geographic size of the fire department's service area and the number of people it serves. This will also mean an increase in response workload.

SFD has recently built and opened two new fire stations, Station 10 and Station 11. These additions provided significant improvement to response coverage in both the West Salem area and east Salem. With the addition of Station 10, the SFD is well positioned to serve urban growth area along the city's eastern boundary. However, two other areas deserve consideration for new fire stations at some point in the future.

Fire Station 12

The Mill Creek Employment Center (north and south of Aumsville Highway east of Cordon Rd.) is a cooperative venture between the City of Salem and the State of Oregon. This area is slated for significant industrial development, including warehousing, manufacturing, and miscellaneous supporting uses. Infrastructure to support this level of development is largely in place and the land is being actively marketed to prospective developers. Surrounding the Mill Creek area is a significant inventory of vacant land zoned for residential and commercial use.

The following map shows the proposed location for the Cordon Road/Aumsville Highway station (Station 12), adjacent stations, incident locations during 2010 and four-minute travel coverage from the proposed location.



During 2006 there were 947 incidents within the Station 12 coverage area. The number of responses by type is shown in the following table.

Figure 73: Incidents by Type – Station 12 Area

Incident Type	2010
Emergency medical	678
Structure fire	9
Other fire	19
Other incident	241
Total	**947**

Response time performance to priority incidents was calculated and is shown in the following table. Responses times are significantly longer than the City Council defined response time goal

Figure 74: Response Time by Incident Type – Station 12 Area

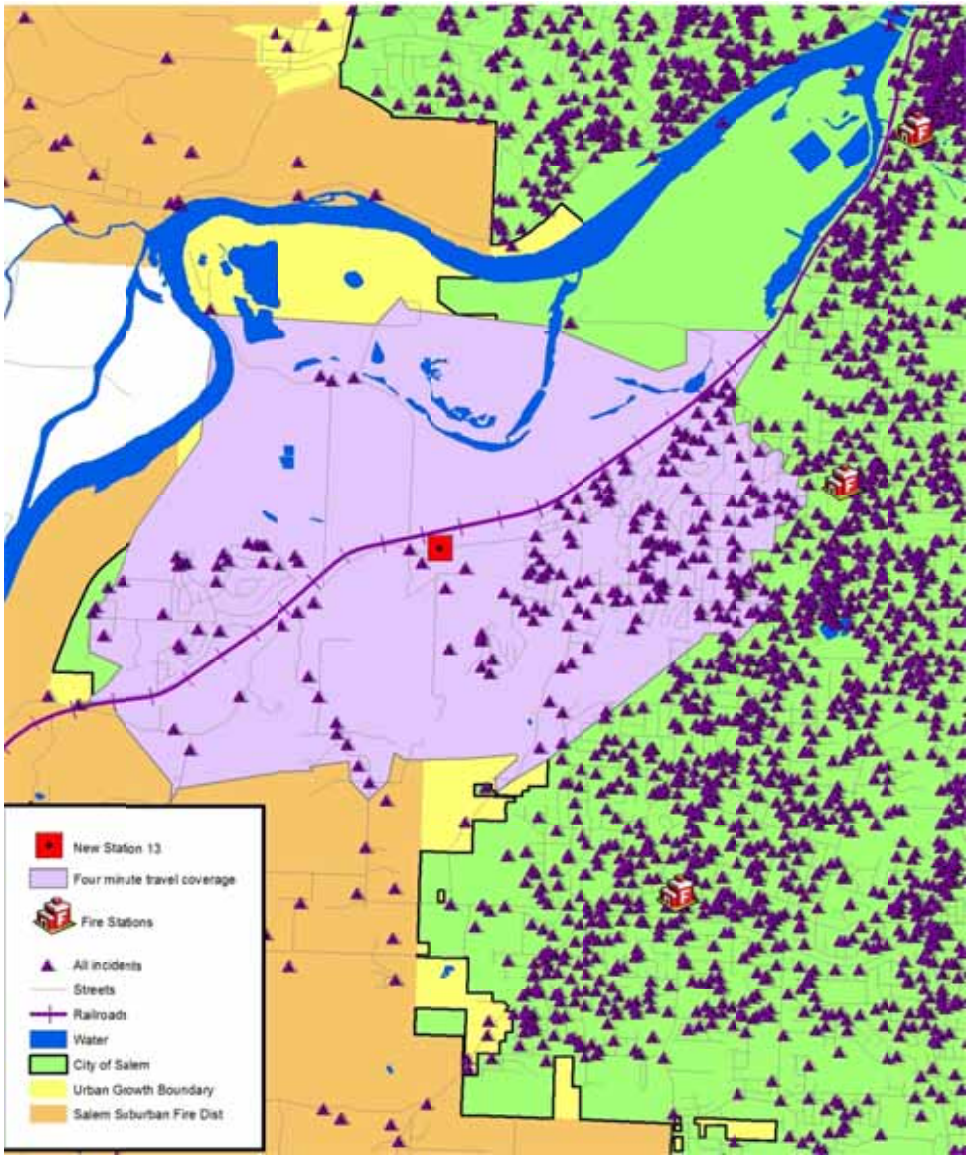
Incident Type	Response Time at 85th percentile	Percentage of Incidents Meeting Council Goal
Emergency medical	8 min 45 sec	35%
Structure fire	9 min 55 sec	8%

The exact scope and scale of ultimate development is not certain nor is the expected service population easily defined. Three properties have developed in this area the past couple of years. Sanyo constructed and is operating a silicone slug manufacturing facility, FedEx has built a freight facility, and Home Depot constructed a 500,000-square foot distribution center. The specific development that occurs in the future will determine the nature and number of emergency responses. However, it is reasonable to anticipate that future workload will increase significantly.

Predictable response increases, combined with this location's ability to provide second due support to the Fire Station 6, 9, and 10 response areas, will make this station and response company a valuable addition to the SFD deployment system.

Fire Station 13

The following map shows the proposed location for the River Road/Homestead Road station (Station 13), adjacent stations, incident locations during 2010, and the four-minute travel coverage area for Station 13.



The population within the station's service area is approximately 1,762, based on the 2000 Census. Responses during 2010 within the River Road station service area are summarized below.

Figure 75: Incidents by Type – Station 13 Area

Incident Type	2010
Emergency medical	173
Structure fire	4
Other fire	2
Other incident	88
Total	**267**

Emergency incident response times to this area rarely meet the Council's response time goal. The table below summarizes response time for priority incidents for 2010.

Figure 76: Response Time by Incident Type – Station 13 Area

Incident Type	Response Time at 85th Percentile	Percentage of Incidents Meeting Council Goal
Emergency medical	**8 min 54 sec**	**49%**
Structure fire	**7 min 48 sec**	**13%**

Response activity and workload is closely tied to population. South Salem is expected to experience significant development activity and corresponding population growth in the coming years. Some of this development will occur within the River Road station "first-due" service area.

The development potential within the station's service area is shown in the following table. The area's zoning is a mix of rural/agricultural (RA), single-family residential (RS), and public amusement (PA).

Figure 77: Land Inventory – Station 13 Area

Land Type	Acres
Total acreage within station service area	3,200
Less: Acreage within designated flood area	1,342
Less: Area zoned as Public Amusement	218
Less: 50% of area with slopes in excess of 25%[8]	113
Less: Street right-of-way	174
Less: Land already developed	329
Net Developable Land	**1,024**

Potential development density and how population growth would affect emergency response workload are shown in the next table. The analysis assumes all 1,024 developable acres would be developed at the densities listed.

[8] Only a portion of land with slopes greater than 25% will be developable. It is assumed that 50% could be developed through re-grading and retention

Figure 78: Development Potential – Station 13 Area

Units per acre	Potential dwelling units	New population at 2.5 persons per household	Existing population	Total population	Total potential responses
5	5,120	12,800	1,762	14,562	1,238
4	4,096	10,240	1,762	12,002	1,020
3	3,072	7,680	1,762	9,442	803
2	2,048	5,120	1,762	6,882	585

It's very unlikely that development densities of five units per acre would be achieved given slope and other constraints. A more reasonable assumption is three units per acre.

Total response activity at three units per acre is estimated at 803 incidents per year. This quantity of responses, by itself, would not justify the addition of a fire station, staffing, and other associated costs. However, response times will not improve unless response resources are located more closely to the area.

The pace at which development of this area will occur cannot be accurately predicted. A variety of influences, such as the overall health of the economy, will impact growth. The population growth projection used for the Salem Transportation System Master Plan for south Salem is 58 percent between the years 1993 and 2015, and 40 percent for the city as a whole. Applying the 58 percent figure to the existing figures projects that population within the Station 13 area will increase to 2,784 by the year 2015. Response activity for this population is forecast to be 237 incidents.

In conclusion, it's unlikely that response workload created by future development will drive the addition of the River Road station. Addressing the currently existing response time problem will be the primary motivation for a future investment in fire station facility, apparatus, and the ongoing cost of staffing.

Component J – Appendices, Exhibits, and Attachments

Appendix A – Hazard Vulnerability Analysis

STRUCTURE FIRES

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Moderate Risk Urban	1	3	2	3	1	1	1	**20%**
High Risk Urban	1	3	3	3	1	1	1	**22%**
Moderate Risk Suburban	2	3	2	2	1	1	1	**37%**
High Risk Suburban	1	3	2	2	1	1	1	**19%**
Moderate Risk Rural	2	3	3	2	1	2	2	**48%**
High Risk Rural	0	0	0	0	0	0	0	**0%**
Low Risk Rural	1	3	2	1	1	2	2	**20%**
AVERAGE SCORE	**1.14**	**2.57**	**2.00**	**1.86**	**0.86**	**1.14**	**1.14**	**20%**

NON-STRUCTURE FIRES

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk Urban	1	1	1	1	1	1	1	**11%**
Moderate Risk Urban	1	1	1	1	1	1	1	**11%**
Low Risk Urban	1	1	1	1	1	1	1	**11%**
Urban/Wildland Interface	1	1	1	1	1	1	1	**11%**
AVERAGE SCORE	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**11%**

EMS-MEDICAL ASSISTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk	1	3	0	0	1	1	1	**11%**
Moderate Risk	2	2	1	1	2	1	1	**30%**
Low Risk	3	1	0	0	1	1	1	**22%**

RESCUE

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Rescue - MVA	3	3	1	0	1	1	1	**39%**
Rescue - Structural Collapse	1	3	3	3	1	1	1	**22%**
Rescue - Trench	1	3	1	1	1	1	1	**15%**
Rescue - Low/High Angle	1	3	1	1	1	1	1	**15%**
Rescue - Confined Space	1	3	1	1	1	1	1	**15%**
Rescue - Swiftwater	2	3	0	0	1	1	1	**22%**
Rescue - Stillwater	2	3	0	0	1	1	1	**22%**
Rescue - Ice	0	0	0	0	0	0	0	**0%**
Rescue - Other	1	2	0	0	2	2	2	**15%**
AVERAGE	**1.33**	**2.56**	**0.78**	**0.67**	**1.00**	**1.00**	**1.00**	**17%**

HAZARDOUS MATERIALS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk Hazmat - Urban	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Urban	2	2	2	2	1	1	1	**33%**
Low Risk Hazmat - Urban	2	2	2	2	1	1	1	**33%**
High Risk Hazmat - Suburban	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Suburban	2	2	2	2	1	1	1	**33%**
Low Risk Hazmat - Suburban	2	1	1	1	1	1	1	**22%**
High Risk Hazmat - Rural	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Rural	1	2	2	2	1	1	1	**17%**
Low Risk Hazmat - Rural	1	1	1	0	1	1	1	**9%**
AVERAGE	**1.44**	**2.11**	**2.11**	**2.00**	**1.00**	**1.00**	**1.00**	**25%**

NATURALLY OCCURRING EVENTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Hurricane	0	0	0	0	0	0	0	**0%**
Tornado	1	1	2	2	2	2	2	**20%**
Severe Thunderstorm	2	1	1	1	2	2	2	**33%**
Snow Fall	1	1	1	1	2	2	2	**17%**
Blizzard	1	1	1	1	2	2	2	**17%**
Ice Storm	1	1	1	1	2	2	2	**17%**
Earthquake	2	2	2	2	2	2	2	**44%**
Tidal Wave	0	0	0	0	0	0	0	**0%**
Temperature Extremes	1	1	1	1	2	2	2	**17%**
Drought	1	1	1	1	2	2	2	**17%**
Flood, External	2	1	2	2	2	2	2	**41%**
Wild Fire	1	1	1	1	2	2	2	**17%**
Landslide	1	1	1	1	2	2	2	**17%**
Dam Inundation	1	1	1	1	2	2	2	**17%**
Volcano	1	1	1	1	2	2	2	**17%**
Epidemic	1	2	0	2	2	2	2	**19%**
AVERAGE SCORE	**1.06**	**1.00**	**1.00**	**1.13**	**1.75**	**1.75**	**1.75**	**16%**

TECHNOLOGIC EVENTS

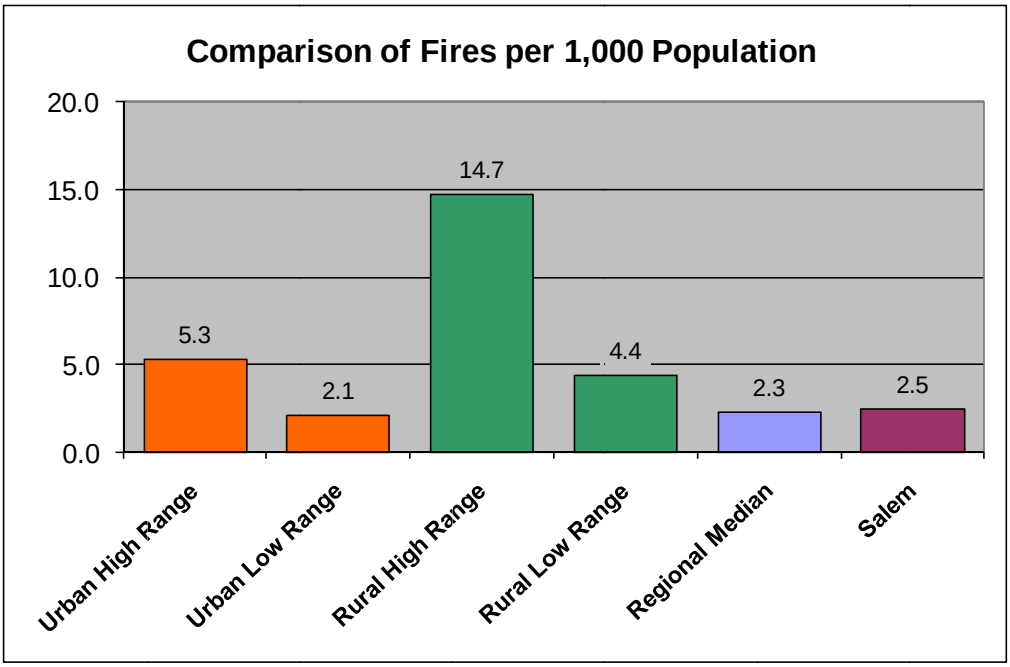
EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Electrical Failure	1	1	1	1	2	2	2	**17%**
Generator Failure	1	1	1	1	2	2	2	**17%**
Transportation Failure	1	1	1	1	2	2	2	**17%**
Fuel Shortage	1	1	1	1	2	2	2	**17%**
Natural Gas Failure	1	1	1	1	2	2	2	**17%**
Water Failure	1	1	1	1	2	2	2	**17%**
Sewer Failure	1	1	1	1	2	2	2	**17%**
Steam Failure	1	1	1	2	2	2	2	**19%**
Fire Alarm Failure	1	1	1	1	2	2	2	**17%**
Communications Failure	1	1	1	1	2	2	2	**17%**
Medical Gas Failure	1	1	1	1	2	2	2	**17%**
Medical Vacuum Failure	1	1	1	1	2	2	2	**17%**
HVAC Failure	1	1	1	1	2	2	2	**17%**
Information Systems Failure	1	1	1	1	2	2	2	**17%**
Fire, Internal	1	1	1	1	2	2	2	**17%**
Flood, Internal	1	1	1	1	2	2	2	**17%**
Hazmat Exposure, Internal	1	1	1	1	2	2	2	**17%**
Supply Shortage	1	1	1	1	2	2	2	**17%**
Structural Damage	1	1	1	1	2	2	2	**17%**
AVERAGE SCORE	**1.00**	**1.00**	**1.00**	**1.05**	**2.00**	**2.00**	**2.00**	**17%**

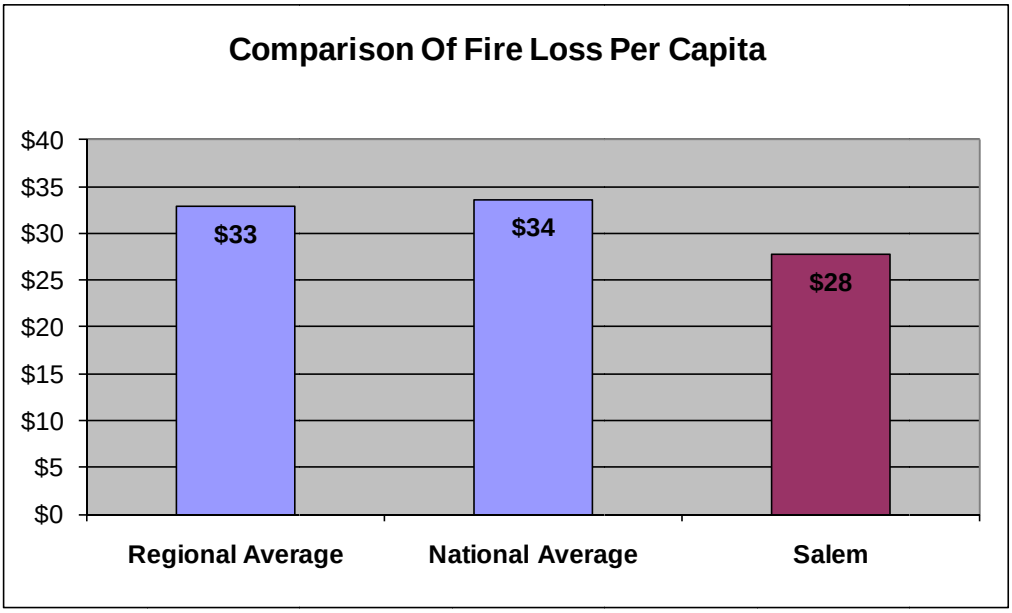
HUMAN RELATED EVENTS

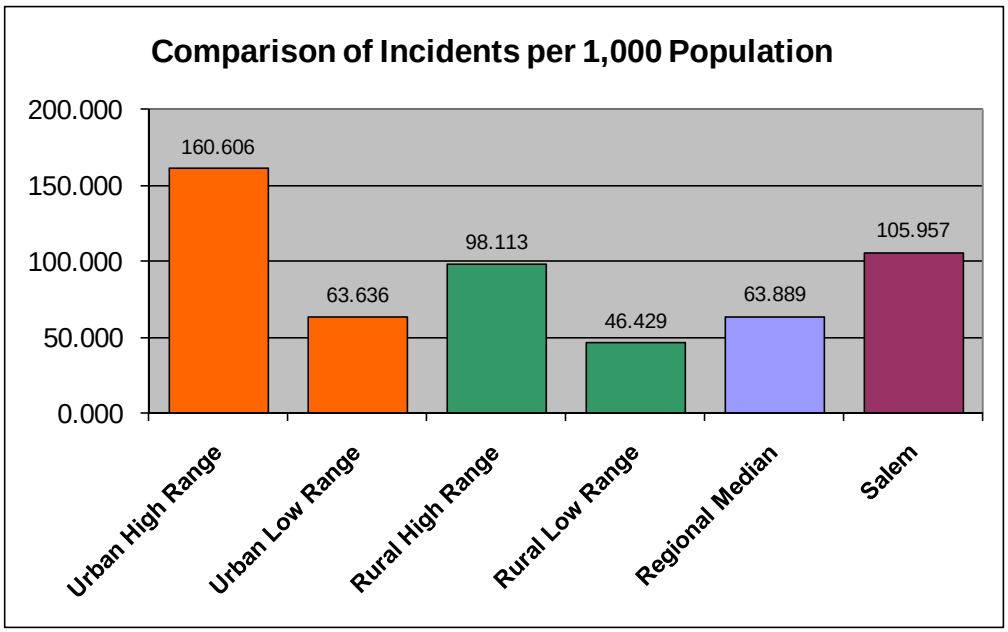
EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Mass Casualty Incident (trauma)	1	3	3	3	1	1	1	**22%**
Mass Casualty Incident (medical/infectious)	1	2	1	2	1	1	1	**15%**
Terrorism	1	3	3	3	2	2	2	**28%**
VIP Situation	1	1	1	1	2	2	2	**17%**
Infant Abduction	1	1	1	1	2	2	2	**17%**
Hostage Situation	1	3	1	1	2	2	2	**20%**
Civil Disturbance	1	1	2	2	2	2	2	**20%**
Labor Action	1	1	2	1	2	2	2	**19%**
Forensic Admission	1	1	1	1	2	2	2	**17%**
Bomb Threat	1	1	1	1	2	2	2	**17%**
AVERAGE	**1.00**	**1.70**	**1.60**	**1.60**	**1.80**	**1.80**	**1.80**	**19%**

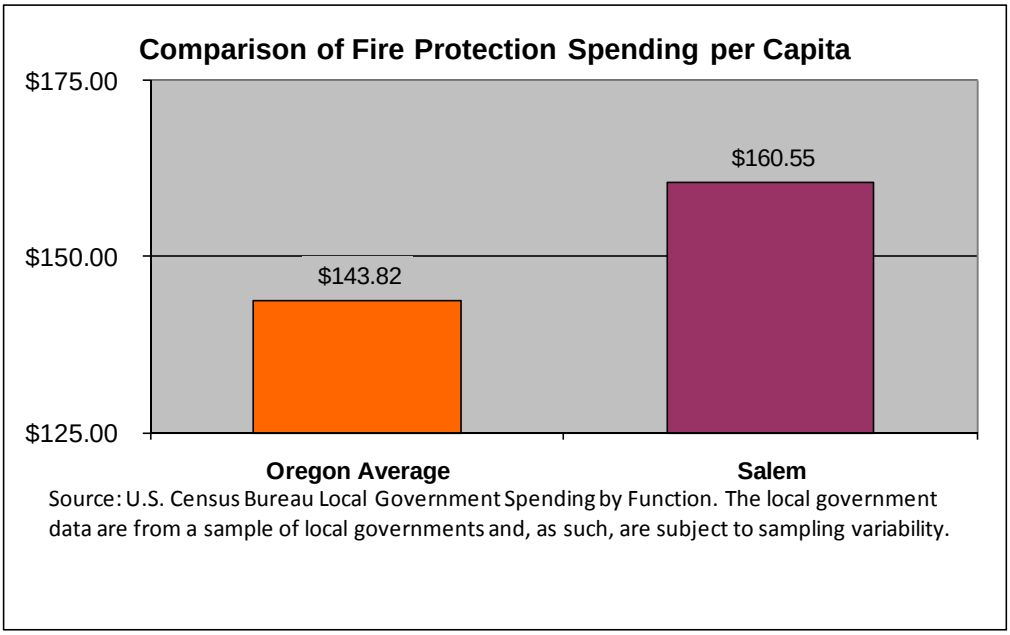
Appendix B – Salem Fire Department Compared to Others

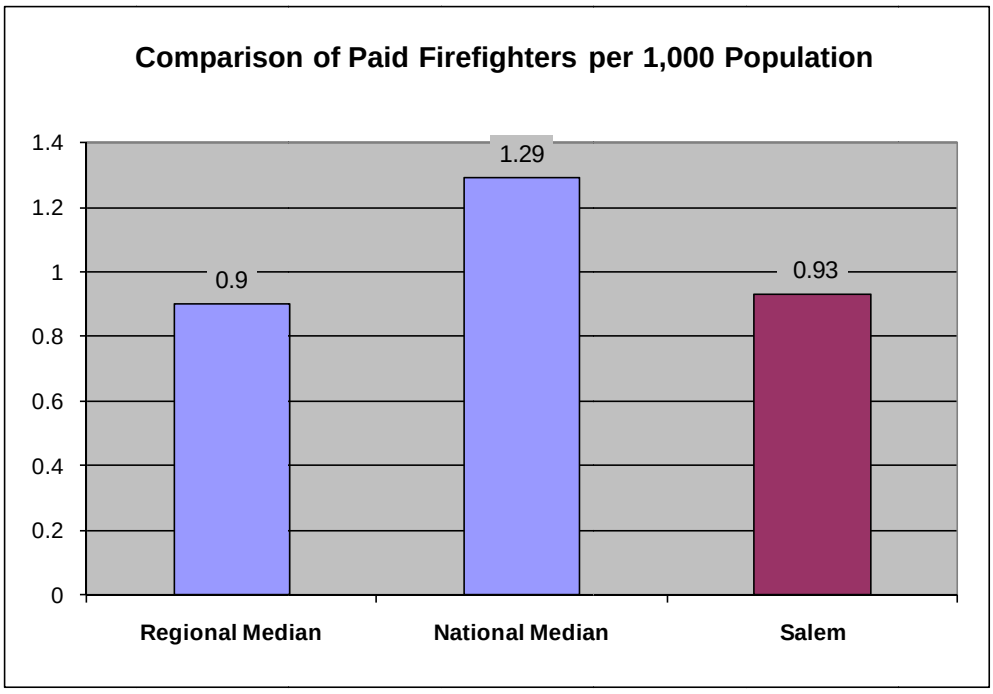
The following charts provide a comparison of the Salem Fire Department to other similar fire service agencies. Comparable information is derived from several sources including the National Fire Protection Association and the U. S. Census Bureau.

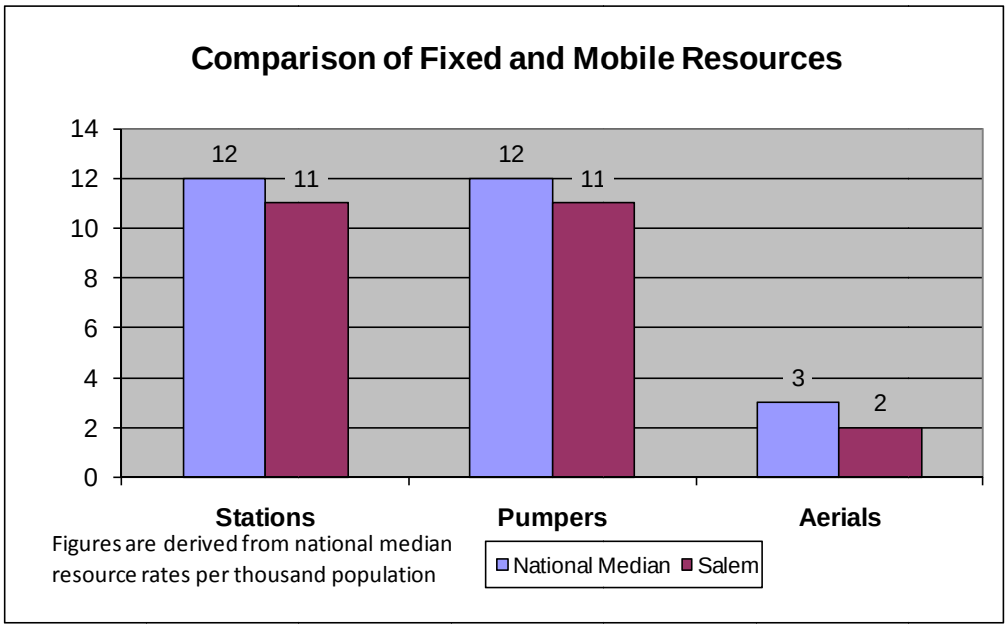





Comparison of Incidents per 1,000 Population
200.000
150.000
100.000
50.000
0.000
160.606
63.636
98.113
46.429
63.889
105.957
Urban High Range
Urban Low Range
Rural High Range
Rural Low Range
Regional Median
Salem


Comparison of Fire Protection Spending per Capita
$175.00
$150.00
$125.00
$143.82
$160.55
Oregon Average
Salem
Source: U.S. Census Bureau Local Government Spending by Function. The local government data are from a sample of local governments and, as such, are subject to sampling variability.


Comparison of Paid Firefighters per 1,000 Population
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.9
1.29
0.93
Regional Median
National Median
Salem


Comparison of Fixed and Mobile Resources
14
12
10
8
6
4
2
0
12
11
12
11
3
2
Stations
Pumpers
Aerials
Figures are derived from national median resource rates per thousand population
National Median
Salem

Appendix C – Fire Station Descriptions

Salem Fire Department Station 1
370 Trade Street SE

Built in 1971, this two-story 12,204 square foot headquarters fire station consists of eight drive-through bays. This fire station has recently been completely remodeled and is located in the downtown core. This building is located on the City Hall property.

Design:	Modern fire station with above average amenities for staff and operations.
Construction:	Type I, cast in place concrete construction with a flat built up membrane roof reported to be in good condition. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 2
875 Madison Street SE

Built in 1977, this single story, 6,378 square foot fire station consists of four drive four drive-through and one back in apparatus bay. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with modified gable roof and composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 3
1884 Lansing Avenue NE

Built in 1970, this single story, 4,887 square foot fire station consists of four drive-through apparatus bays. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, wood framed construction with a gable roof that has composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 4
200 Alice Street SE

Built in 1974, this single story, 6778 square foot fire station consists of four drive-through and one back in double deep apparatus bay. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with modified gable roof and composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for heat and smoke.
Environment:	No issues noted.
Code Compliance:	One room that is being used as a bedroom doesn't have a secondary means of egress. This room was added on during a building remodel in 1996. This issue will be addressed during the 2011/2012 budget year.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 5
1520 Glen Creek Road NW

Built in 2008, this single story 10,481 square foot fire station consists of eight drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 6
2740 25th Street SE

Built in 1966, this single story, 4087 square foot fire station consists of three drive-through apparatus bays. This fire station is located on the grounds of the Salem Airport and is an industrial area. This location also houses the Training and EMS divisions in a adjoining building along with the Fire Training Tower. This fire station has recently been completely remodeled.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, masonary block construction, flat roof with built up membrane. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 7
5021 Liberty Road S

Built in 2008, this single story 10,481 square foot fire station consists of eight drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 8
4000 Lancaster Drive NE

Built in 1977, this single story, 10,289 square foot fire station consists of four drive-through apparatus bays. Salem Fire Department occupies 1,585 square feet of space and shares another 1,282 square feet of living space. This building is home to two different fire engines from different fire departments and the main home of the fire protection program of the local community college.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with a flat roof with a built up membrane.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 9
5080 Battlecreek Road SE

Built in 1982, this two-story, 4,000 square foot fire station consists of three back in apparatus bays. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type V, wood framed with gable roof and composition shingles. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 10
3611 State Street

Built in 2008, this single story 10481 square foot fire station consists of eight drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 11
1970 Orchard Heights Road NW

Built in 2008, this single story 10,481 square foot fire station consists of eight drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Appendix D – Response Performance by Unit and Shift

The following is an analysis of response performance by unit and shift for all priority responses during 2010. This is useful to review both actual achievement of response objectives and to evaluate individual crew performance.

	Reaction Time 85th Percentile in Seconds	Average Reaction Time	Drive Time 85th Percentile	
E1				
	A Shift	**96.5**	**64.56**	**4 m, 12 s**
	60 Seconds or below	51.61%		
	Over 60 Seconds	48.39%		
	B Shift	**110**	**75.79**	**4 m, 55 s**
	60 Seconds or below	27.17%		
	Over 60 Seconds	72.83%		
	C Shift	**125.5**	**86.74**	**4 m, 30 s**
	60 Seconds or below	26.51%		
	Over 60 Seconds	73.49%		
E2				
	A Shift	**91**	**54.87**	**4 m, 16 s**
	60 Seconds or below	67.02%		
	Over 60 Seconds	32.98%		
	B Shift	**90.5**	**53.21**	**5 m, 12 s**
	60 Seconds or below	64.30%		
	Over 60 Seconds	35.70%		
	C Shift	**103**	**59.70**	**4 m, 57 s**
	60 Seconds or below	61.76%		
	Over 60 Seconds	38.24%		
E3				
	A Shift	**91**	**61.11**	**4 m, 49 s**
	60 Seconds or below	53.72%		
	Over 60 Seconds	46.28%		
	B Shift	**96.5**	**60.13**	**4 m, 43 s**
	60 Seconds or below	59.66%		
	Over 60 Seconds	40.34%		
	C Shift	**82**	**53.00**	**4 m, 48 s**
	60 Seconds or below	66.67%		
	Over 60 Seconds	33.33%		

	Reaction Time 85th Percentile in Seconds	Average Reaction Time	Drive Time 85th Percentile	
E4				
	A Shift	**104.5**	**66.87**	**5 m, 45 s**
	60 Seconds or below	52.60%		
	Over 60 Seconds	47.40%		
	B Shift	**96.5**	**64.04**	**5 m, 38 s**
	60 Seconds or below	51.45%		
	Over 60 Seconds	48.55%		
	C Shift	**94.5**	**61.85**	**5 m, 7 s**
	60 Seconds or below	57.59%		
	Over 60 Seconds	42.41%		
E5				
	A Shift	**81**	**52.43**	**5 m, 14 s**
	60 Seconds or below	66.55%		
	Over 60 Seconds	33.45%		
	B Shift	**105**	**65.70**	**5 m, 30 s**
	60 Seconds or below	52.52%		
	Over 60 Seconds	47.48%		
	C Shift	**105.5**	**63.70**	**5 m, 9 s**
	60 Seconds or below	55.84%		
	Over 60 Seconds	44.16%		
E6				
	A Shift	**116.5**	**70.79**	**5 m, 53 s**
	60 Seconds or below	47.66%		
	Over 60 Seconds	52.34%		
	B Shift	**105.5**	**74.08**	**4 m, 56 s**
	60 Seconds or below	35.83%		
	Over 60 Seconds	64.17%		
	C Shift	**99.5**	**71.34**	**5 m, 26 s**
	60 Seconds or below	36.44%		
	Over 60 Seconds	63.56%		

	Reaction Time 85th Percentile in Seconds	Average Reaction Time	Drive Time 85th Percentile	
E7				
	A Shift	**106**	**70.65**	**5 m, 11 s**
	60 Seconds or below	41.40%		
	Over 60 Seconds	58.60%		
	B Shift	**93**	**56.75**	**6 m, 3 s**
	60 Seconds or below	61.01%		
	Over 60 Seconds	38.99%		
	C Shift	**116**	**77.41**	**5 m, 41 s**
	60 Seconds or below	37.10%		
	Over 60 Seconds	62.90%		
E8				
	A Shift	**84**	**50.67**	**6 m, 7 s**
	60 Seconds or below	68.14%		
	Over 60 Seconds	31.86%		
	B Shift	**96**	**65.74**	**5 m, 35 s**
	60 Seconds or below	51.57%		
	Over 60 Seconds	48.43%		
	C Shift	**105**	**66.69**	**6 m, 6 s**
	60 Seconds or below	52.94%		
	Over 60 Seconds	47.06%		
E9				
	A Shift	**102**	**67.59**	**6 m, 47 s**
	60 Seconds or below	47.59%		
	Over 60 Seconds	52.41%		
	B Shift	**106.5**	**69.08**	**6 m, 9 s**
	60 Seconds or below	48.10%		
	Over 60 Seconds	51.90%		
	C Shift	**101.5**	**66.85**	**6 m, 32 s**
	60 Seconds or below	47.86%		
	Over 60 Seconds	52.14%		

	Reaction Time 85th Percentile in Seconds	Average Reaction Time	Drive Time 85th Percentile	
E10				
	A Shift	**83**	**54.06**	**5 m, 60 s**
	60 Seconds or below	64.63%		
	Over 60 Seconds	35.37%		
	B Shift	**106**	**70.01**	**5 m, 34 s**
	60 Seconds or below	46.46%		
	Over 60 Seconds	53.54%		
	C Shift	**116.5**	**77.48**	**6 m, 17 s**
	60 Seconds or below	37.12%		
	Over 60 Seconds	62.88%		
E11				
	A Shift	**92.5**	**59.31**	**5 m, 57 s**
	60 Seconds or below	52.15%		
	Over 60 Seconds	47.85%		
	B Shift	**104**	**62.98**	**6 m, 23 s**
	60 Seconds or below	57.14%		
	Over 60 Seconds	42.86%		
	C Shift	**76.5**	**50.21**	**5 m, 47 s**
	60 Seconds or below	70.95%		
	Over 60 Seconds	29.05%		
L2				
	A Shift	**93.5**	**68.11**	**6 m, 28 s**
	60 Seconds or below	46.59%		
	Over 60 Seconds	53.41%		
	B Shift	**90**	**55.10**	**7 m, 23 s**
	60 Seconds or below	51.90%		
	Over 60 Seconds	48.10%		
	C Shift	**121.5**	**75.03**	**9 m, 10 s**
	60 Seconds or below	35.62%		
	Over 60 Seconds	64.38%		

	Reaction Time 85th Percentile in Seconds	Average Reaction Time	Drive Time 85th Percentile	
L4				
	A Shift	**111**	**77.98**	**8 m, 41 s**
	60 Seconds or below	32.08%		
	Over 60 Seconds	67.92%		
	B Shift	**107.5**	**76.18**	**8 m, 27 s**
	60 Seconds or below	30.77%		
	Over 60 Seconds	69.23%		
	C Shift	**124.5**	**77.48**	**6 m, 54 s**
	60 Seconds or below	36.54%		
	Over 60 Seconds	63.46%		

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