

**EVALUATING REDUCED SERVICE LEVELS AS A RESULT
OF
BUDGET REDUCTIONS**

EXECUTIVE LEADERSHIP

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ABSTRACT

The problem was that after three years of budget and staff reductions the Roseburg Fire Department was forced to consider the elimination of one of its fire stations. A public safety levy was proposed to maintain the current number of fire stations and personnel for a period of five years. The levy was subsequently voted down in all wards of the city. The Roseburg Fire Department was now faced with eliminating more personnel and a fire station. The purpose of this research was to determine the operational impact of service reductions caused by a fire station closure. A Descriptive research methodology was utilized to answer the following questions.

1. What are the percentile response times of station two in their first-in area?
2. How will the station closure affect the remaining units covering station two's area?
3. What impact will the station closure have on emergency responses within the city limits?
4. What affect will the station closure have on the automatic aid agreement with the surrounding fire district?
5. What changes can be made to provide better fire service?

The research targeted textbooks and trade journals containing station closures and fire standards, and was initiated at the Learning Resource Center and continued in Roseburg, Oregon.

The results of the research concurred with the department's emergency response data. The station closure resulted in longer response times and a reduction in response reliability for the fire department. The research also stressed the importance of response times in relation to property loss and life safety.

Recommendations included methods in keeping response times short and ways to increase response reliability. It was also recommended to educate the public on why it is so critical for the fire department to be centrally located within the city.

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INTRODUCTION

Author Lewis Carroll wrote in his book, *Alice's Adventures in Wonderland*, "Alice said, 'Would you please tell me which way to go from here?' The cat said, 'That depends on where you want to get to.'"

Roseburg, once known as *The Timber Capital of the Nation*, has struggled to stay economically viable. For the past two decades the timber industry has been in decline. As a result, unemployment in Douglas County hovers at a national high of over 10 % (Jobless rate climbs, 2003). The public has passed legislation to limit property taxes, making it difficult for municipalities and fire districts to generate revenue to meet growing demands. A public safety tax levy was proposed to the public as an option to maintain services separate from other areas of the general fund. The problem was that the public voiced their opposition to more taxes in all wards by voting down the public safety tax levy. It was widely known that the failure of the levy would result in the closure of one fire station and reduce staffing below the 1968 levels. The purpose of this research was to determine the operational impact of service reductions caused by a fire station closure. A Descriptive research methodology was utilized to answer the following questions:

1. What are the percentile response times of station two in their first-in area?
2. How will the station closure affect the remaining units covering station two's area?
3. What impact will the station closure have on emergency responses within the city limits?
4. What affect will the station closure have on the automatic aid agreement with the surrounding fire district?
5. What changes can be made to provide better fire service?

BACKGROUND AND SIGNIFICANCE

Present

The Roseburg Fire Department is a fully-paid department with a staff of 31. The department provides fire suppression, basic and advanced life support emergency medical services, hazardous materials response, code enforcement, fire investigation and public education. As a result of budget cuts these services are now provided by only two fire stations. The annual operating budget for the fire department is \$2.9 million from a citywide budget of \$38 million. The corporate limits of Roseburg encompass 9.5 square miles, within which reside some 20,170 residents. It serves an urban growth area of nearly 60,000 persons. Roseburg has a manager-council form of government (City of Roseburg, 2003a). The remaining two fire stations and their personnel number fewer than the number of personnel from which the Roseburg Fire Department operated with 35 years ago, while the city has grown and expanded its boundaries around them. Additionally, emergency responses have increased more than 10-fold during this period, from 318 alarms in 1968 to 3,573 in 2002 (Roseburg Fire, 2003).

Roseburg's Fire Department serves a city that includes two urban core areas. The southeast urban core has a greater building density with primarily multiple story structures. The buildings are older and were constructed without benefit of modern building code requirements. The northwest urban core is more expansive with 75 % of the structures having been constructed since 1975. These structures benefit from the utilization of modern fire resistive construction methods and building codes. In addition, this area has benefited from an extremely aggressive and proactive fire prevention program.¹ Thus, the incidence of actual fires is quite low.

¹ For many fire departments, hazard analysis includes a significant component based on the fire flow required to extinguish a fire in buildings of particular sizes and characteristics. Most of the buildings north and west of Garden Valley Blvd. have been built within the last 25 years. During that period, there has been a strong building code in place, requiring special fire protection features in any building whose theoretical fire flow might exceed 3,000 gpm. Thus, fire flow concerns for RFD are limited to the ability to flow 3,000 gpm at a working fire.

Coverage determinations, with respect to fire, have been based exclusively on geographic response time factors (Standard of Coverage, 2002).

Roseburg is the county seat and business center of Douglas County. Roseburg's population increases during the working day from approximately 50,000 to 70,000. Many of the largest buildings are county, state and federal structures. The city has a high proportion of assisted living facilities and accommodates medical facilities for a substantial retired population.

The physical characteristics of the city - the South Umpqua River, Veteran's Administration/Stewart Park property, and Reservoir Hill have - posed logistical challenges to emergency response routes. Interstate 5, bridge locations and the railroad that bisects the town, have compounded these challenges. Station one (774 SE Rose St.) and the closed station two (2177 W. Harvard) were constructed in specific locations based on the center of community activity at the time. In 1968, station three (801 Garden Valley Blvd.) was built in anticipation of municipal growth and property annexation. Station three also provided a solution to the concern of train traffic isolating an emergency in station one's area. In 1980, the Stewart Park Bridge over the South Umpqua River provided additional response options and quicker response times for station two and three (See Appendix A).

Perhaps the greatest challenge to the Roseburg Fire Department's response performance lies with the transportation network throughout the city. Within the core areas of the city, the transportation network is increasingly burdened by heavy traffic. Periods of "rush hour" congestion are steadily increasing in length, and in some areas traffic is heavy throughout the daytime hours. A 1996 transportation study highlighted these main transportation routes with the following daily traffic volumes as seen in Appendix B.

Efforts to expand streets and improve traffic flow are limited by constraints of topography and government finances. The continued reliance of most of the working population on the private motor vehicle as the transportation mode of choice, and the topographic challenges presented by the South Umpqua River and surrounding hills further compound transportation complexities. Within the city limits, limited road networks, terrain contours, and long, narrow and winding private driveways further confound response performance efforts.

Within the last three years, an additional and significant piece has been added to the city's transportation infrastructure. The Edenbower freeway interchange now connects Northeast Stephens to Stewart Parkway, offering another alternative to Garden Valley Boulevard. This new transportation alternative has eased some of the complexity to the Roseburg Fire Department's response planning efforts.

A study of traffic signals in the Garden Valley corridor has been completed. Its findings have resulted in the beginning of a project that will include improvements to damaged vehicle detection loops, the replacement of outdated or non-standard controller components and replacing any non-standard signal heads. Opticom, an emergency vehicle pre-emption system that stops cross traffic when activated by the flashing lights on an emergency vehicle will be installed at all intersections. Opticom installation will address the challenges of emergency vehicles moving through traffic with the added obstacle of medians along Garden Valley Boulevard.

Douglas County Fire District No. 2 surrounds the City of Roseburg. It serves 84 square miles and provides similar services to its businesses and 34,000 residents. To further illustrate this, the City of Roseburg is to the donut hole as Douglas County Fire District No. 2 is to the donut.

Past

The City of Roseburg's motto is *The Timber Capital of the Nation*. The timber industry saw its peak years in the 1970's and early 1980's. Roseburg's lifeblood came from this industry with large mills both inside and outside the city limits. Since that time the economy has struggled as Roseburg and the State of Oregon have reluctantly moved to diversify its industry. Oregon is one of the few states in the union that does not have sales tax. For this reason, most taxes are collected from property owners. In an effort to reduce the burden to property owners, Oregon passed a measure in 1990 limiting city-county tax to a maximum of \$10.00 per \$1,000 of assessed value (Stumbo, 2002d). In 1996 and 1997, measures were passed to cap property tax increases. Revenue increases for Roseburg and most public agencies are set at 3% per year. Because total expenses have risen more than 3% in some years, the ballot measures have resulted in a period of expenditures being greater than revenues (Pollock, 2002a). Roseburg's Finance Director Lance Colley explained:

In the 1990's, Roseburg built up cash reserves that the city council, staff and auditors suggested be used for one-time expenditures. But an unexpected economic downturn resulted in poor interest rates on city investments. It also affected the number of people building in Roseburg, thereby reducing the amount of city fees paid and that flattened the general fund (Stumbo, 2002e, p. 1).

Roseburg had been dipping into its reserves for the previous four years to offset these shortfalls.

The 2002 City budget was the first in 10 years that was lower than the previous year. The city could no longer dip as deeply into its reserves and ended with a shortfall of more than \$650,000. The consequence was a citywide reduction of 12 employees, of which two were members of the 34 person fire department. The department's supplies and expenditure line items were cut sharply. The fire department's Obnoxious Vegetation Abatement Program was

modified to expend less staff time and expense (Stumbo, 2002b). Replacement programs were suspended knowing that if not resumed in the near future, major expenditure cuts would follow. The business self-inspection program was eliminated as were many public safety programs. Outside training was also significantly reduced (Stumbo, 2002a).

The overtime budget was reduced to a level that would fund only emergency overtime and Federal Standards Fair Labor Act overtime. Minimum staffing overtime was not funded, resulting in an occasional closure of a fire station. That station was selected based on the lowest call volume and risk hazards in relation to the other station areas. The Harvard Avenue fire station (#2) responded to 20% of the total call volume and backed-up the other two stations on 80% of the two engine responses (5% of the calls). The remaining two stations call volume was split almost equally at 40 % each (Pollock, 2002b). The minimum number of personnel required to staff three fire stations was six. When an unexpected illness occurred with two personnel off on vacation, the staffing level would drop to five. The Harvard Avenue station would be temporarily closed and the two remaining stations were staffed with three and two personnel respectively. It was anticipated that the fire station would be closed approximately five to ten times per month (Pollock, 2002b). An exerted effort by the firefighters to keep the station open resulted in its being closed an average of only 2.3 times per month. It was well publicized that the reduction in personnel at both fire and police would result in longer response times overall (Pollock, 2002b).

Eleven days after the new fiscal year began, the Harvard Avenue fire station closed for the first time since it opened in 1954. The City Manager responded to the media's disbelief by stating,

The closures are similar to what we had to do when we had cut 12 employees from departments all over the city. It was a difficult decision. The budget committee and the

council thought this was one of the best things we could do to balance our budget situation. In all departments, even here in City Hall, we may not be getting to things as quick as we used to (Pollock, 2002b, p. 1).

The general manager of the Riverview Terrace Retirement Community on Harvard reacted with this comment, “Our main concern is the safety of our residents, always. It’s great because they’re here within minutes, three to four minutes most of the time, never more than five. The Harvard station’s closing – that scares me” (Pollock, 2002b, p. 9).

The station had been closed three times in the previous two weeks when firefighters canvassed the neighborhood surrounding the station. The firefighters passed out fliers informing residents of the consequences of the budget deficit, upsetting council members. Three days later, at the city council, meeting a hot debate was sparked over closing of the station. “The result was a number of angry phone calls to city councilors from residents who want the station open and want their firefighters back” (Stumbo, 2002c, p. 1). Councilor Stacey Crowe accepted the apology of the firefighters, “...but was angered at the perception the council had not done its best to save jobs” (Stumbo, 2002c, pp. 1, 12) “Council member Dan Hern said perhaps jobs could have been saved if the firefighters had accepted a smaller pay raise for this fiscal year” (Stumbo, 2002c, p. 12). This comment was on the heels of a newspaper article reporting, “Roseburg Forest Products, the county’s largest employer, laid off 450 workers in April and announced in June it would cut another 220 jobs by Oct. 1” (Jobless rate decreases, 2003). The County’s unemployment rate was riding at 10.3% at the time (Jobless rate climbs, 2003).

By August, the city council forged a plan to let voters determine the value of public safety by introducing a local option property tax levy, which would allow the city to rehire two firefighters and two police officers laid off due to a \$650,000 general fund deficit (Stumbo, 2002d). The levy could be put into effect for no more than five years and would raise taxes by

45 cents per \$1,000 of assessed value. The issue would appear on the November 5, 2002 ballot and clearly state, “revenues required to fund the city of Roseburg’s General Fund operations, including police and fire services, have not been adequate for the last two fiscal years to continue operations at levels previously established” (Stumbo, 2002d, p. 1). According to a Department of Labor news release, “Increased imports of plywood caused declines in production, sales and employment at the company (Roseburg Forest Products)” (Labor Dept., 2003, p. 2). Putting this in perspective for the community, “Since April of this year, Roseburg Forest Products has announced 670 job cuts 450, mostly at its Plywood Plant No. 2 in Dillard, and 220 at the Green plywood plant at its plywood operations in Dillard and Green”(Labor Dept., 2003, p. 2).

On November 5, 2002, “the vote failed 67 to 33%, with 2,230 voting for the levy and 4,581 voting against it, according to final unofficial results” (Stumbo, 2002f, p. 2). The results of the failed levy attempt were best summed up by Police Chief Chris Brown:

The people are fortunate in that they have the ability to decide what level of services they want, and what level of services they can afford. It’s such an uncertain time for people. There’s always the threat of a new state tax on the horizon, and they have to be wondering where the money is going to come from (Stumbo, 2002f, p. 2).

February marked the beginning of the budget process and the City of Roseburg was once again working its magic in creative financing. Lance Colley, City Finance Director explained, “Costs are rising 7% in most departments without targeted reductions. Taking an average of 6% places expenditures for 2003-04 at \$12.7 million, resulting in a deficit of more than \$1 million” (Stumbo, 2003a). In April it was decided where the cuts were going to occur. Randy Wetmore, City Manager encapsulated it best:

The hardest cuts to make are in emergency service. The Roseburg Police Department will lose one officer and a records specialist. One firefighter will also be cut, resulting in

the closure of the Harvard Avenue fire station, which has been forced to close temporarily several times this year already. Closing the station will result in the demotion of eight fire personnel to a lesser rank. Since 2002, the city has eliminated a total of 21.4 positions, equaling 44,616 work hours. With the exception of one, all departments are below 1980 staffing levels (Stumbo, 2003b, pp. 1, 12).

The fire department would now actually drop below 1968 staffing levels. Lance Colley responded to the staffing cuts saying, “64 percent of the city’s costs come from personnel services. Without increased revenues, there’s no other alternative to reducing expenses than to let people go” (Stumbo, 2003c, p. 1). He expounded by explaining that, “it would cost the city about \$125,000 to keep the station open-\$66,000 for the firefighter to return, \$55,000 to reinstate the rank of the eight firefighters and the remainder for facility maintenance” (Stumbo, 2003c, p. 12).

Present

All was not lost in the closing of the Harvard Avenue fire station. Sufficient overtime was budgeted for maintaining a minimum of three personnel on each of the two remaining engines. Baring unforeseen injuries or illnesses, overtime funds were anticipated to be adequate for the duration of the budgeted year. The firefighter’s efforts to keep the station open the previous year, by monitoring sick time helped set the groundwork for cooperative working relations. It was anticipated that response times citywide would increase. However, the effectiveness of a three-person crew versus the two-person crew of the year before would be more efficient for all emergencies.

July 1, 2003 marked the semi-permanent closure of the Harvard Avenue fire station. Temporary solutions to operational needs were put into place. Most of the changes were general response area changes that took affect when the Harvard Avenue fire station occasionally closed

the previous year. Permanent operational changes were required based on response data, risk hazard analysis, call history and other key elements found in the department's Standard of Coverage for Emergency Response plan. The department's Standard of Coverage for Emergency Response plan would have to be rewritten to modify responses from two fire stations versus 34 years of responses from three. New data needed to be collected and analyzed to provide information on future operational changes. The decisions made would be based upon newly established service levels, national safety standards and available local resources.

Future

This research is relevant to the Executive Leadership course presented at the National Fire Academy. The course offered an important case study, "How to Bite the Bullet: Baltimore Mayor Kurt L. Schmoke and Fire Station Closings (A) and the Sequel" (Harvey, 1992). The lessons taken from this case study were used to soften the impact of the Harvard Avenue station closure from an established neighborhood.

Case study: mistakes made:

1. The mayor in the case study responded to a budget problem without developing a plan or securing a collaborative effort from others.
2. Did not communicate the advantages of consolidating resources with the affected citizens and firefighters.
3. Did not gather historical information to learn what the set-backs were from the last temporary station closure.
4. Did not consider labor relations in building a partnership with the union.
5. Did not use the relationship between the firefighters and the community.

6. Did not use the firefighters relationship with each affected station house, to sell the advantages, while reassuring that the level of service the community was receiving would be unchanged or enhanced.
7. Lacked a more in-depth understanding of the fire chief's reasoning for the basis of his rationale.
8. Needed to provide evidence by circulating the data that supported these station closings, the effect on the budget and any effect felt by interested parties.
9. Did not understand the politics of the situation. Should have involved the council. Should have informed the council and the citizens they were elected to represent, of any action that would have directly affected them. Their buy-in would have added neighborhood credibility to these changes.

Mayor Schmoke immediately established his lack of local community understanding in the manner in which he made his announcement of the station closings. His decision was considered to be “brash” and “uncaring.” The problem with the mayor's decision was not that it was made, but how and when it was made. The mayor needed: (a) to open prior communication with all affected parties to protect his credibility, (b) asked stakeholders to be involved early in the decision making process, (c) identified the issues, (d) developed a vision for the future, (e) implemented a real plan with political buy-in, (f) “sell” the focus and commitment of the fire service to the community, (g) solicited support from the city council, (h) looked to local firefighters to communicate the true intentions behind the station's closure and how it would have no effect on the service provided to the citizens, (I) understood that getting the firefighters involved early would have allowed issues to be ironed out, rather than create a perceived period

of time to derail the process, (j) used experts, and (k) ultimately presented the station closure to the city council.

This case study provided a practical example of the importance of managing change, planning and executive leadership, as taught by Executive Fire Officer classes thus far.

City of Roseburg: Lessons learned

1. A plan was initiated by the city council and mayor that included well advertised public meetings in multiple wards of the city. Open forums were established to discuss the options, explain, the reasons behind the budget problems, and listen to public concerns.
2. An effort was made to provide the citizens with a choice of what services they wanted to pay for through a public safety tax levy.
3. The firefighters were given information on all of the options as they became available. Meetings, planning and open communications with the firefighters paid dividends. Although many members were divided, the overall view of the community's economics left few other solutions.
4. Lessons from an unsuccessful station consolidation attempt in 1994 were not duplicated.
 - a. Providing overtime for staffing, and increasing staffing, from two to three personnel per engine, eased the safety concerns of firefighters. It demonstrated managements commitment and understanding of the needs of the firefighters. This was the primary concern of firefighters in 1994, which were never communicated or addressed by management.

- b. A strong effort was made by management to get all available information out to the media and public, fostering a greater level of trust and credibility of management by the firefighters. At the request of the firefighters, a large 3-foot by 5-foot sign was displayed on the station whenever it was temporarily closed prior to the semi-permanent closure. In 1994, the potential station closure/consolidation was hidden from the public. Only a two inch ad in the newspaper advertised a community meeting to address the issue. That ad appeared on the day of the meeting.
 - c. The firefighters canvassed the neighborhoods in a positive manner to educate the public. The public was informed of its choices. The secretive nature of the potential station closure/consolidation in 1994, forced the firefighters to picket city hall in an effort to draw attention to what was happening behind the scenes.
5. The decision to close the Harvard Avenue fire station came from accurate data that was provided to the city council by the fire chief. The decision was based on frequency of calls and response time increases taken during periodic station closures the year before.
6. The failure of the public safety levy sent a strong message to the city council and firefighters: The public did not want to pay any additional taxes; believing the budgeted money was adequate for public safety or maybe wasn't being used wisely. It was understood that existing public safety services would be reduced. This was an important philosophical understanding for firefighters to realize that the public was asking less of

them. Perhaps after years of threats of laying off fire and police personnel, citizens took on the city and said, “do it”. In doing so, the reduction in resources that the public has sanctioned will undoubtedly change the way Roseburg Fire Department attacks fires. It may come to a point where offensively fought fires are replaced with a defensive attack.

The Roseburg Fire Department had to accept it would need to provide less service because of the fire station closure. Although a difficult reality to swallow, operational changes would have to be made. The question remained, “what extent will the impact of the closure be felt on the community and the fire department?”

LITERATURE REVIEW

The purpose of this review is to provide information relative to the research problem of determining the impact of service reductions caused by a fire station closure. The review has been divided into four main areas and addresses the issues raised by the research questions. These areas include: budget reduction impact on other fire departments service levels, recognized standards and response times, Insurance Services Office (ISO) rating schedule and mutual aid.

Budget reduction impacts to other fire departments service levels

As the economy began to change in 2002, International Association of Fire Fighters (IAFF) President Harold Schaitberger (2003) addressed union members in a newsletter defining current economic concerns. He explained:

The plunging stock market, the sluggish economy, declining tax revenues, and the military buildup in anticipation of war in the Middle East are all factors in the economic

challenges that loom heavily on the horizon. The current decline in the stock market is the longest drop since the 1930s; unemployment is spiking and has climbed over 6% for the first time in eight years (p. 1).

Many cities across the nation have been faced with making difficult decisions because of the tight economy. Gordon Williams (1991), Fire Chief of a mid-sized fire department in Essex County, New Jersey, studied his fire department's funding problems due to deteriorating tax bases with the idea of consolidating area fire departments. Chief Williams stated, "The fire service traditionally has solved its problems by increasing its budget, but now as communities cut budgets fire service managers are faced with the dilemma of trying to do more with less" (p. 1). IAFF President Schaitberger (2003) described the municipal governments as having exhausted their means of raising revenue and having set their sights on cuts in fire service personnel or employee benefits because, "quite frankly, that is where the money is. Personnel costs account for 85% of most fire department budgets" (p. 1). He went on to paint a national picture of what the fire service is doing in the wake of budget deficits. "...Mayor Bloomberg of New York City is talking about cutting staffing on many companies and shutting down fire stations" (p. 2) Chicago is talking about reducing staffing on apparatus in many companies; the city of Seattle is looking at cutting fire fighters, closing companies, and eliminating medic units; city officials in Cincinnati are looking at rotating closures of fire stations and closing some fire companies altogether; and Tucson, Arizona is talking of postponing the construction of a new fire station in a high growth section of the city that it desperately needed (Schaitberger, 2003).

President Schaitberger (2003) believed that cuts in personnel equate to unsafe working conditions and a less effective fire fighting force that only jeopardizes preparedness and places citizens in harm's way. He continued that if personnel cuts are not made then, "...management will seek to freeze wages and cut overtime costs, even when overtime is needed to maintain safe

staffing levels”(p. 2). It was found that heat stroke, as a result of under-staffing, was the cause of a 25 year old firefighter’s death in a National Institute for Occupational Safety and Health (NIOSH) report. The report found that “A two-fire fighter engine company is, at a minimum, 50% understaffed and increases the work effort by a factor of three” (IAFF, 2001, p. 13). It was found that the National Fire Protection Association (NFPA) (2001) Technical Committee reviewed numerous studies, evaluations, and interviewed stakeholders who all approved the effectiveness of four person engine companies. The report offered over 15 citations from NFPA 1500, NFPA 1410, Metro Chiefs/IAFC, American Insurance Association, International City Managers Association, IAFF, National Fire Academy, and others (p. 7-14). President Schaitberger (2003) addressed a common problem, stating:

At the time when two-thirds of our fire departments are already understaffed and many fire departments today operate with fewer firefighters than they did 30 years ago, even as the populations they serve have increased, we cannot allow elected officials to further threaten firefighter or public safety (p. 2).

A similar situation exists for the Greenwood Fire Department in Massachusetts. Faced with a \$100,000 shortfall in overtime funds, concerns existed in the ability to provide a minimum staffing of 10 personnel for two stations. The potential existed for operating out of only one fire station, resulting in an increase in fire insurance rates. Fire Chief David Parr reported that,

A quarter century ago the department had 53 firefighters, 12 man shifts and only 1,500 calls a year. When proposition 2 ½ was passed the shifts went to 11 men. Now with twice as many calls and terrorist threats announced by the federal government there are just 47 firefighters and 10 man shifts (Keohan, 2003, p. 1).

A compromise was discussed by moving the pumper into the Greenwood fire station during the day when traffic was lighter, and into the downtown station at night. “As with retired Fire Chief

Walter Maloney in the past, Parr feels that there must be at least three firefighters with each vehicle if the men are to operate in safety” (Keohan, 2003, p. 2). Flint, Michigan’s solution to layoffs and a station closure was trading longer response times for four person engine companies. Staff from the closed station was distributed onto other engines, meeting NFPA 1500 of four people per engine (City’s Financial Woes, 2001, p. 1).

The budget crisis in Oakland, California is being met with significant changes as to how the fire department operates. Although the firefighters felt the changes put public safety at risk, their safety was not an issue. It was reported that:

Oakland has seven stations with both a fire engine and a fire truck. On a rotating basis, one of those seven engines will not respond to calls. The firefighters usually assigned to the off-duty engine will instead fill in at other spots within the department, which will reduce overtime costs (Leising, 2003, p. 1).

Other municipalities are scrutinizing every dollar spent while analyzing ways to keep services constant. Indianapolis’ proposition to balance a \$25 million budget deficit was to raid the money the city uses for fire department operations and pensions. The county plan was to lay off 125 firefighters, cut 11 civilian staff, close several fire stations, cut equipment maintenance and new purchases, as well as eliminate health programs. According to fire department officials, City of Indianapolis (2002) such cuts would result in:

(a) fewer dispatchers, (b) fewer ladder trucks and engines in service, (c) longer response times, (d) fewer building inspections for fire code violations, (e) a less safe hazardous materials unit, (f) fewer special training programs, (g) more wear and tear on trucks, equipment and protective gear, and (h) increased cost for insurance for the department and the City (pp. 1, 2).

Denver's citizens will not see a station closure or a reduction in services, however over \$2.3 million in overtime was paid out in 2002, twice the amount paid the year before. Mike Rogers, president of Denver's firefighters union said, "With the budget cuts, we're already at minimum staff, and they can't hire enough to catch up" (Crummy, 2003, p. 1).

Portland, Maine faced its budget season straight on by sending out a budget survey of programs and positions. The city council asked the residents to weigh city and school services against each other. "Should the city close two fire stations, four public library branches or an elementary school? Should it lay off 26 firefighters or 22 police officers or 20 teachers?" (Bouchard, 2003, p. 2). The city won praise for seeking public feedback early and getting a jump on what promised to be a difficult budget season. Councilor Jill Duson stated, "Nobody wants to cut anything, but many residents say they can't afford higher taxes" (Bouchard, 2003, p. 3).

It was found that budget reductions have caused several operational changes within the fire service. Reductions in staffing have caused many fire departments to rely heavily on mutual aid agreements with neighboring departments. However, union and non-union firefighters are beginning to question these agreements, which political leaders are so fond of. Hurme (1991) stated that, "The public demands protection but many times they are unwilling to fund the departments. That department manning and service levels must be justified through documentation and comparisons to other departments of equal size and population served" (p. 1).

With the fear of having to close one of three fire stations, Fire Chief Malcolm Larson of Milton, Massachusetts, voiced his concern by stating, "These reductions could cause us to contradict fundamental national fire protection standards and our mutual-aid agreements. They could increase response times, increase property damage and put at risk both residents and firefighters" (Altmann, 2002, p. 2). These three fire stations currently require 11 firefighters to

staff. If the staffing was reduced to 10 firefighters, one of the engine companies would be out of service, thus reducing the city's coverage by one-third. Larson concluded by saying, "...This would be a major step backwards in fire safety" (Altmann, 2002, p. 2).

The City of Edmonds, Washington was forced to cut jobs and services in the amount of \$1.38 million as a result of the effects of a tax-cutting initiative. "The city is considering going to voters in the fall to ask for extra money for public safety, and it is looking for ways to prevent more cuts" (Schiffner, 2003, p. 2). Concurrently, firefighters are cutting back services that were once provided, such as Cardiopulmonary Resuscitation (CPR) instruction and free blood pressure checks.

Doing more with less will eventually have a negative impact on service levels. In the United Kingdom (Parliament, 1996) budget reductions are met with service reductions - a matter of priorities versus the importance of values. In a meeting of Parliament, Cheshire chief fire officer said:

We have now undergone a series of changes, we are still undergoing a series of changes and we are no longer able to provide the level of care that the general public is entitled to assume we will provide. That is the issue—it is an argument about not the political views of individual fire committees, but whether the House of Commons will face up to the fact that we are not allowing sufficient money for the fire service to do the job for which it is retained (p. 2).

James Russo (1990) summed up doing more with less in an Executive Fire Officer's research paper in stating:

The taxpayers have been pushed to the brink of revolution. A direct result of their frustration is their refusal to listen to the fire service community and their pleas for

funding. Station closings and layoffs have created an unsafe atmosphere in which the firefighters must perform their many functions (p. 1).

Santa Rosa, California was faced with a no increase budget where it had to absorb nearly \$2 million in previously negotiated employee wage and benefit increases. It had to cut an equal amount from supplies, services and positions. This meant a hiring freeze and reductions in training and overtime for the 140-member department. As with other departments, the city has expanded with only minor staffing increases. The newest fire station was 20 years old. Fire Chief Tony Pini stated that "...firefighters just can't maintain their previous service level" (Carter, 2003, p. 1). Union secretary Mark McCormick added:

Any cuts would worsen already sub par response times. We're not providing the service level our citizens expect right now. We've always run lean and now we are looking at the loss of a fire engine, which would be a huge impact to service we provide." (Carter, 2003, p. 1)

Contingency cuts based on state aid and weak sales tax revenue could reduce services further, resulting closure of a second station, half-time and employee furloughs.

Many of the economic concerns and operational impacts that face Roseburg are paralleled by the concerns of Lake Oswego, Oregon. In a city budget subcommittee meeting much was discussed regarding its operations and decision making. The department operated with a five minute response "amoeba" surrounding its three fire stations, 90% of the time 75% was emergency medical calls. Fire Chief Dodd, stated that, "If the department had to close one station, the one with the lowest volume of calls would likely be its choice" (City of Lake Oswego, 1999, p. 1). Dodd detailed the effects of a station closure:

Increased response times to many parts of the city, adverse impacts on emergency (and non emergency) service delivery, probable loss of all or part of the revenue from

neighboring fire district contracts, and reduction in the city's ISO rating from three to five. The last would likely result in a 13 to 31% jump in insurance premiums (City of Lake Oswego, 1999, p. 1).

Since October 1998, Oregon fire departments have been subject to a federal OSHA rule-also cited in Oregon Administrative Rule 437-002-0182, Code of Federal Regulations 29 CFR 1910- known as the "two in and two out rule." This requires a minimum of four individuals on the scene at a working fire before two may enter the area to pursue rescue efforts and fire suppression. Lake Oswego staffs each station, or engine, with three firefighters. A minimum of two engines has to be on the scene before anyone can enter a burning structure. Beyond that, a standby unit is required for emergency response as conditions develop (i.e., firefighters overcome by heat or smoke inhalation, or trapped by a collapsing structure), this typically requires an engine from another, neighboring department. Fire response forces typically rotate the Rapid Intervention Team in and the involved team out as its air supplies are depleted, and fulfilling the regulations in this manner. Chief Dodd warned that, "Were Lake Oswego to eliminate a station, it might have to depend a lot more on mutual aid providers, who could conceivably begin to charge the city for such services" (City of Lake Oswego, 1999, p. 1). However, a vice chair of the Palisades Neighborhood Association gave several examples of the neighboring fire department taking 20 to 25 minutes to respond to an emergency in their area, where Lake Oswego's fire department, under an automatic aid agreement, takes only seven minutes.

Chief Dodd looked at other "nickel and dime," non-essential services and planned to eliminate some training, the student firefighter program (worth about \$9,000), Citizen Emergency Response Team (\$15,000), and CPR classes, while replacement schedules for hose and other equipment would be extended. The Heavy Rescue program would be curtailed,

delayed, or cut. The Dive Rescue/Water Rescue program would meet a similar fate.. “They don’t cost us a lot of money each year, but they do cost,” he said (City of Lake Oswego, 1999, p. 2). Subcommittee member Jack Hoffman felt the subcommittee needed to discuss the ramifications of raising revenues in tandem with talk of budget cuts. As he saw it, “There were three basic reasons to reject a tax increase: 1) one is not satisfied with the city’s services, or the city budget is bloated; (2) one cannot afford the tax increase; or (3) one is just philosophically opposed to a tax increase” (City of Lake Oswego, 1999, p. 3).

Standards

National Fire Protection Association (2001) Standard 1710 is a substantive standard that addresses staffing levels, response time obligations, and scene safety. While controversial to many, fire service managers of today could use this standard as a tool to evaluate existing levels of emergency response in their communities, and determine where improvements may be necessary. The Rochester Fire Department has proposed station consolidation based on the NFPA Standard 1710. In an executive summary outlining the fire station location study, it stated:

This response level is consistent with NFPA Standard 1710, which calls for running times of four minutes (240 seconds) [sic] or less for the arrival of the first-due engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the deployment of a full first alarm assignment at a fire suppression incident. This standard envisions fire response systems meeting the four and eight minute performance objective at least 90 percent of the time. (MMA Consulting Group, Inc., 2002, pp. 1, 2).

NFPA 1710 is a standard that has set forth comprehensive minimum criteria to ensure safe and effective fire and emergency medical response by career fire departments. It represents the culmination of more than a decade of work by the NFPA Standards Council, its Technical

Committees and its membership. Courts frequently rely upon NFPA standards to determine the “industry standard” for fire protection and safety measures. “Fire growth and behavior are scientifically measurable, as are the expected outcomes associated with untreated cardiac arrest, and the specific resource requirements to control fires and to prevent deaths” (IAFF, 2001, p. 1). The standard is written to protect two groups, the public and fire department employees. It also sets forth the minimum criteria related to the effectiveness and the efficiency of public entities which provide fire suppression, emergency medical service and special operations (NFPA, 2001, p. 1.1). The standard defines service delivery objectives and requirements for deployment, staffing, response times and necessary support systems (NFPA, 2001, p. 4.1.2).

Before Roseburg attempted to meet NFPA 1710 standards, it first had to go through the process of analyzing its community risk, existing emergency response capabilities and several other factors related to the deployment of resources. The department chose the Oregon Deployment Process in determining its deployment standard. The process was selected because it was designed so that fire chiefs could produce a product that measured existing service levels, presented achievable goals, and outlined a strategic plan for agencies to follow in order to reach those goals. The final product mirrored the Commission of Fire Accreditation International’s (CFAI) Standard of Cover, which relies predominantly on the use of objective criteria and a consensus process for developing community goals and objectives that are related to emergency service deployment (OFCA, 2001a, p. 1).

The deployment plan calls for fire departments to set response time standards by determining the travel distance from each fire station to a probable fire risk area or Emergency Medical System (EMS) incident. This can be a mathematical problem. “Studies have shown that the average speed of fire apparatus on roadways is 35 mph” (IAFC, 1995, p. 6-40). The IAFC (1995) reported that this equates to 53.1 feet per second.

A review of travel time would not be complete without considering the impact of natural and man-made barriers that affect travel time. Such barriers would include railroad crossings, drawbridges, narrow streets, high traffic density, one-way streets, low clearances, and areas subject to flooding. Consideration should also be given to delays in travel time caused by winter weather conditions (De Silva 1995).

In mapping fire station locations, McCarragher (1992) suggested that a “historical analysis over a period of the most recent three of four years” be completed (p.8). This would provide a planning tool to add insight into the potential areas where a particular emergency may occur, based on previous history. A historical analysis of calls for service could also help to determine the availability of fire and EMS apparatus. This is because “as the number of emergency calls per day increases, the probability increases that a needed piece of apparatus will already be busy when a call is received” (Coughlin and Penner, 1991, p. 9).

The desire to place the first company on scene in a timely matter is important for several reasons: (a) fire doubles in size every thirty seconds until it reaches flashover, then fire growth is unrestrained. When flashover occurs the fire and smoke explodes out of the room of origin and rapidly spreads through the entire structure, trapping any occupants; (b) modern construction techniques and modern furnishings contribute significantly to rapid development of flashover conditions. Back draft is as severe a situation as flashover. Back draft occurs when there is insufficient oxygen to support flashover, instead the structure fills with very hot, dense black, smoldering smoke that can explode once exposed to oxygen; (c) when a person has a cardiac arrest without CPR and early defibrillation brain damage occurs in four to six minutes, with brain death in about ten minutes. If defibrillation is not performed in eight minutes, a person’s chances of survival decrease significantly; (d) most incidents do not involve structure fires or cardiac arrests; they involve stove fires, car fires, chimney fires, seizures, heart attacks and strokes.

Although not as dramatic, response times make a significant difference in these incidents. To a civilian involved in one of these “routine” emergencies, a minute feels like an hour; (e) “In most cases, the sooner that trained fire or emergency medical rescue personnel arrive, the greater the chance for survival and the conservation of property.” (Barr and Caputo, 2003, p. 7-311).

Geographic-based information systems and computer technology are now available for planning fire station locations with respect to response times. The previous methods of using circles and grids have been replaced with computer programs that simulate real road networks, travel distances and vehicle speeds, factoring time delays for roadway conditions (e.g. congestion, turning radius, weather, hills, etc.) (Barr and Caputo, 2003, p. 7-315).

In a press release sent out by the United States Fire Administration (2003) No.:03-014, titled FEMA, USFA, and NFPA National Study Identifies Service Gaps in America’s Fire Departments, a needs assessment study of the U.S. Fire Service was conducted by NFPA. The first problem area identified was that, “Many of the nation’s fire departments do not have enough fire stations to achieve widely recognized response-time guidelines and lack key equipment, prevention programs, and a wide range of training” (pp. 1, 2). A list of recent activities that included FEMA grants addressed these problems area identified with the exception of fire station and response time issues. USFA Administrator R. David Paulison confirmed the U. S. Fire Administration’s commitment to support the nation’s firefighters in expressing,

Clearly, we have been effective in delivering some much needed support to our nation’s firefighters. But it is equally clear this assessment will help us determine, seek and develop critical resources in support of the fire service. This assessment will guide FEMA and local officials working to build a safer America (p. 2).

The Roseburg Fire Department developed a Standards of Coverage for Emergency Response Plan based on having three fire stations in its city. The response time goals (reflex

time plus travel interval) for the first-in engine company were to arrive at 75% of all incidents within 5 minutes. This standard was established and adopted by the city council in March 2002 (Standard of Coverage, 2002, p. 37).

The type of dispatch center used plays an important role for many agencies calculating response times. In an early study, Clet and Larson (1998) found that, “fire departments dispatched by a police managed Public Safety Answering Point (PSAP) may be able to ensure only the part after the dispatch; they may have little or no control over the call-processing time before that” (pp. 94-95). Although it may be difficult for fire departments to set goals for police operated PSAP’s, it remains an obligation to the community to provide responsible dispatch services for the fire service.

The San Jose study also identified areas where response times could be reduced through operational changes. They study recommended a pre-alert system to notify the responding station that a call was coming so responders could stop what they were doing and begin to respond. They adopted a signaling control system on several of the engines in the downtown corridor to turn traffic signals to green, thus allowing for a faster and safer passage in downtown congestion. They also began identifying when they went “on-scene” versus “at-patient” for EMS or “set-up” for fires. These times could be very different depending on the location. For example, in a hospital complex with multi-story buildings it may take several minutes to reach the patient after arriving on scene. Another finding was in developing a Computer Aided Dispatch (CAD) to CAD link with a neighboring agency. This arrangement reduced the time it took to get an ambulance by simultaneous dispatching for both resources.

It was identified that without credible, accurate data, response times would be difficult to improve. Hand entering the times by PSAP’s would result in a degree of error that was only compounded by the magnitude of the call, and the number of engines responding.

Take the example of turnout time. If you're telling your firefighters that the turnout time goal is 60 seconds 90 percent of the time and the reports come back and show that they don't meet that, how are they supposed to know where they are supposed to improve if there isn't a way to give them immediate feedback? (Clet and Larson, 1998, p. 96).

Accurate response time information is critical to a standard of coverage plan. The Roseburg Standards of Coverage for Emergency Response plan includes a section on "response reliability. "The Oregon Fire Service Deployment Standard defines response reliability as, "an analysis of the number of calls missed by first-in units while they are committed to emergency calls, training, or other dedicated activity" (OFCA, 2001b, p. 13). Response reliability would be 100% if every company were available and in place every time a call was received. In reality, there are times a call is received when the first due company is unavailable. As demands for training, maintenance, public education, fire inspections, automatic mutual aid, and most importantly, call volume increase, the response reliability decreases. "A department's deployment may look great for travel time on a map and suffer terribly due to simultaneous calls for service" (Stewart, 2001, p. 52).

At a Public Entity Risk Institute Symposium, Chief Bryson (2003) of Miami Fire-Rescue presented a method to evaluate a community's emergency services. Determining emergency response reliability is a method to evaluate if a department is meeting its citizens' emergency needs. In using response times, handling time for fire and EMS calls, and number of calls per shift Chief Bryson was able to calculate response reliability. Chief Bryson found that his rule of thumb for unit availability was 90% for fire suppression and 85% for EMS. This method does have its limitations as it does not factor in such functions as fire prevention and education, public relations, and legislation. However, the method does give a department a "quick and dirty" idea of its abilities to handle emergency requests in a timely manner.

Insurance Service Office

Firefighting standards and Insurance Services Office (ISO) ratings have long driven operational needs in the fire service. The ISO is a nationwide nonprofit service organization that provides services to the property casualty insurance industry, and through its subsidiary corporation, Commercial Risk Services, evaluates public fire protection services (Coggan, 1995). Carter and Rausch (1978) wrote, “All aspects of the management of physical resources are influenced by the grading schedule, and many of the grading schedule’s emphasis on personnel, equipment, and water supply capability” (p. 268). Hickey (1993) maintained:

The insurance industry’s evaluation of a city’s fire protection system is exclusively related to protecting the industry’s interest on property loss... Although this has to be an important consideration for the insurance industry, the actual fire protection needs for a city may be different from those of the insurance industry (p. 221).

In an effort to learn what the impact would be on the city’s ISO rating, a meeting was scheduled with the Senior Field Representative of the Western Region ISO. John Hollensteiner, Senior Field Representative, has been working in the field for over 30 years and provided accurate answers and time lines for a city re-rating. Hollensteiner (personal communication, October 30, 2003), began by explaining that the City of Roseburg was currently a protection class rating of three, a “very slim three at best (70.24 points).” Hollensteiner explained further that he had visually seen the Harvard Avenue station closed and that ISO would have to re-rate the city. He stated that he was rather busy and would not be doing this until sometime after Roseburg’s budget process. Hollensteiner explained that historically ISO’s rating system concentrated more on business properties than residential. The residential properties generally required less water and equipment to suppress a fire. Thus, an ISO rating increase up to a protection class 6 would not affect residential homeowner insurance rates. However,

Hollensteiner estimated that typically business property owners would see an increase in premiums of 12 to 15% per ISO protection class number increase. It was pointed out that the station closure would directly impact the following ISO (1998) Fire Suppression Rating Schedule sections:

1. Section 560-61, Distribution of Companies:

The built-upon area of the city should have a first-due engine company within 1½ miles and a ladder-service company within 2½ miles.

2. Section 570-71, Existing Company Personnel:

Existing company personnel is the average number of firefighters and company officers on duty for existing companies determined by the following criteria: a) On – Duty Strength, b) Call and Volunteer Members, c) Automatic –Aid Response, Special Apparatus, d) Service, Pumper-Service and Pumper-Ladder Trucks, and f) Surplus Companies.

3. Section 580-81, Training (pp. 28-31).

Mutual aid

Most fire departments do not singularly possess all of the resources necessary to provide equipment, staff and quick response to all emergencies. Ron Coleman (1992) stated, “The benefits everyone stands to gain from a cooperative, well-defined and implemented automatic aid program are tremendous” (p. 52). The benefit of instantly increasing a department’s staff at a moments notice is of great value to a community.

Even though equipment and facility costs can be high, labor costs tend to be the single highest cost element of providing fire, EMS and police emergency response services. Consequently, manpower planning is one of the central elements in efficient emergency services provision. (Church, Corrigan, and Sorensen, 2001, p. 219).

Jerry Smith (2002) maintained that automatic mutual aid agreements can resolve shortages of personnel until more firefighters can be funded or hired. Smith believed it made good sense to dispatch the closest available resources to structure fires independent of local boundaries. Although communities may be concerned when their engines respond to calls in neighboring areas, Smith saw it as an affordable insurance policy when faced with personnel shortages.

As defined in the National Fire Protection Association 1710, *Standard for the Organization and Deployment of Fire Suppression, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments, 2001 Edition*, “Automatic aid is the pre-determined response of personnel and equipment for an alarm to a neighboring jurisdiction. This process is accomplished through simultaneous dispatch, is documented in writing, and included as part of a communication center’s dispatch protocols” (NFPA, 2001, p. 4).

John Granito (1993) addressed a question presented to him by a Pennsylvania fire chief who wondered, “Is it fair to our taxpayers...to provide this service to another community that was unwilling or unable to provide for its own protection ?” (p.30). Granito’s answer offered no one single solution. He expressed a need for the community to expand its financial base by increasing the protection area and refiguring the distribution of suppression resources.

An early solution for Roseburg in addressing its resource problems was found in the formation of mutual aid dating back to 1952. For fire service organizations, Lavote (1996) defined mutual aid as “an agreement entered into by jurisdictions to provide for services, resources and facilities when local resources prove to be inadequate to cope with a given situation” (p. 95). Lavote explained mutual aid further by stating that, “Mutual aid agreements are usually designed to be reciprocal in nature with no exchange of payment taking place between the jurisdictions” (p. 95).

The authors of *The Fire Protection Handbook* (1997) documented use of automatic aid on initial responses by fire departments as helpful in getting first-arriving pieces of apparatus to emergency scenes within five minutes of the sounding of the alarm (p. 10-35). William Jenaway (1993) stressed the need to have the closest available units respond to fire emergencies when using automatic aid. His logic rested in the fact that fires became larger the longer they burned. The theory became an easy guide for problem solvers at fire departments considering the challenge of arriving at a scene 20 or 30 minutes into a blaze. Harry Carter (2000) stated that fire does not wait for help from mutual aid to arrive, and when it does, it usually arrives too late to be of any real assistance. For this reason, he is a firm believer in automatic aid and regional dispatching. NFPA (2001) relied heavily on the time-temperature curve for fire departments to meet all initial alarm assignments necessary to ensure sufficient personnel, equipment and resources for fire suppression services. It permitted the use of established automatic mutual aid or mutual aid agreements to comply with these initial alarm requirements (p. 7).

Literature Review Summary

The literature review provided key insights into the forced operational changes that the economy has dictated to fire departments across the country. It provided common problems of reduced stations, staffing and services. It reviewed the importance of response times and the impact of extended times on fire departments and the expanding cities they protect. Fire standards and the methods of measuring those standards were reviewed. The use of mutual aid and the impact of ISO on fire agencies were also examined. The findings will be valuable in providing information for better operational decision making, with the result of minimizing the impact on the service levels provided by the Roseburg Fire Department.

PROCEDURES

This research project employed descriptive research methodology organized according to the *American Psychological Association Guidelines* (American Psychological Association, 1994) in order to (a) illustrate the economic impact on the Roseburg Fire Department and possible future actions it may take, (b) examine service level options, operational changes, and fire service standards, (c) assess the benefits and viability of automatic aid, (d) examine the elements of: response times, response reliability, and staffing of remaining fire stations.

The procedures used to complete this research included: a literature review, examination of city records, a survey of Roseburg's Fire Department response data (City of Roseburg, 2003b), and communications with the Senior Field Representative of the Western ISO region.

Literature Review

The research analysis was initiated at the National Fire Academy's Learning Resource Center (LRC) during April 2003. A search on the subject of budget reductions, station closures, and impacting national standards was undertaken. Additional trade journals and books were located at Umpqua Community College's library in Roseburg, Oregon between September and October 2003. Past articles from the local newspaper provided historical information regarding Roseburg's budget and economic situation. Research in December 2003, was focused on current information available on the World Wide Web. The search targeted fire department budget induced service reductions throughout the country. City council and fire board meeting minutes located on the Web offered current fire department documentation of potential and actual fire station closures, discussions, options and impacts.

Review of City of Roseburg records and OAIRS data

A review of City of Roseburg records was conducted between April and December 2003. The records targeted by this review included response time and call volume data. (City of

Roseburg, 2003b). The raw response data was collected from Oregon All Incident Reporting System (OAIRS). OAIRS is an electronic data reporting software program that was provided to the Roseburg Fire Department by the Oregon State Fire Marshal at the beginning of 1997. OAIRS' emergency response information was entered into a Geographic Information System program made available by the Douglas County Engineering Department. The data was also used in Roseburg's Standard of Coverage for Emergency Response plan and entered into several tables for further analysis. Response times are referenced in "percentile" times rather than average times. A Microsoft Excel computer program was used to calculate percentile results.

All three fire stations have been plotted with four minute (travel distance) "response amoebas" around each station location. The street distances which provided the "response amoebas" were based on actual drive times by staff vehicles simulating emergency response conditions from each site. This data is displayed on the "Response Coverage" maps (Appendix A). The Roseburg Fire Department has found a need for additional reporting information in order to better analyze its operations. As a result, with cooperation of the Oregon State Fire Marshal's Office, Roseburg Fire began beta testing a new OAIRS software program beginning in November of 2003. The new program allows for quicker report generation with more complete information. However, prior to this date, comparison information was not available.

Determining "response reliability" of units

This procedure required data taken from emergencies from the OAIRS program. It included emergency handling times (time spent on all emergencies) and number of responses from each station. These times were broken down by category of calls (EMS, fire, other, back-up fire, and back-up other). The results provided the response reliability of the stations.

Oral communications

On October 30, 2003, a meeting and discussion clarifying the concerns of the fire station closure was conducted with the Senior Field Representative of the Western ISO Region, John Hollensteiner.

Assumptions

Two assumptions were made when performing the research for this project. First, it was assumed that all authors referenced performed objective and unbiased research. Second, it was assumed that the information obtained from City of Roseburg records and OAIRS data were accurate.

Limitations

It was discovered that with the advent of NFPA 1710, many departments are beginning to keep records of response times and emergency data. It was also observed that within the last few years a system with common terminology has been established. However, much of this data has not made its way into the literature. It was found that many fire departments that have made significant operational changes do not have enough data available to quantitatively see the results of those changes.

Roseburg's response times were manually entered into the computer by the dispatch call taker. As an emergency progresses the dispatch call taker may be distracted and may not enter the computer stamped data as it unfolds. This delay and inconsistency may not effect the overall reflex and travel times. However, dispatch times were gathered manually by the responding engine companies and compared with the times from dispatch. The inconsistencies were primarily found in the reflex times. This is when dispatch is at its busiest, gathering additional information and paging out equipment. Until Roseburg gets computer aided dispatch, the split times will be inconsistent.

The Roseburg Fire Department has found a need for additional reporting information to better analyze its operations. There are no distinctions between code three and non-code three responses at patient times, set-up times etc. As a result, with cooperation of the Oregon State Fire Marshal's Office, Roseburg Fire began beta testing a new OAIRS software program beginning November 2003. The new program allows for quicker report generation, with more complete information and data entry. Prior to November 2003, comparison information for some reports was not available. This is a limiting factor to this research.

Another limitation was that relatively few books make reference to the subject. As the subject of station location and response times have been around for several years, much of what has been written is not recent. The books were sufficient for historical data, however, much of that was based on grids and circles without consideration for the actual dynamics of the areas. Most of the innovative changes occurring are computer program driven and many departments have yet to take advantage of them.

The electronic reference formats recommended by the *American Psychological Association* (APA), (<http://www.apa.org/journals/webref.html>) requires only the Web site address is cited in the text when the entire Web site is being referenced. Therefore, the specific documents referenced were the entire site. The additional information provided by this author in the reference list, although not required by the APA, allows the reader to locate the Web sites accessed. Additional information is needed to access specific documents, but the intent is to help interested readers gain access to the information. Research using the search engine Google and Google cache may be necessary to reconnect with some of the addresses.

Definition of terms:

This list of terms and abbreviations is to help the readers better understand the terminology used in this document.

Call Processing Interval: The interval between the first ring of the 9-1-1 telephones at the dispatch center and the time the operator activates station and/or company alerting devices.

ISO: Insurance Services Office collects information on a community's public fire protection and analyzes the data. It then assigns a Public Protection Classification from one to 10.

NFPA: National Fire Protection Association, a nonprofit membership association that produces the National Fire Codes, fire service standards and fire and life safety educational materials/programs.

OAIRS: Oregon All Incident Reporting System is an electronic data reporting system developed in 1996 by the Oregon State Fire Marshal's office. Used by the Roseburg Fire Department since 1997.

Oregon's Fire Service Deployment Standard: A model fire service deployment standard designed to meet the unique characteristics of a community's needs, based on NFPA Standard 1710.

Reflex or Turnout Interval: The interval between the activation of station and/or company alerting devices and the time when the responding crew notifies the dispatch center by voice (or mobile computer terminal) that it is responding.

Standards of Coverage for Emergency Responses: Written procedures that determine the distribution and concentration of the fixed and mobile resources of a fire and EMS organization.

Travel Time (Interval): Begins at the termination of the reflex interval, and ends when the responding unit notifies the dispatcher unit that it has arrived on scene (again, via voice notification).

Two in/Two out rule: OSHA respiratory protection standard requiring a minimum of two personnel be outside a structure fire and ready to rescue firefighters that may become trapped inside.

RESULTS

Research questions

1. What are the percentile response times of station two in their first-in area?

At the time this research paper began, station two was being closed intermittently. The closure was based on staffing levels and budgeted overtime. When the staffing level dropped below six personnel for three fire stations due to illness, injury or vacation, station two was closed and emergency responses were based out of the two remaining fire stations. Response records show that during this period of time, July 1, 2002 to June 30, 2003, station two was closed for a total of 677.75 hours (City of Roseburg, 2003b). During these periods of station closure, station two's response area received 48 emergency calls covered by the remaining two fire stations. Table 1 shows the response times (reflex + travel) in percentile times, during periods of station closure between July 1, 2002 and June 30, 2003:

Table 1 Percentile response times for station two when closed – 7-/1/02 thru 6-30-03

PERCENTILE	RESPONSE TIMES
AVERAGE	0:04:20 minutes
75 PERCENTILE	0:05:25 minutes
90 PERCENTILE	0:06:38 minutes

To clarify the difference between “average” and “percentile,” the author offers the following illustration: Two fire departments can report the same "average" response time, yet the citizens of the two communities can receive vastly different services. For example, City A, has a 3:40 minute average response time, with all response times falling between 3 and 5 minutes. City B, with the same 3:40 minute response time, could have a few calls with response times of

less than one minute and some calls where the response time was 10 or more minutes. Thus, the use of "averages" has the effect of concealing rather than clearly illustrating true response performance.

In the world of EMS system compliance measures, percentile analysis is also referred to as "fractile analysis." While not appearing in statistics texts, readers who have heard the term used should understand that it is simply another name for percentile analysis.

The target threshold for the Roseburg Fire Department is a 5 minute response time, 75% of the time for all station areas (Standard of Coverage, 2002). The response time is (reflex time plus travel time) measured from the receipt of the alarm by the fire department to the arrival of the first suppression unit on scene. It does not include call processing time (the interval between the receipt of the 911 call at dispatch and the time the fire department is notified).

Reports were generated using a new beta software program provided by the Oregon Fire Marshal's Office, for three time periods for station two. The first time period is January 1, 2003 to June 30, 2003 (Table 2). This represented the period of time when station two was staffed. It also included 346.5 hours of station closure with 26 emergency responses into its area by either station one or three. The second time period is July 1, 2003 to December 31, 2003 (Table 3). This represented the period of time when the station was consistently closed and was being covered by the remaining stations. The last time period is January 1, 2003 to December 31, 2003 (table 4). This represented the fire station being open six months and closed six months. The analysis counts the number of emergency responses (both code three and non-code three) in station two's area within the specified date range. The number of incidents on each date range was accumulated to determine percentage performance at various target thresholds.

The bolded line identifies the configured Target Time setting for this Target Zone Group (five minutes at 75% for station two). The percentage of incidents that response time is within

the target time is listed in the right column. Response times of 11 minutes and greater are for mutual aid calls and non-code three calls which could not be excluded from the data. This is a limitation, however, it has no bearing on the results this study is seeking. All response times for station two show a significant increase as a result of its closure.

Table 2
Response Time Performance Analysis
Time Threshold for Station Two
Target: 5 min, 75%
 Reporting period: 1/1/2003 through 6/30/2003
 Intermittent Station Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	19	6.0%	19	6.0%
1-2 min.	37	11.6%	56	17.6%
2-3 min.	66	20.7%	122	38.2%
3-4 min.	71	22.3%	193	60.5%
4-5 min.	52	16.3%	245	76.8%
5-6 min.	41	12.9%	286	89.7%
6-7 min.	12	3.8%	298	93.4%
7-8 min.	10	3.1%	308	96.6%
8-9 min.	5	1.6%	313	98.1%
9-10 min.	1	.3%	314	98.4%
11+ min.	4	1.2%	318	99.7%
Total	319			

Table 2- Shows station two responded 5 minutes or less 76.8% of the time, pre-station closure.

Table 3
Response Time Performance Analysis
Time Threshold for Station Two
Target: 5 min, 75%
Reporting period: 7/1/2003 through 12/31/2003
Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	9	2.7%	9	2.7%
1-2 min.	3	.9%	12	3.6%
2-3 min.	27	8.0%	39	11.6%
3-4 min.	56	16.7%	95	28.3%
4-5 min.	72	21.4%	167	49.7%
5-6 min.	64	19.0%	231	68.8%
6-7 min.	52	15.5%	283	84.2%
7-8 min.	28	8.3%	311	92.6%
8-9 min.	9	2.7%	320	95.2%
9-10 min.	5	1.5%	325	96.7%
11+ min.	9	2.7%	334	99.4%
Total	336			

Table 3- Shows the effect of the station closure on response times. Station two responded 5 minutes or less 49.7% of the time. Response time increased to 6-7 minutes, 75% of the time.

Table 4
Response Time Performance Analysis
Time Threshold for Station Two
Target: 5 min, 75%
Reporting period: 1/1/2003 through 12/31/2003
Six Months Pre & Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	28	4.3%	28	4.3%
1-2 min.	40	6.1%	68	10.4%
2-3 min.	93	14.2%	161	24.6%
3-4 min.	127	19.4%	288	44.0%
4-5 min.	124	18.9%	412	62.9%
5-6 min.	105	16.0%	517	78.9%
6-7 min.	64	9.8%	581	88.7%
7-8 min.	38	5.8%	619	94.5%
8-9 min.	14	2.1%	633	96.6%
9-10 min.	6	0.9%	639	97.6%
11+ min.	13	2.2%	652	99.5%
Total	655			

Table 4- Shows the impact of the response time for the year, changing to 5-6 minutes, at 75%.

2. How will the station closure affect the remaining units covering station two's area?

Response zones for station one and three were changed after the closure of station two. Emergency response data from 2002 – 2003 was plotted onto a Geographic Information System program by the Douglas County Engineering Department (Appendix A). It plotted 3,580 emergency responses in 2002 inside the four minute travel amoebas surrounding each fire station. This provided the information needed to change the response boundaries for station one and three. It was learned that in 2002, 120 emergency responses were within station two's area that would not have been covered by either station one or three within their four minute travel time from their respective stations. This uncovered area was found to contain \$95.9 million dollars of market property value. Observed on the amoeba map, the closed station two location marked the site where station three and one's four minute limits intersect. New boundaries were assigned to the two stations with regard to travel distance and with an anticipated equal call volume (Appendix C). Since the beginning of station two's closure on July 1, 2003 through December 31, 2003, stations one and three responded into each stations area the following number of times:

Table 5
July 1, 2003 through December 31, 2003

Responding Station	Response Area	Number of Responses
St.1	St. 1	494
St. 1	St. 2	284
St. 1	St. 3	84
St. 1-Total		862
St. 3	St. 3	789
St. 3	St. 2	50
St. 3	St. 1	41
St. 3-Total		880
Total		1742

Table 5- Number of emergency responses by station area and responding station.

Table five illustrates the response reliability of each station. To be available in their own area and/or the occasional need to respond to another area when the residing station is already on an emergency. Station one had to respond into station three's area for 9.6% of station three's calls because it was tied up on another emergency. Station three had to respond into station one's area for 7.6% of station one's calls because it was committed to another emergency.

It is important to show station three and one's response time performance for the same periods of time as those chosen for station two in order to illustrate the impact of station two's closure.

Table 6
Response Time Performance Analysis
Time Threshold for Station Three
Target: 5 min, 75%
 Reporting period: 1/1/2003 through 6/30/2003
 Pre-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	30	3.6%	30	3.6%
1-2 min.	83	10.0%	113	13.6%
2-3 min.	172	20.8%	285	34.4%
3-4 min.	177	21.4%	462	55.8%
4-5 min.	156	18.8%	618	74.6%
5-6 min.	88	10.6%	706	85.3%
6-7 min.	57	6.9%	763	92.1%
7-8 min.	29	3.5%	792	95.7%
8-9 min.	7	0.8%	799	96.5%
9-10 min.	2	0.2%	801	96.7%
11+ min.	20	2.4%	821	99.2%
Total	828			

Table 6- Shows station three responded 5 minutes or less 74.6% of the time, pre-station closure.

Table 7
Response Time Performance Analysis
Time Threshold for Station Three
Target: 5 min, 75%
 Reporting period: 7/1/2003 through 12/31/2003
 Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	29	3.4%	29	3.4%
1-2 min.	83	9.7%	112	13.1%
2-3 min.	169	19.7%	281	32.8%
3-4 min.	193	22.5%	474	55.4%
4-5 min.	137	16.0%	611	71.4%
5-6 min.	101	11.8%	712	83.2%
6-7 min.	59	6.9%	771	90.1%
7-8 min.	46	5.4%	817	95.4%
8-9 min.	9	1.1%	826	96.5%
9-10 min.	4	0.5%	830	97.0%
11+ min.	16	1.1%	846	98.8%
Total	856			

Table 7- Shows the effect of the station closure on response times. Station three responded 5 minutes or less 71.4% of the time. Response time increased to 5-6 minutes, 75% of the time.

Table 8
Response Time Performance Analysis
Time Threshold for Station Three
Target: 5 min, 75%
 Reporting period: 1/1/2003 through 12/31/2003
 Six Months Pre & Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	59	3.5%	59	3.5%
1-2 min.	166	9.9%	225	13.4%
2-3 min.	341	20.2%	566	33.6%
3-4 min.	370	22.0%	936	55.6%
4-5 min.	293	17.4%	1229	73.0%
5-6 min.	189	11.2%	1418	84.2%
6-7 min.	116	6.9%	1534	91.1%
7-8 min.	75	4.5%	1609	95.5%
8-9 min.	16	1.0%	1625	96.5%
9-10 min.	6	0.4%	1631	96.9%
11+ min.	36	2.3%	1667	99.0%
Total	1684			

Table 8- Shows the impact of the response time for the year, changing to 5-6 minutes, at 75%.

Table 9
Response Time Performance Analysis
Time Threshold for Station One
Target: 5 min, 75%
 Reporting period: 1/1/2003 through 6/30/2003
 Pre-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	59	11.8%	59	11.8%
1-2 min.	99	19.8%	158	31.6%
2-3 min.	106	21.2%	264	52.8%
3-4 min.	88	17.6%	352	70.4%
4-5 min.	61	12.2%	413	82.6%
5-6 min.	39	7.8%	452	90.4%
6-7 min.	12	2.4%	464	92.8%
7-8 min.	9	1.8%	473	94.6%
8-9 min.	4	0.8%	477	95.4%
9-10 min.	0	0.0%	477	95.4%
11+ min.	7	1.4%	484	96.8%
Total	500			

Table 9- Shows station one responded 5 minutes or less 82.6% of the time, pre-station closure.

Table 10
Response Time Performance Analysis
Time Threshold for Station One
Target: 5 min, 75%
 Reporting period: 7/1/2003 through 12/31/2003
 Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	33	6.3%	33	6.3%
1-2 min.	58	11.0%	91	17.3%
2-3 min.	92	17.5%	183	34.7%
3-4 min.	106	20.1%	289	54.8%
4-5 min.	87	16.5%	376	71.3%
5-6 min.	53	10.1%	429	81.4%
6-7 min.	53	10.1%	482	91.5%
7-8 min.	22	4.2%	504	95.6%
8-9 min.	7	1.3%	511	97.0%
9-10 min.	7	1.3%	518	98.3%
11+ min.	6	1.2%	524	99.4%
Total	527			

Table 10- Shows the effect of the station closure on response times. Station one responded 5 minutes or less 71.3% of the time. Response time increased to 5-6 minutes, 75% of the time.

Table 11
Response Time Performance Analysis
Time Threshold for Station One
Target: 5 min, 75%
Reporting period: 1/1/2003 through 12/31/2003
Six Months Pre & Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	92	9.0%	92	9.0%
1-2 min.	157	15.3%	249	24.2%
2-3 min.	198	19.3%	447	43.5%
3-4 min.	194	18.9%	641	62.4%
4-5 min.	148	14.4%	789	76.8%
5-6 min.	92	9.0%	881	85.8%
6-7 min.	65	6.3%	946	92.1%
7-8 min.	31	3.0%	977	95.1%
8-9 min.	11	1.1%	988	96.2%
9-10 min.	7	0.7%	995	96.9%
11+ min.	12	1.2%	1008	98.1%
Total	1027			

Table 11- Shows the impact of the response time for the year, changing to 5 minutes, at 76.8%.

The bold 4-5 minute response time is what the City of Roseburg adopted as their response standard. The results show the affects of the response times and response reliability of the remaining two stations in relationship to the closing of station two. All of the response times had increased after the station closure. It was also found that station one was having to travel out of its own response area considerably more often than station three.

3. What impact will the station closure have on emergency responses within the city limits?

The greatest impact the station closure had on emergency responses within the city would be the increased response times seen throughout the city. These results were found in tables 1-11, and more specifically in the following tables:

Table 12
Response Time Performance Analysis
Time Threshold for Entire City
Target: 5 min, 75%
 Reporting period: 1/1/2003 through 6/30/2003
 Pre-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	108	6.6%	108	6.6%
1-2 min.	219	13.3%	327	19.9%
2-3 min.	344	20.9%	671	40.7%
3-4 min.	336	20.4%	1007	61.1%
4-5 min.	269	16.3%	1276	77.5%
5-6 min.	168	10.2%	1444	87.7%
6-7 min.	81	4.9%	1525	92.6%
7-8 min.	48	2.9%	1573	95.5%
8-9 min.	16	1.0%	1589	96.5%
9-10 min.	3	0.2%	1592	96.7%
11+ min.	31	1.9%	1623	98.5%
Total	1647			

Table 12- Shows all three stations responded 5 minutes or less 77.6% of the time, pre-station closure.

Table 13
Response Time Performance Analysis
Time Threshold for Entire City
Target: 5 min, 75%
 Reporting period: 7/1/2003 through 12/31/2003
 Post-Closure

Response Time	Response Count	Response %	Cumulative Responses	Cumulative Percentage
0-1 min.	71	4.1%	71	4.1%
1-2 min.	144	8.4%	215	12.5%
2-3 min.	288	16.8%	503	29.3%
3-4 min.	355	20.7%	858	49.9%
4-5 min.	296	17.2%	1154	67.1%
5-6 min.	218	12.7%	1372	79.8%
6-7 min.	164	9.5%	1536	89.4%
7-8 min.	96	5.6%	1632	94.9%
8-9 min.	25	1.5%	1657	96.4%
9-10 min.	16	0.9%	1673	97.3%
11+ min.	31	1.9%	1704	99.1%
Total	1719			

Table 13- Shows the effect of the station closure on response times. The City received response times to emergencies 5 minutes or less 67.1% of the time. Response times increased to 5-6 minutes, 75% of the time

Tables 12 and 13 revealed an increase in response times that exceeded the standard adopted by the city council of 5 minutes at 75% in 2002.

The research showed that the number one concern of station closures was the potential increase in response times. NFPA 1710 illustrated the need for quick response times for patient survivability and reduction of property loss.

During the course of this research, operational changes were made beginning July 1, 2003 to lessen the impact of the station closure on emergency responses within the city limits. Sending two stations/engines to all central alarms was discontinued. Only one engine or ladder truck was to be dispatched on central alarms. This move was based on Chief William Bryson's (2003) method of calculating response reliability (Appendix D). It was shown that station two had been backing-up the other two stations over 100% more often than either of the other two stations. Because of good communication with dispatch and the company officer's discretion, single engines were dispatched to central alarm emergencies. After six months of sending only one engine/ladder truck to central alarm emergencies, there had been no negative impact. However, operationally, it has freed the two remaining stations on a significant number of calls.

Bryson's calculations using 2002 data showed station two had responded to 2.78 emergency calls per day, with an overall response reliability of 95.29%. Station one had responded to 3.4 emergency calls per day with a response reliability of 94.76%. Station three had responded to 4.75 emergency calls per day with a response reliability of 92.33%. Table five above, showed the newly configured station areas had split the total number of emergency responses from July 1, 2003 to December 31, 2003 almost equally (within 1%). Table 5 also revealed that station one had covered 85% of station two's calls and 10% of station three's calls. Therefore, using 2002 data as an estimation of what could be expected for 2003, calculations were made to estimate the change in response reliability for stations one and three after station

two's closure. Taking 85% of station two's calls, and subtracting back-up calls for central alarms, station one is available 3.85% less than when station two was open. The response reliability for station one is now 90.91%. Station three, in-turn, is covering station two 15% of the time, reducing its availability by .42% for a response reliability total of 91.91%. The calculations show a reduction in response reliability for the city, post station two closure. Not only has station one been covering the majority of station two's calls, it is also having to cover the calls station three misses because they are already very busy. As the number of emergency responses continues to increase, the response reliability decreases, increasing the chance that a station will not be available to take an emergency call.

When the Roseburg Fire Department had three fire stations, it required a minimum staffing level of six personnel. Before station two's permanent closure, the station was occasionally closed leaving five or fewer personnel. No overtime was available for maintaining a minimum staffing level. With the anticipation of a station closure, overtime was budgeted in an attempt to maintain six personnel for the two remaining stations. This was due, in part, to a plea to city council by the fire chief to maintain enough personnel on-duty to meet the OSHA two-in, two-out rule that allows firefighters to enter into structure fires. The city council provided the fire department overtime funds to maintain six personnel on-duty barring any extended illnesses or injuries. These funds were partially made available from the demotions of personnel that worked at station two. The number of officers and driver/engineer positions had been reduced by the station's closure. The number of firefighters working each shift has remained constant, yet the overall number of personnel in the department has decreased by three personnel in two years.

The station closure impacted the number of apparatus and/or special equipment that arrives at an emergency. Taking two engines to a fire emergency also removed the flexibility of

having a third engine available at a fire scene to respond to another city emergency, if needed. The research agreed, three person engine companies were found to be safer and more efficient than a two person engine company. The effectiveness of a three person engine company held true for EMS and fire calls alike. The minimum staffing of three personnel on a fire engine was a side-benefit in having the fire station closed.

Ultimately, response data revealed increased response times throughout the city and a reduction of response reliability. The fact that three stations once provided more equipment to an emergency than two stations showed a decrease in equipment and potential response flexibility. The overall number of resources that would respond to an emergency through automatic aid has also been reduced and has a direct impact on fire emergencies. This is discussed further in the answer to question four.

4. What affect will the station closure have on the automatic aid agreement with the surrounding fire district?

Douglas County Fire District No. 2 is the fire district that surrounds the City of Roseburg. The entire city's border can be reached more quickly by the Roseburg Fire Department. Roseburg Fire had received aid from the County Fire District a total of 299 times in seven years, equaling 92 hours of aid. On the other hand, Douglas County Fire District No. 2 had received aid from the Roseburg Fire Department a total of 1,078 times in the same seven year period, for a total of 553 hours of assistance (Appendix E). In 2002, Roseburg's response data was being scrutinized as its deployment plan was being written. The data magnified the suspected inequities that existed in automatic aid between the two departments. Discussions began shortly after, and the result was a scaling back of automatic aid for both agencies. Roseburg Fire was to respond into the county for fires only - no longer responding to medical aid calls bordering the

city limits. The data reveals this reduction in automatic aid by both parties as seen in the number of total responses in 2003 (City of Roseburg, 2003c).

Negotiations concerning automatic aid between the two departments began again after the defeat of the public safety levies in both the county and the city. Stretched resources in both departments and a potential station closure in Roseburg had both departments critically looking at sending resources out of their respective areas. The research demonstrated that automatic aid could provide the means for the fire departments to operate more efficiently and effectively by sharing personnel and equipment without significantly impacting an operating budget. It also showed that an increase in personnel at emergencies provided an increased level of safety and a means to meet NFPA firefighting standards. Additionally, revealed automatic aid as a resource available to save fire departments the expense of duplicating resources. This was demonstrated by the sharing of equipment, special teams and apparatus. NFPA 1710 offered automatic aid as the solution for fire departments to provide the closest available resources for a timely response. The two advantages given for sending the closest available units were found in the time-temperature curve for fighting smaller fires and increased medical viability of patients at medical emergencies.

Automatic aid thus far has remained the same as it was prior to the station closure. After lengthy negotiations with the fire district, run-cards are presently being changed. The Roseburg Fire Department will be limiting its response into the county to one engine company, or 50% of the city's resources. In turn, Douglas County Fire District No. 2 will be sending one engine into the city on mutual aid (20% of its resources). In the event the City has more than two emergencies at one time, Douglas County Fire District No. 2 has stated that they will not be sending an engine into the city to take the third call. This stance is similar to Granito's (1993) stance of a fire department having to rely on automatic aid for its day-to-day operations as being

unacceptable. He expressed a need for the community to expand its financial base by increasing the protection area and refiguring the distribution of suppression resources.

The Roseburg Fire Department is looking at a reduction of automatic aid with Douglas County Fire District No. 2. The mutual aid agreement remains, yet as time goes by and resources continue to shrink, the mutual aid agreement will undoubtedly be reviewed again.

5. What changes can be made to provide better fire service?

As stated previously, during the course of this research modifications were made to operations and station boundaries. Operational changes have included a single engine response to central alarm emergencies, two engine response to fires (with the exception the station three crew is in quarters and can respond in the ladder truck), and early request for off-duty personnel to respond to fires. The single engine response to central alarms was made to increase the response reliability of the remaining apparatus.

The review of the research provided verification that the City of Roseburg was on track in their efforts to reduce response times. This was being done with the upgrading of the Opticom signal control system, and use of pre-alerts. The research revealed room for improvement where the police operated dispatch center was concerned. Areas to be improved include providing accurate data and timely notification of alarms. An effort is underway to implement the use of a computer aided dispatch center which would provide much of the critical data needed in evaluating the fire department.

The ISO representative made it clear that the city would be seeing a new rating in the future. The actual increased costs could not be calculated but it was indicated that increases in insurance rates for businesses could increase as much as 30%. The operational changes made by the city were an effort to minimize the reduction in service levels provided on the majority of emergency responses. These changes are in direct conflict with ISO as the focus is solely on fire

emergencies, which represent a minority of the emergency responses. Hollensteiner of ISO made it clear that there are no considerations made by ISO for EMS emergencies. The operational changes made by the Roseburg Fire Department will undoubtedly result in a lower level of service in the eyes of ISO.

The research provided numerous examples of what other cities have done to reduce the impact of budget cuts. Like other cities throughout the nation, the city will have longer response times, less time for building inspections, CPR instruction, blood pressure checks, public education, fire extinguisher training and specialized in-house training. The City of Roseburg's year end report for 2003 showed fewer fire preplans, self-business inspections, business registration inspections, public education programs, and automatic aid responses (City of Roseburg, 2003c).

Altmann (2002) expressed concern that the increased response times would increase property damage and put both residents and firefighters at risk. The research was clear, increased property loss and decreased public safety would be a direct result of increased response times. The current Standard of Coverage for Emergency Responses plan for the Roseburg Fire Department was adopted in 2002 with three fire stations being deployed to emergencies (Standard of Coverage, 2002). The station closure has forced the need to rewrite the deployment plan for the fire department. The increased travel distances by station one into station two's area (approximately 2½ miles per call) has increased the wear and tear on apparatus. The elimination of equipment replacement schedules has delayed the purchase of replacement equipment.

In review, budget cuts and a lack of funding have closed a fire station, cut material and supplies spending to maintenance levels, and reduced staffing. All of which has resulted in a reduction of services to the public. The most significant change has been the increase of response times and limited fire fighting force on the fire ground. The reductions made in various

programs have eased the strain on the response reliability of the engine companies, for example sending a single engine to central alarms. Future changes in the operation of the dispatch center may improve some elements of the response times. Lastly, fire ground operations will be critically evaluated with regards to the amount of resources operating at a fire scene. Safe operations for the remaining firefighters are crucial.

DISCUSSION

Relationship between the study results and findings of others

Reviewing the City of Roseburg's response data and the concerns of fire departments throughout the nation, it was revealed that the dilemma of increased response times as a result of station closure was a very valid concern. Station closures and corresponding reductions in service levels were outlined by various authors (Schaitberger, 2003; Altmann 2002; City of Lake Oswego, 1999; City of Indianapolis, 2002; NFPA, 2001; MMA Consulting group, Inc., 2002; Clet and Larson, 1998; City's Financial Woes, 2001; and NFPA, 2001). Roseburg's station two closure was shown to have increased citywide response times from a five minute response, 77.5% of the time, to a five minute response, 67.1% of the time.

The service level decline in relation to increased response times was shown to be endemic of the correlation between fire growth and the escalation of a medical emergency (Barr and Caputo, 2003). Simply put, as response times increase so do the chances of increased property loss and reduced safety for the public and firefighters alike. In addition, longer response times reduce the chances of rescue and confinement of the fire to the floor of origin, while the chances of back draft, flashover, and firefighter injury are increased. The following authors stressed public and firefighter safety in relation to response times (Altmann, 2002; Russo, 1990; Schaitberger, 2003; Keohan, 2003; Barr and Caputo, 2003; and NFPA, 2001).

Clet and Larson (1998) provided mechanisms to reduce response times through their examination of the utility of pre-alerts, fire based dispatch, CAD to CAD dispatch, control signal intervention and accurate, retrievable response data. The following authors (Granito, 1993; Lavote, 1996; Fire Protection Handbook, 1997; Jenaway, 1993; Carter, 2000; and NFPA, 2001), addressed the use of automatic aid for allowing the closest units to respond to emergency scenes. They also provided a method to amass an adequate response force to an emergency scene. Budget shortfalls and subsequent station closures forced the City of Lake Oswego (1999) to consider an increased reliance on mutual aid with the possibility of direct payments for those services. Similar circumstances also led Hurme (1991) to consider increased reliance on mutual aid. However, it was found in Roseburg that when two adjoining fire departments have been reduced to minimum staffing and response levels, the benefits of automatic aid are difficult to negotiate. The risk of dispatching a fire engine outside the provider's area becomes too great as a result of already reduced response reliability within its own borders.

William Bryson (2003) provided a method used to calculate the City of Roseburg's response reliability. Bryson stated that it was up to the authority having jurisdiction to set what would be an acceptable "availability rate". However, Bryson offered his own rule of thumb: 90% availability for fire suppression and 85% for EMS availability. Roseburg's station closure placed its response reliability at the threshold of Bryson's recommended limits. The response results after the station closure in table five (City of Roseburg, 2003b) revealed valuable information in regards to the response reliability of the two remaining stations. The table showed that 43% of the calls station one was responding to were outside of its own area. Thirty-three percent of station one's calls were in station two's area. In turn, station three was negatively impacted, having to cover station two's area 50 times (6%) and station one's calls 41 times (5%). This illustrated that the two remaining stations were now spending much more time

in areas other than their own. The impacts of these findings are consistent with longer response times and less response reliability resulting from station closures.

Table six disclosed that station three was just below the city's response time standard of 75% before the station two closure at 74.6%. This is easily explained by using DeSilva (1995) and McCarraher's (1992) explanations for response times being dependent upon a multitude of factors. IAFC (1995) provided a standard 35 miles per hour in all directions from a station. However, multiple factors dictate a realistic response. Station three is located on Garden Valley Boulevard. A 1996 traffic study revealed it to be the busiest street in the City by far (Appendix B). When station three responded to an emergency negotiating the high traffic volume consistently slowed their responses. Although station three's responses to emergencies were impacted less by the closure of station two than station one, the data still showed an increase in overall response times.

It was learned from John Hollensteiner (personal communication, October 30, 2003) an ISO senior field representative, that resource location (staffing and equipment) and deployment play a key role in the evaluations undertaken to determine a city's fire protection class. Although, without a full re-rating of the city it was only an educated guess as to what the city's new rating would become. It was thought that business owners would see an increase in rates between 15% and 30%. This same figure was hypothesized in the City of Lake Oswego's (1999) expectation of a station closure. The City of Indianapolis (2002) was also anticipating an ISO protection class increase with a corresponding increase in insurance rates. It is unfortunate for the City of Roseburg to not have an exact dollar amount that would reflect the increase and its impact on business owners. During the budget process it was determined that to keep the fire station open it would have required approximately \$125,000 (City of Roseburg, 2003a). It would be even more unfortunate if it was learned that the business owners would be paying

\$125,000 for insurance premiums without the benefit of having a fire station and a corresponding higher level of service.

The research offered further examples of service level reductions as a result of a station closure. City of Lake Oswego (1999) looked at the elimination of specialized training, a firefighter program, CPR classes, and Citizen Emergency Response Team. Carter (2003) was more general in illustrating supplies, services and positions being impacted. Schiffner (2003) showed an elimination of CPR classes and blood pressure checks. The City of Indianapolis (2002) had a laundry list of reductions that included fewer building code inspections, fewer special training classes, increased wear and tear on equipment, and longer equipment replacement schedules. The station two closure forced more activity onto the two remaining fire stations. Increased call volume has undoubtedly impacted similar non-emergency related programs in the Roseburg Fire Department. The City of Roseburg's year-end report for 2003 showed fewer fire preplans, self-business inspections, business registration inspections, public education programs, and automatic aid responses (City of Roseburg, 2003c). Greater pressure on the two remaining stations has increased the wear and tear on apparatus and equipment. The delayed replacement schedules will ultimately catch up to the city and will require larger one-time purchases.

In six months time, station one has responded into station two's area 284 times and into station three's area 84 times. The increased activity will undoubtedly impact vehicle maintenance schedules, tire replacement and fuel consumption.

Author's interpretation of study results and organizational implications

The study results have shown that the service levels provided by the City of Roseburg's Fire Department have been impacted by the station closure, most significantly in response times and response reliability. These impacts have the potential for increase property loss while

decreasing public and firefighter safety. Although NFPA standards define fire department operations, as has ISO recommendations for insurance rates, one has to ask who really determines the service level standards for the public? In the case of the City of Roseburg, the level of service the fire department provides has been defined and shared by many. The citizens had an opportunity to keep the fire department at a static level for five years, in the form of a public safety tax levy. At that time the Roseburg Fire Department was not meeting NFPA 1500 and 1710 staffing standards. It did, however, have its own council adopt Standard's of Coverage for Emergency Response Plan. The plan provided a mechanism allowing the fire department to respond to emergencies with existing resources. The plan included three stations and required modifications to include only two stations and the corresponding reduction in staffing and equipment. The modified Standard of Coverage for Emergency Response Plan shall include new expectations and limitations to structural firefighting. On scene staffing reductions will limit those expectations of service on the fire ground. Interior attacks may be scaled back to exterior attacks depending on the resources available.

The public safety levy to maintain public safety services was voted down in all wards of the city. The public was made aware of the potential reductions in fire service levels which included the knowledge of an ultimate fire station closure. The city council and budget committee defined the funds allocated for the operating budget of the fire department. The fire department made operational decisions to lessen the negative impact of the station closure and to maximize the funds it received from the general fund. The fire department's operational changes were consistent with those changes found in the research by other fire departments throughout the nation.

It was found that during the six months of station closure the 5 minute response times for station two's area was being met only 49.7% of the time. This was a significant reduction from

76.8%, prior to the station's closure. Station one is 2 1/2 miles from station two and takes an average of two minutes to respond with an engine into station two's area. The research was very clear on the importance of quick response times to emergencies. Station one and three have been forced to absorb station two's response volume making them significantly busier with longer distances to cover. The newly adjusted response areas have balanced the call volume between the stations and have optimized response reliability. However, response times have increased while response reliability has decreased.

The frequency of emergency calls has made it difficult for Douglas County Fire District No. 2 to rely on Roseburg Fire for automatic aid. The reduced response reliability of both departments has all but eliminated the sharing of valuable resources when needed. After months of negotiations, both departments mutually agreed to eliminate their automatic aid arrangements and rely only on mutual aid agreements for staffing and equipment. Although this is an apparent giant step backwards, it was found that maintaining day-to-day operations with automatic aid was not a viable solution (Granito, 1993).

The City of Roseburg, its city council, voting public, and fire department were responsible for setting the new levels of service as a result of budget reductions. This research paper now provides quantitative measurements as to the impact of the station closure on the service levels provided to the public. As Alice of Wonderland wanted to know which way to go from here, the cat's advice holds true to the City of Roseburg, "That depends on where you want to go?"

RECOMMENDATIONS

The problem that prompted this research project was that due to budget constraints and a failed public safety tax levy the Roseburg Fire Department had to close the West Harvard fire

station where there were unknown impacts with regards to public safety demands. The purpose of this research was to determine the operational impact of service reductions caused by the fire station closure.

Based upon this research the following recommendations are offered: every effort should be made to improve response times and response reliability. The recommended first place to begin is with the police based dispatch center (Clet and Larson, 1998). The local fire departments in Douglas County have little overall influence in procedural policy-making at the center. A user group with stakeholders could influence positive change. The dispatch is currently taking 2:43 minutes to process calls (Standards of Coverage, 2002, p. 32). The mandated time should be within 90 seconds per the center's own policy. A user group could evaluate the performance standards and make recommendations for improvement. A computer aided dispatch would also eliminate the errors and delays incurred as a result of data being manually entered into the computer. Response times would be more accurate for all users of the system. Response data needs to be accurate data.

The dispatch center currently dispatches all calls received and filters no requests for service. It is recommended that a means to reduce insignificant calls would be to study the feasibility of a "priority" dispatch. The dispatch center currently does not want the liability associated with prioritizing calls. However, the size and resources of Roseburg are such that it can no longer run code three to every situation that comes into the 911 center. The Battalion Chiefs and engine company officers are currently attempting to prioritize calls with insufficient information. A priority dispatch would improve the response reliability of the department.

The dispatch center is very busy manually entering information into the computer with automatic time stamps. It is too difficult for the dispatchers to add additional time marks that

track “at patient” time for EMS calls and “set-up” time for fires. Recommendations to maintain this additional data would be valuable in determining the real impact of response times.

Six months has passed without incident in responding single engines to central alarms. This operational change has turned out to be more efficient and has helped with the already increased wear and tear on the apparatus. It is recommended to continue this response level. Although it may effect the ISO rating of the city, it has improved the response reliability for the majority of other calls.

It is recommended that the fire department continues its efforts to synchronize traffic control devices throughout the city with the use of Opticom. The use of Opticom would be particularly beneficial on busy Garden Valley Boulevard, allowing quicker response times for station three.

Over 45% of all station three calls are to senior housing centers (City of Roseburg, 2003b). It is recommended that the fire department begin to educate the personnel at these centers to provide standard information to determine the level of response by the fire department. The fire department needs to evaluate sending 50% of its fire resources to pick residents up off the floor and to place them back into bed.

It is recommended that the Roseburg Fire Department’s Standards for Emergency Response Coverage plan be updated. With fewer stations and fewer personnel, the deployment plan requires updating to reflect these changes. The revised plan should reduce firefighter expectations (service levels) on emergency responses while increasing firefighter safety. It is recommended that the city council evaluate the changing response times and adopt a new standard.

It is recommended that the city council be informed of the calculated response reliability of the stations (Bryson, 2003). It is recommended that a response reliability threshold limit be

established for future department planning. It is also recommended that the council be informed of the potential ISO changes and the impact they may have on the business community. The city council has been working on alternative revenue sources to boost the general fund and reopen the fire station. Reopening the fire station would roll back response times to previous standards. However, regardless of the current budget, it is recommended that planning for future fire station locations in the urban growth boundary, in response to the city's growth, get underway. Advanced planning would allow for the purchase of less expensive property for new fire stations and a plan to keep response times in line with acceptable standards.

It is recommended that the city council support another public safety levy to bring service levels back to those of 2001. The response data collected for this research paper could be instrumental in illustrating the impact the station closure has had on increased response times. The lessons learned in Baltimore's fire station closures should be observed (Harvey, 1992). Portland, Maine's budget survey was well received and could be used as a tool to educate and provide a selection of options for the public (Bouchard, 2003).

It is recommended that an option to the fire department cutting services would be to ask the public what services they are willing to pay for prior to their elimination. For example, rather than telling the public or city council, that the fire department can no longer provide public education, it would be more beneficial to show that providing public education will cost a specific amount. This way the public or city council can decide the fate of the program based on cost and value to the community.

It is recommended that patient follow-up data from EMS emergencies begin to be collected. The impact of the station closure with respect to longer response times on actual lives saved or lost would be of great value to the city council and public at large. Although the research is strong in regards to longer response times equating to property loss/life loss, relevant

data would be more impressive in keeping a station open in the future. Fire data is currently being collected on property loss.

The research found a number of cities that are utilizing peak activity units. Other cities are moving apparatus to different sections of the city at different times during the day. In the event the City of Roseburg becomes healthier financially it is recommended that as staffing increases and personnel are gradually hired back they should be placed on a peak activity unit. This may be a viable, temporary solution, to insufficient staffing levels prior to opening a fire station full time.

It is recommended that the Roseburg Fire Department be receptive to positive solutions with respect to automatic aid with Douglas County Fire District No. 2. Neither department can operate autonomously. Continued joint training and communication will foster better relations for the possibility of automatic aid.

In summary, it is recommended that whatever the Roseburg Fire Department can do to shave crucial seconds off the response times would be of value to the public and to the responding firefighters. Every effort should be made to obtain the necessary funding to reopen the fire station. It becomes an important safety issue for the firefighters and the public alike. With reduced staffing and resources, safety en-route and on-scene is paramount. It is very important for the engine companies to be available as much as possible to increase a diminishing response reliability. This can begin with company officers monitoring the radio for pre-alerts and emergency information, allowing them to make more informed decisions.

This author strongly recommends communicating with similar organizations and departments outside Roseburg. Other fire department experience and success can be of great value to the Roseburg Fire Department. *Future readers* may want to expand the scope of research by contacting those departments that are currently having a high success rate in saved

lives due to quick response and early defibrillation. Follow-up data on lives saved (quality of life saved) would be valuable in seeing the precise benefit of quick response. *Future readers* may want to further explore the dynamics of who sets the level of service provided by the fire department for the community? Is this level of service strictly a monetary issue? Does the public have the final say in their own personal safety as well as the safety of the firefighters? The answers to these questions would be an excellent topic for a future research paper.

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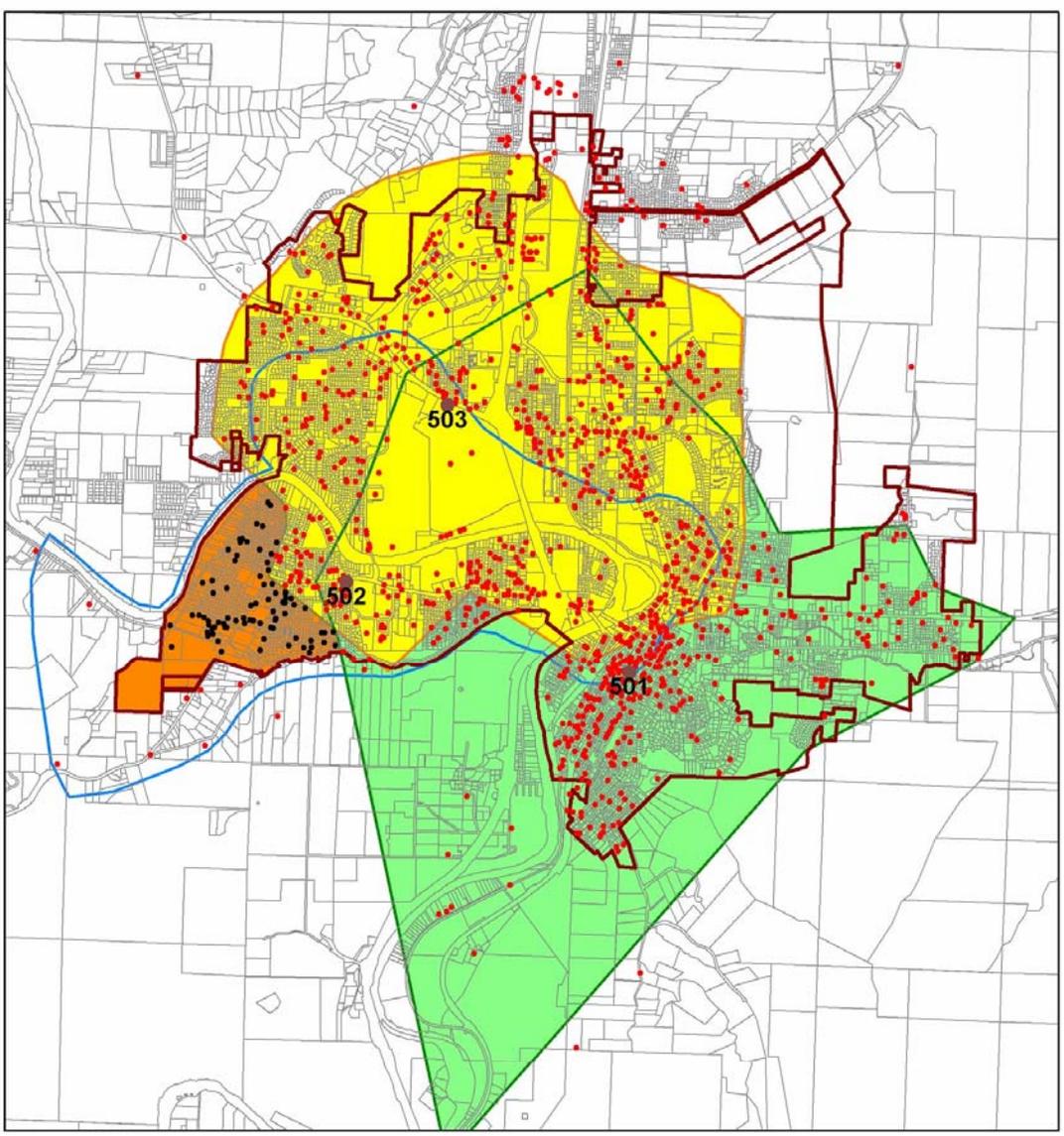
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APPENDIX A

ROSEBURG FIRE DEPARTMENT

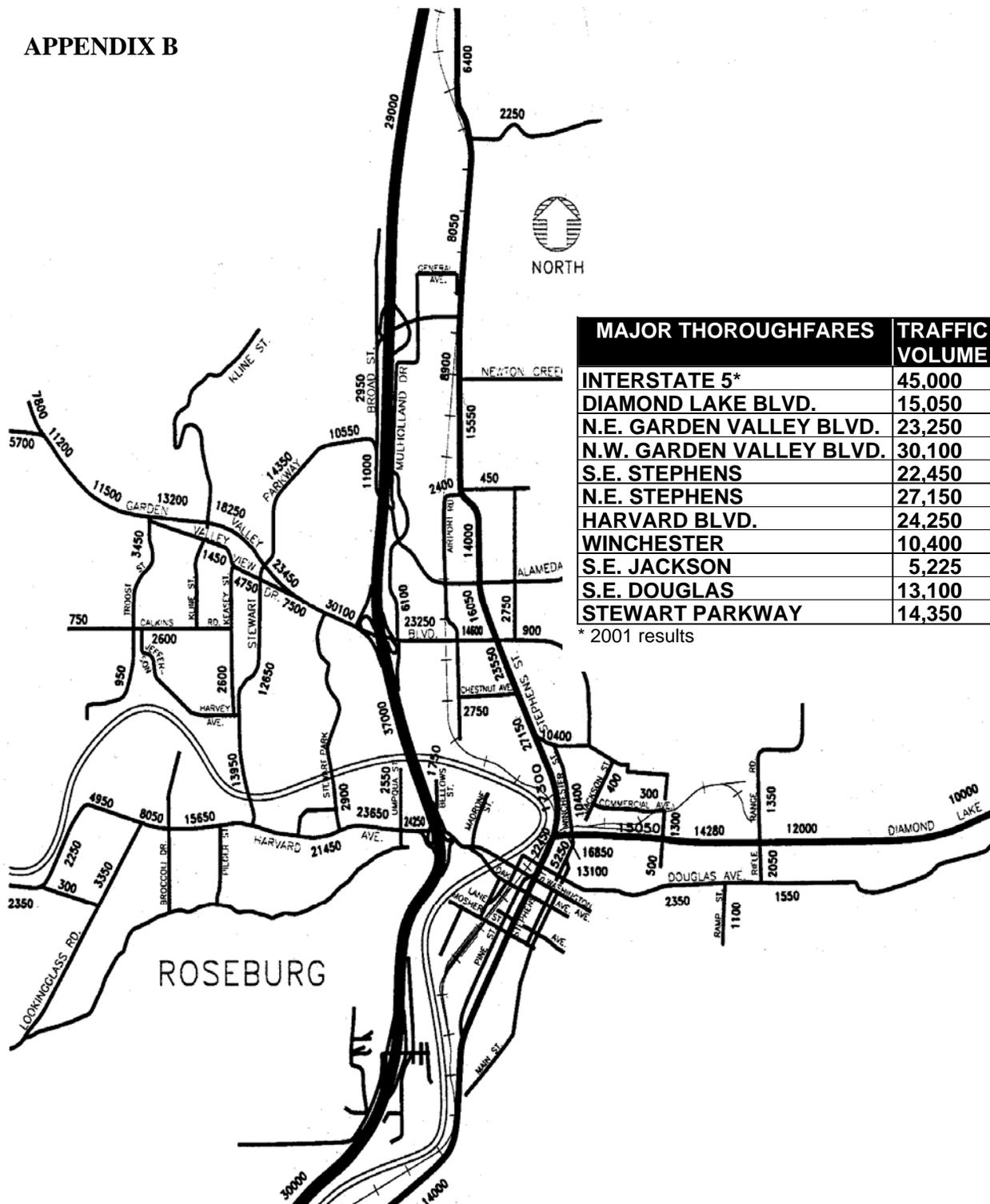


-  B_City_District
-  Station 502 less 503 less 501 in City Contains 120 Incidents
Property Value ~95.9M
-  Station 502 - 4 min.
-  Station 503 - 4 min.
-  Station 501 - 4 min.

2002 Incidents 6/2003

4 minute response amoebas around each station. 2002 emergency responses are plotted using a red and black dot. Orange shaded area falls outside a 4 min. response area for station one and station three.

APPENDIX B

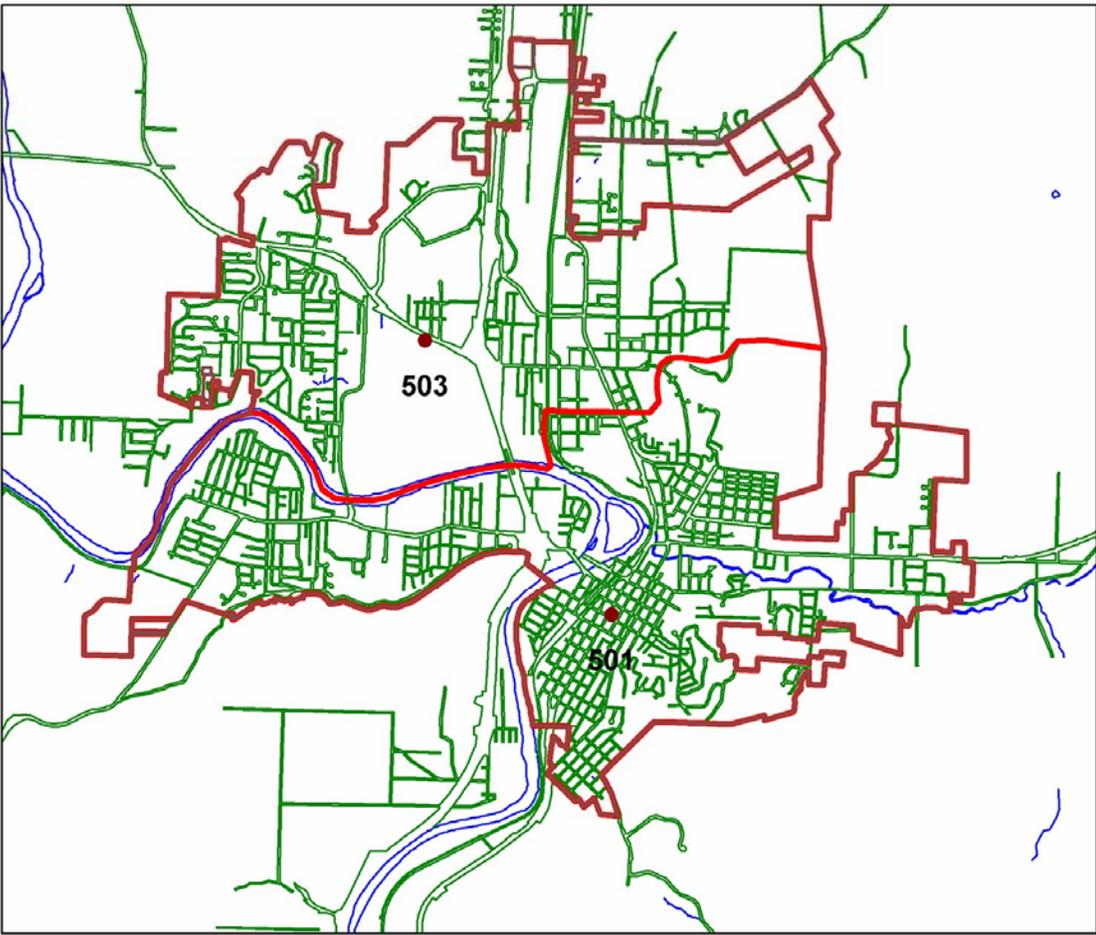


Since 1996, Roseburg has experienced tremendous commercial growth in the northwest quadrant of the City. Specifically on Stewart Parkway, Garden Valley Blvd., and Edenbower

The construction of an additional I-5 on/off ramp at Edenbower has redirected traffic flows off Garden Valley Blvd.

APPENDIX C

ROSEBURG FIRE DEPARTMENT



STATION RESPONSE AREAS

New station boundaries beginning July 1, 2003– Orange line denotes the border between station 503 (Sta.3) and 501 (Sta. 1)

APPENDIX D

STATION	TYPE	# OF	AVERAGE	OUT OF	AVAILABLE	UNAVAILABLE	AVERAGE #	AVAILABLE
	OF CALL	CALLS	HANDLING	SERVICE	(MINS.)	(%)	IN 24 HOURS	(%)
			average (Minutes)	total (callsxht)	(525,600)- (oos)	(F/525,600)		
Station 1	EMS	710	22	15620	509980	2.97%	1.95	97.03%
	FIRE	99	38	3762	521838	0.72%	0.27	99.28%
	OTHER	333	16	5328	520272	1.01%	0.91	98.99%
	SUBTOTAL	1142	25	24710	500890	4.70%	3.13	95.30%
	BACKUP FIRE	56	38	2128	523472	0.40%	0.15	99.60%
	BACKUP OTHER	44	16	704	524896	0.13%	0.12	99.87%
	SUBTOTAL	100	27	2832	522768	0.54%	0.27	99.46%
	TOTAL	1242	26	27542	498058	5.24%	3.40	94.76%
Station 2	EMS	559	25	13975	511625	2.66%	1.53	97.34%
	FIRE	58	34	1972	523628	0.38%	0.16	99.62%
	OTHER	167	19	3173	522427	0.60%	0.46	99.40%
	SUBTOTAL	784	26	19120	506480	3.64%	2.15	96.36%
	BACKUP FIRE	89	38	3382	522218	0.64%	0.24	99.36%
	BACKUP OTHER	141	16	2256	523344	0.43%	0.39	99.57%
	SUBTOTAL	230	27	5638	519962	1.07%	0.63	98.93%
	TOTAL	1014	26	24758	500842	4.71%	2.78	95.29%
Station 3	EMS	1063	23	24449	501151	4.65%	2.91	95.35%
	FIRE	94	45	4230	521370	0.80%	0.26	99.20%
	OTHER	490	18	8820	516780	1.68%	1.34	98.32%
	SUBTOTAL	1647	29	37499	488101	7.13%	4.51	92.87%
	BACKUP FIRE	65	38	2470	523130	0.47%	0.18	99.53%
	BACKUP OTHER	23	16	368	525232	0.07%	0.06	99.93%
	SUBTOTAL	88	27	2838	522762	0.54%	0.24	99.46%
	TOTAL	1735	28	40337	485263	7.67%	4.75	92.33%
All Stations	SUBTOTAL	3573	27	81,329	444,271	15.47%	9.79	84.53%
All Stations	TOTAL	3991	27	92,637	432,963	17.63%	10.93	82.37%

OAIRS Data: Emergency responses for 2002 - collected for Bryson's method in determining Response Reliability.

APPENDIX E

OAIRS data

Automatic Aid Given to DCFD No.2 by RFD - 1/1/97 To 12/31/03

Year	Alarms			
1997	109			
1998	143			
1999	196			
2000	183			
2001	202			
2002	156			
		Alarms	Minutes/alarm	Hours
2003	89	Fires	365	42
		Other	713	25
Total	1078	Total	1078	-
				553

Table E1. The table shows the year and the number of alarms RFD gave automatic aid to DCFD No. 2 from January 1, 1997 to December 31, 2003 (City of Roseburg, 2003b).

APPENDIX E

OAIRS Data**Automatic aid Received From DCFD No. 2 for RFD -1/1/97 TO 12/31/03**

Year	Alarms			
1997	42			
1998	45			
1999	41			
2000	37			
2001	60			
2002	45			
		<i>Alarms</i>	<i>Minutes/alarm</i>	<i>Hours</i>
2003	29	Fires	161	30
		Other	138	11
Total	299	Total	299	-
				92

Table E2. The table shows the year and the number of alarms automatic aid was received from DCFD No. 2 for RFD from January 1, 1997 to December 31, 2003 (City of Roseburg, 2003b).