

City of Boulder, Colorado

**OPERATION AND MANAGEMENT
ASSESSMENT OF THE BOULDER
FIRE-RESCUE DEPARTMENT
REPORT**

June 1, 2011



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Operation and Management Assessment of the Boulder Fire-Rescue Department

City of Boulder, Colorado

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Although we received valuable input from a variety of sources, the findings and recommendations contained in this report are entirely those of the TriData project team. Principal members of the team and their areas of responsibility are shown below.

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Operational Review

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FOREWORD

TriData, a division of System Planning Corporation (SPC), is based in Arlington, Virginia. SPC is a 200-employee defense and national security contractor specializing in high-level systems engineering and national security.

Over the past 29 years, TriData has completed over 250 fire and EMS studies for communities of all sizes. In addition to this local government consulting, TriData undertakes research in a wide range of public safety issues. TriData is also noted for its research on behalf of the United States Fire Administration (USFA), Department of Homeland Security (DHS), and other Federal and state agencies, as well as the private sector. TriData also conducts international research on emergency response topics and has conducted extensive research on effective fire prevention strategies in Europe and Asia.

EXECUTIVE SUMMARY

TriData, a division of System Planning Corporation (SPC), was contracted to conduct a comprehensive operation and management assessment of the Boulder Fire Rescue Department (BFRD). BFRD protects over 100,000 residents, many businesses, a major university (University of Colorado), and the foothills of the Rocky Mountains. To accomplish its mission, 112 personnel are assigned to staff and manage seven stations that deploy seven engines and one ladder. Fire units are available 24/7. The Wildland Division is an important part of the BFRD and includes 3 additional full time personnel and a 5 person seasonal crew, during 10 months out of the year.

Overview

The BFRD is a good department, operationally sound and well trained in the basics. It is a philosophically aggressive department in its approach to fighting fire and is quite competent in its ability to implement operations. The operations and response procedures of the BFRD are sound. Response times are good. The current configuration of fire stations provides good coverage and station locations are fairly ideal. The protocols with regard to fire suppression and EMS response are solid and exceedingly professional, and there is an abiding department-wide pride in providing professional service to the Boulder community. The structure and size of the BFRD serve to effectively meet the department's mission. There is an appropriate span of control and the structure has created a functional organization, particularly at the administrative level. The BFRD has an excellent mutual and automatic aid system. There is seamless cooperation between the BFRD and every fire protection agency across the county and state in no small part attributable to the fire chief's leadership in this arena.

The city also receives a very high quality of pre-hospital emergency medical services. All emergency response personnel from the fire department are trained as Colorado Emergency Medical Technicians (EMTs). Wildland fire suppression and mitigation efforts are also very good. The city's wildland division is considered a pioneer in the field. The fire prevention division of the department has an excellent public education program. The training division provides a comprehensive program, is an excellent resource and few departments can match the quality of the recently completed and state-of-the-art training facility. The Boulder Office of Emergency Management is professional, well run and well organized. The city has an advantageous fleet maintenance and replacement program for fire apparatus.

In summary, the Boulder community can be assured that on the street level, competent fire emergency services are being delivered. It is important to highlight that the City of Boulder has significantly fewer fires, dollar loss, civilian fire injuries and civilian fire deaths per capita than the average of U.S. communities of similar size.

Findings and Recommendations

Organization and Management – The BFRD provides competent and sound service when responding to emergencies in the City of Boulder and the surrounding area where wildfires are a natural hazard. However, in some areas the BFRD has become stagnant. Labor-management relations and internal communications are areas to improve. While fire personnel's input on contractual matters is important, as represented by the International Association of Firefighters (IAFF) Local #900 union, there needs to be better communication and mutual respect between labor and management in the final decision-making process. With regard to management, there is a lack of leadership and a perceived powerlessness in the ability to implement needed change because of poor labor management relations and union influence. The Wildland Division and the union do not get along and this needs to improve. There is virtually no succession plan for future leadership.

While internal communications within the department need improvement, external communications with outside partners and stakeholders are excellent. In fact, it is one of the best we have seen in the country. Every outside agency we spoke to express an excellent working relationship and communication between their respective agencies and the BFRD.

Negotiated firefighter compensation seems to have had an indirect effect on the operational budget. The City of Boulder is fortunate to experience a relatively good financial state, while many cities are negotiating and exacting needed concessions to keep essential emergency services viable. It is incumbent upon the City to continue to shift towards establishing a more pragmatic balance between its positioning of fair bargaining and basic operational needs for the department.

Recommendations to improve the BFRD include:

- The proposed addition of an Administrative Battalion Chief position to the organizational structure, and
- A proposed plan for enhancing leadership and communications training department wide, including a focus on Oversight and Planning, Leadership, Communication, Employee Development and Support and Community Education and Outreach. (Appendix A includes a detailed list of training programs.)

Risk and Demand/Station Location – The Boulder team was particularly responsive to all of our data requests. In fact, this was one of the best data collection experiences we have had with any of our clients. There are few gaps in Boulder’s use of data or its completeness. However, there are some areas that could use improvement.

A significant finding is that only the demand for emergency medical service (EMS) is increasing. EMS calls increased from 4,828 in 2005 to 5,384 in 2010 accounting for an 11 percent increase. With Boulder’s population and employment projections, EMS incidents are expected to increase, particularly in areas being redeveloped. Boulder has significantly fewer fires, dollar loss, civilian fire injures, and civilian fire deaths per capita than the averages for communities of similar size in the United States.

Response times were found to be good, but slightly higher than national standards. Areas for the improvement of response times, particularly with respect to turnout times, are identified in this report. Citywide travel times are approximately 20 seconds longer than the National Fire Protection Association (NFPA) 1710 recommendations at the 80th percentile level and 80 seconds longer at the 90th percentile level. Total response times are approximately 30 seconds longer than the NFPA 1710 recommendations at the 80th percentile level and 90 seconds longer at the 90th percentile level.

Although BFRD should continue to reduce the travel time to emergencies, it is not realistic to achieve the 6 minute total response time NFPA goal 90 percent of the time. A better approach is to improve call processing and turnout times to compensate for slightly longer travel times.

Recommendations for slight station location improvements include:

- The proposed relocation of Station 3 to the north and out of the floodplain, and

Long-term recommendations include:

- The proposed relocation of Station 5 closer to the intersection of Iris Avenue and Broadway Street.

Fire Operations – As a fire department, BFRD is operationally sound. The residents and businesses of Boulder can be assured that competent fire emergency services are being provided at the street level. The city’s Wildland Division has been a pioneer in the field, receiving well deserved national recognition for its comprehensive approach towards forest management. For EMS, the city uses a combined and integrated service network that initiates care from an enhanced 911 emergency call center operated by the city’s Public Safety Communication Center.

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First responder services are rapidly initiated from each of the City's seven fire stations operated by BFRD. Recommendations to improve these areas include:

- The proposed use of a 2-person rescue vehicle in its busiest fire stations, running in tandem with fire apparatus. This recommendation is also intended to address environmental concerns related to greenhouse gas emissions and fuel usage.
- The continuation of the 48/96 work schedule for the immediate future, while monitoring the use of sick leave and overtime.
- Reclassifying the Wildland Fuels Manager and Fire Management Coordinator positions in order to align position titles and pay scales with other fire response positions.
- Adopting the International Wildland-Urban Interface Code.
- The proposed purchase by BFRD and Open Space and Mountain Parks (OSMP) of two Type-3 engines (one per department) to be added to the wildland response fleet.
- Exploring options to transition the BFRD's current seasonal crew members to a full-time fuel crew.

Environmental Sustainability – Environmental sustainability is a major concern and initiative in the City of Boulder. BFRD is currently engaged in these efforts, but objectives could be more clearly defined and communicated in the department. There are a number of significant opportunities for BFRD to improve its sustainability practices by working more closely with the city's sustainability staff in order to help the city meet its sustainability goals. Examples of sustainability initiatives are highlighted in the report, such as the United Kingdom's deployment of fire bikes specifically equipped to fight fires and the use of domesticated animals (such as goats) to help prevent and mitigate wildfires. In addition to the recommendation mentioned previously for smaller EMS response vehicles, recommendations include:

- Further implementing basic sustainability practices such as recycling, energy conservation, employee commuting reduction, fuel conservation, and employee awareness at all facilities.
- Working with city sustainability staff to perform an environmental baseline assessment and developing a department sustainability plan.
- Designating an internal sustainability program leader.
- Developing a firefighter green team.
- Tracking sustainability actions and reporting the results to the city sustainability staff and City Council.

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- City sustainability staff providing training to BFRD leadership to reinforce the City's sustainability program, goals and expectations.

Support Services – Under the heading of Support Services, this study also reviewed fire prevention activities; training and professional development; fleet and facilities; health, wellness and fitness programs; and emergency communications. It should be noted that BFRD's Fire Prevention Division is one of the best run in the department, and implements some of the best programs in the entire area. Its public education efforts with the University of Colorado (CU) program in particular, have become a national model. Recommendations to improve areas in Support Services include:

- Enhancing clerical support to the fire training division.
- Establishing a training steering committee to guide the training curriculum and to provide input on the content and delivery methods.
- Continuing the use of wildland team members for out-of-area assignments and expanding the number of personnel who maintain National Wildfire Coordination Group (NWCG) credentials.
- Examining the expansion of wildland fire training opportunities, offered through the Wildland Division and the Front Range Fire Consortium, for Front Range communities urban and rural fire districts inside and outside the state.
- Evaluating a reduction in BFRD's participation in the delivery of fire academy instruction by its training division personnel in order to focus resources on department needs.
- Taking an aggressive approach in implementing a mandatory wellness and fitness program for all emergency response personnel, especially related to annual physicals.
- Reconsidering the current fire apparatus replacement strategy by extending the replacement cycle for engines from 10 to 15 years, while accelerating the replacement of the current brush truck fleet.
- Modifying the current computer aided dispatch (CAD) system to track and report on call handling time for all 9-1-1 calls.

Appendix B – This section is a Plan and Financial Prioritization List which lists all of the recommendations in the report which include plan priorities, financial priorities and approximate costs. Several recommendations are asterisked to indicate areas that need to be addressed first. The recommendations in the Executive Summary closely align with the priorities cited in this section.

I. INTRODUCTION

Scope of Project

The scope of this project was to provide a third party independent review of emergency services such that city officials can understand how well the system is working. Officials also desired to understand whether the fire department can provide services more efficiently.

Specifically, the city requested an opportunity to evaluate the manner in which the city currently operates and manages the fire department and to identify opportunities for efficiencies and improvements. The assessment was intended to inform the basis and intent of a future BFRD Master Plan.

Study Process

The process used for this project combined multiple research techniques, including personal interviews, collecting and reviewing background information, analyzing computer aided dispatch (CAD) and incident data, and performing geographic information system (GIS) analyses. We also visited each of the city's fire stations and drove throughout the city with city officials and fire department personnel to understand its unique setting and geography. Throughout the project we maintained contact with the city's designated project manager and we followed up with key individuals by e-mail and telephone.

Organization of the Report

Chapter II, Organization and Management – This chapter looks at the current organization of the BFRD and the major issues confronting management. Major recommendations occur here to improve department leadership skills and communication.

Chapter III, Population Growth, Risk, and Demand Analysis – This chapter discusses the pressures on the fire system, including an analysis of future population changes and a projection of demand. These factors are important in evaluating future viability of the system and identifying resource needs related to future demand for fire and emergency services.

Chapter IV, Station Location and Response Time Analyses – This chapter presents the GIS analysis of station locations and response times. The section discusses the station configuration recommended by this study and includes the maps depicting the current and proposed system.

Chapter V, Analysis of Fire and EMS Operations – This chapter discusses fire suppression, including discussions of the command structure, staffing, and the deployment of apparatus and staff. Presented here are the major deployment modifications recommended. A discussion of overtime and the staffing analysis is also in the chapter. This chapter also discusses wildland response and mitigation, EMS and Boulder Fire Rescue’s relationship with Boulder OEM.

Chapter VI, BFRD Environmental Sustainability Analysis – This chapter discusses and evaluates existing sustainability practices and opportunities for new actions. It also provides set of recommendations for environmental sustainability management and specific actions BFRD can take to improve their organizational involvement in citywide sustainability initiatives.

Chapter VII, Support Services – This chapter discusses the delivery fire prevention and code enforcement that are so important to risk management. The BFRD training division, the operation of the city’s 9-1-1 dispatch system and apparatus and facility maintenance are also presented.

Appendices

- Appendix A, Professional Development Resources and Activities
- Appendix B, Plan and Financial Prioritization List
- Appendix C, Evaluating Relocation Sites for Station 6
- Appendix D, Possible Merger Sites for Station 3 and Station 7
- Appendix E, Staffing Options for the Use of Two-Person Rescue Units

II. ORGANIZATION AND MANAGEMENT

This chapter discusses the existing structure, reporting mechanisms, support services, and communications in the Boulder Fire-Rescue Department (BFRD). It also discusses the interaction with other County departments/agencies and their shared service.

Organizational Structure

The BFRD is a medium-sized, all-career fire department that provides all-risk emergency services, including a very active wildland fire division. The goals of its mission statement are to make Boulder a safe place to live and work, and to reduce the human suffering caused by fires, accidents, sudden illnesses, hazardous material releases, or other disasters.

As with most departments, the fire chief is an appointed position which usually takes the form of either being hired from within the ranks or bringing in a chief from the outside. Many years ago, Boulder hired the current chief from the outside. The chief was hired at a cathartic time in the department's history as a change agent, and in many ways, much of his tenure over that twenty year period has continued to define both him and the organization he leads (more on this later in the chapter).

The BFRD has a traditional organizational structure for a department its size and for the city it protects. It effectively meets the intent of its mission statement. The department has two major divisions, and within those two divisions, are four primary sub-divisions, which comprise the operational structure of the department. The department has a staff of 112 full-time equivalent (FTE) personnel. A portion of those FTE positions include 3 full time personnel in the Wildland Division, which also employs a 5 person seasonal crew 10 months out of the year, and are not tallied in the 112. The four divisions within the department under Support Services and Operations respectively are the fire safety/prevention and training divisions, and the fire operations and wildland divisions.

Authorized FTE personnel for the BFRD, including the part-time wildland seasonal personnel, are shown in Table 1.

Table 1: BFRD Authorized Positions, 2011

Position	Authorized Personnel
Fire Chief	1
Deputy Chief	2
Fire Marshal	1
Wildland Division Chief	1
Battalion Chief	3

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Position	Authorized Personnel
Training Division Chief	1
Training Division Captain	1
Wildland Fire Management Coordinator	1
Wildland Fuels Management Coordinator	1
Wildland Fire Crew*	5
Emergency Management Assistant	1
Assistant Fire Marshal	1
Fire Protection Engineer	1
Fire Inspector	1
Public Education Specialist	1
Program Specialist	1
Administrative Assistant	1
Fire Captain	3
Fire Lieutenant	24
Engineer	27
Firefighter	39
Total Full Time	117

*Seasonal

Fire personnel are represented by the International Association of Firefighters Local # 900. The current three-year collective bargaining agreement went into effect on January 1, 2011 and expires on December 31, 2013. Wildland Division personnel are not represented by Local 900, nor are they unionized. All chief officers are appointed.

The FY 2010 fire department budget is approximately \$14.8M. Ninety percent of the budget is driven by personnel and collective bargaining. Percentage-wise this is on par with other fire departments where salaries and benefits typically average from 85-92 percent of the total budget. Table 2 shows a breakdown of the budget over the last 4 years to 2010:

Table 2: BFRD Budget, FY 2007-2010

	FY 2007 Actual	FY 2008 Actual	FY 2009 Actual	FY 2010 Actual
Emergency Services	\$10,547,188	\$11,253,786	\$11,548,892	\$12,208,678
Administration	\$702,530	\$724,045	\$780,428	\$772,712
Communications	\$392,944	\$197,393	\$140,147	\$182,250
Wildland Coordination	\$587,638	\$612,757	\$567,140	\$609,959
Wildland Team (seasonal)	\$22,561	\$27,807	\$29,394	\$26,818
Dive Team	\$30,256	\$36,445	\$27,983	\$27,067
Hazmat Team	\$23,555	\$44,210	\$44,868	\$24,712
Training	\$253,385	\$313,206	\$304,519	\$312,208
Fire Safety/Prevention	\$550,827	\$557,189	\$496,102	\$614,942
Fire Training Center*				\$100,089
Capital Budget				\$700,000
Total Budget	\$13,110,886	\$13,766,839	\$13,939,474	\$15,579,433

*Added in 2010 to track expenses

From 2008 to 2010 the fire department budget has increased by 31 percent, but the operating budget during that same period has decreased by 8 percent. In these challenging economic times, these disparate percentages beg the question of priorities and how budgets are conceived. While workforce collective bargaining agreements should remain consistent and keep pace with the cross section of other city departments, especially with public safety employees, they should not do so to the detriment of basic serviceable functions within the department such as training, equipment maintenance and procurement, PPE, CIP, etc.

Although not reflected in the organizational chart, one significant change that has occurred structurally from a budgetary standpoint is with regard to Communications. This change resulted from moving the allocation for dispatchers to the Boulder Police Department (BPD) budget.

Table 3 shows the salary for the various positions within BFRD. These are used as a discussion point from which to estimate the savings or additional costs if the city implemented any of the deployment and personnel changes recommended later in this study.

Table 3: BFRD Salaries, 2010

	Hourly	Monthly	Annual Average
Shift Employee			
Battalion Chief	\$50.10	\$8,684	\$104,208
Fire Captain	\$31.63	\$7,675	\$92,095
Fire Lieutenant	\$28.62	\$6,945	\$83,335
Fire Engineer	\$26.40	\$6,407	\$76,886
Firefighter 1st Class	\$23.80	\$5,776	\$69,311

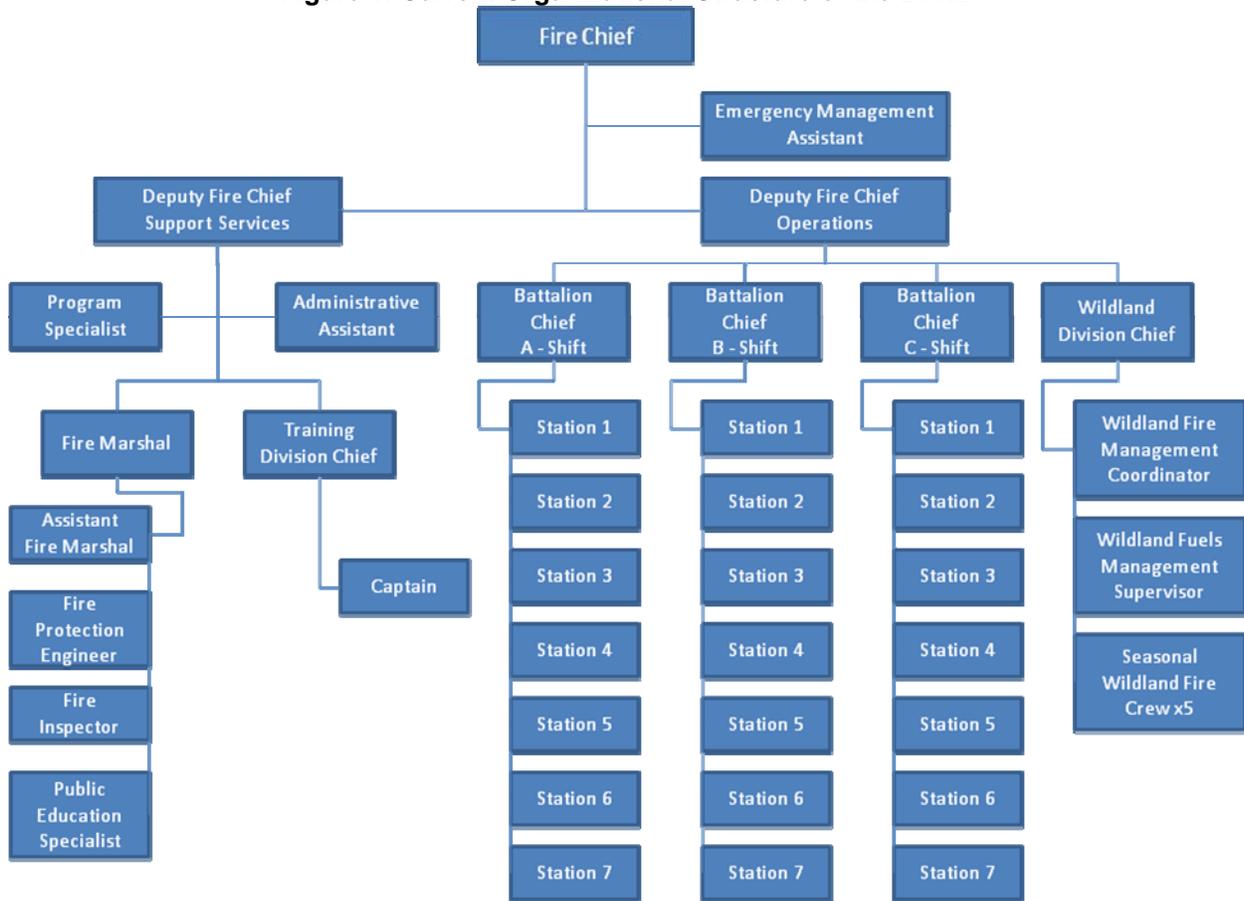
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	Hourly	Monthly	Annual Average
Firefighter 2nd Class	\$21.97	\$5,332	\$63,985
Firefighter 3rd Class	\$18.35	\$4,452	\$53,426
Seasonal Crew	\$15.05	\$2,408	\$24,080
Administrative and Support Staff			
Fire Chief	\$70.43	\$12,208	\$146,494
Deputy Fire Chief	\$53.75	\$9,317	\$111,800
Wildland Fire Division chief	\$50.73	\$8,793	\$105,518
Fire Marshal	\$50.00	\$8,667	\$104,000
Assistant Fire Marshal	\$44.28	\$7,675	\$92,102
Training Chief	\$48.87	\$8,471	\$101,650
Training Captain	\$44.28	\$7,675	\$92,102
Wildland Fire Management Coordinator	\$32.36	\$5,609	\$67,309
Wildland Fire Fuels Management	\$29.78	\$5,162	\$61,942
Fire Protection Engineer	\$32.69	\$5,666	\$67,995
Public Education Specialist	\$35.00	\$6,067	\$72,800
Fire Inspector	\$40.07	\$6,945	\$83,346
Administrative Assistant	\$27.61	\$4,786	\$57,429
Program Specialist	\$30.00	\$5,200	\$62,400

BFRD line personnel are amongst the highest paid in the Front Range. This is no coincidence. Previously, city administrations worked with the union during contract negotiations to consider elevating firefighters in the city to being one of the three highest paid departments in the Front Range. While this is an understandable goal given the high cost of living in Boulder and the surrounding area (only two BFRD firefighters live in the city due to the high property values within city limits), such an effort may have unintended impacts on the operational budget. The current administration has altered the compensation philosophy in a way that addresses previous salary targets. To date, the City of Boulder has been fortunate to experience a relatively good financial state while many cities are negotiating and exacting needed concessions to keep essential, viable emergency services. It is incumbent upon the City to continue to shift towards establishing a more pragmatic balance between its positioning of fair bargaining and basic operational needs for the department.

Figure 1 shows the current organizational structure of the department. The department has a traditional structure. The organizational structure changed in 2004 from one deputy chief to two in a significant reorganization, and this was a smart reconfiguration.

Figure 1: Current Organizational Structure of the BFRD



The current structure has two deputy chiefs who report directly to the chief of the department. These deputy chief positions are uniformed, appointed positions. Each position has four direct middle management and support positions reporting to them. This is an appropriate span of control and the structure is quite manageable and does not require any major fundamental changes. For an organization of this size it is simple, lean and not overly complicated with regards to span of control, and on the other end of the spectrum, deters micro-management. This organizational structure is one of the strong suits of the BFRD in that it has created a functional organization particularly at the administrative level.

However, there are two areas in particular within the current organizational structure which require addressing. One is in relation to a major vacuum that exists within the managerial structure of the department. There is a real absence of succession planning and preparing people for promotion throughout all levels of this department. Organizationally, nearly half of the line personnel and administrative staff are eligible or ready to retire. The institutional memory and brain trust at the heart of many of the most fundamental functions of the department will be decimated if certain individuals leave the department, without any real planning for their

replacement. The following chart gives an overview of the average ages and number of years of service.

Table 4: Average Ages and Years of Service for Fire Department Personnel

Years of Service		Age	
35+	3	60+	7
30-35	6	50-59	28
25-30	8	40-49	40
20-25	10	30-39	27
15-20	25	21-29	10
10-15	29	Total	112
5-10	16		
0-5	15		
Total	112		
Average Years of Service	14.00	Average Age	44.91

It should also be noted that 46 percent of the department has 15-35+ years of service and 67 percent falls into the 40-60+ age range.

Recommendation 1: Consider adding an administrative battalion chief position. The position is needed for the long-term health of the organization.

There are numerous department-wide projects that a new administrative battalion chief position could address. During our site visit, we observed firsthand the potential for such a position, because one of the most respected battalion chiefs in the department was on light duty due to an injury. He was working in headquarters and was able to make significant progress on many of the outstanding projects that needed addressing, while gaining valuable administrative experience. To fill this gap, we recommend that the city seriously consider adding an administrative battalion chief.

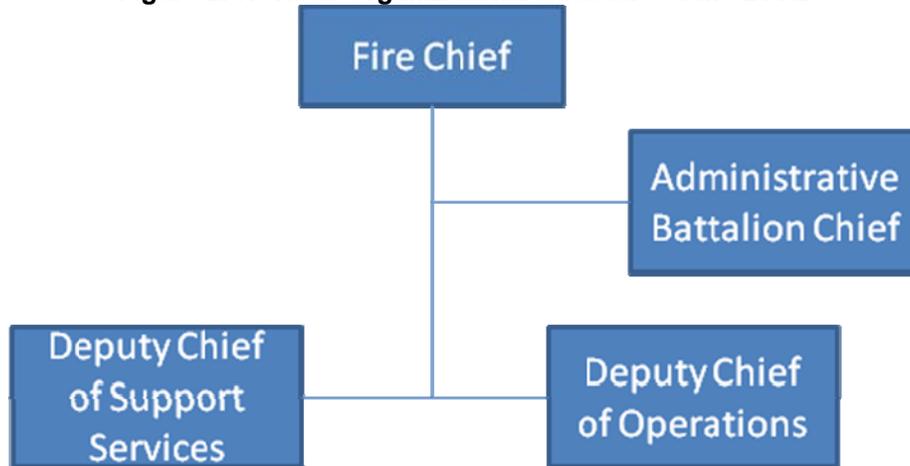
An ancillary benefit that can be wrought by this move is to create a specific sustainability leadership liaison to address the “three-legged stool” concept fostered by the city leadership. In addition to other project duties this position could act as a BFRD representative and direct conduit to the community, environmental sustainability needs and the economic concerns that connects all three legs together. Finally, this position should act as a direct conduit between labor and management without in any way diminishing management’s rights and decision making power.

The second area to address would be to formally move the Emergency Management Assistant position to the County under the Emergency Management (EM) Director. The position of Emergency Management Assistant is in the BFRD organization chart, but is a coordinating resource for the city, and one, which essentially answers to the EM Director. The most logical place for this position to be is in the Office of Emergency Management (OEM).

Recommendation 2: Move the city’s EM Assistant position to the county under the EM Director and have the county assume 100 percent responsibility for OEM. The city’s Fire Chief and Police Chief are already on the Board of Directors thus the city’s interests would be considered on major plans and decisions. The move would improve coordination on day-to-day operations within EM where it is crucial.

The revised organizational chart would incorporate the following changes:

Figure 2: Revised Organizational Structure of the BFRD



The new battalion chief position would answer to and receive direction from the office of the chief, but would also be within the direct line of the triumvirate of the chief and the two deputies. The communication and administrative link would also need to extend to the shift commanders (battalion chiefs) in terms of policy and follow through on initiatives, with the power of the two deputies bolstering the position’s authority.

Organizational Culture

Organizational culture refers to the values, beliefs, and traditions shared by all members of the organization. Culture has a profound impact on organizational performance as it guides everyday practices and behaviors. These practices and behaviors may or may not be in harmony with the stated vision of an organization. Many interviews were conducted as part of the site visit and there was considerable testimony about organizational culture.

In the fire service, understanding and managing an organization’s culture is key to promoting and reinforcing positive team behaviors, and addressing obstacles to individual

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fulfillment and performance. It is therefore important to talk about the organizational culture in the BFRD, because it directly and indirectly affects much of what is wrong with aspects of the department, as well as aspects of what is right with it.

This is a traditionally run fire department whose operations and response procedures are quite sound. The fire and EMS protocols with regard to suppression and EMS response are solid and exceedingly professional, and there is an abiding pride, department wide, in providing professional service to the Boulder community. This is a good department which is well trained in the basics and “knows their stuff” as one senior division chief described. In our assessment we found this to be true.

There are, however, several areas for improvement. The Wildland Fire Division is a big part of this department, because of the inherent and constant risk posed by the wildland fire interface between the city proper and the panoramic and breathtaking open spaces that surround it. These open spaces, which are by and large city-owned land, are extremely important to the identity and fabric of Boulder. The political will to protect and maintain them are an essential part of city legislation and policy. As such, the Wildland Division plays a major role in mitigating risk and protecting the city. However, there is a major disconnect between many line firefighters, the union and the Wildland Division. Our team was struck by this disconnect and surprised by the lack of cohesion between the divisions. The root of the problem is labor management-based and lies within the fact that the Wildland Division is not a part of the union. Thus, the union does not consider the Wildland Division as part of the fire department, and they don't consider the full-time staff or seasonal crew as firefighters, down to the detail that wildland personnel cannot even wear the BFRD patch. This lack of recognition and, quite frankly, disrespect is far from the truth and should not be tolerated. The Wildland Division personnel are proven professional firefighters and should be viewed as such. This cohesion should exist and become a well-established part of the organizational culture. It must be addressed. Fortunately, the Wildland Division is top notch operationally, but the department and the city would be better served if there were a much improved synergy between the divisions, and less friction.

Labor/management relations have a significant impact on the strategic and everyday operation of the department. It is generally agreed that relations between the fire chief and Local 900 are strained as well.

Part of the issue that characterizes the culture and continues to affect this organization is a tragic incident that occurred 25 years ago. In 1982, during a live fire training exercise, two firefighters were killed and three were seriously injured. The incident was caused by a serious lack of protocols and training in fundamental live fire safety practices. This incident led to the genesis and adoption of NFPA 1403 *Standard on Live Fire Training in Structures*.

It also forever changed the department, and as a result it is ingrained in its fabric to this day. In many ways it is as alive as it was 25 years ago. The current chief was originally hired to establish a new training division and reestablish an aggressive interior attack mentality for fire suppression. He succeeded in this, but the incident continues to color relations in the organization, which has in turn contributed a generally poor atmosphere and working relationship between management and the union.

This is but one factor in the equation. In the 20 years that have passed, little has been learned from the incident. Stagnation in relations has not moved forward or progressed to a more mutual respect-based level of doing business.

In this case, both management and labor are culpable for this state of affairs for different reasons. From a management standpoint, there is a lack of leadership and assertiveness necessary to offset or downright override union influence over certain policy initiatives. The confrontational style and persona embodied in its leadership further contribute to the current atmosphere. This in turn has created an inertia that both labor and management share and commiserate about. A major organizational mindset that infects the BFRD and one that our team both observed and repeatedly heard from members of the department was: “we can’t do it because the union doesn’t support it,” or “we don’t have the money.” While these phrases were voiced by many in the department, an equal number of individuals view this mindset (along with the members of our team) as a false reason and excuse to not move forward in certain areas to improve the department. The movement forward requires cooperation, communication and a will to go beyond the status quo. It will have to emanate from both labor and management. It requires leadership. Leaders have to lead; they need to motivate. There has to be a vision and a plan for the department to progress beyond its current inertia in certain areas. This vision and leadership must be an incessant working effort from both the union and management, which must be collaborative if it is to succeed. The department needs to aggressively identify and address leadership issues and not avoid them. An investment must be made in career-development and succession planning of department members. Everyone has to take ownership and become part of the solution. None of these leadership initiatives currently exist in our estimation on either part.

Internal and External Communications

Internal communications, the system by which organizations give and receive information and feedback, is a cornerstone of effective communications and a well run, well functioning fire department. The best labor-management relationships combine collaborative relationships and communication mechanisms that are inclusive in their decision-making process. They are respect-motivated and driven.

During the triage visit, the project team observed a bifurcated internal communication dynamic. The division between management and labor has almost completely compromised the input and feedback process. As a result of little information, individual speculation, and a pervasive “us versus them” attitude, organizational continuity and synergism have suffered between the rank and file and management. The fire chief and the deputy chiefs do not have the communication mechanisms in place that foster meaningful cooperation and working relationships that are the hallmark of healthy organizations. The fire chief and the deputies do not spend enough time in the stations. There are no meaningful regular meetings or forums to exchange issues and concerns. Scheduled monthly meetings between the chief and union representatives as required by an existing MOU are currently sporadic if not non-existent. Moreover the battalion chiefs are not really part of the management team. Part of this problem stems from battalion chiefs being on a 48/96 schedule. It creates a disconnect that renders them separate from the important daily administrative workings and hinders the flow of information and managerial initiatives down to the firefighter ranks. Consequently, communication at the station level needs to improve.

Recommendation 3: Move the shift battalion chiefs to headquarters where they can be more active in the day-to-day administration of the department. To make this change, the Wildland Division would have to be relocated, as we recommend later in this report. At the time a new fire station is constructed, space should be included to move the administration staff to the new station, which should include adequate space for records storage too. The recommendation to move and build a new Station 3 out of the 100-year floodplain is a great opportunity to explore this further. (See Chapter IV, Recommendation 20.)

At the administrative level, internal communications work well. The lack of communication found in the department as a whole is not a factor in the higher reaches of the department. The upper management level of the department that encompasses the offices of the chief, the two deputies, fire prevention and the fire marshal, and the wildland division chief is a close-knit working group. They implement policy uniformly and collaboratively. They do, however, seem to be slightly detached from the line personnel.

The recommendations to create a new battalion chief of administration coupled with moving the shift battalion chiefs to headquarters should help to ameliorate the real problem of the battalion chiefs working a 48/96 schedule. It will create a situation whereby there will be a continuity structure in place. The rotation of the battalion chiefs into that position will naturally facilitate the follow through of projects, communication between management and mid-management, and improve communication between the shifts and make a physical, face-to-face interaction possible.

External communications refers to department communications with other agencies and community residents. There are two sharp points of this effort which are unique to BFRD in particular and the City of Boulder as whole. One is the department's relationship to the county, the Boulder County Sheriff's Office, the Emergency Operations Center (EOC), Open Space and Mountain Parks (OSMP), the U.S. Forest Service, Colorado State Fire Service and various countywide fire protection agencies with regards to wildland firefighting and mitigation efforts. The second is the public education and code enforcement activities of the BFRD. These functions tend to be the most visible operations of the department, which engage more organizational elements outside of the department. These efforts are particularly important in a community that includes the University of Colorado (CU) and an aggressive three-pronged city sustainability initiative. The public relation function provided by the BFRD is an extremely important communications tool because this function provides a first point of contact for many stakeholders. The public perception of the BFRD is one of the single most important issues the department needs to monitor. BFRD needs to check the pulse of the community and ascertain what level of satisfaction the residents have with the job done by the department.

On both of these levels BFRD is doing an excellent job. In fact, it is one of the best we have seen in the country. Every outside agency we spoke to expressed an excellent relationship and communication between their respective agencies and the BFRD. Seamless cooperation was repeatedly characterized as the bedrock to the inner workings of the relationship dynamics. This permeated both the wildland relationships with BFRD and the Fire Prevention Division's outreach to the community. This is in no small part attributable to the fire chief's leadership in this arena. He has fostered the atmosphere and allowed his administrative staff to flourish and take an equally vibrant leadership role in developing and nurturing these relationships. This same approach should be employed with other internal communication and working relationships.

There is one area of external communications and community outreach where the BFRD is lacking, especially in light of the sustainability initiative the city so covets. The battalion chiefs and firefighters are not as connected to the community as they can and should be. The battalion chiefs do not attend community meetings, nor are they involved in community projects. We understand that the Boulder Police Department (BPD) is engaged heavily in community outreach and we believe that BFRD personnel should be engaged in a similar manner to the extent that their schedule permits. Again, the proposed administrative battalion chief position can play a key role in the facilitation of this goal.

Initial Steps Going Forward: Additional Recommendations

Department and management issues and leadership issues are the predominant areas of concern that keep this department from moving forward and reversing its inertia. As the city begins to choose to initiate changes recommended by this study, there is a need to infuse a new culture and ideas into the fire department. The city should consider using a specific plan of action to begin the implementation process of this study's major initiatives. The following is a combined list of potential solutions:

- Improve communication by soliciting input on issues and providing feedback on decisions. Conduct quarterly or semi-annual station and other workgroup visits by chiefs to promote open discussion of issues and needs. Develop formal communication cycles and peer level groups across the department to combat negativism and poor communication.
- Employ a conflict resolution approach that fosters communication, trust, consistency and enhances supervisor and management skills.
- Invest additional resources in officer development and training for all personnel, especially leadership, supervisory, interpersonal and technical subjects. Create and utilize new weekly roll-calls as training opportunities as well as multi-company drills under the direction of a comprehensive training plan put forth by the Training Division.
- Address “us versus them” behaviors between labor and management through team building strategies that promote a positive atmosphere of open discussion, understanding and problem solving. Further, attack the impact of negative behavior and attitudes through education and incentives on a workgroup level.
- Develop a feedback process that provides explicit and productive information to employees on their personal performance and aids them in defining professional needs. Work with officers and supervisors to provide positive feedback by recognizing good work and achievement on a daily basis.
- Enhance community involvement by conducting surveys through development of an education and outreach plan.

Change is not accomplished through a singular or “flavor of the month” approach; rather, it is achieved through a steady, repetitive, disciplined method that targets obsolete or inappropriate behaviors and reinforces new ones that support healthy performance practices. To paraphrase Aristotle, excellence is not an act but a habit.

The following recommendations support a culture of candor and cooperation. The recommendations are subdivided into five categories: Oversight and Planning, Leadership, Communication, Employee Development and Support, and Community.

Oversight and Planning

Recommendation 4: Construct a work plan that identifies the tasks, resources, timetable, and position requirements for implementation of the recommendations in this report. For each of the recommendations contained in this report, project plans will need to be developed along with the specific tasks that would be associated with each. To coordinate all these projects, an overall work plan will be necessary.

The work plan is a detailed document that provides information necessary on the various projects and/or tasks that must be taken to implement the recommendations in this document, as well as reasonable timeframes for their implementation. It defines all essential elements so department managers can effectively monitor the process aspects of the project.

The following sample template is a suggested format for the work plan. The far left column lists the recommendations and related tasks for completion, followed by who is responsible, start and end time, and any relevant comments. The work plan accomplishes the functions of keeping the department focused on execution and evaluation functions. There is also excellent project management software that exceeds the suggested format below by automating the information into relevant templates and timelines, as well as creating progress report summaries.

Table 5: Sample Work Plan Format

Recommendation/Task(s)	Who/Resources	Est. Time		Comment(s)
		Start	End	

A work plan ought to be the product of the key parties involved in this effort. They are critical to identifying the numerous variables and choices that can impact the successful execution of a plan. Consequently, it is imperative that the project facilitates agreement on the tasks and timelines with the appropriate principals. It is also important that given the emergency response nature of the department that adequate flexibility is built into the plan to allow for unexpected events. A work plan will aid in accomplishing this task.

Recommendation 5: Implement a communication, leadership, and accountability system that strengthens organizational and team oversight for interpersonal, operational, and administrative performance. It will be important to implement a system that proactively defines and addresses key communication and performance issues on a regular, ongoing basis. Further, the system should be designed to enhance individual, team, operational, administrative, and interpersonal functions by supporting strong communication practices, continuous quality improvement, and, most importantly, leadership development. The system would routinely engage everyone in the department on a quarterly or trimester schedule in an assessment exercise. The outcome of the exercise would then be reviewed and triaged at the middle and upper levels of the department, enabling a sharp and systematic focus on issues that inhibit performance. Moreover, this systematic approach will promote effective, sustained changes in individual and organizational practices.

While department leaders would sanction such an exercise, line supervisors and mid-level managers are the linchpin to success as they set the tone and role model the process. Collectively, top and middle managers, based on best practices, must be in alignment in their leadership practices, tone and communications. These parameters are essential for this particular fire department.

Within the context of the issues presented in this report, such a system would provide the following benefits:

- Rapidly and significantly improve the ability of managers and supervisors to define and address department issues, direct and monitor individual and team practices, critically analyze performance, as well as build and sustain a positive culture.
- Strengthen the competency and confidence of managers and supervisors to recognize and take prompt, preventive action to address performance problem behaviors.
- Improve the approachability and responsiveness of managers and supervisors and strengthen their relationship with subordinate staff.
- Reinforce positive behaviors that are critical for achieving a higher level of individual and organizational performance.
- Promote employee buy-in and encourage a supportive attitude within the department's culture for effective performance systems, self-initiative, and related personal behaviors based on a set of best practices.
- Enhance the leadership path for all personnel in operational, administrative, and interpersonal areas, particularly supervisors, and strengthen succession planning.
- Reinforce positive behaviors that are critical for achieving a higher level of individual and organizational performance.

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- Promote employee buy-in and encourage a supportive attitude within the department's culture for effective performance systems, self-initiative, and related personal behaviors based on a set of best practices.
- Enhance the leadership path for all personnel in operational, administrative, and interpersonal areas, particularly supervisors.
- Strengthen communication throughout all levels of the department, particularly between supervisors and subordinate personnel to foster more openness about issues that inhibit individual and team performance.
- Embed these processes and principles into departmental systems, e.g., promotional, succession planning, personnel appraisal, in order to improve accountability and organizational discipline supportive of desired performance behaviors.
- Strengthen professional development initiatives by incorporating self-study exercises that can be conducted within the station setting.

Leadership – Meaningful leadership—or a lack thereof—is a major issue in BFRD. The term leadership covers a host of qualities that are both tangible and intangible. The traditional view of leadership encompasses formal organizational positions, ignoring the power and influence of informal leaders in the organization. The following recommendations are both philosophical and substantive in encouraging a healthier form of leadership practices.

Recommendation 6: Create the opportunity for all managers, middle managers and current and future officers to enroll or engage in leadership development programs that include a significant self-awareness component, as well as development of general leadership skill sets. The foundation of leadership development is self-awareness. Leaders must understand how their personal and/or professional style impacts the people around them. They must have a clear understanding of their personal value system and how it aligns with organizational values before they are capable of assisting others in doing the same. Leaders must have a clear view of the difference between self and role to ensure that they do not let personal feelings or friendships interfere with needed actions.

With regard to leading organizational change, the definition of leadership is the ability to mobilize people to do adaptive work.¹ In other words, it means providing structures, plans and a vision that will assist the people doing the work to adapt to the changing environment at their respective levels. In order to do this, leaders at all levels both in labor and management must role model a number of qualities. They must be approachable by being physically and emotionally available to all members, and use a participatory style that values and empowers all members.

¹ Heifetz, Ronald L., and Linsky, Marty, 2002 *Leadership on the Line*, Harvard Business School Publishing, Boston, MA.

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Approachability is the relationship bridge between the supervisor and workgroup members. It is very important for a supervisor to be mentally engaged, actively demonstrate a sincere interest, and support workgroup members. A participatory style helps to establish the relationship between the supervisor and individual members. Moreover, it is imperative that supervisors build and maintain positive relationships with each member so that organizational and personal issues can be addressed in a prompt, constructive manner. The supervisor's language and practices have a profound impact on motivating and developing employees.

Leaders must also be proactive in addressing negative behaviors that may divide the workgroup. This is critical because of the impact it has on creating a productive, team-based work environment. This has to be done assertively and consistently to encourage respect amongst workgroup members. If negative behavior surfaces, it has to be addressed quickly, firmly and tactfully. This is where leaders must advocate appropriate positions and take a firm stand on professional conduct. Moreover, a leader supports doing the right thing by upholding organizational values and standards, by maintaining a high level of productivity and team function, and by supporting the well-being of individual team members.

Leaders also treat workgroup members equally while being flexible to individual circumstances. They recognize that consistent application of practices is essential to building trust and respect within the workgroup. However, consistency does not equal rigidity. A leader must respond differently to circumstances that may appear the same—but are not. To this end, being fair and just based on situational factors may be more on target than being consistent.

Leaders must model desired behavior and maintain a professional boundary with workgroup members while upholding organizational priorities and responsibilities. A major part of the supervisor's job is standing up for what is right, which happens to be a core value of the City of Boulder's organizational philosophy. Sometimes this becomes difficult when he or she has a personal relationship with other workgroup members. It can be very tempting to compromise one's beliefs or allow oneself to slip into a lax state of behavior. However, being a supervisor is a special honor and responsibility for which a higher level of behavior is required.

To understand, as well as put all these leadership concepts and principles into practice, regular life-long learning is required so that these skills do not become stagnant which may well be the case in BFRD. Officers must insure that they are regularly involved in leadership development programs and activities. There are a number of leadership development education opportunities many of them free (minus the cost of time off, backfill and travel costs) that we recommend for BFRD managers and officers, below are just a few. We feel the costs far outweigh the benefits for the future of the department. Additional leadership resources can be found in Appendix A.

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- a) “The Forum” and “The Advanced” are excellent 3.5-day self-awareness programs put on all over the world by Landmark Education (landmarkeducation.com). These two self-awareness programs are pre-requisites for the 6-month “Self Expression and Leadership Program” month. These programs are highly recommended for the senior leadership team and individuals aspiring to these positions.
- b) Effective Leadership Skills for Fire and EMS Organizations is an excellent self-awareness and leadership 2-week on campus program at the National Fire Academy. Some of the instructors can also be contracted to provide this program on-site at BFRD. This program is open to civilian as well as fire service personnel of all ranks, including firefighters.
- c) The “Executive Fire Officer Program” at the National Fire Academy provides excellent leadership development and is recommended for mid to upper level managers.
- d) The Command Officer Training Curriculum (COTC), developed by the National Fire Academy and handed off to state fire training agencies, has leadership and human resources modules that could be implemented to provide these important skills sets. The Colorado Division of Public Safety, Division of Fire (<http://dfs.state.co.us/ContactUs.htm>) has implemented this program.
- e) “The Building Bridges” program used in the Richmond Fire Department (VA) and the Pike Township Fire Department (IN) is a highly participatory leadership development program. Virtually every employee in an organization has the opportunity to participate in individual and group interviews, focus groups and large group orientation sessions that engages participants in completing extensive surveys and/or providing opinions on issues effecting the department. In addition, the department designates a Project Resource Team (PRT), a group comprising a cross-section of organization members, to assist with the interpretation of information and recommended actions. The work of the PRT is shared with a group of executive and command personnel who serve a similar function. Both groups receive verbatim summaries of an orientation exercise and surveys in advance of their planning sessions. These summaries allow the groups to hear uncut opinions about department performance and related issues and concerns. All of these activities culminate with an action plan for positive change and organization-wide generated leadership strategies for the future.

It is really not part of the culture of this department to encourage its members to participate in outside training experiences that will foster personal growth. Members appear reluctant to do so for a variety of reasons including schedule conflicts with second jobs, personal obligations or using the lack of funds as an excuse. There are ways to create an atmosphere of

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learning that require leadership, creativity, sacrifice and compromise. There appears to be no lack of interest, just a lot of complaining about lack of opportunities. Professional development is a departmental and personal responsibility. There are times the department will be able to sponsor at work programs, and there are times that the individual, based on personal commitment, must undertake learning opportunities on their own time.

Communication – Poor communication practices can rapidly undercut confidence and trust between individuals and the department. A systematic approach is required to institutionalize behaviors and practices that encourage open, direct and responsive communication practices. Lastly, strong communication practices and behaviors should minimize or eliminate “us versus them” condition.

Recommendation 7: Top department managers and command staff should regularly conduct open forums with all personnel and employee groups, and then record and respond to concerns. Direct, personal communication in a department the size of the BFRD is an ongoing challenge. Some participants stated a strong perception that the department leadership is out of touch with its members. Other members report that information does not appear to flow up and down the chain of command as effectively as it should. A number have recommended that top leaders conduct more station and workgroup visits to discuss issues first-hand.

There are some simple things that can be done to remedy this situation. Foremost is to document concerns in a log that defines the issue as well as the response (see Suggested Issue/Concern Log). The log should be available to all personnel on the department’s intranet website. For example, if someone raises a question about a new policy regarding the use of specialized rescue equipment, the first step is to develop a clear understanding and agreement of the issue. The next step is to determine the response or action(s) that may be addressed on the spot or later. Then, the issue is recorded in a log that defines the concern, the date received, the response and/or action(s) and the date communicated. The department should periodically (e.g., monthly or quarterly) communicate updates via the battalion chiefs, a newsletter, memo and/or intranet regarding issues that have been raised and its response to all members of the organization.

It is essential to have multiple communication sources to relay this information, as well as all priority initiative updates. Not all department members read or listen to any one source. The issue update report would reinforce disciplined communication practices and prevent issues from becoming neglected. Moreover, it ought to improve the relationship between line personnel and department leaders and increase transparency.

Table 6: Suggested Issue/Concern Log

Issue/Concern	Date	Response/Actions	Date

Employee Development and Support – Successful organizations establish clear expectations for employees and a path for success. The actions offered in this subsection will enhance existing efforts to strengthen important organizational processes and practices.

Recommendation 8: Implement monthly company level drills, officer development sessions and maximize existing self-training opportunities. First, establish regular training schedules for company level drills where each company officer, with the assistance of their respective battalion chiefs, determines the subject matter and lesson plan. Each session should include a classroom segment and practical application exercise. Coordination of subjects between each shift’s battalion chiefs is strongly encouraged. All training modules should also be coordinated with and reviewed by the training division to enhance continuity between department training goals.

Second, have each battalion chief insure that tailboard reviews are conducted for all fire, rescue and/or EMS emergency incidents as a means to review quality assurance protocols for emergency incident operations and external customer service delivery. In addition, each battalion chief should ensure that a formal post incident analysis session is conducted within one week following a significant incident where all personnel on the scene have the ability to provide input and receive feedback. The sessions should be conducted in a manner that facilitates learning rather than blaming. A record of lessons learned should be compiled and a system developed to make this information available to all personnel in the department on all shifts.

Third, establish regular (e.g., monthly) officer development sessions on all three shifts where company officers have the opportunity to regularly meet, discuss and receive guidance regarding personnel human relations scenarios, as well as develop management and leadership skills. This type of setting also allows the lieutenants and captains to develop relationships in their own supervisory peer group that will support their efforts to establish professional conduct boundaries and continuity for their stations. Without this peer support, it is difficult for supervisors to take a stand to effect change at their individual stations given the peer pressure from close familial relationships they develop with their co-workers due to spending 48-hour shifts together.

Fourth, establish “round table forums” featuring a presentation of major incidents by current and retired veterans for the purpose of conveying and discussing challenging experiences with junior members. Such forums could be jointly sponsored by the department, union and other employee groups. It also ties back to breaking down the generational barrier and gaps that some

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have referenced by tapping into and sharing professional life experiences of veteran members. This can be done on an informal basis within teams facilitated by the company officer.

Fifth, as some have recommended, conduct a morning roll-call briefing session at each station each morning, where station officers can give priority item updates, as well as highlight stories of organizational excellence that are consistent with reinforcing organizational mission, vision and values. The stories of excellence could be collected via the department intranet or other source where they can be easily found and used to reinforce positive actions.

Recommendation 9: Establish and implement core competencies for all managers and supervisors that will enable them to effectively manage and supervise a diverse work force.

Essential core skills need to be developed across the supervisory ranks. The department, with assistance from the human resources department, should be moving toward strengthening professional development for new officers. It needs to do the same for all supervisors. And, in recognition that one course does not accomplish or sustain behavioral change, learning needs to happen on an advanced and repetitive basis.

The following is a list of core competencies that should be addressed:

- Leadership
- Team building
- Conflict resolution
- Communication
- Intercultural Development (Diversity and Inclusion)
- Supervision

Recommendation 10: Conduct a skills inventory for all positions starting at the top of the department. As a tie into the previous recommendation, this is an initial step in developing an upward mobility approach and related to the preceding recommendation. Conducted in a non-discriminatory manner, a skills inventory determines individual needs and the type and substance of training courses. It will begin to build a strategic focus into the direction training must take and increase individual and organizational expectations and accountability for a higher level of operational and interpersonal performance.

Recommendation 11: Continue the practice of conducting department-wide training on basic discrimination and sexual harassment subjects. Understanding and preventing discriminatory and harassing behavior is one responsibility of supervisors. It is also an essential knowledge and skill area for all employees, which should be repeated every 2-3 years to remind and assist members with supporting healthy teamwork practices. In addition to discrimination and harassment training, a segment on the appropriate use of email should be incorporated. This area warrants proactive attention, as too many organizations have had negative experiences with the inappropriate use of email.

Recommendation 12: Continue to foster and develop ways to enhance a formal performance appraisal process. There is a compelling need to encourage direct one-on-one conversations about performance issues and accomplishments. A formal performance system is one way of fostering improved communication, professional development and performance behaviors. While an appraisal system may foster honest feedback, it is not a panacea as personal and organizational behaviors will have to change if such an approach is going to work. The change part is going to rest on the commitment of every person to make it happen.

Community – From an external marketing perspective, the community is the ultimate arena for measuring the department’s mission against customer needs and satisfaction. While the department does well on meeting customer needs, most entities in the city government feel it needs to be more proactive and systematically engaged in the city’s three pronged sustainability approach which is focused on community concerns. BFRD is not fully integrated into this initiative.

Recommendation 13: Develop a community education and outreach plan in the spirit and philosophy of the city’s sustainability efforts. There may be many moving parts to this recommendation. The first is who is going to do it. It could become a joint project of the operation and administrative staffs, as it will ultimately lead to coordinated education efforts that tie in both groups. We suggest that our proposed administrative battalion chief position would be a perfect fit to tie these pieces together. It will also entail doing some surveys, perhaps internal and external. In the end, the plan ought to ensure internal focus on community issues and develop a stronger relationship with community members and with the entirety of the city departments and staff.

III. POPULATION GROWTH, RISK, AND DEMAND ANALYSIS

This chapter discusses the major factors that drive emergency service needs: population growth, risk and demand. The assessment of risk is critical to not only the determination of the number and placement of resources, but also to the mitigation measures that may be available to the fire department.

Data Specification and Issues

This study and particularly the next two chapters required a significant amount of data. It is not uncommon to have difficulties collecting this data in the format we require for our analysis. The Boulder team was particularly responsive to all of our data requests. In fact, this was one of the best data collection experiences we have had with any of our clients. Although there are areas where the City of Boulder can improve their data collection systems (discussed later), we were particularly impressed with the speed and attention with which all of our data requests were handled. The remainder of this section provides specifications for each of the data components we used in compiling the analysis for this chapter and the subsequent response time and station location chapter. Within the data specifications, we provide recommendations where Boulder could improve data quality or content.

NFIRS Data – The National Fire Incident Reporting System (NFIRS) is a system established by the National Fire Data Center of the United States Fire Administration (USFA) to gather and analyze information on the magnitude of the Nation's fire problem, as well as its detailed characteristics and trends. The first version of NFIRS released in 1975 only collected fire incident data in a paper-based form. Over the last 35 years, the system has progressed to version 5.0 and now includes EMS, hazmat, and other data collection modules to reflect the all-hazard nature of current-day fire department work.

Boulder Fire-Rescue collects NFIRS data and we were provided 2005-2010 NFIRS data in the USFA transaction file in which we requested it. One of the first things we looked for in this data was whether CAD data from the Boulder dispatch center is automatically passed over into the NFIRS database. This data link is important because it provides a more concrete link between response data and incident data. It also potentially allows responding crews to review timestamps and note any inaccuracies (typically we find that CAD data includes many incorrect and inaccurate records as a result of missing radio traffic, changing use dispatch based on field requests, and human error). We found that the Boulder dispatch center does automatically transfer data and both Captains and Commanding Officers regularly review and note CAD data

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inaccuracies within their incident reporting software. Any response times longer than 20 minutes are automatically flagged and reviewed by the Boulder Fire-Rescue Program Specialist.

Although the NFIRS data collection system is well setup and appropriately monitored, there are some areas for improvement. Although the USFA NFIRS database specifications have evolved into a fairly comprehensive system, there are some areas where Boulder would benefit from using optional NFIRS data for recording important CAD data that is not currently collected by the NFIRS system. As we will discuss later in this section, we had to cobble together CAD and NFIRS data for our response time analysis because the NFIRS database does not include a unit dispatch time (it records all other timestamps). We recommend that Boulder Fire-Rescue work with its CAD vendor to use one of the optional NFIRS Table 1800 fields for recording a unit en route time. Once Boulder moves to a newer CAD system that automatically records incident coordinates, it would also be advised to pass this data into the NFIRS database. With these small changes it will be possible to conduct all fire department data analysis directly from the NFIRS database.

Recommendation 14: Setup up a system by which en route data and eventually coordinates (once there is an updated CAD system in place) are placed into the NFIRS database as special fields. This will effectively allow in-house analysts and consultants to use a single database for conducting performance measurement and risk analysis. This will lead to more accurate information than having to try to cobble together several different data sources.

Computer Aided Dispatch Data – Computer aided dispatch (CAD) data provides a permanent record of communications between the dispatch center, the public, and fire department units in the field. Typically CAD data includes an incident dispatch type, incident address, incident coordinates, and response timestamps for all responding units. We requested January 2009 through November 2010 and received this data in our specified format. Typically we find that CAD data includes significant amounts of incorrect and inaccurate records as a result of missed radio transmissions (may result in a timestamp not being recorded), units taking calls for each other (may result in inaccurate unit response records), and human error. CAD records can be thought of more as permanent records of all dispatch center actions rather than a perfect reflection of actions in the field. CAD data quality issues are almost always present, but we found that the Boulder CAD data had less issues than most.

We did, however, come across some CAD issues that should be immediately addressed. We found for instance that in the data collection process there was not a great understanding of the underlying CAD database. It is our understanding that Boulder is in the process of getting a new CAD system. The dispatch center should make sure that they always have somebody on staff or on call that has the capability of managing the underlying CAD databases for the new CAD system.

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It also appears that there may be an issue with collecting accurate call received time. We found that almost 70 percent of all incidents had a call-received time that matched the dispatch time. It is not uncommon to have a phone system that cannot pass a call-received time into the CAD system. We are not sure if this is the issue or, perhaps, there is an issue with how the call received time is passed to the NFIRS data (which is where we took the call received timestamp for our analysis). Finally, and perhaps most importantly, we are concerned that the CAD system does not track incident coordinates. Newer CAD systems allow call-takers and dispatchers to display and verify incident locations in real-time. These systems record an accurate GPS coordinate for each incident (assuming dispatchers correctly verify incident locations). Boulder is still using an older system where units are picked based on an address database rather than real-time address mapping. In this system, call-takers have to either input addresses that perfectly match up with the database or manually figure out where an incident is located and what units to dispatch. This type of system has no way of determining or recording GPS coordinates and, as a result, there is no definitive incident location recorded. This type of system limits the accuracy of neighborhood-level fire department analysis that depends on knowing where all incidents are located.

Recommendation 15: Upgrade the CAD system so that GPS coordinates are collected for all incidents. We understand this process is currently in progress, and BFRD should continue this important initiative.

Because incident coordinates were not available, we had to attempt to geocode all incidents based on their address for us to conduct neighborhood-level analysis. The geocoding process is never perfect because of incorrectly entered and missing incident addresses. The Boulder Information Technology and Information Resources staff graciously offered to geocode six-years of incident data and was able to locate approximately 70 percent of incidents. By knowing where most incidents occurred, we were able to provide some neighborhood-level analysis. We have to assume that the missing 30 percent of incidents are not skewed in any particular way (i.e. University of Colorado addresses were more likely to not locate than addresses in other parts of the city) to skew the results of our analysis. Neighborhood-level analysis is extremely important for measuring fire department performance and, by upgrading to a CAD system that tracks incident coordinates, it will be possible to produce much more accurate analysis.

Geographic Information System Data – A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows one to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the

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form of maps, globes, reports, and charts.² This and the following chapter include a significant amount of maps prepared using ESRI's ArcView software. In order to tailor our analysis to the city of Boulder, we requested several GIS files for our analysis. We received the following ESRI shapefiles from Boulder:

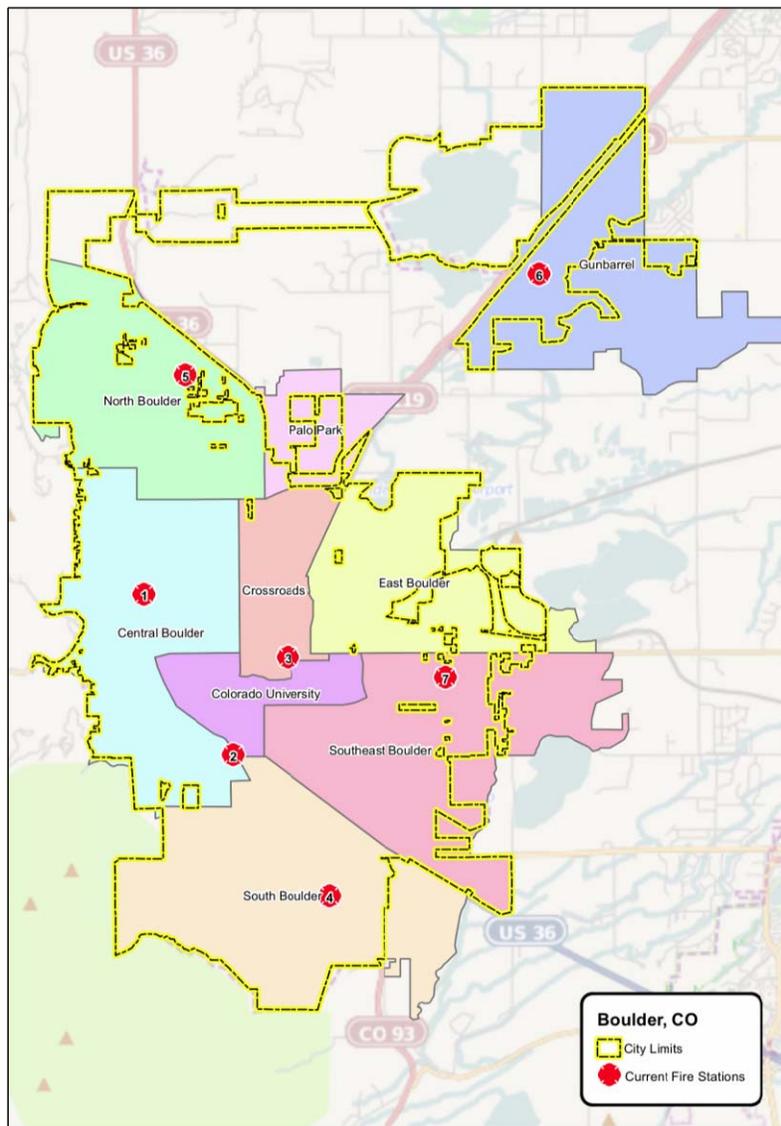
- Shapefile (points) showing the location of all fire stations
- Shapefile (points) showing the location of all EMS and police agencies
- Shapefile (polygon) showing fire department first-due areas
- Shapefile (polygon) showing jurisdiction boundary

We also requested a GIS file that shows neighborhoods or planning areas within Boulder. It is good practice for fire departments to consider risk and demand at a neighborhood level. In order to accomplish this, fire departments must have some predefined planning areas by which to summarize incident information. We originally received a GIS file that showed all Boulder's neighborhoods. In total there were 46 neighborhoods, which was a higher level of detail than was needed or would be useful for comparing fire risks between different parts of the city. Instead we decided to use the "Planning Subcommunities" to break Boulder up into nine regions. This subdivision was much more appropriate for our purposes. Please note that some of these subcommunities do stretch beyond the current Boulder jurisdictional boundaries. Throughout this report, when we provide analysis by planning area, we are only looking at the portion of these subcommunities that fall within Boulder boundary. Also note that when we refer to, for instance, the "University of Colorado" area, we are referring to the University of Colorado subcommunity as shown in Figure 3 and not what might typically be thought of as the University of Colorado area.

Figure 3 shows the nine the nine planning areas used for our neighborhood level risk and demand analysis in this chapter (see Table 18 in Chapter V for station addresses).

² Source: ESRI, "GIS"

Figure 3: Planning Areas



Datasets Used for our Analysis – We used predominantly two separate data sets for our analysis. For our long-term analysis (trend analysis, demand forecasting, and geospatial density mapping), we coupled together 2005-2010 NFIRS data with the geocoded incident addresses provided to us by the city of Boulder.

For our short-term analysis (response times and workload) we used predominantly NFIRS data cobbled together with a couple fields from the CAD (that were not available within the NFIRS dataset). Because we only had January 2009 through November 2010 CAD data (because of the timing of our data request), we decided to compile a single calendar year of data that begins December 1, 2009 and ends November 30, 2010. To prepare this shorter dataset we took a subset of the NFIRS data that included all available unit response timestamps for the specified time period. We used the NFIRS incident type classification to determine whether the

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incident warranted an emergency (lights and sirens) response. Essentially, we remove “service calls” and other similar calls from the response time analysis. We also used the NFIRS data to classify whether each incident was within the jurisdiction boundary or a mutual aid response. In addition to the NFIRS data subset, we pulled in geocoded incident locations and “unit en route” timestamps from the CAD data (because this field is not available within NFIRS). By using mostly NFIRS data for compiling this dataset, we ensure higher-quality data because NFIRS data is typically reviewed and corrected more so than CAD data.

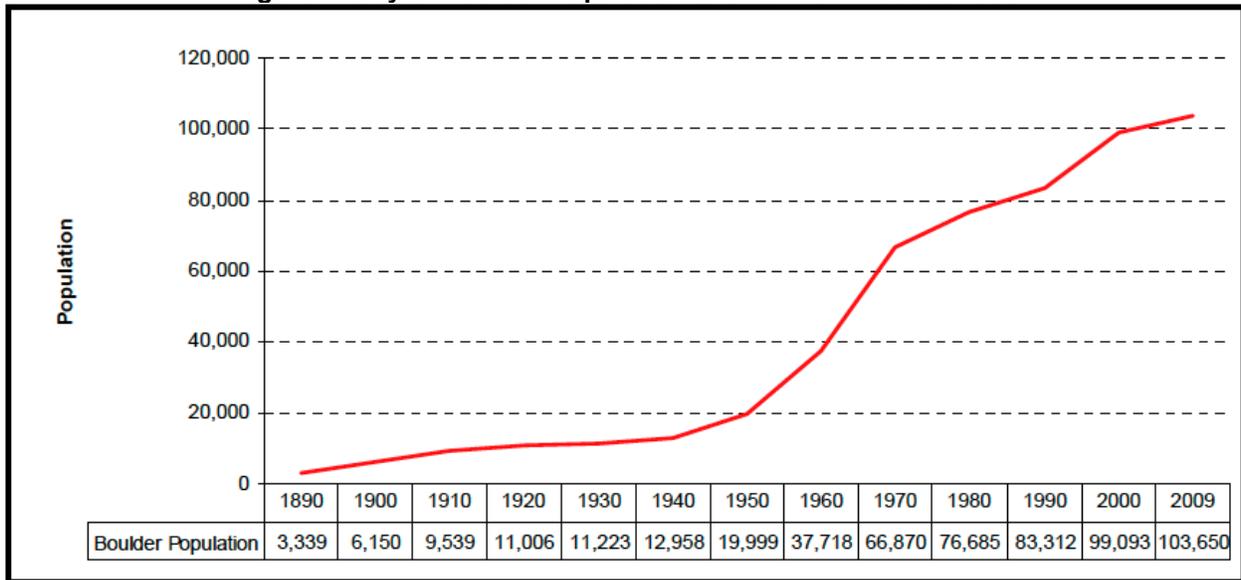
Within our analysis, we always specify in the figure and table headings the analysis time period. Upon request, our two datasets can be provided to Boulder for further review and analysis.

Population Growth and Development

For this study, TriData reviewed the “2009 Community Data Report” to better understand what changes are predicted for Boulder over the next 20 years. We also reviewed the Boulder Valley Comprehensive Plan (BVCP), which is responsible for setting future growth and development within the city and just outside of the city boundaries. The plan is adopted by both the city of Boulder and Boulder County and provided us a good understanding of future growth within the community.

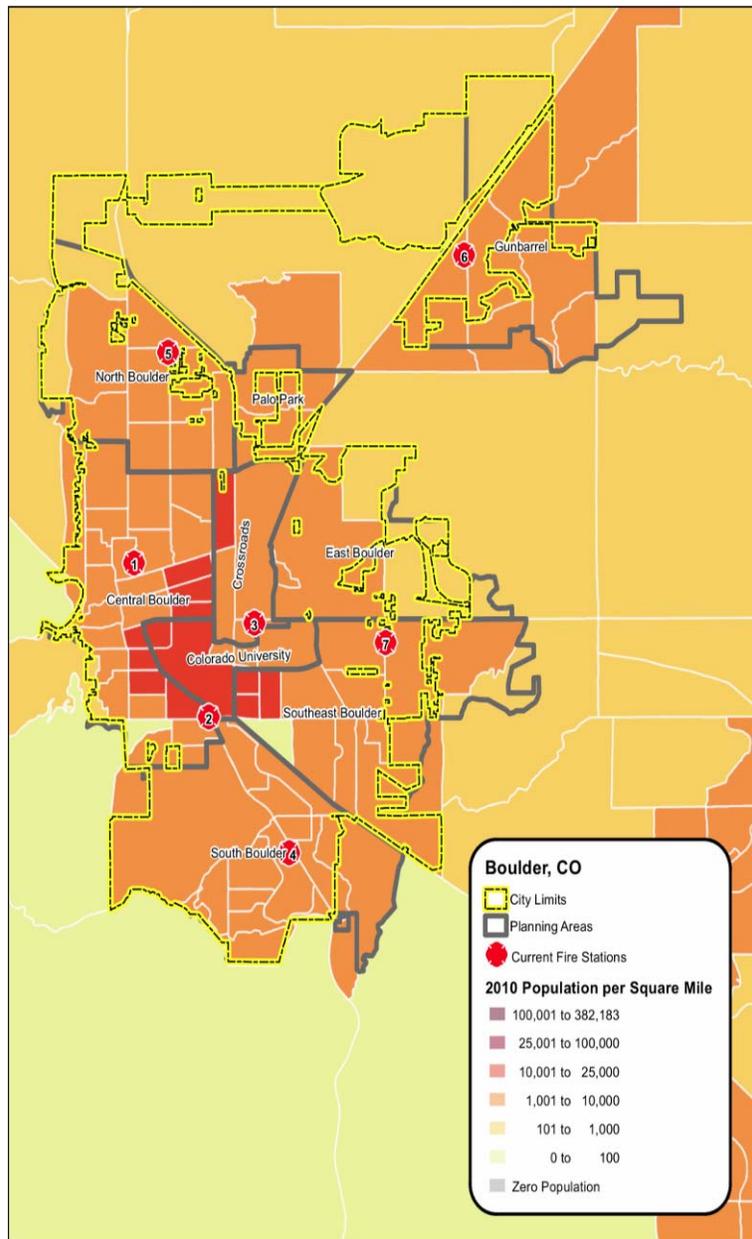
Since 1890, Boulder has always had an increasing population, with the last decade showing less rapid, but continued growth. Figure 4 shows population growth from 1890 to 2009 and Figure 5 shows the current population density (compiled by ESRI using United States Census data).

Figure 4: City of Boulder Population Growth from 1890 to 2009



Source: U.S. Census Bureau and city of Boulder

Figure 5: Population Density, 2010

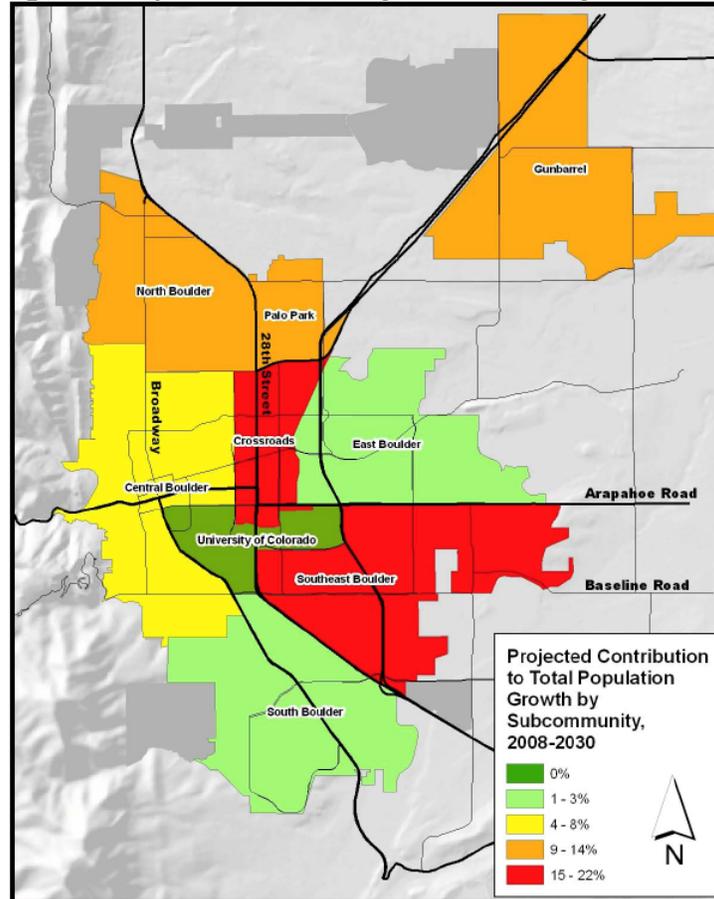


Currently, the vast majority of the boulder population lives right between Stations 1, 2, and 3, the area that we expect will have the highest amount of emergency services demand. Knowing this current population picture, we need to determine what kind of population growth and development is predicted for the future.

An important part of this study is to understand where growth is expected to occur and to determine whether those areas will have adequate fire service going forward. Boulder expects an increase in population from the current population of 103,658 (January 2009) to 118,500 in 2030, an increase of approximately 14 percent. The reviewed BVCP document actually provides

a very nice picture of where most of this projected population growth is expect it to occur as shown in Figure 6. The map shows that the majority of the population increase will occur in Southeast Boulder and the Crossroads area with a lower level of population growth occurring in Central Boulder, North Boulder, Palo Park and Gunbarrel. It is not expected that South Boulder, the University of Colorado, and East Boulder will see much population growth. Based on this map, it is expected that population density is expected to increase slightly moving southeast from the current demand center (between Stations 1, 2, and 3) and there will be some increase in population for the areas served by Fire Station 5 (North Boulder) and Fire Station 6 (Gunbarrel).

Figure 6: Population Growth by Subcommunity, 2008-2030



Demand Analysis

Demand is defined as the number of emergency incidents that required fire department intervention. In this section we review jurisdiction-wide incident type counts, make incident type forecasts, and review incident type breakdowns by the nine planning areas. Understanding both current and predicted future demand will assist the city and fire department officials to make important decisions in the following areas:

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- **Fire Unit Locations** – Planning areas with high levels of demand show where fire apparatus should be located. Further understanding of the types of incidents in each area helps to determine the type of response equipment is most appropriate.
- **Weight of Response** – The demand analysis shows the number of fires versus the number of fire alarms. A higher weight of response is prudent for planning areas with higher-risk properties, and where more structure fires actually occur.
- **Prevention** – Some areas have such a high demand for emergency service that prevention and education efforts must often be increased.

Demand Projection – Using a statistical software package, a multi-linear regression procedure was used to investigate how both time and population affect the total number of incidents to which Boulder Fire-Rescue responds. (Time reflects changes in inclination to use EMS and factors other than population growth per se.) A best-fit multi-linear model was used to analyze each incident type and the population projections (discussed earlier) and these were then used to predict future demand.

In statistics, linear regression is an approach to modeling the relationship between a dependant variable y and one or more independent variables denoted x_i . For our incident type trending, we are using year (x_1) and population (x_2) to predict incident type totals (y). We realize that time and population are not the only factors determining emergency services demand, so the model is not perfect for predicting the exact number of incidents. The use of linear regression is useful in that it shows trends, and trends are valuable for planning purposes.

Ideally, we would include information about housing stock, population demographics and other variables in our model. Although many of these additional statistics are available as historic data, they are usually not projected by jurisdictions. We would need both historical and projected values to use within our model. For that reason, we have chosen a simpler model that is only based on two inputs.

For any model, it is necessary to say how statistically accurate it is, or what the confidence is in the estimates. For example, if we predict that there will be 1000 emergency incidents ten years from now, we also have to state the confidence limits of that prediction. The confidence interval is a statistical plus/minus calculation. To continue with our example, we might say there will be 1000 emergency incidents, plus or minus 100. This gives the reader both a prediction and a range within which we are fairly certain (95 percent certain to be exact) that the eventual number of incidents will fall.

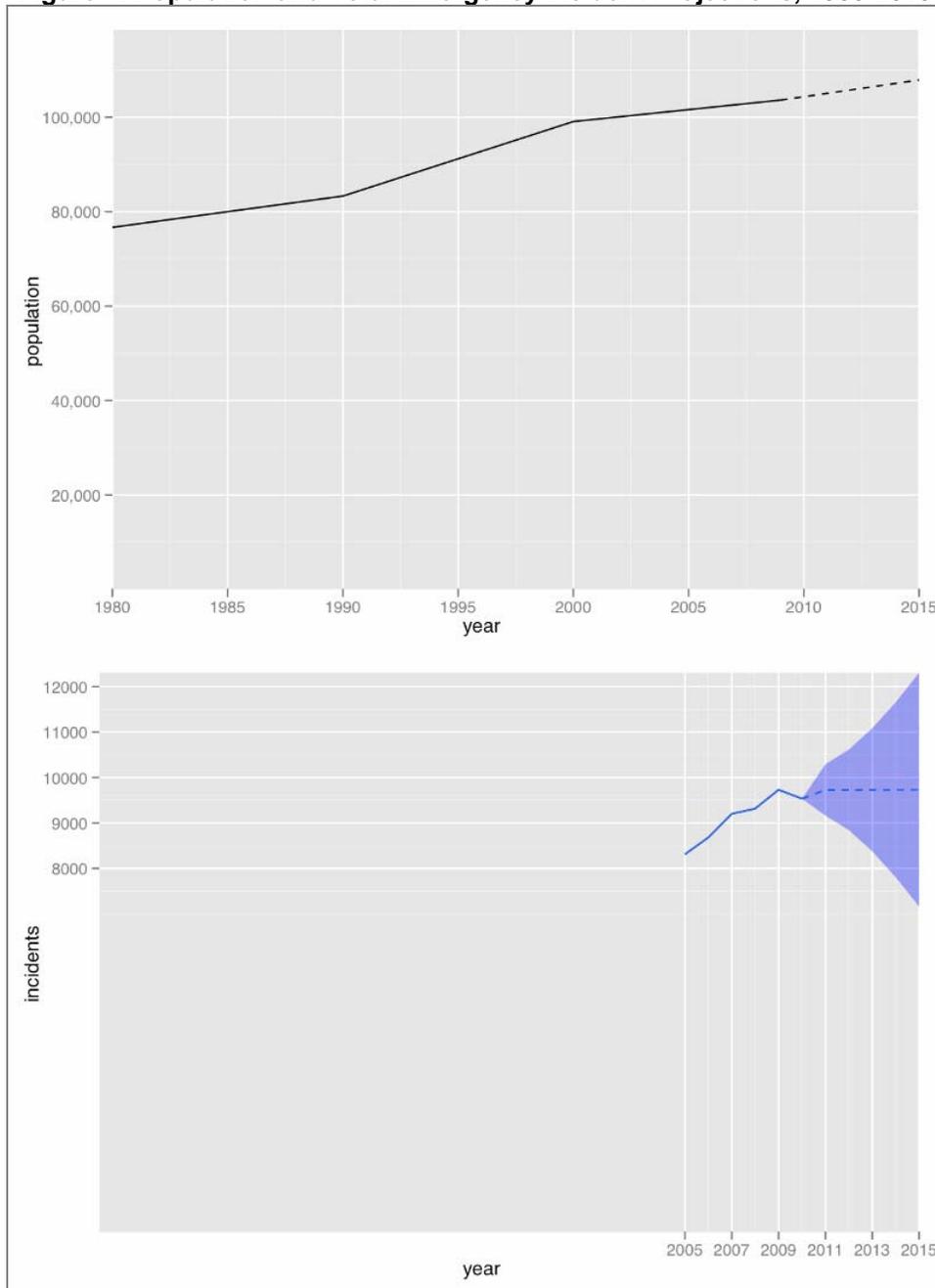
The confidence intervals are the result of a statistical calculation that analyzes how accurately our prediction model represents the actual data. A very good model will have a small confidence interval and is typically the result of historical trend that stays fairly steady from year-to-year; as a result a multi-linear regression is able to make fairly accurate predictions for total incidents for at least several years into the future. The further into the future, the wider the confidence limits.

Large confidence intervals occur when there are big incident type fluctuations from year-to-year that are inconsistent and cannot be accurately modeled with any of the independent variables (time and population). For instance, if the annual number of incidents fluctuates up and down 30 percent from year-to-year, the model cannot accurately predict the exact number of incidents for a given year. In that case, there would be a large confidence interval that essentially says we predict y , but the number could be much higher or much lower.

Figure 7 on the next page shows the actual population from 1980 to 2010 (top figure, solid black line), the projected population up until 2030 (top figure, dashed black line), the actual emergency incident totals from 2005 to 2010 (bottom figure, solid blue line), and our emergency incident total projections going forward (bottom figure, dashed blue line). The shaded blue area around our projected incident totals shows the 95 percent confidence interval (meaning that statistically there is a 95 percent chance that the actual incident total will fall within that range).

It must be remembered that as a statistical prediction judgment should also be considered. A solid understanding of the underlying factors that drive demand for local emergency services combined with statistical forecasting like that provided in this section is a powerful combination for successful deployment planning. Although the statistical prediction shows a leveling of emergency incidents over the next five years, based on our knowledge of expected population increase and an increasing number of EMS incidents (see next section), we expect total incidents to continue increasing slightly over the next few years. There was a small drop in number of emergency incidents in 2010 that has no clear-cut explanations. In talking with the Boulder Fire-Rescue staff it was hypothesized that this drop may be the result of certain service calls no longer being answered.

Figure 7: Population and Total Emergency Incident Projections, 1980-2015



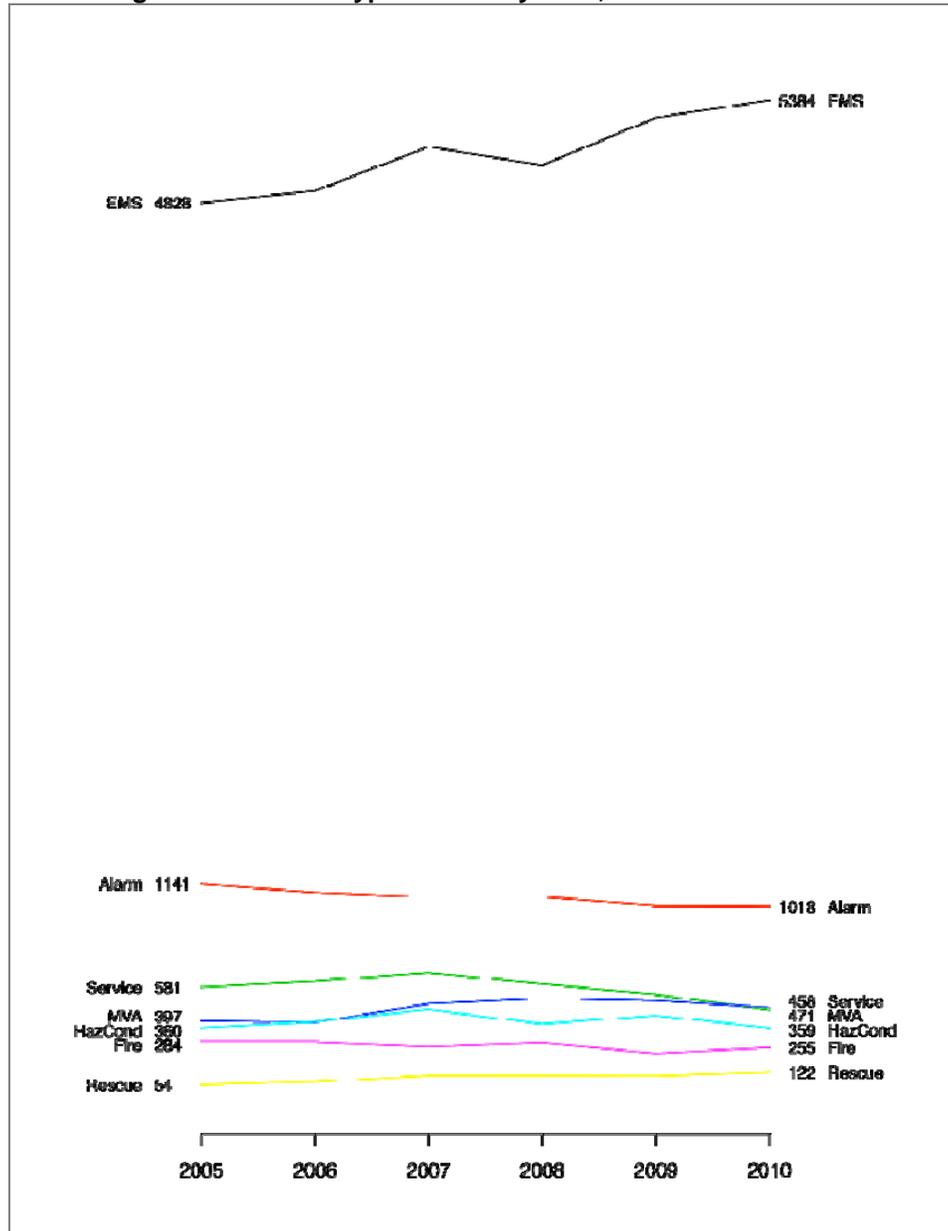
Incident Type Trends – Figure 8 shows incident type trends over the last six years. The significant finding in this figure is that only demand for emergency medical service is increasing. EMS calls increased from 4,828 in 2005 to 5,384 in 2010 accounting for an 11 percent increase. Over that same time period, we saw all other incident types holding fairly steady. Although within the other incident types there may have been a slight increases or decreases overall there was no significant up or down trend noted (at least nothing that can compare with the increasing EMS trend). Expecting a slight increase in total incidents (previous section) and understanding

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that essentially only EMS incidents are currently increasing, we can expect that any increase in emergency services demand will be the result of increasing EMS incidents. This assumption makes sense because EMS calls are so closely tied in with community population.³ With Boulder expecting an increase in population and employment, it should be expected that EMS incidents will continue to increase in city growth and development areas.

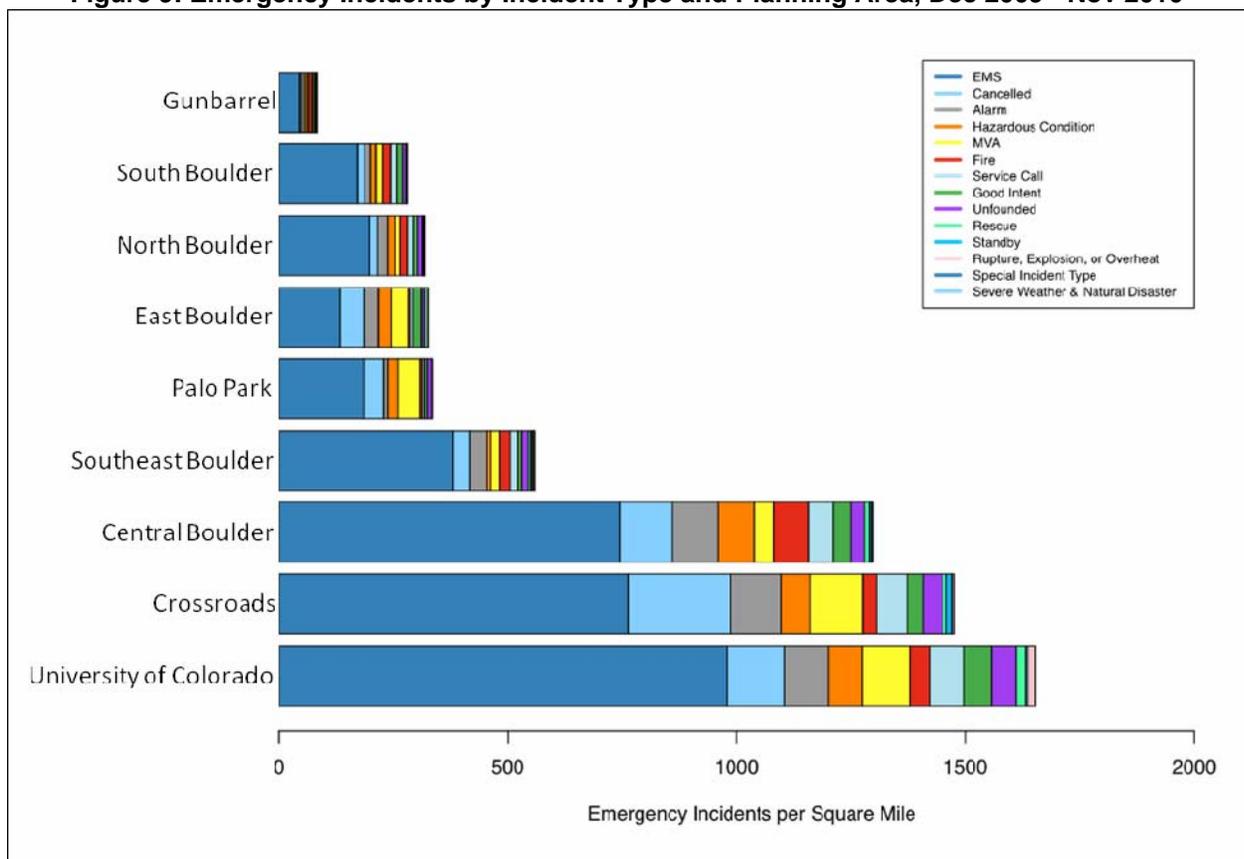
Figure 8: Incident Type Trends by Year, Jan 2005 - Dec 2010



³ CPSE Developing Standards of Cover

Demand by Planning Area – The following figure shows emergency services demand by planning area. For this analysis we used the planning department’s “Planning Subcommunity” areas that were mapped out earlier in this chapter. The length of each bar represents the total number of incidents that occurred in that planning area over the period of a year. Within that bar, the different incident types are represented by different colors depicted in the legend. Please note that these values are normalized by land area. Planning areas that have particularly large land areas may have higher total emergency services demand, yet have relatively low emergency services demand per capita or per square mile. To provide a fair comparison between planning areas, we simply divided the demand totals by the planning area’s land area (in square miles).

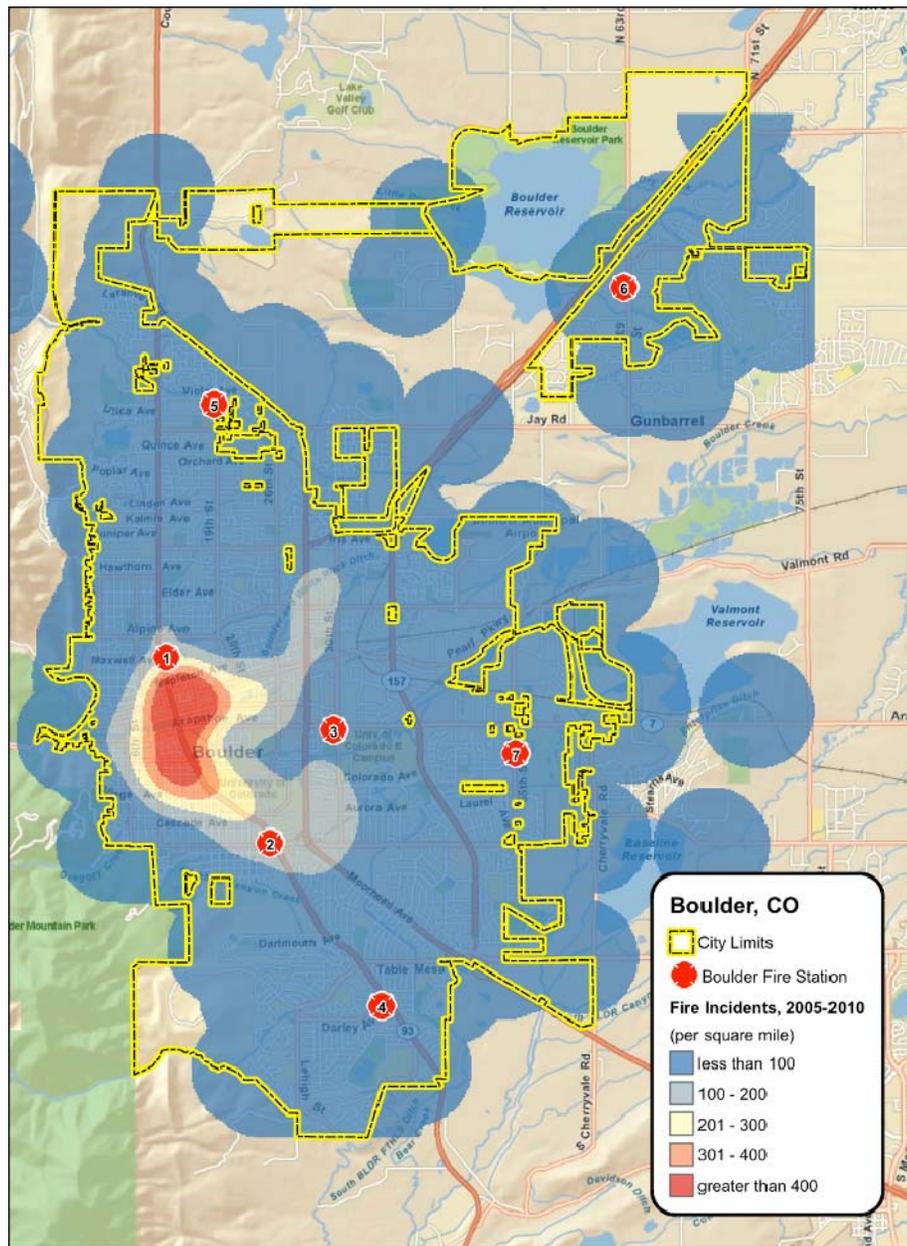
Figure 9: Emergency Incidents by Incident Type and Planning Area, Dec 2009 - Nov 2010



It is clear from this figure that there are significant differences in emergency services demand for different areas of the city. University of Colorado, the Crossroads, and Central Boulder account for the vast majority of emergency services demand. Southeast Boulder currently has a moderate amount of emergency services demand, but this area is expected be developed more over the next 20 years and may contribute more demand over time. All the other areas, particularly Gunbarrel, have low levels of demand.

Geospatial Mapping of Fire and EMS Demand – An even better way of looking at demand than by planning area is to actually map out fire and EMS incident densities using GIS software. This allows us to even further pinpoint high-demand areas (or hotspots). Figure 10 and Figure 11 show fire and EMS incident densities.

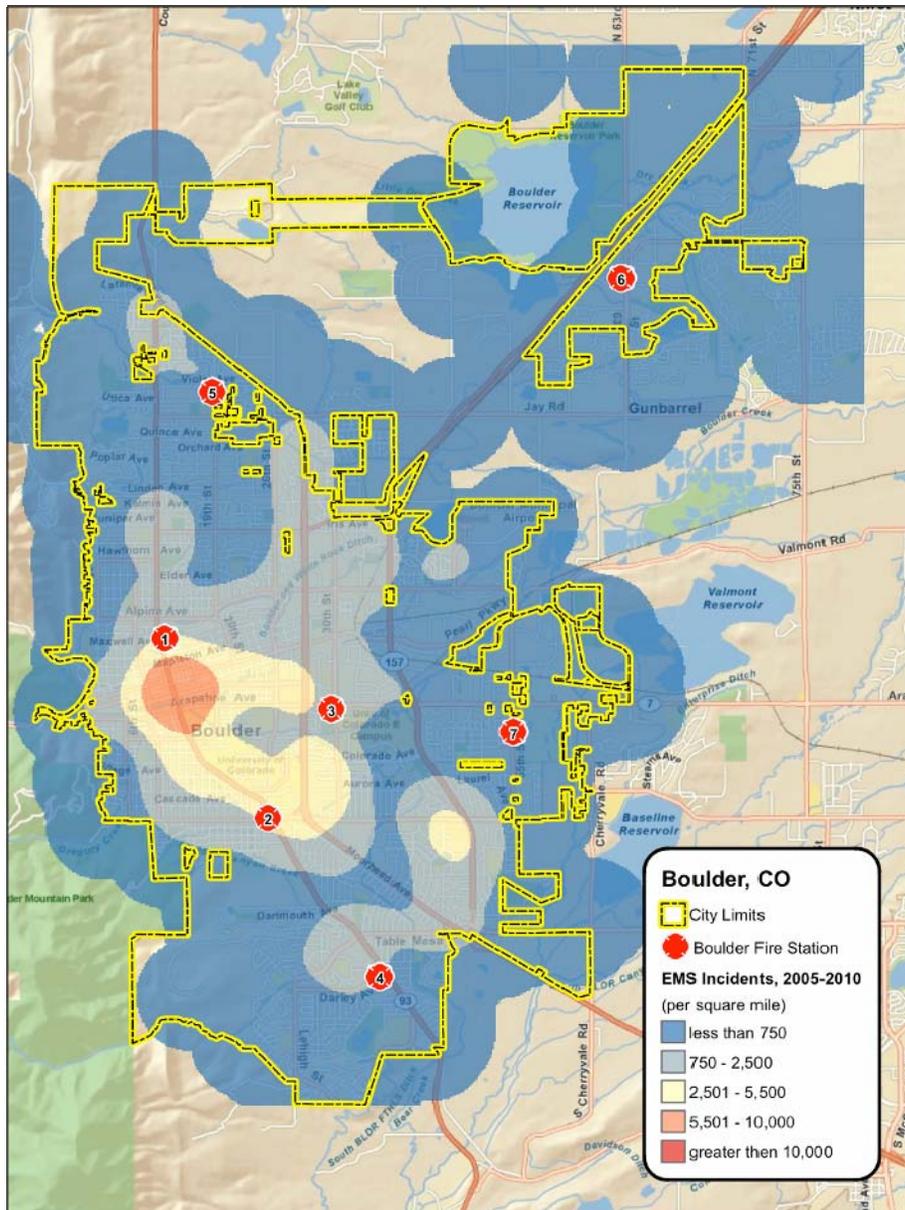
Figure 10: Fire Incident Density



The fire incident density maps out all incidents classified as a fire within the NFIRS database (based on fire department reports of the incident). This includes structure fires, vehicle fires, and outside fires. Based on the fire density map it is pretty clear that the vast majority of

fire demand is located between Fire Stations 1, 2, and 3. The greatest hotspot (shown in dark red) is located along North Broadway Street, between Mapleton Ave and Euclid Ave.

Figure 11: EMS Incident Density



EMS incident density, as shown in Figure 11 is typically very closely related to population density.⁴ The population density map shown in an earlier section showed the highest population density right between Fire Stations 1, 2, and 3. We would expect to and do see the highest number of the EMS incidents in this area. The area of highest demand (shown in light

⁴ CPSE, Developing Standards of Cover

red) is found along North Broadway Street just south of Fire Station 1. We also see somewhat of a hotspot southwest of Baseline Rd and the Foothills Pkwy. The significant EMS demand southwest of Baseline and Foothills Parkway are driven by assisted living and housing for seniors.

There are two additional EMS demand considerations that were not directly considered because of the limited scope of the EMS portion of this study. Retirement homes are significant contributors of EMS demand and they often skew the typical relationship between population density and EMS incident density. Also, business hour commercial districts typically add peak-hour EMS demand to the equation. A more detailed EMS risk and unit location study would take also take a closer look at both of these factors with respect to the overall EMS picture.

Fire Risk Analysis

Fires are a small percent of total emergency services demand, but fire suppression activities require more personnel to mitigate than do most other emergencies. The fire risk assessment in this section evaluates the overall trend in fires, the probability of fires in different planning areas, and the consequence or likely severity of fires in different planning areas. All of these factors were considered for the overall protection requirements of each planning area.

Jurisdiction-Wide Fire Losses – One of the best indicators of fire risk is actual data collected from fires over multiple years. The following table shows total fire deaths, injuries, and property loss (defined as both the property and contents) over the last six years.

Table 7: Total Fire Loss, Jan 2005 - Dec 2010

Year	Total Fires	Dollar Loss	Injuries	Deaths
2005	284	\$670,036	2	0
2006	284	\$2,569,206	6	0
2007	259	\$5,361,304	7	0
2008	281	\$5,718,702	6	2
2009	223	\$349,179	2	0
2010	255	\$529,196	0	1
(average)	264	\$2,532,937	4	.5

The data reflects all fires, including vehicle fires and outside fires. It appears that, on average, there are around 260 fires and several fire injuries per year. Fire deaths are much more rare with only two occurring in 2008 and one in 2010. Annual dollar loss due to fire varies significantly from \$349,179 in 2009 to \$5,718,702 in 2008; on average there was about \$2,500,000 of fire damage annually.

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Table 8 compares Boulder fire loss data to regional and national averages. For a moderately sized jurisdiction such as Boulder, six years of data is good for comparing dollar loss statistics, but fire death and fire injury statistics can be easily skewed over this period of time because of their low numbers. Any slight under-or over-reporting of deaths or injuries could have a huge impact on the validity of the results. These comparisons should also be taken with a certain degree of healthy skepticism because it is not always assured that comparison jurisdictions are collecting their data in the exact same manner.

Table 8: Per Capita Fire Loss and Comparison Statistics, Jan 2005 - Dec 2010

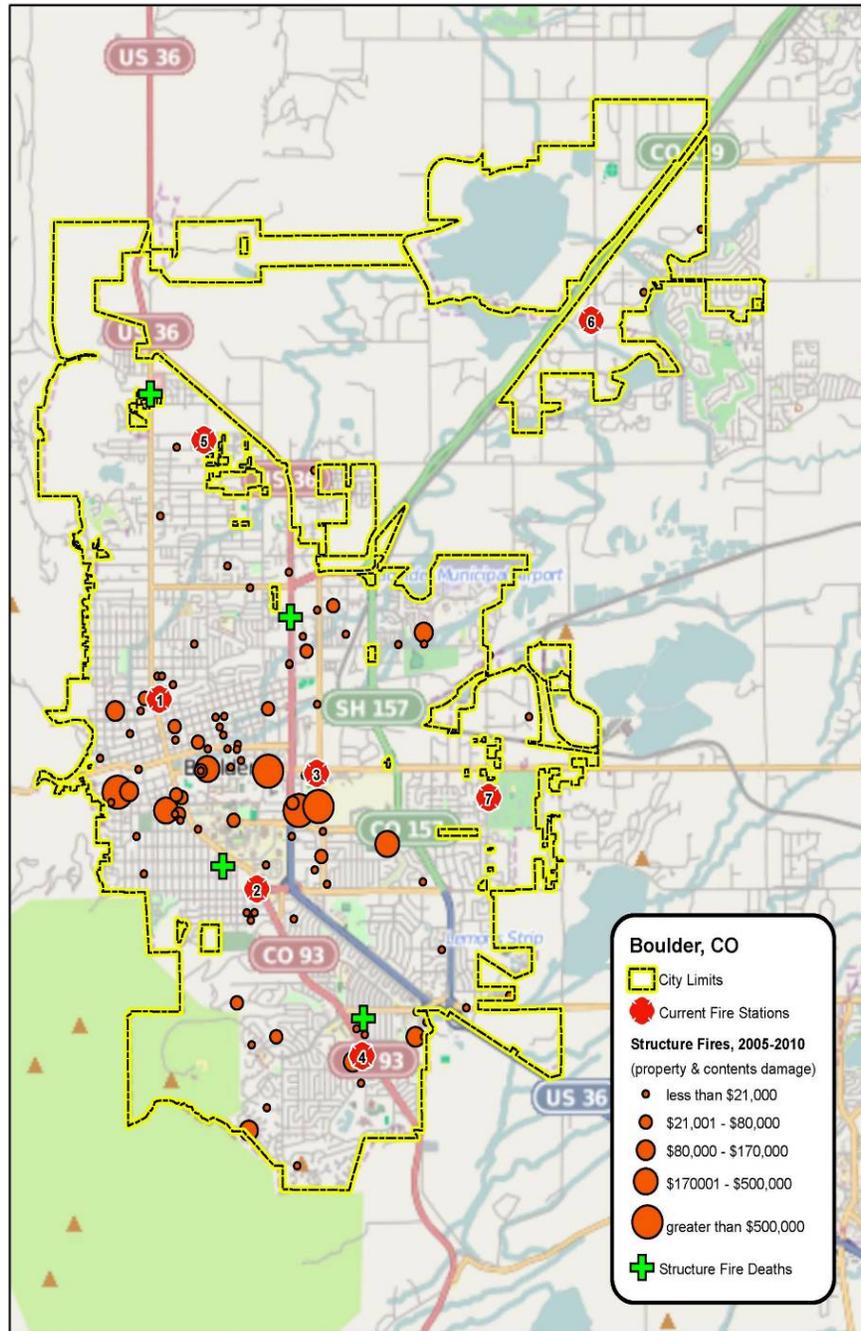
	Total Fires (per 1K capita)	Dollar Loss (per capita)	Civilian Injuries (per 1M capita)	Civilian Deaths (per 1M capita)
United States	4.4	\$40.8	55.5	9.8
Region: West	3.1	\$30.9	44.2	5.7
Population: 100,000 to 249,000	3.3	\$33.6	57.4	9.2
Region and Population	2.3	\$32.9	36.8	7.1
Boulder: 2005	2.7	\$6.6	19.3	0.0
Boulder: 2006	2.7	\$24.8	57.9	0.0
Boulder: 2007	2.5	\$51.7	67.5	0.0
Boulder: 2008	2.7	\$55.2	57.9	19.3
Boulder: 2009	2.2	\$3.4	19.3	0.0
Boulder: 2010	2.5	\$5.1	00.0	9.6
Boulder: (average)	2.6	\$24.5	37.0	4.8

Boulder has significantly fewer fires, dollar loss, civilian fire injures, and civilian fire deaths per capita than the averages for the US, the Midwest, and communities of similar size. Clearly, if the loss data is correct Boulder has a very low fire loss averages. This is good and probably attributable to factors such as the, sprinklered and fairly modern building stock, as well as the education level of and fire prevention public education efforts for community members, students off and on the CU campus and those who work in the city. Rapid response by competent firefighters also should make a difference.

Geospatial Location and Severity of Fire Incidents – To help evaluate the appropriateness of fire unit locations, it helps to understand where the more serious structure fires (those that involve deaths or large fire losses) are occurring. Figure 12 shows the location and severity of structure fires shown by orange dots that are scaled based on the amount of fire loss. Additionally, we mapped out the location of all the civilian fire deaths shown with green crosses. The structure fire location figure does not show any particularly unusual trends. For the most part structure fires are occurring in the noted areas of high fire demand. Please remember that one of the issues we ran into on this project is that the CAD system does not hard-code coordinates for each incident. Boulder staff had to geocode the addresses that were provided in the fire department incident reports. Like all other fire departments, these addresses can be quite

poor because of misspellings and omissions. For this study geocoding yielded a 77 percent match rate, leaving 23 percent of incidents unlocated.

Figure 12: Structure Fire Locations



Note: The fire death in North Boulder occurred in the Boulder Rural Fire District.

Fire Risk by Planning Neighborhoods – Fire Risk is the product of fire probability and fire consequence. High risk, therefore, can result from either a large number of small fires, or a small number of large fires. Table 9 provides both probability and consequence statistics for each planning area. Probability is reflected in the total number of structure fires, defined as the number of fires that spread beyond their object of origin (meaning we excluded things such as trash can fires and cooking fires that did not extend beyond the pot). The table shows both the actual number of structure fires and the number normalized by land area (per square mile). Consequences are compared for each planning area using the following metrics:

- Property loss in dollars
- Contents loss in dollars
- Civilian fire deaths
- Civilian fire injuries
- Number of fires that spread beyond the room of origin (more serious structure fire)

We also normalized the consequence statistics by land area to make them more comparable between planning areas. Finally we color-coded each of the statistics using the normalized value. If the normalized value fell in the better 25 percent of values, it was color-coded green. If the normalized value fell into the worse 25 percent of values, it was color-coded red. The remaining values were left uncolored. Using this technique it is fairly easy to determine which planning areas have higher fire risks (higher probability and/or consequence of fire) and which planning areas have lower fire risks (lower probability and/or consequence of fire).

The results of this planning area fire risk analysis were fairly straightforward. Central Boulder and University of Colorado (CU) have the highest probability of fire; Gunbarrel, North Boulder, and Palo Park have the lowest probability of fire (we already knew this from our previous demand analysis). Structure fire consequences fell out in similar fashion. Central Boulder and University of Colorado generally had the highest consequence of fire; Gunbarrel, North Boulder, and Palo Park have the lowest consequence of fire. It should be noted that this finding is very much related to population density. Although we normalized the probability and consequence stats by land area, we did not take into account planning area population. The reason for this was simple. When considering the where to appropriately locate fire stations (this chapter risk and demand chapter is somewhat a setup to the following station location chapter), it is important to consider the risk per unit of land rather than per capita because ultimately fire stations cover land and area. An area that has more people brings more fire risks and, ultimately, requires more fire department attention.

Table 9: Fire Risk Classification by Planning Areas, Jan 2005 - Dec 2010

	Fires (per sq mi)		Beyond Room (% of fires)		Property Loss (per sq mi)		Contents Loss (per sq mi)		Deaths (per sq mi)		Injuries (per sq mi)	
Central Boulder	38	9.0	15	39	\$2,629,100	\$624,261	\$422,125	\$100,231	1	0.2	2	0.5
Univ. of Colorado	10	9.1	4	40	\$5,207,100	\$4,726,092	\$1,072,600	\$973,518	0	0.0	3	2.7
Crossroads	13	9.5	6	46	\$1,869,000	\$1,368,697	\$899,600	\$686,791	1	0.7	4	2.9
East Boulder	5	1.6	1	20	\$134,000	\$42,646	\$18,200	\$5,792	0	0.0	0	0.0
Gunbarrel	2	0.4	0	0	\$1,500	\$333	\$1,000	\$222	0	0.0	0	0.0
North Boulder*	5	1.4	1	20	\$11,500	\$3,191	\$7,300	\$2,026	1	0.3	0	0.0
Palo Park	1	0.9	1	100	\$8,500	\$7,723	\$5,585	\$5,074	0	0.0	0	0.0
South Boulder	15	3.0	5	33	\$353,500	\$71,349	\$118,260	\$23,869	1	0.2	0	0.0
SE Boulder	10	2.2	3	30	\$237,200	\$51,171	\$17,550	\$3,786	0	0.0	2	0.4

* The fire death in North Boulder occurred in the Boulder Rural Fire District.

Note: The fire loss totals for this table do not exactly match the citywide fire loss totals because not all incidents were successfully geocoded resulting in a certain number of fires that could not be associated with a particular planning area.

The results of the analysis conducted in this chapter have essentially pointed to the same conclusion, that the Central Boulder, University of Colorado (which also includes surrounding non-CU areas), and Crossroads planning areas have the highest emergency services demand and the highest fire risk. More specifically, we know that the area of highest risk and demand is located right between Fire Stations 1, 2, and 3 where these three planning areas meet. Going forward this may change slightly to the east as Boulder Junction develops. Based on our understanding of expected population growth in Boulder, we would expect that the risk and demand spread slightly southeast as Southeast Boulder gains population. We also expect some population growth in North Boulder and Gunbarrel, but because these areas are currently very low demand and low risk, some development in these areas should not have a huge impact.

IV. STATION LOCATION AND RESPONSE TIME ANALYSES

Our response time analysis found times to be slightly higher than national standards, but still good. There are areas for response time improvement identified in this chapter, in particular turnout times. The station location portion of this chapter determined that the city's seven fire stations provide good coverage in their current arrangement but that small improvements may be possible.

The major steps for a deployment analysis include a risk assessment (discussed in the previous chapter), working with the public and local government officials to determine response time goals for the community as a whole or by individual planning areas, and measuring current and potential performance against selected goals. The Center for Public Safety Excellence (CPSE) publishes an excellent reference that can be used by communities to understand the process and determine the choices available to them. Generally referred to as a "standard of cover" analysis, we used the CPSE methodology in the analysis of response time.

Deployment decisions concerning fire station and apparatus locations should be an iterative process largely based on continual or periodic performance measurement. Because the needs of Boulder do change, the recommendations made by this analysis should be considered as a step in a continuing process. Going forward, the fire department needs to be regularly conducting neighborhood-level performance measurement for the process to be effective.

Strategic Goals

Establishing goals against which to measure response effectiveness rests with BFRD leadership. The following steps should be considered:

- Discuss with community leaders and local government officials the desired performance measures for fire and EMS response times. Very few residents and elected officials understand the concept of response time as it relates to emergency services. Educating them on the available choices and trade-offs are necessary parts of the planning process. For example, it is useful to note to them that rapid response may prevent a food on the stove fire from becoming a house fire; a cardiac arrest from becoming a fatality; and a gunshot wound from becoming a murder.
- Implement a method for tracking unit reliability. The CPSE Standards of Cover manual places great importance on considering deployment changes when a unit falls below 80 percent performance reliability. Reliability in this case means whether the unit located at the closest fire station is available to answer the call.

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- Prepare a monthly response time report and distribute the report department wide. (TriData could help set up such a report.)
- Conduct an annual performance review for the entire system and each planning area. The report should summarize the systems overall performance, note changes to specific planning areas, and recommend deployment modifications, near and long-term.

Response Time Analysis

The initial aspect of our review of BFRD deployment was to collect available data and analyze response times. Response time is defined as the time from an individual calling 911 to emergency service personnel arriving at the scene. Response time has three segments: call processing, turnout (or reaction) time, and travel time. Some departments also consider the time segment from when personnel first arrive at the street address until they reach the fire or a patient; usually referred to as "vertical" response time because it is often considered where there are high-rise buildings. (It can take another 5 minutes to get to the side of a patient from the street.)

Response time is the most common performance measure used by the fire service because it is understood by residents, easy to compute, and useful in the evaluation of end results. Rapid response is also an aspect of the quality of service that most residents care about. NFPA 1710 provides generally accepted response time standards for career fire departments, though there is no single set of nationally accepted response time standards. Many communities choose to develop their own response time goals in light of what is currently achieved versus what it would take to improve them. There have been a few attempts to measure the incremental value of a minute faster response time for fires and EMS calls, but there is no definitive study of the incremental benefit. Faster is better, but it is unclear how much better in terms of dollars or lives saved.

Most fire departments use the NFPA 1710 standard as a goal, not as a prescriptive requirement. Few departments are currently meeting or exceeding NFPA 1710, especially with respect to travel time (which is the hardest to improve). Citywide travel times are only about a 20 seconds longer than the NFPA 1710 recommendations at the 80th percentile level (80 seconds longer at the 90th percentile level). Total response times are about 30 seconds longer than the

NFPA 1710 recommendations at the 80th percentile level (90 seconds longer at the 90th percentile level).⁵

Measuring Response Time

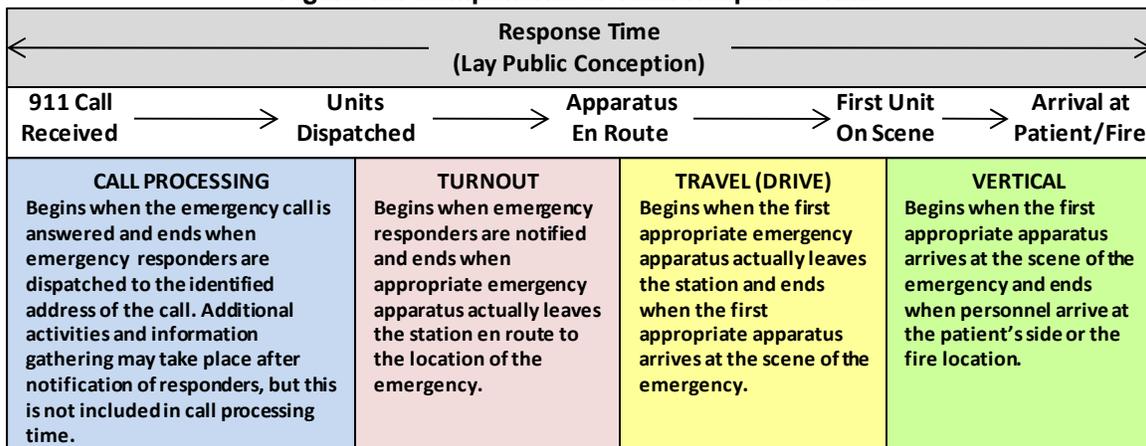
Because BFRD is a career department, NFPA 1710 is the applicable standard that is useful as a benchmark. Table 10 summarizes the response time goals established by 1710. NFPA 1710 is a guideline, not a requirement.

Table 10: NFPA 1710 Response Time Goals for Career Departments

Time Segment	Response Time	Percentile
All Calls: Turnout	01:00	90
Fire Suppression		
First Arriving Engine Company	04:00	90
Full First Alarm	08:00	90
EMS		
First Responder	04:00	90
ALS Unit	08:00	90

Response times include the four components illustrated in Figure 13.

Figure 13: Components of Total Response Time



When considering response time, several caveats should be kept in mind. First, response times are subject to a variety of measurement errors and only measure one aspect of overall system performance. For example, response times are distorted when units report their arrival on scene either early or late. Second, response times are frequently not comparable across fire-rescue systems because of the differing manners in which they are calculated. Not all departments track vertical response times (that is, the time from arrival on scene to patient

⁵ Note: we are still not completely sure that these times are accurate because it appears that there may be some incorrect call-received times being logged.

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contact), so their total response times likely would be lower than the total response times of the few departments that do track them.

Many fire/EMS departments report average response times while others report fractile response times. Average response times have been increasingly less used by the emergency service industry because small numbers of very short or long responses are often recorded in error. Also, one or a few long response times (or errors) can distort the results. The public is interested in how fast a system responds to most calls, which is better reflected in fractiles rather than averages. More and more departments are adopting the 90th percentile for reporting response times (mostly due to NFPA 1710's use of this measure). However, meeting the 90th percentile goal is not always the most efficient means for delivering emergency services. A fractile response time of x minutes at the 90th percentile means that at least one unit responds in x minutes, 90 percent of the time. The remainder beyond the compliance fractile (10 percent in this case) is the operational tolerance for the system, meaning the system is designed with the understanding that 10 percent of the calls may have response times that exceed the target. Although it is possible to design a system that may ensure rapid response close to 100 percent of the time, it is generally not cost-effective.

Most departments, including BFRD, do not record the vertical response time component. It would, however, be a good idea to start measuring vertical response time, especially for EMS calls. Vertical response time affects the realistic expectations for cardiac resuscitation outcomes, and should be considered in response strategy, such as deployment of AEDs, training neighbors in CPR, and deploying more units in high-rise areas. A longer interval of collapse to care time lessens the likelihood of successful resuscitation. Travel times of four minutes to a bedroom community are likely to yield different patient outcomes than to urban, high-rise communities, as "with patient" times increase the time to care and decreases the probability of successful resuscitation.

Another aspect of measuring the time to be "with patient" or "at fire" is better quality oversight. For incidents such as cardiac arrest or fire showing, crews could report additional intervals such as "AED placed" or "water flowing," allowing BFRD to measure some aspects of skill quality. For AED placement times, technology and clock synchronization may be used in lieu of extra radio transmissions. Reportedly the fire department is already collecting the time until the application of an automatic external defibrillator (AED). However, the data is not routinely analyzed.

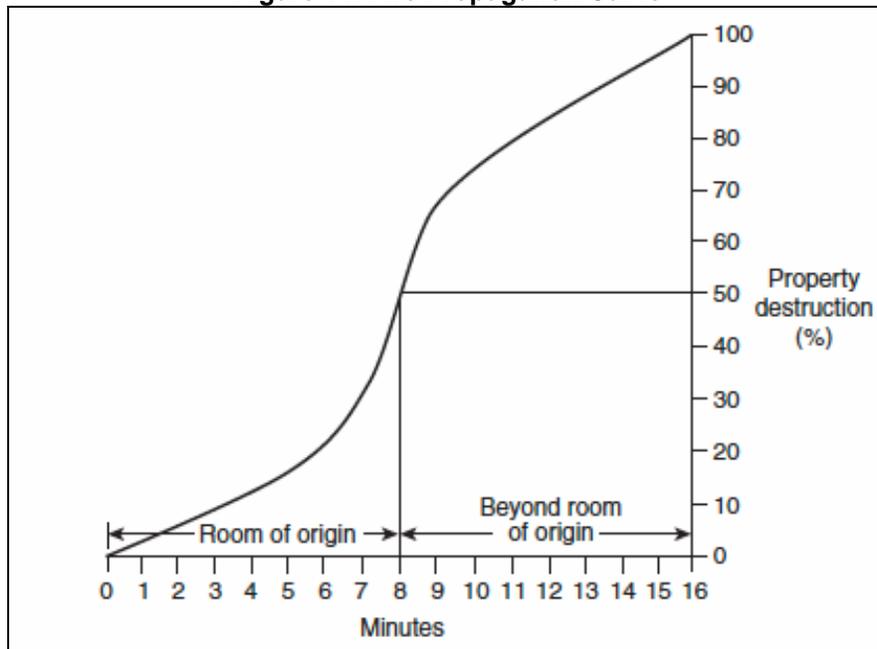
Recommendation 16: Consider expanding incident benchmarks transmitted and analyzed to include activities such as primary search complete; ventilation completed; extinguishment started (complete) and begin tracking vertical response time as part of incident data collection, especially for medical calls.

While the speed of response is not directly indicative of service quality, it does affect the number of lives saved and the value of property losses averted when an emergency occurs. This means that while arriving in three or four minutes every time does not guarantee everyone will live and there will be less damage, more people can be helped or the fire can be extinguished before it becomes severe when emergency personnel arrive in 5 minutes rather than 10 or 20. Fire spreads quickly after ignition and the faster it is found and extinguished, the better the results; similar to someone suffering from life threatening symptoms, the probability of survival increases the quicker the patient is treated. There are also real time limits as to how long one can go without breathing or when bleeding profusely.

Even with general observations and response-time analyses, current statistical models cannot realistically assess nor predict the quality of fire services in terms of lives saved and property losses averted. In place of true measures of fire rescue service outcome, response time is often used as a proxy measure.

According to multiple studies, extension of the fire beyond the room of origin typically begins before 6 minutes after ignition, and flashover of the room of origin occurs within 10 minutes of ignition. (Flashover is the simultaneous ignition of all flammable material in an enclosed area.) In some modern rooms with low ceiling and plastics, flashover can occur in two to four minutes, according to studies by the National Institute of Standards and Technology. Figure 14 shows the fire propagation curve, which shows the effect of time and temperature rise of a free-burning fire on the destruction of property.

Figure 14: Fire Propagation Curve



The fire propagation curve above is based on a typical unsprinklered room. Boulder fire and city officials should keep in mind that the public and private investment in sprinkler systems may affect what are reasonable response time standards. Building design and sprinkler systems can be used to hold fires in check for longer periods of time. When an entire area is sprinklered, response times for fire incidents can be increased. However, unless a whole area is sprinklered, there are still many unsprinklered buildings that need rapid response. Later in this chapter, we discuss setting both citywide response time and planning area response time goals. The percentage of buildings sprinklered should be considered when setting response time goals for fire incidents.

Boulder Response Times

The analysis of response times for Boulder included only incidents dispatched as an emergency (we eliminated service calls from the response time analysis). Our analysis included only engines, the ladder truck, and the two cross-staffed brush trucks; we did not include battalion chiefs or administrative staff in the analysis. These criteria were applied to keep the analysis in line with the standards against which times are being compared.

For all time segments, we analyzed one year's worth of CAD/NFIRS as specified in the previous chapter. We eliminated those time segments that were more than three standard deviations from the median (outliers). Three times the standard deviation was used because if travel times had a normal probability distribution, 99.7 percent of incidents are expected to fall within three standard deviations. Anything more than three standard deviations is likely to be an

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error in the data or a highly unusual situation. Each response time segment is analyzed both by hour of the day and incident type. Incident type was determined using the NFIRS incident type recorded by fire crews after the incident. This means that response time to “fires” only reflects responses to actual fires, not reported fires.

Please note that, although NFPA 1710 recommends a 90 percent compliance with their goal times, we typically analyze response times at an 80th percentile level instead. There are several reasons for this. First, we subdivide our analysis into incident types and geographic areas (which most departments do not do). To have 90 percentile compliance in each of these subdivided areas would result in much higher than 90 percent compliance citywide. Second, departments that do not have rigorous data quality controls will typically have more calls with incorrectly long response times than incorrectly short response times. Because 90 percent compliance is very difficult to achieve, we use 80 percent compliance to account for some erroneous data. Finally, almost no department is able to achieve 90 percent compliance with NFPA 1710. Achieving NFPA 1710 at 90 percent compliance is a great goal but, in our professional judgment, using 80 percent compliance is a more appropriate measure of current performance [The CPSE Standards of Cover Manual also uses 80th percentile times for assessing station location performance].

Call Processing – Call processing time in theory should include both call taking and the actual dispatch of the equipment. Call taking is the time to get information from the caller and enter it into the dispatch computer system. This is measured from the time the call is received to the time the call is transferred to a dispatcher. Dispatch time begins when the call is transferred from the call-taker to a dispatcher and continues until units are alerted to respond. The NFPA 1710 Standard recommends a 1:00 minute dispatch time.

In our response time analysis, we found that almost 70 percent of the call-received timestamps matched the unit-dispatched timestamp, meaning that we calculated a zero second call processing time for most incidents. We use both the call-received and unit-dispatched timestamps from the NFIRS data, so it is possible that there is an issue sending the CAD timestamp correctly into the NFIRS database. It is also not uncommon for dispatch centers to have a phone system and CAD system that cannot communicate and, therefore, there is no recorded call received time, and this is the issue with Boulder dispatch as well.

Turnout (or Reaction) Time – Turnout time is the second segment in total response time. It begins when personnel are alerted at the station for the emergency until the crew is aboard the apparatus and ready to respond. If data collection is accurate, it can be calculated as the difference between the unit dispatch time and the en route time. The goal for turnout is also one minute, 90 percent of the time. However, this goal is sometimes difficult to achieve for most departments and a more realistic goal is one minute for daytime calls and one and one-half minutes for calls occurring during times when firefighters are not awake. Turnout times for non-emergency calls also need to be eliminated from the data set since firefighters do not react as quickly if the call is not an emergency.

Even when a more realistic goal of 90 seconds for turnout is considered, the BFRD is still taking almost twice as long to turn out for calls. This should be a huge area for concern and the reasons investigated.

Figure 15 and Table 11 show the turnout times by time of day and incident type. As expected turnout times during nighttime hours were longer, but the difference is not as pronounced as what is found with most other fire departments.

Figure 15: Turnout Time by Hour of the Day, December 2009-November 2010

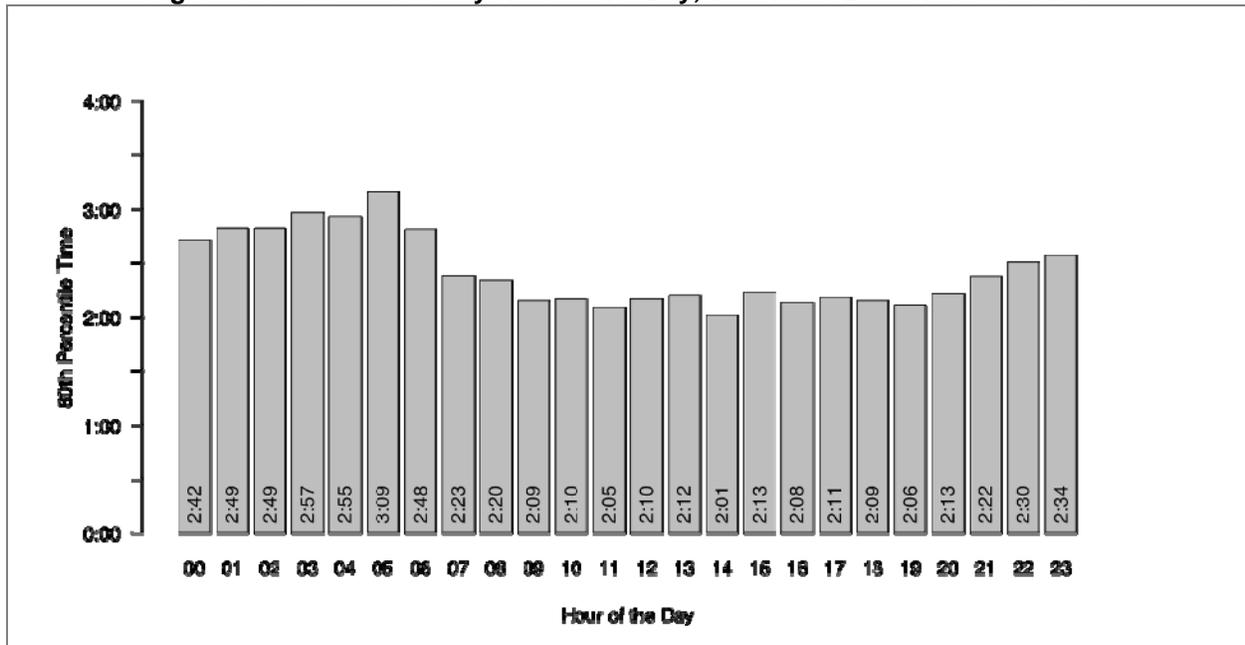


Table 11: Turnout Time by Incident Type, December 2009-November 2010

	80th Percentile	90th Percentile
Alarm	2:31	2:53
EMS	2:14	2:35
Fire	2:44	3:05
Good Intent	2:40	3:09
Hazardous Condition	2:43	3:02
MVA	1:59	2:16
Rescue	2:02	2:27
Rupture, Explosion, or Overheat	2:43	3:01
(all)	2:23	2:45

Findings of excessively long turnout times led to our having doubt as to the accuracy of the data since the turnout time for firefighters in Boulder significantly exceeds those found in most other communities. In 2007 and 2008 BFRD performed an extensive study of turnout times which confirms our findings. It should disaggregate the results by fire station (and shift) to determine if there are problems at a particular station. Longer turnout times can sometimes be related to the layout of a particular fire station more so than to a particular crew, but crews also need encouragement to respond more quickly too. Fire stations in Boulder are not overly large, and there is no architectural layout reasons that it should take so long for personnel to don their turnout equipment and mount the unit once alerted.

Ultimately, the issue of long turnout times needs to be addressed because these times can be improved more easily and with little expense than moving stations. If the turnout times found in this study are correct, BFRD could bring total response times in line with NFPA standards simply by improving turnout time by a minute. Once the apparatus leaves the fire station, response times are more difficult to improve since the speed is related to the type of roads traveled, weather, and traffic.

Recommendation 17: Revisit the analysis of turnout times and take the necessary steps to improve them where possible. Establish a performance goal for each time segment and assess them monthly. Evaluate turnout times by fire station and shift.

Travel Time by Hour of the Day and Incident Type – Travel time starts when a unit begins its response from the fire station until it arrives at the scene. Travel times are a function of geography, road conditions, traffic/congestion, and the number of and location of fire stations with respect to the location of actual calls. A travel-time goal of four minutes is suggested by NFPA. Later in this section we discuss in more detail the location of fire stations and the performance of the current layout of stations.

At the 80th percentile level, most of the travel times were around 4:30 with the lowest being 3:40 for rupture/explosion calls and the highest being 6:05 for rescue calls. Technically the

NFPA standard requires that these standards be met at the 90th percentile level, but it does not specify whether this applies at the neighborhood or incident type level. As the response time analysis becomes progressively more detailed, it becomes harder to meet the 90th percentile level in all areas of the city. The reliability with which response times are achieved in different parts of the city should be a judgment call for fire department and city officials. It probably makes sense to set the bar at 90 percent in high-demand downtown areas, but 80 or even 70 percent is probably an acceptable goal in harder to reach areas. We see later in this chapter that response times vary between the fire station first due areas. Although citywide travel times are a little bit slower than the NFPA standard, very few fire departments actually meet the standard.

Although BFRD should clearly continue to try and reduce the travel time to emergencies, it is not a realistic goal to reach the 4:00 NFPA goal 90 percent of the time. A better approach is to improve call processing and turnout times to compensate for slightly longer travel times.

Figure 16 shows the 80th percentile travel time by hour of the day for the first-arriving unit. Call volume for the 24-hour period is also depicted. Table 12 depicts the travel time categorized by incident type. It can be seen in this table that when a goal of 80 percent is used, the response time for the first unit to arrive is one minute faster (4:21 versus 5:16) for all calls.

Figure 16: Travel Time (First Arriving Unit) by Hour of the Day, December 2009-November 2010

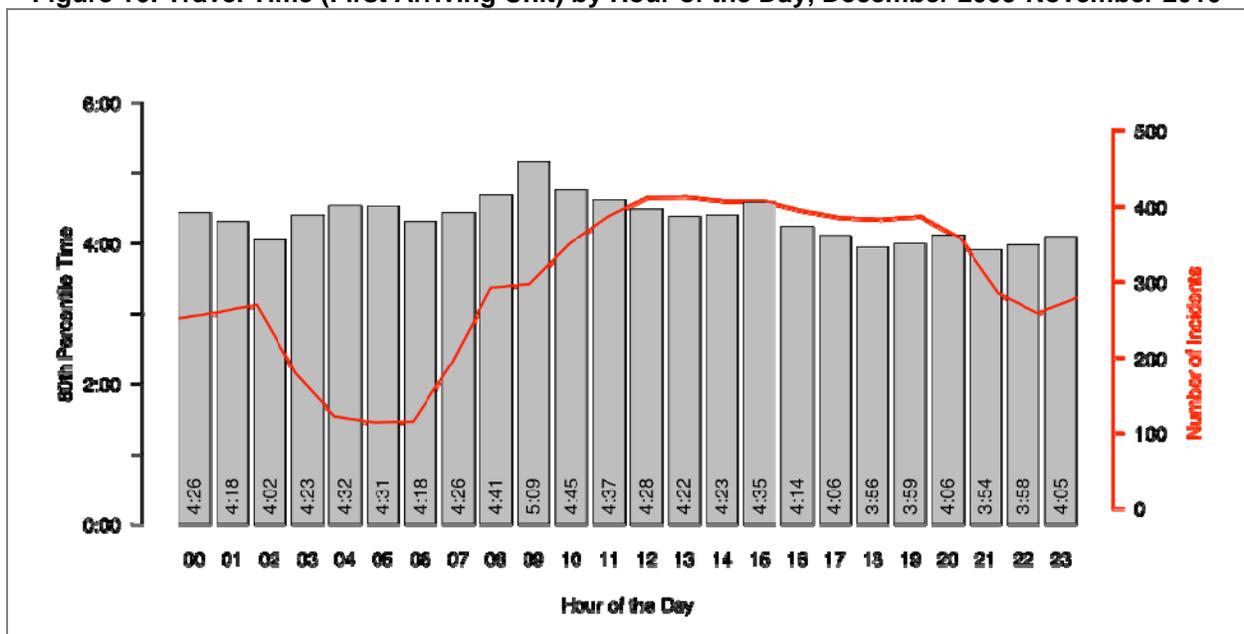


Table 12: Travel Time (First Arriving Unit) by Incident Type, December 2009-November 2010

	80th Percentile	90th Percentile
Alarm	4:44	6:07
EMS	4:12	5:02
Fire	4:10	4:51
Good Intent	5:06	6:30
Hazardous Condition	4:52	6:19
MVA	3:55	4:53
Rescue	6:05	7:21
Rupture, Explosion, or Overheat	3:40	3:53
(all)	4:21	5:16

Total Response (Reflex) Time – As discussed earlier, total response time is measured from the time the call is received by the dispatch center until a unit arrives on scene. Total response time is, for most residents, the most important time element and the measure they use to evaluate the effectiveness of fire and EMS service.

A review of the total response time was conducted using NFPA 1710, which recommends a six-minute total response time. Again, this is based on one minute for call processing, one minute for turnout, and four minutes for travel time.

BFRD is actually pretty close to this goal time at the 80th percentile level (about 30 seconds off for most incident types), but remember that the short call processing times may be an indication that we are not looking at the total response time here; it may be necessary to add about 30 seconds to these total response times to account for a missing call taking segment.

Table 13 shows the total response time for the first unit to arrive at an emergency. Figure 17 shows total response time by time of day. As can be seen there is little difference in total response time between daylight and nighttime hours, which is somewhat unusual.

Figure 17: Total Reflex Time (First Arriving Unit) by Hour of the Day, December 2009-November 2010

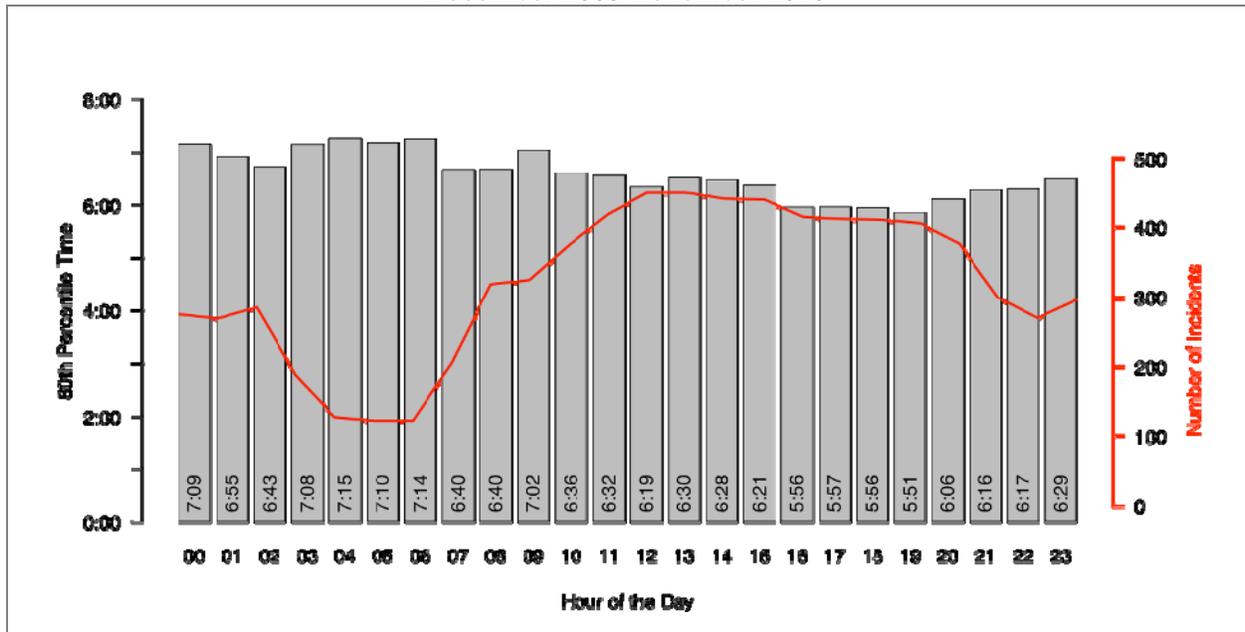


Table 13: Total Reflex Time (First Arriving Unit) by Incident Type, December 2009-November 2010

	80th Percentile	90th Percentile
Alarm	7:07	8:28
EMS	6:16	7:15
Fire	6:29	7:21
Good Intent	7:28	8:35
Hazardous Condition	7:17	8:25
MVA	5:39	6:50
Rescue	8:10	9:46
Rupture, Explosion, or Overheat	6:10	6:25
(all)	6:30	7:32

Table 14 shows the travel time, fire department reflex time, and total response (reflex) time for each of the fire department’s first-due areas. Here we see that, although the overall response times are a little bit slower than the NFPA standard, the areas of highest demand and highest risk (serviced by Stations 1, 2, and 3) have the fastest travel and total response times. This is good. The outer lying areas have slightly longer response times, likely the result of covering slightly larger areas and less station overlap (if the correct unit/station is unavailable, it is difficult for another unit/station to achieve a good response time).

**Table 14: 80th Percentile Total Response Times by First Due Areas,
December 2009-November 2010**

	Travel	FD Reflex	Total Reflex
1	3:53	5:32	6:07
2	4:16	6:03	6:19
3	4:17	6:08	6:20
4	4:27	6:36	6:43
5	4:53	6:49	7:01
6	5:34	7:21	7:38
7	4:53	6:51	7:03
(all)	4:25	6:19	6:36

Performance Measurement

As part of the planning process, BFRD should work with city officials to decide the performance goals it considers right for the city overall and for each planning area. It will also need to find a reasonable response time and a reliability goal for each planning area (and each incident type).

Setting performance goals by planning area is one way to do this because risk factors can be matched with travel time and reliability goals. Then, if analysis shows a problem with response times (or reliability), further analysis can be done to determine the contributing factors. Another way is to create demand zones across the city. However, the planning areas (either the subcommunities or neighborhoods) appear to be a good framework. Ultimately, fire leaders need to understand why the desired goals are not being achieved in a particular area and the response situation for each fire station protecting that area before it makes changes to the system.

As stated earlier, the NFPA 1710 response time standard is based on typical fire growth rates and patient outcomes, primarily those involving cardiac arrest. The recommended time for the first unit to arrive under the standard for both fire and EMS incidents is six minutes (four minute travel time plus two minutes for call processing and turnout time). The time is based on research showing that a structure fire begins to grow exponentially after six minutes and individuals in cardiac arrest need defibrillation within six-minutes.

The problem with using standards “carte-blanche” is that they are sometimes overkill for the particular situation. For example, an area with a very young population might be okay with an eight-minute medical response time since the more serious and time-sensitive EMS calls occur less frequently. Likewise, an area with a large percentage of sprinklered buildings might not require as fast of a response as those in unprotected buildings. Planning areas where a majority of structures are equipped with sprinklers can have a lower performance goal (80 percent or even 75) applied as the acceptable goal.

Appropriate performance levels are very much based on the characteristics of individual planning areas. Fire department personnel are very good at determining appropriate response time and reliability goals. For its part, BFRD should have its strategic planning team, and others within the fire department familiar with the various planning areas, recommend the response time goals for each of the city's planning areas.

Recommendation 18: Use NFPA 1710 (and other standards) to develop performance goals, but consider each planning area on the merits of its particular situation.

Assessing Deployment Performance – Assessing fire department deployment is a difficult task because of the many factors that affect performance. A simplistic way of determining fire station locations would be to use a GIS program to map out four-minute coverage areas to make sure there are no coverage gaps. This method focuses entirely on the location of the fire station and would work well if the fire department only answered one call at a time. The problem of this approach for a city like Boulder is that some stations are busier than others and concurrent calls are common, especially during weekdays.

We recommend that Boulder use the Center for Public Safety Excellence (CPSE) Standard of Cover process to evaluate the overall performance in Boulder. The premise of this assessment method is that for each analysis area, there is a trade-off between unit availability and performance. Generally speaking, as the correct unit for a particular area becomes less available (due to other calls, training, etc.), performance for that area should decrease because outside responding units from other stations have further distances to travel. For this analysis two metrics are used:

- Unit Availability - the percentage of incidents where a unit from the correct station was available to handle the call and did so.
- Performance Level - the percentage of incidents where the travel time was at or below (faster) than the recommended goal.

Although performing this type of analysis was out of the scope of this study, we recommend that BFRD familiarize themselves with this performance measurement methodology and use it to gauge station and unit location performance.

Recommendation 19: BFRD should familiarize themselves and use the performance measurement methodologies outlined in the CPSE Standards of Cover Manual.

Workload Analysis

In this section we look at the call volume and workload for each fire station and unit. As explained in previous section, these factors affect performance and reliability. For example, a fire station with a high workload (such as Fire Stations 1, 2, or 3) might continue to meet its goals

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because other nearby stations can also cover the area adequately. Other areas however (Fire Station 6), are more susceptible to workload increases because of the larger distance between stations (no other stations can adequately cover their calls in a reasonable amount of time). Table 15 shows the run totals by station and unit for the previous year.

Table 15: Responses by Station and Unit, Dec 2009 - Nov 2010

	Brush Truck	Dive Van	Engine	Hazmat	Ladder	Total
ST1	8	0	1961	0	1418	3387
ST2	24	0	2101	0	0	2125
ST3	0	7	2346	0	0	2353
ST4	0	0	953	0	0	953
ST5	0	0	1203	0	0	1203
ST6	0	0	262	0	0	262
ST7	0	0	721	13	0	734

We can see from this table that stations 1, 2, and 3 were the busiest with around 2,000 annual runs (excluding the ladder from Station 1 because it has a citywide first-due area). The other stations have currently had significantly less call volume. Figure 18 and Table 16 show the workload and call types for each of the individual units. Table 17 provides additional workload statistics for each unit. In the following figure, the first seven units (from the left) are engines with the final number in their four-digit unit ID signifying their home station. The last unit (on the right) is the ladder, which is currently housed at Station 1.

Figure 18: Workload (Unit Hours) by Unit and Incident Type, December 2009-November 2010

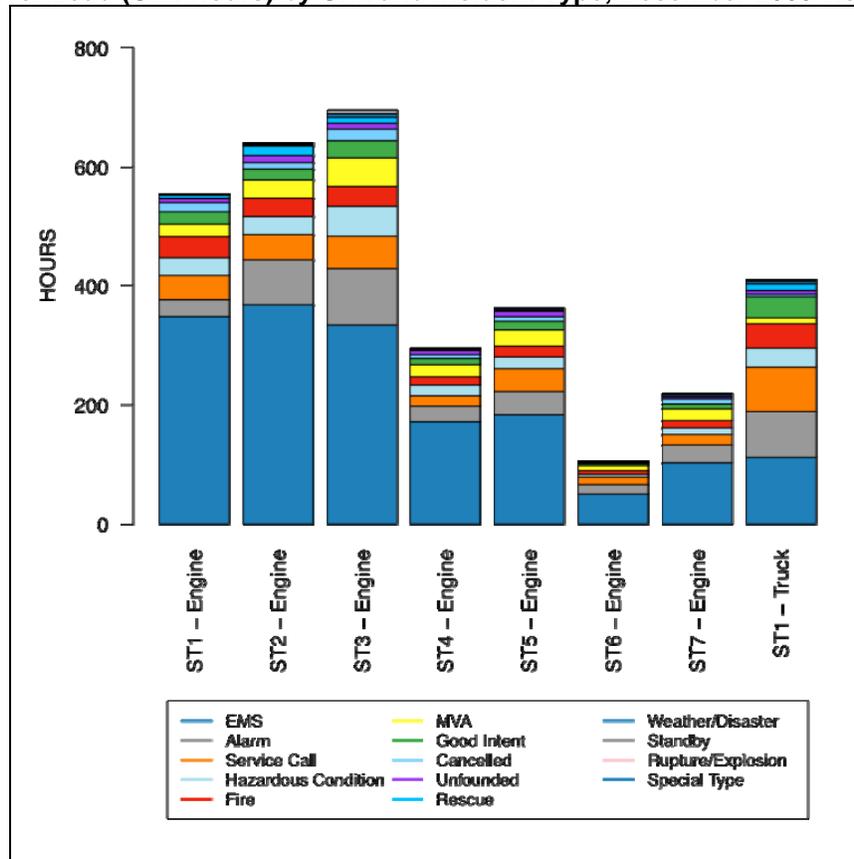


Table 16: Unit Workload (Unit Hours), December 2009-November 2010

	ST1 - Engine	ST2 - Engine	ST3 - Engine	ST4 - Engine	ST5 - Engine	ST6 - Engine	ST7 - Engine	ST1 - Truck	(all)
EMS	347.3	267.1	333.2	171.4	183.1	50.0	102.6	111.5	1695.4
Alarm	28.4	75.3	84.6	26.1	38.9	16.1	29.8	78.7	385.7
Hazardous Condition	40.6	42.2	54.1	17.3	38.2	12.7	17.8	74.7	287.4
Service Call	29.8	30.3	50.0	18.1	19.5	4.6	11.0	31.8	194.9
Fire	35.6	30.6	35.1	13.7	16.1	6.3	12.2	40.9	192.6
MVA	20.6	32.4	47.8	20.1	27.4	8.1	19.8	9.7	185.7
Good Intent	20.7	18.3	28.9	10.7	14.4	3.2	8.2	35.5	139.9
Cancelled	15.2	10.9	18.5	6.2	7.6	0.9	8.4	4.0	72.7
Unfounded	7.2	11.5	9.7	8.9	8.3	1.0	3.2	6.5	55.3
Rescue	6.6	16.9	9.8	1.2	1.9	1.0	1.1	11.0	47.6
Rupture, Explosion, or Overheat	1.8	2.3	5.7	1.6	2.7	1.4	3.1	4.3	22.8
Standby	1.1	2.0	6.4	1.1	0.6	0.8	1.4	2.5	16.1
Special Incident Type	0.0	1.5	0.0	0.2	0.1	0.0	0.7	0.4	2.9
Severe Weather & Natural Disaster	0.0	0.3	0.0	0.0	0.8	0.0	0.0	0.8	1.7
(all)	553.6	640.6	695.0	294.6	382.4	106.1	219.1	410.2	3261.8

Table 17: Workload Statistics by Unit, December 2009-November 2010

	Total Runs	Runs per Day	Total Unit Hours	Unit Hours per Day	Unit Hours per Run
ST1 - Engine	1961.0	5	621.5	1.7	0
ST2 - Engine	2101.0	6	706.0	1.9	0
ST3 - Engine	2346.0	6	751.9	2.1	0
ST4 - Engine	953.0	3	336.5	0.9	0
ST5 - Engine	1203.0	3	431.4	1.2	0
ST6 - Engine	262.0	1	154.6	0.4	1
ST7 - Engine	721.0	2	252.4	0.7	0
ST1 - Truck	1418.0	4	478.8	1.3	0
All Units	10965.0	30	3733.0	10.2	0

The takeaway from this section is that the engines at Stations 1, 2, and 3 are significantly busier than those at the other stations. Although we did not conduct a performance vs. unit availability analysis to determine how much unit workload is affecting the performance of each of the units, we can use our professional judgment to classify the engine companies at Station 1 (2501), Station 2 (2502) and Station 3 (2503) as moderately busy engines. Each of these engines is busy for approximately two hours out of every 24-hour shift handling approximately six incidents per day. The ladder truck (2516) is slightly less busy. It spends, on average, 1 hour and 10 minutes handling 4 calls per day. The other units have significantly less workload and would not be considered busy. While city officials often want to assume this means units can be simply eliminated and workload consolidated, it does not quite work that way. Often units are required, despite low workloads, to maintain response time goals. In the following section we will pull together our understanding of risk, demand, response times, and workload to decide if any station/unit consolidations are possible.

Assessment of Fire Station Locations

In this section we present an analysis of fire station locations using GIS software (ArcGIS 10). GIS data for our analysis came from both the City of Boulder and ESRI. We also visited each fire station to get a feel for its location and overall condition. This allowed us to understand the location of the fire stations relative to the area protected, not just from a GIS map.

Figure 19 shows the current location of Boulder’s 7 fire stations. This map also shows the location of all mutual aid stations (in other jurisdictions) that may respond into Boulder on occasion.

Figure 19: Current Fire Station Locations

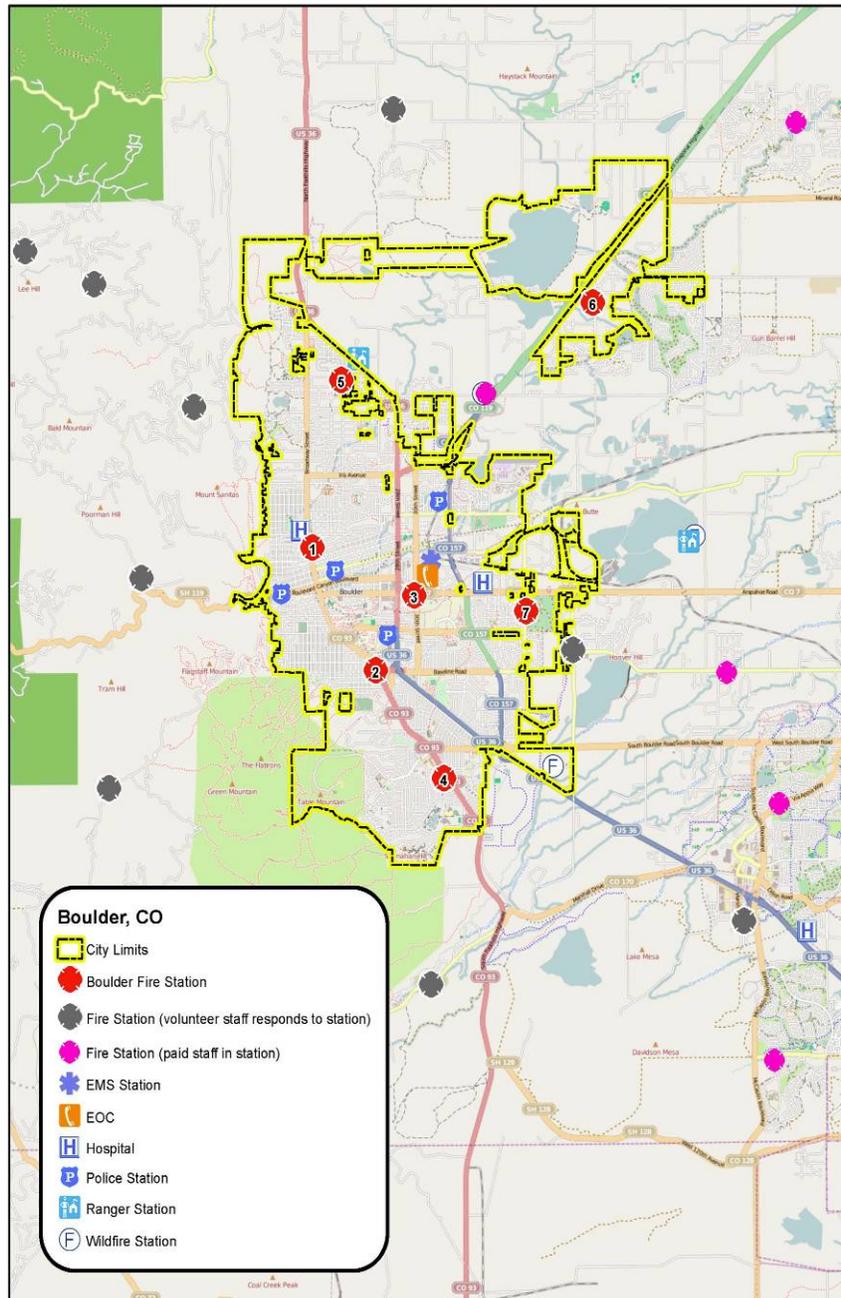
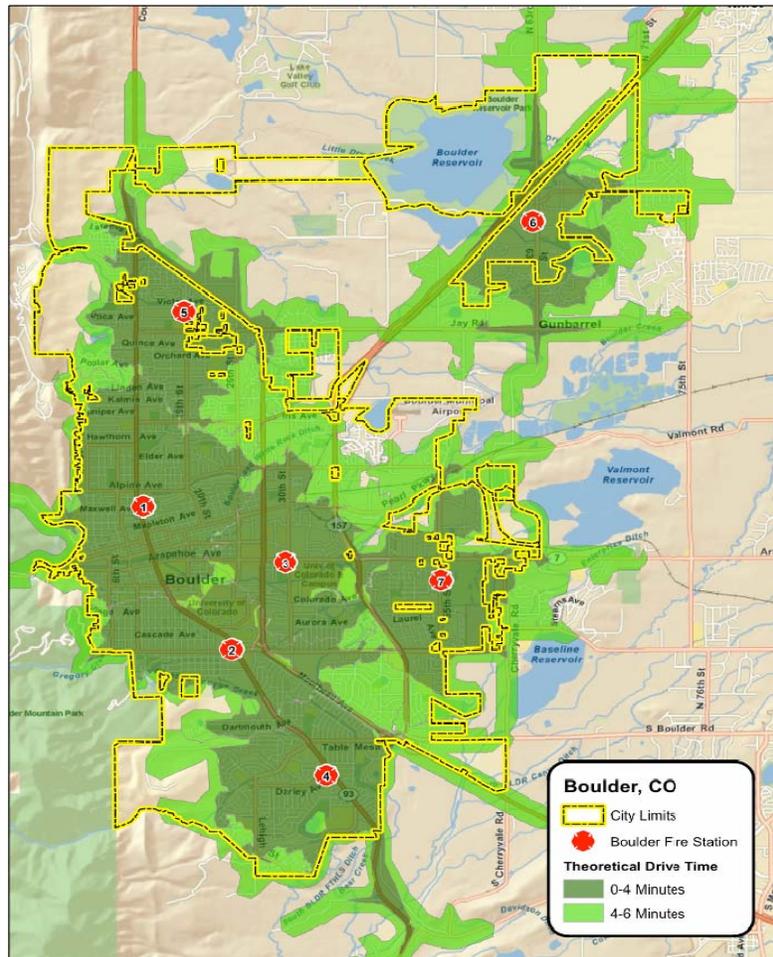


Figure 20 shows the theoretical travel time from each of the city's 7 fire stations. Areas in dark green can theoretically be reached in four minutes and areas in light green can be reached in six minutes. As stated at the outset of this chapter, the current configuration of fire stations provides good coverage. Typically we discuss any coverage gaps that are found in the theoretical drive time analysis, but Boulder does not appear to have any major coverage gaps. There is one small area west of the airport, but this is a minor issue. All other parts of the city have a fire station with six minutes drive time and most of the city is within four minutes of a fire station.

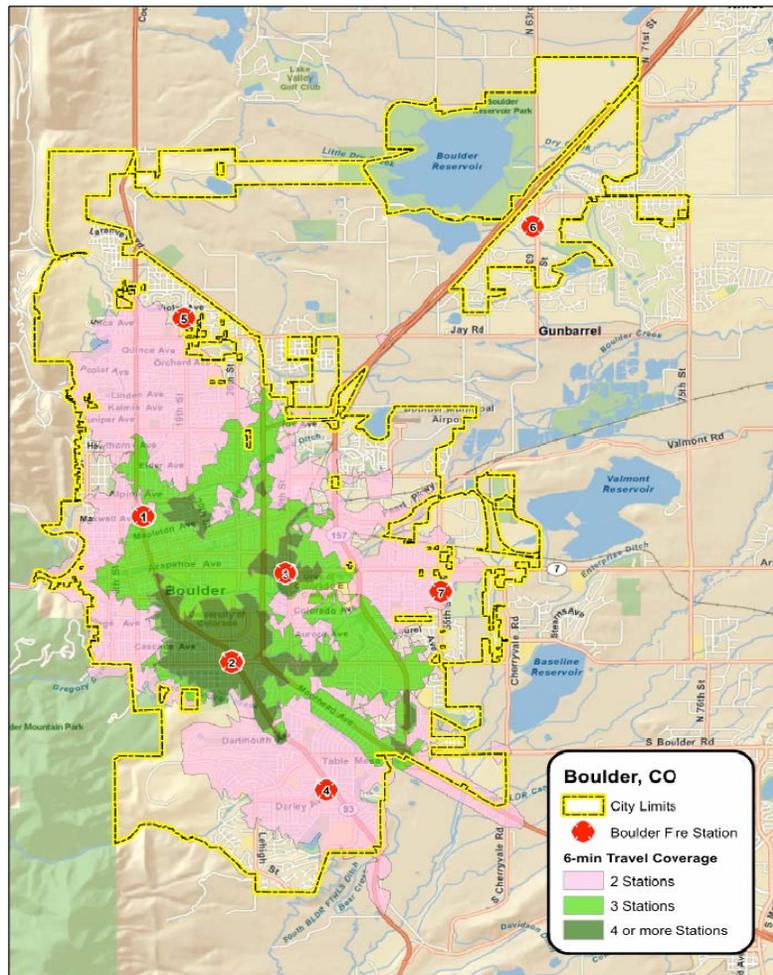
There are other coverage gaps seen within the city limits, but these are the result of areas that do not have roads.

Figure 20: Four- and Six-Minute Travel Time Analysis



Simply showing that there is adequate coverage from all the fire stations does not take into account that more than one incident often occurs at the same time in a first due area. Some coverage overlap is good in the areas of highest demand. Figure 19 shows how many stations can reach each part of the city within four minutes. Thinking back to the plots of fire and EMS incident density in the previous section, we remember that the vast majority of emergency services demand occurs in the University of Colorado area. It is this area that we would want to have coverage from multiple stations; this is, in fact, the situation. Stations 1, 2, and 3 can all reach this high-demand area within 4:00 travel time. There does not appear to be much redundant station coverage overlap where the risk and demand level does not justify it.

Figure 21: Current Station Overlap



For this study we considered whether new stations were needed, whether existing stations should be moved, and whether station merger opportunities exist. As stated earlier, we found that most stations were located in good positions for providing effective emergency response coverage. The travel time map showed good theoretical response time coverage and the coverage overlap map showed good 6-minute response time overlaps in the highest demand areas. The current location of Boulder fire stations is fairly ideal, so it is difficult to propose any radical layout changes. We did, however, evaluate potential fire station locations outside of the 500-year floodplain that might effectively replace both Station 3 and Station 7. We also considered alternative locations for Station 6 in areas where BFRD might provide contract service outside of the Boulder city limits. Neither of these investigations yielded significant opportunities. These two investigations are provided in Appendix C and Appendix D respectively.

We did, however, find that there were some areas where slight station location improvements could be made. The following provides a quick review and recommendations for each of the station locations.

Station 1 (2441 13th Street) – Station 1 was relatively recently renovated and sits just north of the high-demand University of Colorado area. The station sits far enough east of the city boundary as to not waste any response area. The station is currently moderately busy and, combined with Stations 2 and 3 provide good coverage overlap to the University of Colorado area. The station currently houses the ladder truck. Although not a bad location because of close proximity to the high-demand University of Colorado area, this location is not the most centrally located station for providing ladder coverage to the whole city. Although there appears to be no reason to move this station, it is not clear that this station requires both an engine and a ladder truck.

Station 2 (2225 Baseline Road) – Station 2 sits just south of the high-demand University of Colorado area. The station is inset far enough from the city boundary to maximize its response coverage. This Station sits on two main roadways allowing it good access in all directions. This station is moderately busy and, combined with Stations 1 and 3, provides good coverage overlap to the University of Colorado area. The station currently houses a single engine. It appears that this station is appropriately placed and has the appropriate units.

Station 3 (1585 30th Street) – Station 3 is the third oldest station and sits in the floodplain. For this reason, serious consideration needs to be given to its location. The station houses a single engine and is the city's busiest. Currently the station provides good coverage overlap together with Stations 1 and 2 for the University of Colorado area. In the next section, consideration is given to merging this station with Station 7 at a new location. We saw that there are some possible merged station locations that provide decent travel time coverage. , Station 3 and 7 could probably be merged, but we do not feel this is a sound decision. Response time coverage would, suffer in the Crossroads area and it's not clear that Station 1 and Station 2 could handle much additional workload (if their first-due areas had to expand east) without affecting their performance.

If Station 3 is not merged with Station 7 and has to be rebuilt, it would likely make sense to move it slightly north to move it out of the floodplain and provide better coverage for the area just west of the airport. A slightly more northern Station 3 would be very centrally located, still close to the high-demand University of Colorado area, and an optimum location for the ladder truck.

Recommendation 20: Consider relocating Station 3 just far enough North to clear the floodplain and moving the ladder truck from Station 1 to Station 3.

Station 4 (4100 Darley Street) – Station 4 is staffed with one engine and has low workload. The station is inset from the city boundaries to provide optimum coverage and is in the right position for South Boulder. No changes are recommended.

Station 5 (4365 19th Street) – Station 5 is staffed with one engine and it has low workload. The station is very close to the city boundary. This station is in a decent position to provide service for North Boulder, but could benefit from eventually moving slightly southwest of its current location, perhaps the corner of Iris Ave. and North Broadway St.

Recommendation 21: In the long term for future city planning consider moving Station 5 closer to the intersection of Iris Avenue and North Broadway Street.

Station 6 (5145 63rd Street) – Station 6 is staffed with a single engine and has extremely low workload. For Boulder to provide good fire service to the Gunbarrel community, this is a good station location, despite the fact that station, on average, runs less than a call per day.

Station 7 (1380 55th Avenue) – As was discussed earlier, a merger between Station 7 and Station 3 is possible, but does not appear optimal. The station is staffed with a single engine, and was built in 2000. The station currently has low workload, but is responsible for the Southeast Boulder area that is expected to see some development and population growth. The station currently sits closely to the city boundary, and sits in the 500 year floodplain. This means that it could have improved response time coverage and be in a safer location if it were moved slightly further within the city borders, but because of the road network this is not essential. Moving the station slightly southeast would provide a little coverage improvement. Currently this station provides mutual aid to Rocky Mountain Fire District, which may require that it stay in its current position.

V. ANALYSIS OF FIRE AND EMS OPERATIONS

This section discusses fire suppression, including discussions of the command structure, staffing, and the deployment of apparatus and staff. Presented here are the major deployment modifications recommended. A discussion of overtime and the staffing analysis is also in the chapter.

The BFRD provides service from seven stations year-round and in “the Cache”, which is the seasonal quarters for the wildland seasonal crew. The seasonal station is staffed for 9 to 10 months out of the year, which is considered the high-fire season. In addition to providing wildland firefighting crews, it provides wildland mitigation as well. BFRD has an Insurance Services Office (ISO) rating of four, with the highest being one. This rating is a technical guide for determining insurance costs and not intended to be a guide in the design of a fire department.

In order to provide effective service, fire departments should have an operational profile that permits them to provide a level of service consistent with the demands of the community. Sometimes the decision about the type of operating profile to use is consistent with the demand and sometimes it is not. In many cases, the decision about what type of operating profile is best for the community is not made by a rational decision-making process; rather, it is often the result of incremental policymaking or is based on tradition.

Overview of the Present System

BFRD is operationally sound. The residents of Boulder can be assured that on the street level they are receiving competent fire emergency service. It is very traditional in its delivery system, which is totally designed to devote a majority of its effort and resources toward fire suppression. It is a philosophically aggressive department in its approach to fighting fire and is quite competent in its ability to implement operations. Wildland fire suppression and mitigation is very much a prominent part of its operations and they are very good at that as well. The Wildland Division and BFRD line personnel do not get along off the fireground as they should, but from all indications they function well together on the fireground.

As stated earlier in the report, the 1982 fire training incident has had a lasting effect on the department which has influenced tactics. After the accident the department became a street firefighting department which employed master streams lobbed onto structure fires from the street. The current chief was hired to establish a revamped training division and reinstate aggressive interior firefighting. Both he and his line firefighters have accomplished this admirably. However, there is one area that the department is still lacking in, the Incident

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Management System (IMS). The fire department still does not use the National IMS to the fullest extent and in many ways, the fire department still operates at major fires in much the same way it did in the 80's, according to several officers that we talked with. Particularly lacking is overall incident management and on-scene accountability, which is not formalized; mostly the on-scene battalion chief just picks someone to be the accountability/safety officer.

Recommendation 22: The BFRD should institute and formalize the National IMS model into its fire operations, incorporating on-scene accountability measures.

To fully understand the discussions in this chapter, the following definitions are provided:

Engine – An engine is used primarily to supply water at the scene of a fire. These units are staffed by three personnel, including an officer.

Type III Engine – A type III engine is a smaller version of the engine listed above. Its pumping capacity is also less than an engine and its use is primarily for brush and wildland fires and the unit is specially designed for off-road use. When staffed, the Type III engine has three personnel, including an officer. (Type IV, V&VI are similar versions to the Type III engine with greater or equal water capacities and differing gallons per minute pumping capacities.)

Quint – A quint is a combination fire apparatus that facilitates the performance of both engine and truck company fireground functions by using one all-purpose apparatus. Because they comprise an aerial ladder, water source, hose, ground ladder, and pump, quints provide multi-functionality that the traditional pumper and ladder response cannot provide.

Water Tender – A water tender, also known as a tanker in some regions, is a specialized firefighting apparatus designed for transporting water from a water source to a fire scene. Water tenders are capable of drafting water from a stream, lake, or hydrant.

Rescue – A rescue unit is primarily responsible for extrication at accidents and the personnel augment the on-scene staffing at structure fires. BFRD rescue personnel are also trained and equipped to provide technical rescue and hazmat services. This unit is an ancillary unit which when put in service is staffed by three personnel, including an officer.

Ladder – The ladder is typically responsible for performing search, rescue, and ventilation services at a structure fire. It is also capable of performing vehicle extrication and supporting the rescue at the scene of a technical rescue incident.

In addressing the daily inventory of emergency events related to its stated mission, BFRD brings a full inventory of personnel and equipment to provide fire protection, first responder services, and other specialty emergency services for the community. Table 18 displays the daily array of personnel and equipment along with their locations and staffing patterns.

Table 18: BFRD Stations, Staffing, and Units Assigned

Station	Staffing and Units Assigned	Staffing by Station Totals
1 – 2441 13 th St.	3 – Engine 2501 3 – Ladder 2516 1 – Battalion Chief	7
2 – 2225 Baseline Rd.	3 – Engine 2502	3
3 – 1585 30 th St.	3 – Engine 2503	3
4 – 4100 Darley St.	3 – Engine 2504	3
5 – 4365 19 th St.	3 – Engine 2505	3
6 – 5145 63 rd St.	3 – Engine 2506	3
7 – 1380 55 th Ave.	3 – Engine 2507	3
Total Minimum Daily Staffing		25

The current configuration of staffing for the assigned apparatus in the City is appropriate for operations.

BFRD’s daily minimum staffing is 25. There are 31 assigned to each shift plus one battalion chief. The five extra personnel per shift are used to accommodate an allowable number of firefighters off per shift of five. There is a total complement of 96 of first line firefighter personnel for all shifts providing emergency service for the City of Boulder.

BFRD Operations are commanded by a deputy chief. He commands a three shift configuration, A, B, and C shifts and the wildland division. The wildland division is headed by a seasoned Wildland Division Chief and although he works closely with the Deputy Chief of Operations, the unit is highly self sufficient. Battalion chiefs command each A, B, and C shift respectively.

BFRD resources are assigned to seven response districts and units are dispatched outside of their assigned district when the incident requires multiple units, or when the unit assigned to a particular district is unavailable. All seven of the districts have fire units available 24/7. Fire suppression units are all staffed with three persons to include one captain or lieutenant, one equipment operator or engineer, and one firefighter.

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Captains and lieutenants are the first line supervisors in the command structure of the operations division, and act as the officers on the engine and truck companies. They are also the lead officers in many special project areas and functions within the department. For instance Station 3 handles small engine repairs and Station 4 handles hose repairs.

Firefighters including battalion chiefs work a 48 on/96 off schedule. The schedule has been in effect for two years. This schedule has pluses and minuses. This schedule is recently finding favor in many fire service organizations, particularly in the western United States. The schedule utilizes the traditional three-platoon system in which each platoon or shift works 48 consecutive hours followed by 96 hours off. This schedule is often criticized because of a concern that firefighters become fatigued when operating in high volume systems for a 48 hour timeframe. Conversely, the schedule receives positive reviews in that it provides an extended period of operation (48 hours) which enable crews to follow-up on their support activities. This improves continuity and improves accountability. When crews operate for two consecutive work days the hand-off process to the on-coming crew is reduced.

The schedule is generally well received by BFRD line personnel and management indicates anecdotally that sick leave use has reduced since the schedule's implementation. Perhaps the most significant efficiency associated with the 48/96 schedule is that it reduces the number of work-related commutes by fire employees in half. The reduction in the amount of travel hours the firefighters have to expend getting to and from work and thus reducing their use of cars in and out of the city (only two firefighters on the department live within city limits), is very positive from an environmental sustainability perspective. Given the general favor with the schedule and the absence of any negative attributes, we would recommend that BFRD maintain its operation of the 48/96 schedule and monitor job performance indicators that are related to the 48/96 schedule. Boulder is not an excessively busy system. The numbers of working fires or extended rescue operations are limited. Very few BFRD units respond regularly to more than 10-12 incidents each day, so firefighter fatigue should not be an issue.

Battalion chiefs currently do all shift scheduling. The current schedule requires an inordinate amount of time to implement and leaves little time for battalion chiefs to focus on planning and special projects. The department is in the process of implementing TeleStaff into its operations and this will help to ameliorate many of the shift scheduling issues. Many in management and mid-management positions also feel that the 48/96 schedule negatively affects efficiency and continuity of operations. The argument being that the 48 hour shift on gets personnel bogged down on the second day. The 96 hours off is too long to be off, because it creates a disconnect from daily operations and projects and affects continuity of operations.

However, it is statistically clear that sick and injury leave is down, as well as the overtime budget. What is unclear is if the schedule has helped to reduce overtime. Management feels that the reduction in overtime is directly connected to the filling of 8 vacancies, which occurred over several years prior to 2010. As the following chart demonstrates, overtime was down significantly in 2010.

Table 19: Overtime Budgets, 2005-2011

Year	Budget Appropriation January 1	Final Appropriation December 31	Actual Expenditure December 31
2005	\$485,297.95	\$485,297.95	\$630,942.31
2006	\$492,577.42	\$685,998.42	\$765,588.28
2007	\$518,371.00	\$823,871.00	\$853,998.85
2008	\$555,637.00	\$826,927.00	\$1,042,131.46
2009	\$612,018.00	\$656,975.00	\$820,468.40
2010	\$627,318.45	\$810,876.99	\$596,722.42
2011	\$636,264.00	TBD	TBD

All indications are that this trend is continuing for 2011. It should continue to be closely monitored and weighed against the operational continuity concerns expressed earlier. In the long term, the City and the fire department are going to have to make a conscious decision as to what is most advantageous to the city and its residents. As a cost benefit/budgetary concern the new schedule seems to be working. If this is a priority, along with the environmental benefits then the current schedule may be the answer in the long term.

Recommendation 23: The City of Boulder and BFRD should continue using the 48/96 schedule for the immediate future, and closely monitor the use of sick leave and overtime. If the current trend discontinues in these areas then the department and the City can reevaluate the plus and minuses of the schedule and retool if necessary.

Alarm assignments for a typical call are as follows:

1st Alarm All Structures	MVA	2nd Alarm	Gas Leaks	Automatic Alarms
3 Engines 1 Ladder 1 Battalion Chief	2 Engines 1 Battalion Chief	Remaining Engines All Available Resources	2 Engines 1 Ladder 1 Battalion Chief	1 Engine

Interestingly, the BFRD is unique with regard to its ladder company operations. Traditionally in the fire service, rescue equipment that is usually relegated to ladder companies, is on engine companies in the BFRD system. All BFRD engines are rescue equipped but the ladder is not. The fire department has only one ladder (Station 1). This unit is staffed by three personnel, including an officer. In our estimation, the primary focus for the fire department moving forward is BFRD's need to reconsider its technical rescue capabilities and to eventually

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consolidate rescue and special operations to a centrally located station where the ladder company is located. While there are unique geographical and truck accessibility issues in Boulder we feel that in the long term there is a need to consolidate these operations. In the designing of any new stations this concept should be of paramount consideration. Having multiple engines equipped with extrication tools is neither efficient nor necessarily effective.

Recommendation 24: Centralize the specialty team for hazmat, water and technical rescue to one station with the staff of Engine companies and Ladder companies trained in these areas. Augment the specialty team and train a few personnel on each shift in hazmat, water and technical rescue, and detail these personnel to the designated central station when vacancies must be filled.

Recommendation 25: Consider providing premium pay for personnel with the required certifications in those areas.

Mutual Aid

Mutual aid relationships in the City of Boulder and Boulder County are extremely important because of the wildland fire threat that is inherent throughout the entire region.

The BFRD has an excellent mutual and automatic aid system and is part of the Intergovernmental Agreement For Mutual Aid Between Fire Departments. It involves various levels of cooperation and formalized agreements throughout the county. It is a system that works, is reliable. There are 50 districts that are part of the various more specific formalized agreements and involvement set up by each jurisdiction within the mutual aid system. BFRD is also part of the Intergovernmental Agreement for Emergency Management and the Intergovernmental Agreement for Participation in the Boulder County Hazardous Material Response Plan. There are specific mutual aid and automatic aid agreements in the form of letters of understanding (LOU) and contracts with the following districts for various emergency services:

- Contract between City of Boulder and Boulder Emergency Squad
- Contract between City of Boulder and Rocky Mountain Rescue Group, Inc.
- Letter of Understanding between BFRD, Boulder Rural, and Cherryvale Fire Protection District (1998)
- Letter of Understanding between BFRD and Boulder Rural Fire Protection District (BRFPD) (2007)
- Mutual Aid Agreement with Denver Metro

The letters of understanding between BFRD, Boulder Rural, and Cherryvale Fire Protection District have the most significant impact on BFRD on a daily basis. BFRD responds to most of BRFPD's calls automatically, and is a major backup resource for them. BRFPD

provides reciprocal services to BFRD but not to the extent that BFRD responds to their district. BRFPD, is building a new station literally a stone’s throw from Station 6. We understand that there were, at some point during the conception phase of the plans to build the new station, discussions about the possibility of a merger between the BFRD and BRFPD that did not come to fruition. We consider this a lost opportunity.

Staffing and Overtime Analysis

For this study we conducted a staffing-factor and overtime analyses. A staffing factor is the ratio of FTE positions per minimum on-duty position requirements. Because fire departments are 24/7 operations, the staffing factor (multiplier) determines the level at which to staff the department based on its daily staffing requirements.

Staffing Factor – To determine the BFRD staffing factor we examined leave data for all fire personnel for an entire year. The staffing factor is based on the total number of hours in a year (8,760) divided by the average number of available hours for a single firefighter. Boulder firefighters are paid for 2,912 hours per year, but because of holidays, vacation, sick leave, other time off, and other duties such as training, a firefighter is not really available to work all 2,912 hours.

On average, each firefighter was absent an average of 484 hours during FY2009-2010. Thus, a firefighter is only available to work 2,428 hours. The staffing factor to cover one on-duty position 24x7 (8,760 hours per year) is 3.63; that is, it takes 3.63 firefighters ($8,760 \div 2,507 = 3.63$) for every position filled 24/7. An example of how to compute the staffing factor is illustrated in Table 20.

Table 20: Illustration of Staffing Factor Calculation

A	Number of Days in a Year	365
B	Number of Hours in a Day	24
C	Number of Hours in a Year (A X B)	8,760
D	Number of Shifts	3
E	Number of Hours of Scheduled Work per Employee per Year (C / D)	2,912
F	Less: Average Number of Hours of Leave Consumed Per Year	-484
G	Number of Productive Hours per Employee per Year (E-F)	2428
H	Staffing Factor (E / G)	1.21
I	Number of Employees Needed per Position for 24/7 Staffing (H X D)	3.63

A minimum of 96 FTE position are needed to staff the current shift fire system comprising one battalion chief, seven engines and one ladder 24/7. The overtime budget appears to be within respectable levels given that 96 FTE positions is the authorized strength for the BFRD. This may be attributable to the change in schedule to 48/96, which occurred in 2008. Again this bears some scrutiny over the next several years. As the following chart suggests, over

the past three years, since the installment of the new schedule, sick leave has trended downward; injury leave has fluctuated; and vacation leave has steadily increased. These trends are comparable to national averages and are not outside of the norm.

As noted earlier in the chapter the overtime budget for 2010 is about 27 percent less than its appropriated level.

Table 21: Leave Hours and Averages

95 members	2008		2009		2010	
	Total Hours Used	Average	Total Hours Used	Average	Total Hours Used	Average
Sick Leave	13,594.66	143.10	12,424.88	130.79	11,830.21	124.53
Injury Leave	985.56	10.37	1,669.42	17.57	570.25	6.00
Vacation Leave	31,869.66	335.47	33,604.30	353.73	33,619.97	353.89

If station personnel are assigned temporary or light duty, or to outside training and these are not included in daily absence records, the fire department may not reasonably know how many firefighters (or overtime) are needed for its situation.

Some overtime will always be incurred because of daily staffing fluctuations that require more firefighters to be off above the norm. Overtime often costs less than carrying more firefighters—the cost of overtime may be less per hour worked if benefits are considered. The tipping point depends on whether the overtime is earned by experienced higher paid firefighters vs. full time entry level firefighters. It may be surprising to those who hold the widespread belief that overtime significantly drives up costs. In fact, if you don't spend enough on overtime, and have extra full time firefighters above the number needed each day, it costs more, not less.

Wildland Response and Mitigation

There is little doubt as to the magnitude of the threat that wildfire has on the City of Boulder and its surrounding open space areas. In 2010, two of the Colorado's larger wildfires, the Dome Fire and Fourmile Canyon Fire, caused significant damage to the forest ecosystem, threatened critical watersheds, and resulted in widespread loss of homes and structures. These intense fires threatened the economic base of the community for weeks on end.

The year 2010 was not an anomaly as wildfires occur frequently in the Boulder area. The city is located within two distinct woodland habitats. At lower elevations, the plains life zone is dominated by grasslands, tall grass prairie remnants and riparian vegetation growing along water courses and in drainages. At higher elevations, the foothills area moves into eastern slope of the Northern Colorado Front Range. The dominant vegetation is Ponderosa pine and Douglas fir.

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The foothills area also contains dense stands of mixed conifers primarily on north facing slopes. Both habitats are very susceptible to wildfire, typically during the late summer and early fall.

In 1990, the city established a wildland division within its fire department. Though the fire department was well trained and versed in wildland firefighting, this new division was charged with fuel mitigation efforts, particularly forest stewardship. The primary goal was to reduce the threat of wildfire and minimize their intensity once ignited. The forest management process utilizes scientific methods that are based on forest health and ecologic strategies. The goal is to keep the forest healthy and more resistant to drought and insect infestation. Healthy trees are better suited to withstand wildfire. The Ponderosa pine and Douglas fir habitats, requires periodic low-intensity fires to remain healthy. Natural fire starts, primarily through lightning caused ignitions, are a natural part of this forest ecosystem. Low-intensity forest fires, which stay primarily on the ground, provide a natural clearing of the grasses, shrubs and smaller saplings that often compete for the limited moisture and resources in the soils. When natural ground fires are eliminated, fuel loads increase, the forests become overcrowded and more susceptible to disease. When a forest is overcrowded, large-scale crown fires are more prevalent. Crown fires are difficult to control, and are devastating to the ecosystem and pose a grave hazard to populated areas in the interface areas.

The city's wildland division has been a pioneer in this field, receiving national recognition for its comprehensive approach towards forest management. The city has utilized a multi-pronged approach that is based on the following objectives:

- Promote community awareness and wildfire prevention through education
- Facilitate and prioritize hazardous fuels reduction
- Effectuate cross-boundary, multi-jurisdictional projects
- Promote improved and coordinated suppression response

In 1994, the city adopted a code change banning the installation of all wood roof covering materials, including wood shakes and wood shingles. The code amendment allows existing wood roofs to be maintained until January 1, 2014, at which time these roofs must be replaced with fire-resistant materials. The city's effort in this regard was very aggressive and indicative of its commitment to wildfire prevention and public safety. The community has responded well to this regulation and at the time of our visit the numbers of wood shake roofs were reduced markedly in the more vulnerable interface areas. BFRD is planning a public information campaign in 2013 to remind those residents who still have wood-shake roofs of the upcoming deadline.

Because the process has been so successful, we believe that enforcement efforts for the remaining roofs are best dealt with on a case by case basis. In no instance, however, should any new or replacement roofs be permitted if constructed with disallowed wood products. In addition, occupancies that pose significant life safety hazards may also be excluded from being granted an extension.

Recommendation 26: BFRD should continue its plan to conduct a public information campaign regarding the upcoming deadline for replacing wood-shake or wood-shingle roofs.

Wildland Organization and Budget – The wildland fire division is supervised by the Wildland Fire Division Chief, which is a civilian chief officer, reporting to the deputy chief of Operations. This division is responsible for wildland training, emergency response, mitigation programs and regional cooperative efforts in areas related to wildfire and wildfire prevention. The wildland division is funded through two primary revenue streams. In FY 2011, the division’s budget has an appropriation of just over \$583,000. In the past three years the division’s actual expenditures have averaged approximately \$596,000 annually. The wildland division receives approximately \$80,000 of its budget through a fund transfer from the Open Space fund, which covers one third of the Wildland Fire Division Chief’s salary and expenses. This is based on a formula that allocates a portion of wildland division personnel salaries for work done on open space properties outside city limits. Also included in the budget is an allocation of approximately \$125,000 which is utilized to fund a seasonal fuel crew.

Staffing: The wildland division has a staff of 3.33 full-time personnel: one Division Chief, a Wildland Fire Fuels Manager and a Wildland Fire Management Coordinator. The division also maintains a part-time Wildfire Technician (.33-FTE), which has remained vacant for the past two years. The Wildland Fuels Manager and Fire Management Coordinator are considered civilian, are FSLA exempt and are not included in the firefighter bargaining unit. The salary rates for these two positions are significantly less than that of a Fire Fighter First Class, yet their job duties and educational requirements are significantly greater than that of a fire fighter. Both the Wildland Fuels Manager and Fire Management Coordinator have emergency response duties and frequently respond with line personnel during wildfires.

Recommendation 27: The city should consider the reclassification of the Wildland Fuels Manager and Fire Management Coordinator positions in order to align their titles and pay scales with other fire response positions.

As mentioned in the training portion of this report, it was recommended that wildland personnel assume an expanded role in the training of line fire fighters. In addition, wildland personnel specifically the Wildland Fuels Manager and Fire Management Coordinator, respond

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jointly with line personnel to wild fire incidents and in many instances assume supervisory or command roles during these events. The title designation for these two positions should have greater alignment with response personnel. “Wildland Fire Officer,” “Wildland Fire Lieutenant,” or “Wildland Crew Boss” are possible considerations. In addition, salary upgrades to that of a fire engineer or fire lieutenant should be considered along with a title change.

The division also hires 5-6 seasonal crew members each year. Seasonal crew members typically work from March until November and are utilized for wildfire response and fuel mitigation efforts. The wildland division has indicated that because of the seasonal nature of these positions and the absence of certain benefits, they have had difficulties in the recruitment of key seasonal positions, particularly the Crew Supervisor and Lead Firefighter.

Recommendation 28: The city should examine options, including an increase in the fund transfer from the open space fund, in order to move to a year-round fuel crew.

A significant amount of the mitigation work done by the seasonal crew occurs on open space lands. Wildland division personnel are the only entities in city government who are authorized under the Colorado State Forest Service regulations to conduct prescribed burns on non-federal lands. OSMP currently funds a portion of those full time salaries that are devoted to work done on their properties. In addition, fuels and operational personnel frequently respond to incidents on OSMP lands for which no reimbursement is provided. BFRD should work with OSMP in an effort to adjust the annual budget allocation in order to move some of the seasonal crew members to a full-time status.

The utilization of the fuel crew is one of the most cost effective aspects of fire department operations. These crews work a 40-hour schedule and are utilized for both wildland emergency response and in fuel treatment. They are some of the lowest salaried employees in the department and are not covered under the collective bargaining agreement. We believe the fuel crew can become a very effective method to recruit future fire fighters. This concept has the potential to also expand the diversity of the department and forge a stronger alignment between the wildland and operations divisions. BFRD has the opportunity to offer training opportunities for fuel crew members that provides a career path to become future fire fighters.

Recommendation 29: Consider the use of the fuel management program as a recruiting process for future firefighter positions.

BFRD may consider an incremental process in moving seasonal fuel crew members to a full time status by offering enrollment, at no charge, to those crew members who enter into a multi-year employment agreement with the city. Employees can be paid on a seasonal basis and at the end of their season be admitted to the fire academy and Emergency Medical Technician

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(EMT) courses. Employees who successfully complete this coursework and have satisfactory employment records may be given preference in future firefighter hirings. These individuals can also be considered for placement into year-round seasonal positions with the option of moving into fire fighter positions when openings occur. By promoting this type of “Fuels-to-Fire” trainee program it can be utilized to expand departmental diversity recruitment efforts. Simultaneously, this system creates a pool of perspective firefighters who are trained and orientated in both structural and wildland firefighting.

Interaction with Line Personnel: There was a noted disconnect between the operations division and the wildland division. Much of the separation is believed to be driven by historical influences that have their root in a labor management context. The perception is one in which the wildland division is a “non-union shop” while the operations division is a “union shop.” Our perception is that this disconnect is minor in nature and driven by personalities. Over time, as personnel change and certain organizational adjustments are made, there will be stronger alignments between these two critical departmental functions.

As indicated above, a change in the titles of the key wildland position will provide a closer alignment. Titles such as “Wildland Fire Officer,” “Wildland Fire Lieutenant,” or “Engine Boss” should be considered. It is also recommend that an expansion of the promotional requirements for engineers and officers include more wildland qualifications. Job descriptions for all line positions (firefighter, engineer, lieutenant, captain, battalion chief) should be modified to include wildland and fuel management knowledge, skills and abilities.

Recommendation 30: Modify the job descriptions for all line positions in operations to include knowledge, skills and abilities in both wildland firefighting and fuel mitigation efforts.

As line personnel become more versed in wildland operations, including prescribed burn activities, they can work jointly in the forest mitigation projects. The department should also look at the future manager of the wildland section to be a ranked battalion chief and consideration given to rotating line battalion chiefs into this position on a cyclical basis.

Recommendation 31: BFRD should consider in the future that a ranked battalion chief be assigned to manage the wildland section.

Interaction with Area Partners: The wildland division has fostered an exceptional working relationship with its area partners. Because of the unique governmental structure that exists in Boulder and surrounding Boulder County, the city’s wildland division has been able to capitalize on this situation and spearhead very strong working relationships with these partners. Boulder Open Space and Mountain Parks and the Boulder County Sherriff’s Office are the primary partners with which the wildland division interacts. These agencies work jointly on

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mitigation, suppression and planning efforts. This three-part alliance is as effective a partnership as we have seen nationally. It is very unique to see so much city-owned land, primarily as open space, outside of city limits. In addition, these areas are some of the most vulnerable lands from a wildfire perspective.

Colorado law establishes each county sheriff as its “fire warden.” In this capacity the sheriff has overall fuel management and suppression responsibilities in the unincorporated areas. Again this is a very unique arrangement and the Boulder County Sheriff, Joe Pelle has taken these duties very seriously, perhaps more so than any other sheriff in the state. Sheriff Pelle has built an extremely competent staff in the Emergency Services Division that includes personnel specifically trained in fuel management and wildfire suppression efforts. In addition, they hire a seasonal fuels crew to work in conjunction with the city wildland division and OSMP in thinning and clearing projects.

In unincorporated Boulder County, there are a number of fire protection agencies that have various inter-actions and working relationships, with BFRD wildland division:

- Boulder Mountain Fire Protection District
- Boulder Rural Fire Protection District
- Coal Creek Fire Protection District
- Fourmile Fire Protection District
- Hygiene Fire Protection District
- Indian Peaks Fire Protection District
- Lefthand Fire Protection District
- Louisville Fire Department
- Mountain View Fire Protection District
- Nederland Fire Department
- Rocky Mountain Fire Protection District
- Sugarloaf Fire Protection District
- Sunshine Fire Protection District
- USFS-Boulder Ranger District

Community Wildfire Protection Plan: In September of 2007 the city adopted its Community Wildfire Protection Plan (CWPP). This plan is a requirement of the 2003 Healthy Forest Restoration Act and is intended to provide communities with a planning tool to guide them in their management of wildfire hazards. A key component of the CWPP is its community wildfire hazard analysis. This analysis looks at ways to restore forest and rangeland health and reduce the risk of catastrophic wildfires. The primary objectives of the CWPP are:

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1. Identifying and prioritizing fuels reduction opportunities
2. Addressing structural ignitability
3. Collaborations with regional stakeholders

The CWPP is based on an area risk analysis. This assessment estimates the risks and hazards associated with wildland fire to the City of Boulder and its neighboring communities. This information identifies the “Values at Risk” and defines “Areas of Concerns.” From this analysis a prioritization of mitigation efforts are established. In addition, the CWPP is intended to promote community awareness and improve wildfire prevention through public education.

The CWPP has identified three communities, Kohler, Upper University/Boulder Canyon, and Shanahan West as those communities with a Very High Hazard Rating. It also showed the potential for extreme fire conditions based on weather conditions, fuel loads and the slope particularly in interface areas and canyons. Matrices were developed identifying the prioritization for treatments and mitigation considerations.

The CWPP is a very useful tool to guide the wildland division and area partners in prioritizing its efforts. Based on scientific and historical data, this document is an excellent basis for developing both long and short-term planning.

Hazardous Fuel Mitigation – Guided by the CWPP and in cooperation with area partners, the wildland division develops its work plan on an annual basis. A number of factors drive the prioritization of mitigation projects. Funding is the primary driving force in determining the amount of work that can be done and the concentration of these efforts. The amount of funding available is directly related to the number of grants that are received. There are a number of grants that are available for hazardous mitigation projects in the Boulder area. These are primarily federal grants originating from the Departments of Interior, Agriculture, and Homeland Security. Many federal grants utilize state agencies to pass-through these funds and provide oversight on their administration. The Colorado State Forest Service is the primary agency that serves in this capacity. Both OSMP and the Sheriff’s Office have been aggressive in pursuing and receiving mitigation grants for the area. The wildland division has been noticeably deficient in its receipt of grant funding in recent years.

Recommendation 32: The BFRD wildland division should be more aggressive in its pursuit of wildland mitigation grants.

Of particular interests are public education and awareness efforts that focus on wildfire preparedness amongst residents. Specifically, the wildland division should expand its efforts in promoting Firewise communities. NFPA, who hosts the Firewise program, offers a 2-day *Home Ignition Zone* workshop that is designed to do the following:

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- Provide reference materials and basic knowledge regarding wildfire threats to the home and surrounding areas
- Increase an understanding and competency in wildland/urban interface fire mitigation
- Assist wildfire mitigation and prevention professionals in assessing risks to individual homes in wildland, forested, or grassland areas
- Encourage and prepare residents and homeowner associations to participate in Firewise Communities/USA®

When adequately prepared, a home or structure may be able to withstand a wildland fire without the intervention of the fire service. In fact, a house and its surrounding community can be safe and compatible with the area's ecosystem. By applying Firewise principles, communities are able to achieve a high level of protection against wildland/urban interface fire as well as a sustainable ecosystem balance.

Recommendation 33: The wildland division should spearhead a comprehensive public awareness and preparedness program that promotes community efforts to incorporate Firewise concepts that increase a residential structure's ability to withstand wildland fire without fire service intervention.

Also of interest in the pursuit of home preparedness efforts are cost-share grants that provide 50 percent matching funds to private property owners who conduct mitigation projects on their property. The 2011 *Western Wildland Urban Interface Grant Program* is available for this purpose. Because much of the work eligible under the 50 percent matching grant programs are on private property, it is necessary that private vendors are utilized for this work. The Colorado Revised Statutes (39-22-104(4)(n)) also provides a 50 percent tax subtraction for the cost of mitigation efforts on private property within the state. The amount that may be subtracted through this provision cannot exceed \$2,500 in any taxable year. As money becomes available and there is an increased demand for thinning projects on private property, there is a corresponding increase of new businesses to meet this demand. The wildland division must play a critical role in providing instructions to private vendors as to the requirements of the grant programs including eligibility guidelines and payment procedures. Ultimately local government becomes a sort of conduit between the private vendor and the private residents that facilitate work projects that improve fire safety in residential neighborhoods.

Recommendation 34: The wildland division should work with private vendors in providing instruction and assistance on grant requirements for mitigation and treatment projects on private lands.

Light Fuels/Grasslands: Vegetation management and grass mitigation efforts are needed in many of the vulnerable residential areas interspersed throughout the Boulder foothills. Grass fires are problematic because they spread rapidly and are difficult to contain. Many of Boulders residential areas are adjacent to open space areas in which these grasslands predominate. When winds are high and the grasses dry up, the spread of these fires throughout drainage areas and in riparian habitats often impinge on residential structures causing widespread structural damage. It is critical that this exposure is addressed.

Grassy areas and other light fuels (shrubs, bushes, etc.), are the easiest and least expensive fuels to mitigate. In most instances, residents are capable of reducing these fuel loads through mowing or other removal methods that do not require specialized training or equipment. When large areas of treatment are needed, these habitats are best suited for broadcast burns. This type of treatment is the least expensive of all other treatment methods, typically ranging in the \$50 -\$75 per acre. Grass mitigation should be a primary focus of the public awareness and wildfire prevention campaign. Many communities, particularly in California, have imposed vegetation management programs that required residents to remove hazardous fuels in an effort to minimize wildfire risks (See Orange County Fire Authority Defensible Space & Fuel Modification Program). These regulatory efforts are intended to reduce the risk of grass fires on residential structures and harden these properties through the use of fire restrictive landscaping and construction materials.

Recommendation 35: BFRD should consider the adoption of code provisions that require vegetation mitigation and fire resistive construction practices for residential properties.

Code Management: Fire departments have long utilized the code management process to insure life safety and regulate construction practices. Recently communities have adopted wildland interface codes that specifically address the dangers of wildfire. The International Code Council (ICC) has developed a model wildland interface code that includes the key aspects of code application related to wildfires. Topics include:

- Defensible space and accessibility
- Water supply
- Road access and multiple means of egress
- Fire resistive construction, materials and landscaping
- Hazardous fuel mitigation
- Smoke management
- Impacts of slope on fire spread
- Fuel loads

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Boulder has not adopted a wildland interface code for its jurisdiction; instead, they utilize provisions of the fire code to address specific wildfire considerations. One of the unique aspects of the wildland interface code is that it does not have universal application throughout the jurisdiction. Specific code provisions are applied to various sections of the community based on the hazards that exist in these neighborhoods. Hazard assessments are done throughout the jurisdiction and from this evaluation various vulnerability zones are created. More stringent code provisions are applied to those zones with the greatest hazard. For example, structures built in the downtown areas where the threat of wildfire is minimal, few if any wildfire related code restrictions apply. In other areas that may be in direct proximity to hazardous fuels or there are slope considerations; these areas will be subject to more stringent restrictions. From this perspective, the code is customized and its applications are utilized depending on the hazard. In addition, the model interface code is much more comprehensive in addressing those critical concerns for development in fire prone areas.

Recommendation 36: The city should consider the adoption of a wildland interface code for its jurisdiction.

The city cannot impose its wildland interface code on properties that are developed outside city limits in Boulder County. It may however, enter into an agreement with Boulder County, particularly in those open space properties owned by the city, to apply the provisions of the wildland interface code to any structures that are built in these areas.

Wildfire Suppression – Firefighting tactics in wildland settings are much different than those typically encountered in structural environments. Wildfires are very seasonal in nature and are most prevalent during weather conditions that are conducive to wildfire growth and rapid spread. Wind, temperature and humidity are the factors that most influence the complexity in managing wildfires. When winds are high and humidity is low the potential for exponential growth of a wildfire increases dramatically. If these conditions are aligned with high temperatures in which nighttime cooling does not occur, the formula for disaster increases markedly.

The topography of an area and its orientation to the prevailing winds also impact fire growth and containment strategies. Rugged terrain impacts the ability to access the seat of the fire and to position resources to effectively contain the blaze. Also of critical concern is the fuel load of the forested area. Dense forests that have not been treated or those areas that are unhealthy or dead because of insect infestation create conditions that greatly impact the potential for catastrophic wildfire. Finally, the proximity and numbers of residential or inhabited structures, always create a priority in developing firefighting tactics. Structural preservation and fire fighter safety are always the priority objectives in fighting wildfires. Other infrastructure

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concerns will also impact tactical strategies: the proximity to electrical transmission lines, natural gas or oil pumping stations, watershed areas or recreational facilities.

Initial Attack: Firefighting tactics in wildland settings utilize an initial attack that in most instances takes considerably more time to unfold than that experienced in more urban settings. Because wildfires are typically in rural areas the detection process is usually delayed. If ignition areas are not adjacent to roadways or areas of travel, there is a likelihood that the fire will grow and begin producing more smoke before it is spotted. In the most remote settings fire towers are the method through which fires are spotted and reported to the responding jurisdiction, but they are not used in Boulder County. Depending on road access and routing, additional delays are encountered by the arriving fire units. The initial attack is the composite of resources that first arrive at the fire and determine how the fire can be managed. A rapid determination is made as to the types of resources that are needed and what are the containment objectives for the event. At this point additional resources are requested and again because of the rural nature of the setting, it may take several hours before an appropriate force is assembled. In some instances the fire is so remote or the terrain so rugged, that vehicles are unable to access the fire. In these instances, hand crews are assembled and they walk into the fire area to initiate containment efforts. Often, air resources, helicopters or smaller fixed-wing aircraft are used for reconnaissance purposes to locate the fire and provide guidance as to size, access and the spread of the blaze.

In Boulder, as in many communities, multiple agencies assist one another in the initial response to an incident. These resources include the city's wildland team and BFRD structural personnel who may deploy in wildland vehicles. The OSMP crews also respond along with Boulder Sheriff's Office (SO) and neighboring fire districts. In larger incidents or depending on the conditions and areas impacted, additional resources are brought in from Colorado State Forest Service and the US Forest Service. The combined fleet operated by BFRD, OSMP and Boulder SO is very limited. It is composed of 7 wildland response vehicles. This includes 5 Type-6 engines, 1 Type-3 engine, and 1 water tender. The Type-3 engine is the most versatile of the wildland fleet. It is suitable for both wildland and structural protection. Its size allows more compartments and it is able to respond both on and off-road. The Type-3 engine carries a minimum of 500 gallons of water, a pumping system capable of producing 150 GPM at 250 psi and carries a minimum of 1000 feet of 1-1/2 hose. Given the size and interface areas in the Boulder service area, it is recommended that at least two additional Type-3 engines be added to the fleet.

Recommendation 37: BFRD and OSMP should consider the purchase of two Type-3 engines (one per agency) to be added to their wildland response fleet.

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The initial responding units will establish the incident commander (IC) for the fire and name the fire. From this point the IC will request additional resources as needed. Most agencies work under mutual aid agreements that provide the closest available resources, typically at no charge for this initial attack. Mutual aid agreements are pre-established and agencies coordinate these requests through local dispatch centers. The Boulder system appeared very proficient in the organization around which it establishes its initial attack. Agencies are familiar with these joint operations and understand the incident command structure that is utilized to manage larger, multi-agency incidents.

Most wildfires are successfully contained during the initial-attack stage. However in those instances where the fire becomes more complex and the engagement may expand into extended operating periods (more than one day), a decision is typically made to call in additional resources from outside the immediate area.

Extended Attack/Overhead Teams: When a fire cannot be controlled during the initial attack, or the period of containment goes beyond the initial operational period (usually 12 hours), the fire moves into what is termed an *extended attack*. In these situations the fire requires greater organization and additional resources. Depending on the location of the fire and its access, a decision is made as to whether some sort of *base-camp* of operation is needed. A base-camp is merely a forward operating post from which resources are stored, supplies are stockpiled and support for the fire fighters are provided (food, water, rest areas, medical care, etc.). As the logistical support for the incident grows an *overhead team* is assigned to the incident and this team assumes command of the fire. This overhead team is composed of specially trained individuals with designated assignments necessary to manage a growing and more complex incident. Overhead teams for extended attack operations may be composed of personnel from the local agencies or they may be from agencies in the region. The primary objective of the overhead team is to develop an incident action plan for managing the fire and to assemble the necessary resources that will be needed.

A critical phase in the management of an incident occurs when an overhead team is assigned to a fire and the command of that fire moves from the local jurisdiction to this expanded group. At this point resources are ordered through the state and then from federal resources. Mutual aid resources are released and the additional resources utilized are paid for by the jurisdiction having responsibility for the fire.

Incident Management Teams: As the fire grows in complexity and size, the management of the incident is shifted from the local overhead team to either a Type-2 or Type-1 Incident Management Team. The assignment of incident management teams (IMT) in Colorado is done by the Rocky Mountain Area Coordination Center (RMACC). The center is the focal

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point for coordination and mobilization of resources for all wildland and all risk incidents in the affected geographic area. This coordination center is the first point of contact for resource ordering in the 5-state area that includes Colorado, Wyoming, Kansas, Nebraska and South Dakota. A Type-2 Team is a self-contained, all-hazard or wildland team recognized at the National and State Level. They are coordinated through the Area Coordination Center. All personnel assigned to the team meet NWCG training requirements at the Type-2 level for their specific position. A Type-2 IMT is composed of 20-35 members and is utilized to manage incidents of regional significance that require a large number of local, regional, state and national resources. This includes incidents where the operational requirements approach 200 personnel per operational period and the total incident personnel can be as high as 500. There are several dozen Type-2 Teams currently in existence and operated through the US Forest Service.

A Type-1 IMT is a self-contained, all-hazard team recognized at the National and State level. Type-1 teams are requested and dispatched through the Area Coordination Center. All personnel meet the NWCG training requirements at the Type-1 level for their specific position. A Type-1 IMT is composed of 35-50 members and utilized to manage incidents of national significance that require a large number of local, regional, state and national resources over extended operating periods. This includes incidents where the operational requirements may exceed 500 personnel per operational period and the total incident personnel can be as high as 1000. When fully operational, Type-1 IMT's incur costs that often reach \$1M dollars per day. There are eighteen Type-1 Teams currently in existence and operated through the US Forest Service.

Delegation of Authority: Whenever an IMT assumes control of a fire it will request the authority having jurisdiction of the fire to enter into a written *Delegation of Authority*. This document defines the areas of responsibility and the authority that have been granted to the incoming team in managing the incident. This document further identifies those responsibilities maintained by the authority having jurisdiction. It will also include provisions regarding the responsibility for paying the costs that are incurred by the team and any limitations that may be stipulated regarding the incident. In short, the delegation of authority is a formal contract between the local jurisdiction and the team that defines the terms of their relationship during the incident.

Erosion Control/Habitat Restoration: After a fire is fully contained, there is a need to restore the forested habitat. Because the impacted areas are denuded of vegetation and ground cover, the soils become unstable and during periods of rainfall or snow run-off there can be flooding and mudslides. In many instances the impact of the flooding extends well beyond the fire area. These damages compound mitigation efforts and necessitate funding sources that in

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many instances are different than those available for wildfire response and containment. Flooding usually requires a FEMA declaration whereas wildfire costs are typically funded through the UF Forest Service and the Department of Interior. Compounding this issue is the management of the incident. As described above, large-scale wildfire incidents are managed by IMT's who are specifically trained and equipped for these events. Flood events fall under the purview of the local government, typically the county or municipal jurisdiction with assistance provided by the state when necessary. These agencies, particularly local governments, are not well versed in the large-scale management of such incidents. In addition, the residents of those impacted areas who have withstood the ravages of the fire and now are faced with flooding and mudslides; these residents have lost patience and are desperately seeking a resolve to these issues.

Bare Area Emergency Response (BAER): After a wildfire is contained a BAER team is deployed, typically under the supervision of the US Forest Service. This team is charged with developing a plan for the restoration, identifying the methods best suited for the impacted habitat. The team identifies the critical priorities for restoration that include:

- Fish and animal habitats
- Water quality and watershed preservation
- Public safety
- Property preservation
- Soil stability
- Road and utility stabilization
- Hazardous tree removal
- Drainage

The team may utilize sophisticated techniques that often includes satellite mapping to identify the extent of the burned areas and to make determinations of those most severely impacted areas. They often plant grasses and saplings that are specific to the area. Mulching materials are also applied to provide some immediate stabilization for the soils, and from there, planning can occur to move towards a more natural long-term restoration. It is not uncommon for the restoration process to take upwards to -10 -20 years to be completed, depending on the extent of the damage, the terrain involved and the regenerative factors that are impacted by climate, moisture and the types of forested areas that are being restored.

Emergency Medical Services

The City of Boulder receives a very high quality of pre-hospital emergency medical services. The city uses a combined and integrated service network that initiates care from an enhanced 911 emergency call center operated by the city's Police Communication Center. First responder services are rapidly initiated from each of the City's seven fire stations operated by BFRD.

Advanced life support services and patient transport is provided by Pridemark Paramedic Services under contract to Boulder County and the City. Dr. Todd Dorfman, the medical director for Pridemark, provides medical oversight and quality assurance services. Almost all patients requiring follow-up medical care are transported to Boulder Community Hospital, a 265-bed full service hospital located in central Boulder. There are three aero-medical EMS units (Flight for Life Colorado, Airlife Denver and North Colorado Med Evac) that provide aero medical transportation for severely injured or ill patients. There are some on-scene referrals, but most patients are initially transported from Boulder Community Hospital after initial treatment.

EMS first response is provided on the campus of the University of Colorado by BFRD with assistance from campus police.

The City of Boulder is currently in the process of requesting proposals for the provision of advanced life support (ALS)/basic life support (BLS) ambulance response for 911 emergency calls. The successful contractor will be the city's exclusive provider of these services. The current contract with Pridemark is between Boulder County and Pridemark. A stipulation under this agreement is to provide services within city boundaries.

Boulder-Fire Rescue Department – The city operates its seven fire stations with a minimum daily staffing of 25 personnel. All emergency response personnel from the fire department are trained as Colorado EMTs. All new hires since the mid-1990's must obtain and maintain Colorado EMT certification as a condition of employment. The department does not utilize or recognize paramedics within its ranks, though there are a number of individuals who have achieved this level of certification. The fire department operates eight first-line emergency response units, including, five engines, three ladder trucks/quints and one battalion chief command vehicle. All vehicles carry basic life support supplies and provide initial response and typically assist Pridemark personnel in patient care. BFRD staffs its engines and ladder companies with three personnel. The battalion chief vehicle is staffed with one chief officer. The closest fire department unit responds on all potentially serious EMS calls. They usually arrive and begin care before the Pridemark unit arrives on-scene. Fire station personnel and Pridemark

units operate on a common radio channel and are dispatched to incidents through the city's 911 Communication Center.

EMS Oversight: The fire chief and department command staff oversee all EMS first responder functions. There is no designated EMS manager and like many departments, the operations deputy chief is responsible for daily EMS operations with direct field supervision provided by the on-duty battalion chief and company officers. EMT continuing education is handled by the fire department training officer.

As the city develops a new contract relationship with an ambulance provider it is imperative that it establish an EMS contract administrator who is charged with interacting with the ambulance provider for the purpose of contract oversight and compliance. The EMS contract administrator should be a line officer, preferably a battalion chief who has the ability to interact with the ambulance provider in both an administrative and field setting. We believe this assignment can be managed by one of the existing battalion chiefs or the proposed administrative and may not require additional staffing. They should also have the technical expertise to interact with the medical director in administering protocols, quality assurance and training curriculums.

Recommendation 38: The city should consider the appointment of an EMS contract administrator from within the mid-management ranks of the fire department to have oversight on contract administration and compliance of the ambulance provider.

These duties will create a significant workload for the assigned chief officer, but it will also provide career development and the honing of necessary skills for future advancement into senior management roles within the fire department.

BFRD EMTs receive medical direction through the City of Boulder's EMS medical director, and continuing education is provided by the BFRD training staff in accordance with Colorado EMT recertification guidelines. Pridemark and the BFRD training staff work cooperatively in delineating the training schedule and course content for EMS continuing education training. BFRD and Pridemark work together on quality improvement issues, and there was no evidence of any significant problems with regard to the quality of EMS care provided. The Training Division maintains comprehensive records regarding each employee's course completion and monitors compliance in accordance with state guidelines.

All BFRD engine and trucks are equipped with basic EMS first responder supplies, oxygen with delivery systems, and automatic external defibrillators. At the time of our interviews, paramedic level (ALS) equipment was not carried. The current two-tiered response system utilizing BFRD as the Basic Life Support (BLS) first responder, and Pridemark as the ALS service provider and transport agency. This arrangement appears to provide a high level of

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patient care and is extremely cost effective. Many fire agencies nationally provide first responder care at the ALS level. Though this level of care would be an enhancement over the current level of care for the most critical patients, it does not appear that the expansion of first responder care to the ALS level is warranted at this time.

Recommendation 39: At this time, the expansion of the fire department EMS delivery system to the Advanced Life Support level is not justified. The current working relationship with the private ambulance provider is good and response times are in line with national standards.

Given the current financial climate the added costs associated with the expansion of the fire department's EMS service delivery to the ALS level is neither warranted nor justified. However, the city is developing a new contract for ambulance service within its boundaries and it is imperative that this new relationship (especially if another ambulance company is selected) be monitored closely to ensure that response times, quality of care and the working relationships between the provider and the fire department are maintained.

Vehicle Deployment to EMS Incidents: As in most fire departments in the United States today, EMS related incidents dominate total call volume. In Boulder 63 percent of all responses are EMS related. EMS alarm activity has steadily increased in the past 20 years and it is believed that this trend will continue in the future. Boulder operates a fleet of fire apparatus, including engines and ladders/quints. These are heavy vehicles with high horsepower diesel engines. Fire engines typically average 5-6 MPG while ladder trucks and quints operate less efficiently, 2-3 MPG. Fuel consumption is further diminished because once on-scene, vehicles continue to operate or are left at idle. It is estimated that on an annual basis, the city's fleet of apparatus utilizes over 15,000 gallons of fuel for its combined response to EMS related calls. While smaller vehicles still use fuel, it is anticipated to be much less than current levels.

Many fire agencies have moved to a smaller, more efficient rescue vehicle in handling their high volume of EMS calls. Typically these units operate in tandem with a fire apparatus and are staffed with 2 personnel. These smaller vehicles are much more maneuverable and have higher fuel efficiency, between 9-10 MPG. In addition, maintenance and replacement costs are typically half the cost of fire apparatus when compared throughout their life cycle.

Recommendation 40: The city should consider the use of 2-person rescue vehicles in its busiest fire stations, running in tandem with fire apparatus.

NFPA 1710 provides the opportunity for municipalities to utilize multiple units in meeting the minimum 4-person staffing designated as part of a fire company (NFPA-1719-Ch.5.2.1.2). A 2-person rescue vehicle operating under the supervision of a singular company officer, are considered part of that engine company. In addition, the use of a rescue vehicle will

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reduce significantly the wear and tear on the more costly fire apparatus, reduce GHG emissions and will subsequently extend their service life. Possible options for staffing two-person rescue units are provided in Appendix E.

Fire departments across the country continue to increase their involvement and oversight of EMS delivery systems. They usually are charged with monitoring and assuring that the private ambulance provider is meeting the requirements of their service agreement. The city's effort to expand its oversight of the private ambulance provider through a formal contract agreement is commendable and greatly encouraged. BFRD has the management talent to accomplish the task, but lacks direct experience with EMS management. Developing these management skills will become essential, and expanded training in this process is warranted. Fortunately, additional training is available, at very low cost, from the National Fire Academy (NFA) in Emmitsburg, MD. The NFA offers the following EMS courses that would benefit fire personnel including:

- **Management of Emergency Medical Services** – A two-week program that covers the basics of EMS supervision and leadership.
- **Advanced Leadership Issues in Emergency Medical Services** – A two-week course that covers executive EMS leadership issues. The program targets chief officers and senior EMS officials.
- **EMS Special Operations** – A two-week course that provides an expanded view of ICS for EMS, and EMS functions during special, complex situations. Completing the program certifies the provider at the ICS-300 level.
- **EMS Quality Management** – A six-day program that covers EMS quality management techniques that include metrics, outcome measures, analysis, reporting, and making decisions based on quantitative and qualitative information.

Recommendation 41: BFRD should send key personnel to the National Fire Academy in order to participate in EMS management programs.

Fire departments should be charged with the oversight of EMS delivery systems within their jurisdiction. Fire department personnel are charged with the management of incidents and the deployment of resources. Ambulance companies are operational in a given jurisdiction for the term of their contractual agreement. Ambulance companies will change over time and the fire department oversight is constant. Fire and Police departments also provide much needed assistance in scene management, patient care, extrications services, and providing patient access and lifting. Many agencies have developed as part of their formal agreement with an ambulance provider, a first responder fee for these services. Because the city is currently developing a new

Request for Proposal (RFP) for an ambulance provider contract, it is an ideal time to explore this option.

Recommendation 42: The city should explore the option of incorporating a first responder fee as part of its new RFP for ambulance services.

Many states regulate the imposition of fees in the delivery of EMS services. In recent years states, through the urging of ambulance company and insurance lobbyists, have adopted new legislation that places restrictions on municipalities in the adoption of these types of fees. In most cases however the provider contract is the basis from which fees are established. It will be beneficial for the city's legal staff to evaluate the ability to establish a provision in the newly developed ambulance contract to authorize this type of fee. It is estimated that Pridemark conducts 4,750 transports that originate within city limits. A first responder fee of \$25 per transport has the potential to generate nearly \$120,000 annually (assuming all fees are paid). This revenue may be utilized to fund EMS operating costs, supplies and equipment directly related to this service.

Boulder Police Department – The Boulder Police Department (BPD) fulfills two major EMS roles, assisting as a first responder and providing EMS dispatch and communications.

Assistance to First Responders: BPD officers are trained in basic first aid techniques as part of their State of Colorado certification process. Several police officers are EMTs and often provide valuable assistance. In general, all parties agree that BPD officers provide whatever assistance is needed without compromising their primary roles of maintaining community safety or law enforcement.

Fire and EMS Dispatch: The BPD is responsible for all public safety 911 access and communications services, including police, fire, and EMS dispatching. The oversight of the Communications Center is provided by the Staff and Support Services Division of the Police Department, and day-to-day operational oversight is provided by a non-uniformed communications manager. There are 26 authorized dispatchers and 4 Dispatcher Supervisors, all qualified to operate in police, fire, and EMS dispatching. This includes certification in the medical priority dispatch system. The center is also staffed with a System Administrator, an Administrative Assistant and the Communications Manager. The minimum staffing is four personnel, one for the police radio channel, one for fire and EMS, one on the data channel and one dedicated 911 call-taker. If necessary, the supervisor can fill in at any position.

For medical emergencies, the center uses pre-arrival instructions and a portion of the coding sections of the National Medical Priority Dispatch program. Since all calls are dispatched at the ALS level, they do not use call prioritization. The future ambulance contract oversight requirements may include the need to discriminate between high-priority and low-priority calls.

Recommendation 43: Begin to expand the use of Medical Priority Dispatch in determining the prioritization of response between fire and ambulance units.

Medical Priority Dispatching is a key component of every EMS delivery system. National guidelines recommend that the dispatch center handle each 911 call in less than 60 seconds. This is the time it takes for the 911 dispatcher to obtain the pertinent information regarding the call and completes the page-out to the appropriate response agency. In addition, the delivery of “pre-arrival instructions” by the 911 call taker is guided by a series of questions that identify the nature of the complaint and the subsequent direction provided to the caller while they await the arrival of the first responders. These standards also identify a recommended level of proficiency that should be achieved. A quality assurance process that reviews a cross-section of calls is also a recommended as part of this process. On the basis of this review, remediation and training objectives are developed. The oversight of this process is typically under the purview of the EMS medical director. Though the communications manager oversees all dispatch operations, medical control is utilized in guiding pre-arrival instructions. In addition, continuing education and quality assurance review are typically under the purview of the medical director. Pridemark’s medical director has informally assisted in this process but there are no formal guidelines established contractually for this service.

Recommendation 44: The city should include in the development of its ambulance RFP a requirement that the ambulance medical director provide oversight regarding medical guidelines in the dispatch center and for both police and fire first responders.

Common medical protocols, in-service training, and quality assurance functions are common elements in a quality EMS delivery system. It is beneficial from a service delivery perspective and perhaps more importantly, a liability standpoint, that the entire delivery system has medical oversight from the time the patient enters the system (by calling 911) to the time the patient is delivered to the emergency department at the hospital.

The Boulder communications system operates on a VHF analog system. Fire and EMS operate on the same frequencies. A dispatcher keeps track of Pridemark’s availability, and Pridemark provides a courtesy notification for non-emergency transports. At the time of our interview, the city was adding 2 new repeated radio channels and 2 simplex channels to the system. These channels offer additional frequencies necessary to provide dedicated communication during major incidents and will enhance the ability to operate on tactical

channels for both emergency and non-emergency communications without interfering with the primary emergency radio traffic.

Pridemark Paramedic Services – Pridemark operates a minimum of three licensed ALS transport ambulances that are available 24 hours a day, 7 days a week. During peak periods of operation as many as eight units are available to handle emergency and inter-facility responses in the City of Boulder and adjacent areas of Boulder County. During special events and major incidents, additional units are added to the response fleet. Pridemark's coordinates its Boulder operations from their operations center located in 3200 block of Walnut Street.

Pridemark utilizes a system-status deployment process in handling alarm activity in the Boulder area. Units are posted in strategic locations throughout the city. Most units are deployed for 12-hour shifts and these periods of operation are staggered so that sufficient units are available during select timeframes. A system-status management deployment does not utilize fixed facilities for ambulance posting. Instead, units are staged at key locations (intersections, parking lots etc.) and await assignments through their dispatch center.

Pridemark operates its own dispatch center, which is located in Arvada, Colorado. Once the Pridemark dispatch center is notified of an incident by the Boulder 911 communications center it will assign the closest available unit to that incident. As calls occur, the remaining ambulance units may be re-deployed to other postings in order to provide the most direct routing to those areas of the city which historically generate the greatest amount of alarm activity. Pridemark ambulances are running and operational throughout their operational period. Ambulance personnel sit in their vehicles at their assigned location waiting to be dispatched to the next incident.

Each unit is staffed and equipped under State of Colorado Department of Public Health and Environment licensing guidelines with a minimum of two personnel, one of which is a Colorado National Registered paramedic and the other an EMT. Pridemark also has an EMS supervisor on duty at all times. Pridemark's EMS supervisor is also a paramedic and serves as a command officer. The supervisor is responsible for coordinating patient care and unit deployment within the City and adjacent unincorporated areas. The Pridemark Supervisor also responds to emergency incidents and provides assistance as part of the incident management system.

In 2010, Pridemark responded to approximately 6,500 emergency incidents within the city's service area. This equates to approximately 18-20 responses each day. Approximately 12-13 of these calls result in an ambulance transport. According to Pridemark, 4,750 emergency patients are transported annually. In addition, Pridemark transports approximately 2,200 inter-

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facility patients annually, approximately 6 per day. We were told that on an annual basis Pridemark responds to nearly 2,000 EMS calls in unincorporated Boulder County. The call volume in the unincorporated area of Boulder results in an additional 900 calls each year.

Pridemark is the exclusive provider of 911 emergency medical services in the neighboring cities of Arvada, Edgewater, Fairmount and Wheat Ridge. In October of 2010, Pridemark Paramedic Services merged with Rural Metro Colorado. Rural/Metro Ambulance, is a nationally recognized ambulance provider. They are the exclusive 911 ambulance provider for the City of Aurora through a partnership with the Aurora Fire Department. Rural/Metro also provides 911 backup ambulance services for the City of Littleton, Littleton Fire Protection District, and Highlands Ranch through a partnership with Littleton Fire Rescue. Pridemark is able to draw on these extensive resources during periods of heightened demand.

The current contract between Pridemark and Boulder County requires Pridemark to achieve a response time of 7-minutes or less on 90 percent of all incidents. Pridemark indicates that they achieve the 7-minute response time 95 percent of the time within city limits. Pridemark is required to provide specific reporting to Boulder County and this data has not included a breakout of these measurements for the city. In the newly developed ambulance RFP, it is recommended that a more comprehensive reporting process be included.

Recommendation 45: The future ambulance service contract for the city should require reporting requirements concerning precise performance measures for ambulance activities.

It is critical that the future ambulance agreement contain specific performance standards designed for the city of Boulder. This agreement should avoid a “Level of Effort” contract. This type of contract is measured only in terms of the resources provided and not a definitive or measured outcome. For example, a level of effort contract will specify only the number of ambulance units operational, but does not specify a performance measure regarding response time or time in which a unit comes available for response when notified. Critical measures including unit/hour utilization rates, frequency of periods when no ambulances are available, and other service measures are typically included in most contract agreements between private providers and municipalities.

Statistical data involving the numbers of calls, number and types of transports, types of incidents, the number of patient contacts, and call distribution by time of day or seasonal trends are all helpful information in managing the system and determining the appropriate deployment strategies. In addition, any new contract specifically negotiated with the city should include provisions requiring the ambulance provider to appraise the city of any complaints levied against the company, its billing and collection practices or other feedback from residents and visitors.

At a minimum the ambulance contractor should include the following in its operational monthly reports:

- Total Responses
- Total Emergency (911) Transports
- Total Inter-facility (non-emergency) Transports
- Total Responses and Transport Activity by Ambulance Unit
- Total Cancelled Calls (prior to arrival)
- Total Patient Refusals (Treatment or Transport)
- Distribution of Responses by Time of Day and Day of Week
- Distribution of incidents by location (fire station response zones)
- Description of incidents by severity of injury/illness
- Summary of patient complaints (situation found)
- Response Time Summary for All Responses
- Response Time Summary by fire station response zones
- Response Time Summary by Ambulance Unit
- Frequency of simultaneous calls for service (Citywide)
- Summary of mutual aid requests
- Summary of Call Duration (Transports and Non-Transports)
- Listing of equipment or vehicle breakdown/malfunctions
- Listing and disposition of all patient complaints

For performance standards to be taken seriously, they must be enforced. Failure to follow performance standards should lead to monetary or administrative sanctions. Sanctions should be fair, but must be significant enough to deter lack of compliance. Token monetary penalties often make the sanction for violation cheaper than meeting the standard. This situation is obviously counterproductive and should be avoided.

Recommendation 46: The city should adopt a structured list of sanctions and warnings to be negotiated into the ambulance contract.

The transport rates Pridemark charges are regulated by the Boulder County Commission. The average rate charged is estimated at \$960. Pridemark uses an unbundled fee schedule. This means in addition to a base rate charge for transport, there are additional charges for the medical procedures carried out, a charge for disposable supplies and a charge for medications. The full rate schedule for these services is presented in Table 22. On average Pridemark's rate schedule has increased 3 percent each year over the term of the agreement. Pridemark does not receive a financial stipend for its services.

Table 22: Pridemark Paramedic Services 2011 Rate Schedule

Service	Rate
Transport Charges	
ALS Emergent	\$829.77
ALS Non-Emergent	\$743.84
BLS Emergent	\$660.71
Mileage Charge	\$1.38 per mile
Treat on-scene No Transport	\$105.06
Procedure Charges	
Blood Draw	\$42.02
CPR	\$28.70
Defibrillation	\$103.33
EKG Monitoring (12-Lead)	\$43.07
Extrication	\$45.90
IV Set-up	\$57.78
Oxygen Administration	\$51.66
Disposable Charges	
Oral Airway	\$7.35
Defibrillation Supplies	\$59.88
EKG Supplies	\$22.06
<i>Intubation Supplies</i>	\$65.14
<i>Linens</i>	\$3.15
<i>Oxygen Supplies</i>	\$11.56
Medication Charges	
Ranges from	\$1.14 to \$231.13

Financial Stewardship: The financial oversight that is provided in the contractual arrangement between Pridemark and the city is non-existent. Pridemark is not required to provide any periodic reporting regarding its collections or the distribution of payments from the various paying groups (Medicare, Medicaid, private insurance, no-insurance/private payment, bad debt, etc). The city has no review or oversight on its fee schedule and there is no requirement or formalized process for requesting an increase to the fee schedule.

Shrinking municipal revenues and good government makes financial oversight of emergency services essential and *the right thing to do*. A strict system of financial oversight is essential for stewardship. At a minimum, the ambulance contractor should, on a quarterly basis, provide the city with the following information:

- Total expenses and revenues
- Total average charge per patient
- Total average patient charge for medical supplies
- Total average patient charge for medications
- Total average patient charge for disposable equipment

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- Total average patient charge for mileage
- 30, 60 and 90 day Accounts Receivable
- Distribution of payments by all payment groups (Medicare, Medicaid, Private Insurance, Direct Payment, Non-collectables/Bad Debt)
- Quarterly Collection Rate (percentage) for all ambulance billings
- Total accounts written off as bad debt after 180 days attempted collection

Emergency Management

In 2005 the city and county formed the Boulder Emergency Management Board. The Director of the Boulder Office of Emergency Management (OEM) is technically a Boulder County Sheriff's Department employee, but really works for the Board. OEM is a non-operational authority. They are neutral and command and control falls under the Sheriff's office. OEM is a planning and facilitation resource and a policy group. The agencies work together as the Multi Agency Coordination (MAC) group, and perform disaster management through the MAC group. The OEM office facilitates that group. The current Director has been in his position for a year and a half, is a former BFRD firefighter and the former fire chief of Loveland, CO, and is very knowledgeable about emergency management. He received high marks from every official we spoke with, and has made marked improvements in operations during his short tenure. OEM is very progressive and has top-notch facilities.

In addition to the County OEM operation, the city also has an OEM assistant who reports directly to and coordinates extensively with the OEM Director (see the Organization and Management chapter). Also reporting to the OEM Director are two county personnel, a deputy director, who is a sergeant in the sheriff's department and a coordinator specialist.

Relationships with all of the stakeholders are currently good, and the overriding philosophy of the organization is "we are not the city or the county we are Boulder." All stakeholders, which includes 20 plus fire department and other agencies, work well together, everybody gets involved and there is reciprocity.

The most prevalent threat for the city and county is wildfires and a major flood. Consequently, OEM planning is a significant issue for the city and county. There is a need to coordinate response resources better throughout the county. Volunteers make up a large portion of the county services and they are reluctant to implement a countywide response system such as the Mutual Aid Box Alarm System (MABAS) used in Illinois which the Directors thinks could be a good model for the county. Despite these issues which the OEM is trying to resolve to improve the overall system performance, we found the Boulder OEM to be professional, well run and well organized.

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Recommendation 47: Create a planning committee within OEM and begin discussions with all fire departments on the best way to improve response and mutual aid. A system such as MABAS might not be the most appropriate system as far as volunteers go, but the response system should be more formalized than it is at present.

VI. BFRD ENVIRONMENTAL SUSTAINABILITY ANALYSIS

Overview

The City of Boulder is a leader in promoting and implementing environmental sustainability and greenhouse gas (GHG) reduction programs. The city has embraced the triple-bottom-line concept and understands the importance of working toward environmental sustainability in a manner that simultaneously protects and promotes economic vitality and social equity. As part of the city, the BFRD understands that sustainability is an important initiative of the city and the community at large, and it has a desire to do its part to help the city achieve these sustainability goals. BFRD can play a significant role in providing community leadership and in helping the city meet its sustainability vision, as outlined in the *Boulder Valley Comprehensive Plan*. These include but are not limited to the following:

Environmental Sustainability

- Reduce GHG emissions
- Conserve Energy
- Use renewable energy
- Reduce waste
- Limit toxics into the environment

Economic Sustainability

- Limit property damage
- Ensure business security

Social Sustainability

- Ensure public safety
- Protect infrastructure

Community Leadership

- Involve neighborhoods
- Lead by example

Recommendation 48: BFRD should better understand and promote the significance of its current and potential future contribution to the *Boulder Valley Comprehensive Plan* and triple-bottom-line sustainability in the Boulder community.

BFRD Sustainability Practices

Management and Awareness – BFRD is familiar with of the City of Boulder’s commitment to sustainability, and it has a desire to do its part. However, it lacks an overall understanding of how and what it should be doing to assist the city in meeting its goals. Specifically, it is not familiar with the city’s Climate Action Plan (CAP) and its emissions reduction strategies, which include energy efficiency, renewable energy, transportation, waste and recycling, water conservation and urban forestry, and carbon sequestration. We found no evidence of clear communication, guidance, or direction regarding the CAP from the city’s sustainability staff to BFRD. For example BFRD did not seem to be aware of the city’s zero-waste goals based on our observations at the various fire stations we visited. In addition, BFRD has no internal plan or sustainability leader to communicate, promote, or drive internal sustainability activities. This lack of understanding and leadership has created a piecemeal approach to BFRD’s sustainability actions. However, some progress has been made, and BFRD has implemented a number of environmental actions that could be expanded upon. These are as follows:

Recycling – Recycling containers have been placed at each BFRD station. These containers were observed at the two visited stations. At one station, there was trashcan next to the recycling container. Based on a quick observation of its contents, it appeared the recycling efforts at this location were sporadic. It is not known how robust BFRD recycling efforts are; however, recycling efforts likely vary from station to station and shift to shift. BFRD could improve its recycling practices through awareness and contribute significantly to the city’s zero-waste goals.

Energy Efficiency – As part of the city’s energy efficiency program, several fire stations have received energy-efficiency lighting and weatherization upgrades. Also, BFRD recently participated in the city’s power-down initiative and was recognized for its energy reduction efforts. To achieve additional efficiencies, BFRD could implement the basic energy management practices outlined in the CAP. These include actions such as powering down equipment when not in use, upgrading lighting, implementing “turn it off” programs, efficiently using HVAC temperature and zone control, and purchasing efficient equipment. Our experience indicates that by implementing basic energy-management practices and increasing energy-use awareness, reductions of 10 percent or greater can be achieved.

Biodiesel and Low Sulfur Emissions – Biodiesel (B5) fuel is being used at the city’s fueling facility, and BFRD vehicles that fuel at that facility are currently operating on that fuel. BFRD is also operating three low-sulfur emissions diesel vehicles. Although biodiesel fuel does

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not dramatically reduce emissions, its use does promote the use of renewable fuels and overall may help reduce environmental/emissions impacts over conventional fuels. BFRD could consider expanding its use of these fuels where appropriate. We also understand that BFRD is considering purchasing a B20 vehicle.

Fire Prevention – Part of BFRD’s responsibility is managing the open space wildlands in and near the city. This management consists primarily of fire mitigation activities such as clearing of underbrush vegetation to help prevent the starting and spread of wildfires. This mitigation plays an important role in managing the open space and in helping prevent the spread of wildfires, which could threaten the Boulder community. Prudent management of these lands helps enhance public safety and protect infrastructure.

The Fire Training Center – This center has incorporated a number of green design elements into its site and building. These include implementing water conservation and site drainage control and building design elements such as using recycling in the building. These many green design elements at this center could be used as a model for a new BFRD station and other city building construction or remodeling as well as including designs for geothermal heating and cooling and solar water heating systems. The environmental benefits of the various green building elements could also be tracked and quantified for future assessment and demonstration of their effectiveness.

BFRD Sustainability Opportunities

There are a number of significant opportunities for BFRD to improve its sustainability practices and help the city meet its sustainability goals. These opportunities range from improving BFRD’s basic sustainability practices to implementing some innovative and market-leading practices that may be unique to BFRD operations. Research conducted as part of this assessment indicates that there are only a handful of fire departments in the United States that have implemented formal sustainability programs, although many may be taking actions that are not reported. This presents an opportunity for BFRD to develop some cutting edge practices and demonstrate sustainability leadership within the fire fighting community. The observations, suggestions, and ideas presented below are intended to provide the basis for internal discussions and future planning.

Sustainability Program Leadership – The upper management and leadership in BFRD lack understanding regarding sustainability, the city’s program, and what is expected of them. This is a major impediment to developing and implementing a sustainability program within BFRD. BFRD leadership would benefit from working more closely with the city’s sustainability staff to provide guidance and improve BFRD’s understanding of the city’s sustainability goals.

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BFRD would also benefit from clear guidance from the city regarding what it should be focusing on and what goals it should be working toward. Once this understanding and clear guidance are received, BFRD senior management should communicate the importance, convey the city's goals and direction of the sustainability program to all members of BFRD. Regardless of the sustainability actions or goals that BFRD undertakes, it is important to get the buy-in and support of the firefighters and the Union.

BFRD also has not identified an internal sustainability leader to oversee sustainability efforts within the department. In addition to this leader, BFRD would benefit from creating a BFRD green team. This team could consist of firefighters from each station who could act as each station's sustainability representative.

Recommendation 49: City sustainability staff should work with the BFRD leadership to help them better understand the City's sustainability program, goals, and expectations. BFRD leadership should increase internal sustainability awareness through frequent direct communication and/or a formal firefighter awareness training program.

Basic Green Practices – BFRD currently lacks consistency in implementing basic sustainability practices in its standard operating procedures. These practices should be considered the foundation of its sustainability efforts. Basic practices, as a minimum, should include the following:

Waste Reduction and Recycling: To support the city's zero-waste initiative, recycling bins have been placed at each fire station, and BFRD should take full advantage of this program. The department should aggressively communicate the importance, expectation, and benefits of recycling to all personnel. It may also be beneficial to track and report the recycling efforts at each station. BFRD should also consider setting a goal of becoming a zero-waste fire department. Although a waste audit was not part of this study, this is very achievable with the addition of composting food waste at each station. Compost can be collected for community-wide composting along with other city facilities or nearby residences. This compost could be used for station and/or city parks landscaping, thereby reducing the need for fertilizers. The city's grounds maintenance personnel could provide set-up help and training for a BFRD composting program. A simple waste-reduction practice could include firefighters using reusable grocery bags and eliminating the use of plastic water bottles and disposable coffee cups.

Recommendation 50: BFRD should set a goal of becoming a zero-waste department.

Commuting – Only two BFRD employees live within the city limits, which likely results in a significant amount of fuel consumption and GHG emissions. To help reduce these impacts, BFRD could consider creating greater buy in within the department for the existing GO Boulder

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program where all city staff are given (free of charge) an Eco pass (bus pass for folks commuting in/out and around Boulder). The city also offers "pool" cars and bikes, for commuting to meetings when at work. Affordable housing within the city limits may also be an option to help reduce commuting for firefighters and other city employees. It should also be noted that in 2009 the change of schedule to a 48/96 work cycle reduced employee annual commutes in half.

Energy Management Best Practices – Energy-use reduction can be achieved through implementing standard energy-management practices at all BFRD facilities. Many energy efficiency opportunities exist. BFRD should implement the basic energy management practices outlined in the CAP; these include upgrading HVAC systems and controls and light bulbs, checking buildings for proper door and window seals, setting thermostats at 68 to 70 degrees in winter and 76 to 78 degrees in the summer, discouraging the use of personal devices (such as mini-refrigerators, décor lighting, and space heaters), and turning off computer monitors, speakers, and lights when not in use. These are all easy-to-implement energy efficiency practices that would likely result in measurable energy-use reduction and cost saving.

Fuel Conservation and Biofuels – Fuel consumption likely represents a large GHG emissions source for BFRD, who responds to approximately 10,000 calls a year. Most of these calls are responded to using large vehicles such as fire trucks and emergency response vehicles. These vehicles general have high-fuel consumption and GHG emissions. It is likely that many of these calls do not require large emergency vehicles, and BFRD may have an opportunity to respond with smaller, more efficient vehicles. In addition, other fuel consumption reduction policies, such as no idling when in stand-by mode (which is contingent upon weather conditions so that the engine pump will not freeze) could be implemented.

Green Purchasing – BFRD should continue to pursue the green purchasing policy adopted by the city that encourages the use of nontoxic, post-recycled, and recyclable materials. Implementing such a program would not only help reduce BFRD's environmental footprint; it would also act to increase awareness and promote the efficient use of materials.

Firefighter Awareness – Awareness and understanding at all levels of BFRD can increase the program's success. Educating and engaging all department personnel would greatly enhance the success of the program. It is likely that many firefighters would appreciate clear guidance and communication regarding a sustainability program and would welcome the opportunity to do their part in making the program a success.

Recommendation 51: BFRD should aggressively continue to implement basic sustainability practices such as recycling, energy conservation, employee commuting reduction, fuel conservation, and employee awareness at all facilities.

Innovative Sustainability – BFRD is a unique and specialized department within the city, and there may be opportunities for some advanced and innovative sustainability actions that can be specific to BFRD. Innovative practices would help establish BFRD as a leading fire department and also help spawn new ideas and out-of-the-box thinking and solutions. Several ideas are presented below.

Renewable Energy – Fire stations are located throughout the city. They are a visible part of local neighborhoods and represent community safety and protection. This creates a unique opportunity for BFRD to incorporate renewable energy into its operations. Retrofitting fire stations with solar energy and/or solar hydro panels would help communicate department sustainability commitment and could act as 1) an effective means of reducing the stations' overall energy consumption and GHG emissions and 2) a strong example and message to residents of the city.

BFRD should also consider reducing lighting energy use by using more natural lighting in its stations. Depending on the type of structure, it is possible that solar tubes or skylights could be easily and economically installed.

Eco-friendly Fire Suppressants – BFRD could consider using eco-friendly fire suppressants such as TetraKO™ or equivalent. TetraKO™ is a water additive that transforms water into a liquid that adheres to vertical and ceiling surfaces and will not fall to the ground. Once applied and exposed to heat, TetraKO™ converts to steam for enhancing fire suppression and prevents rekindling. It can be used with existing equipment and is independently certified non-toxic and biodegradable. TetraKO™⁶ is a product that was developed as a direct response to the growing concern over the toxicity of existing foams, retardants, and super absorbent polymer-based fire suppressants.

Call Response – BFRD responds to approximately 10,000 calls per year. First responses on many calls could be handled by motorcycle and/or high-fuel efficient/low-emissions vehicle such as hybrids, natural gas, or electric. Depending on the type of requested response call, BFRD may be able to significantly reduce its fuel consumption and resulting GHG emissions by using fuel-efficient or electric vehicles in first response. In some cases, the use of smaller vehicles such as a motorcycle could help shorten response times. This practice has been successfully deployed in the United Kingdom and elsewhere. In the United Kingdom, the Merseyside Fire and Rescue Service has operated a number of fire bikes in different roles since 2005. They became the first service in the United Kingdom to deploy fire bikes specially equipped to fight fires. The bikes

⁶ TetraKO costs approximately 1\$ per gallon sprayed. It is roughly ten times more effective than foam. It would take 5000 gallons of foam at \$0.20 per gallon to be as effective as 500 gallons of TetraKO thus it is cheaper overall.

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are fitted with two 6.6-gallon canisters filled with water and foam and a high-powered 100-foot-long jet hose. They are used to combat small fires to free up main fire appliances. Using a fire bike to attend automated fire alarm calls has been found to be particularly effective to assess situations ahead of the arrival of larger equipment, due to rising traffic congestion and because many of these automated calls are false alarms. We understand that this is a radical and highly controversial approach to fire suppression and fire operations. It is proffered in this forum from a purely environmental perspective and in the spirit of future innovation and potential long term goals for the fire service. As previously stated this is new and fallow ground as far as the fire service is concerned and while truly outside of the box in terms of U.S. practices, it is practiced in other departments around the world, and provides a starting point for future discussions around environmental sustainability issues. TriData does not promote this as an immediate recommendation or fire emergency response practice for Boulder at this time.

Runoff Mitigation – Although we understand that BFRD is exempt from water quality regulations during firefighting events, reasonable effort should be made to prevent runoff from ending up in storm drains, local waterways, and/or other environmentally sensitive areas. This runoff could be contaminated with pollutants and toxics that were spilled and/or released from the fire. We understand that BFRD has worked with Partners for a Clean Environment (PACE) on spill/fire runoff mitigation measures, and the department should continue to pursue these efforts and discussions with PACE as future opportunities arise. These may include runoff containment, storm drain covers, runoff capture equipment and PACE assistance in runoff mitigation for significant fire incidents. BFRD should continue to work with Partners for a Clean Environment on developing best management practices, awareness, and implementation of these measures.

Open Lands Fire Mitigation – An important part of BFRD’s mission is to prevent the spread and damage of wildfires. Currently this is done by slash-and-burn and controlled-burn methods. These fires need to be carefully controlled and create emissions. Recent study results show the promise of using domesticated animals such as goats to help prevent and mitigate wildfires. Goats vigorously eat fire-prone undergrowth, while trampling parts of the area to bare dirt. In some situations, goats may be a more effective, economical, and safer way to mitigate wildfires. Fire goats have been successfully used in many cities and states through the Western United States, including Los Angeles, Laguna Beach, and Berkley, California, and in Utah and Nevada. Goats are economical, ecological fire-fighting machines that produce fertilizer as they clear hills and canyons of weeds and dry undergrowth. Additionally, the animals are likeable, newsworthy ambassadors for fire safety and environmental action.

Community Engagement – BFRD is a visible and respected part of the Boulder community, providing BFRD with a unique opportunity to demonstrate sustainability leadership and communicate its action and progress. BFRD can help promote sustainability actions in the neighborhoods it serves. Setting an example and engaging the residents may result in increased environmental saving beyond BFRD and could go a long way in promoting the city’s overall sustainability program. For example, BFRD could include a discussion of its sustainability commitment and practices whenever it participates in any public outreach or school events.

Recommendation 52: BFRD should further evaluate additional sustainability practices and develop an implementation program for those that provide the best environmental, community, and financial benefits.

Potential Future Actions

As with any program, the keys to successful execution are understanding, planning, leadership, communication, execution, and tracking. BFRD may benefit by following a systematic approach to advancing its sustainability program—ideally, one that is custom to the department and one that supports the city’s and community’s sustainability goals.

Develop a BFRD Sustainability Plan – Developing a sustainability plan (sustainability ladder) specific to BFRD would help provide clarity and focus to the program. This plan could 1) include the BFRD overall sustainability vision and commitment, 2) outline sustainability initiatives and goals specific to the department, 3) relate how these support the city’s overall goals, 4) map out specific actions and timelines, and 5) define responsibilities and measurement indicators and progress reporting. This plan need not be lengthy; it could simply be developed as a sustainability guideline for the BFRD. As a first step in preparing a plan, with help from the city staff, BFRD should consider completing an environmental baseline assessment to identify and quantify its major environmental impacts, cost, and opportunities. This baseline could also help measure and report future progress.

Recommendation 53: With the help of the City sustainability staff, BFRD should perform an environmental baseline assessment and develop a department sustainability plan.

Identify a BFRD Sustainability Leader – We recommend that BFRD identifies an internal sustainability leader to oversee and lead the program. This individual’s duties might include the following:

- Act a liaison between BFRD and city staff.
- Participate as a member of the city’s sustainability team.
- Serve as a conduit for sustainability program communication between BFRD leadership, the city, and firefighters.

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- Oversee the execution of the BFRD sustainability plan.
- Collect and report on feedback and ideas from firefighters for continuous sustainability improvement.
- Manage the collection and reporting of sustainability program data from BFRD facilities, including the collection of greenhouse gas emissions data.
- Act as a community spokesperson for BFRD sustainability actions.

Recommendation 54: BFRD should designate an internal sustainability program leader.

Create a BFRD Green Team – BFRD may also want to consider creating its own internal green team. The team could consist of a representative from each station and/or department. The combination of sustainability leader and an active and engaging green team could be an important factor in the overall success of the program. Each green team member’s duties might include the following:

- Act as the local station sustainability program leader.
- Oversee and manage the sustainability plan execution.
- Manage the collection of sustainability program data for their station, including the collection of waste, recycling, and greenhouse gas emissions data.
- Participate in BFRD sustainability team meeting and/or teleconferences.
- Serve as a conduit for sustainability program communication.
- Collect and report on feedback and ideas for continuous sustainability program improvement.

Recommendation 55: BFRD should develop a firefighter green team.

Engage Firefighters – Maximum results and benefits will be achieved through understanding, engagement, and action at all levels of BFRD. Firefighter understanding and buy-in is a must. Sustainability program implementation should include increasing employee environmental awareness—both at work and home. This training could range from simple lunch-and-learns to comprehensive sustainability manager and executive training. The city should take an active role in increasing the awareness of all firefighters and invest the time and resources to do so.

Recommendation 56: BFRD should increase the environmental and sustainability awareness of all personnel.

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Perform Monitoring and Reporting – Another important component of the sustainability program is tracking and reporting progress. This might include developing a BFRD sustainability scorecard that includes BFRD’s specific actions, goals, and progresses. Using the environmental baseline for the department, this scorecard could include measured reductions in energy use, fuel use, waste, recycling, and other desired sustainability performance data. This score card should be developed to directly support the initiatives and goals outlined in the *Boulder Valley Comprehensive Plan* and CAP and the city’s tracking and reporting system.

Recommendation 57: BFRD should track its sustainability actions and report the results to the city sustainability staff and City Council.

VII. SUPPORT SERVICES

Fire Prevention

As the division responsible for preventing fire loss and managing risk, BFRD Fire Prevention has a very important function. Fire Prevention services include building and fire protection system plans review, new construction inspections, code enforcement inspections of existing buildings, annual licensing inspections, public education, as well as fire and arson investigations. These services are typical of fire prevention divisions in other fire departments. Fire departments most effective in reducing losses are those that have successfully integrated prevention as a core value throughout the organization and continuously review the impact of prevention on the overall services provided by the department. There are basic approaches that can be used to insure that prevention is treated as a paramount department-wide priority. BFRD has been very successful in this in most instances, but can improve in several areas. However, overall, BFRD's Fire Prevention Division is one of the best run in the department, and implements some of the best programs in the entire area.

Staffing – BFRD Fire Prevention (BFRD FP) is managed by a Fire Marshal (FM) and the division he heads up is the authority having jurisdiction (AHJ) for the City of Boulder. Primary responsibilities include plan checks, new construction inspection, consulting with developers and builders, building permit inspections, and inspections mandated by the State of Colorado. Colorado has no State FM because it is a home rule state and BFRD FP has sole authority for enforcement in the City of Boulder. It is also responsible for coordinating the inspections conducted by fire engine companies. The current FM has been managing the division for the last seven years, has an excellent previous background in fire prevention, and does an excellent job at managing the unit.

BFRD FP staffing also includes an Assistant Fire Marshal who is a uniformed firefighter and is the rank equivalent of a captain. There is also a Fire Inspector in the unit who is a uniformed firefighter with the equivalent rank of lieutenant. Finally, there are a Fire Protection Engineer and a Public Education Specialist who have civilian status. The Public Education Specialist handles and coordinates all public education efforts for the division. All FP personnel perform inspections. The FM handles all of the more complex inspections such as sprinklers, locks and latches, complicated FP codes, etc. As alluded to earlier, fire companies assist FP with doing inspections in the city, and the FM made it quite clear that without that assistance the division would never meet its yearly commercial inspection goals. The department and the line personnel are to be commended for their efforts in this area. We have witnessed across the

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country that all of the well-run and well-employed best practices in FP bureaus in the country use fire companies to assist with inspections. Not only does it help with inspection volume, but it also is an excellent familiarization and pre-planning tool for fire companies. The FM is generally pleased with the job the fire companies do on inspections with a few exceptions.

Recommendation 58: Create a community-oriented risk management program where fire companies complete fire inspections and pre-planning activities in their response area, and then use the information from the inspection and pre-plans for battalion chiefs to develop risk management programs for each district.

The division performs about 2,000 to 2,500 inspections a year. The goal is to perform 2600 per year. For the number of inspections required per year it is our assessment that the unit is understaffed. There is also no hazmat inspector for the city and given the hazardous materials hazards/risks that exist in Boulder having this position even on a part-time basis is advisable.

Recommendation 59: The City of Boulder should consider hiring a full-time hazmat inspector for BFRD FP division.

The City of Boulder and the BFRD should consider civilianizing the BFRD FP division. This will provide some benefits. One significant benefit is it will place two additional firefighters back on the line and replace them in the FP division with trained and certified inspectors. Two, the division could be managed more efficiently from a budgetary standpoint with decreased salaries and benefits, and would not compromise the quality of the excellent services provided.⁷

Recommendation 60: The City of Boulder should consider civilianizing the Assistant Fire Marshal and Fire Inspector positions in the BFRD FP division.

Fire Prevention Programs – As stated fire companies assist with performing commercial inspections, and in 2010 the FM made a decision to discontinue having companies do re-inspections. That task came back to FP personnel and created an atmosphere whereby the fire companies began to do better inspections and relieved them of follow-up. More inspections were completed, it saved costs and time lost, and improved the fire companies' outlook on the process and created more buy-in on their part. It also made the entire inspection process from start to finish more efficient for FP personnel.

Information Technology: BFRD FP uses Firehouse software which is customized to meet their needs. From what our team could see, the system works well and is efficient, and this is in line with the generally excellent IT functions and capabilities found in both the fire data center of the department and the City of Boulder overall.

⁷ It should be noted that the city pays a slightly higher percentage of salary into the civilian PERA system than it pays as a match into the public safety defined contribution plan (12.8% vs. 11%).

Fire Prevention and Building Codes: BFRD FP works well with the Boulder Building and Codes division and the two agencies adopt and enforce codes together as a citywide package. The two agencies use the 2006 International Building Codes, the National Electrical Code, NFPA 101, the 2006 Fuel/Gas Code, etc., and the City of Boulder's Building and Fire Prevention Codes which consist of adopted international codes along with local code amendments. It should be noted here that the University of Colorado (CU) has a huge presence in the City of Boulder, and while the BFRD and BFRD FP have no statutory authority over the university they work very closely with both divisions. One result of this cooperation has been that all major building and on campus residential housing is or will be sprinklered by 2020.

Public Education: BFRD FP has an excellent Public Education program. The Public Education specialist on staff has been instrumental in developing Public Education Programs for the at-large community and CU. The CU program in particular has become a national model. The BFRD FP has been able to "infiltrate" CU and has worked in various programs and educational opportunities for both the community and the campus community. The following is a list of the impressive programs used for fire prevention education:

- Work with Greeks off campus in their sometimes huge fraternity houses and enforce fire codes and promote safety practices.
- Work with property owners and property managers to require fire drills and occupancy codes, especially in the University of Colorado area.
- Reaches out to parents of college students; for example, letters about fire safety are sent to parents whose children are moving to off-campus housing.
- On-campus Resident Assistants get a full ½ day of FP training.
- A Greek leadership program on a yearly basis takes as many as 30 student leaders out to the new fire training center for training and orientation for extinguisher training, Search and Rescue, full bunker gear donning, simulated search for victims, smoke tower training, combat challenge, fire safety and respect for firefighters. As a result student leaders are cognizant about the effects of fires on students and firefighters.

Recommendation 61: Conduct a fire training familiarization program for elected officials similar to that of the Greek Academy/Leadership program.

Fire Investigation – The Fire Marshal and his inspection staff have peace officer status with power to arrest, but rarely if ever exercise that power. Fire prevention staff also does most of the cause and origin investigations but they do not have many investigations to perform. The BFRD FP investigated 28 fires last year, and the FM expressed the view that Boulder does not have a serious arson problem. The City typically has only three of four arson related fires each

year. BFRD investigators rely on the BPD, who has well trained detectives familiar with fire investigations, for arrests and follow-up on arson investigations. Two to three detectives in BPD are well versed in arson investigation and have a loosely organized arson unit, and the two agencies have a great working relationship.

BFRD FP does not seem to get very involved in any criminal aspect of an investigation, except for cause and origin. The division has no conviction rate statistics because they feel they don't have that many fires to justify keeping such statistics. They also have a nominal juvenile firesetter program.

BFRD FP is a member of the Mutual Agency Fire Investigation Team (MAFIT) under the Boulder County Sheriff's Office which includes Boulder County, Boulder Rural FPD and Rocky Mountain Fire Authority. BFRD FP does assist MAFIT with open spaces cause and origin investigations on both city and county land. MAFIT does many more investigations than the city.

Our team did not feel that BFRD FP's approach to fire investigations is very robust at all, and if there is one area that is lacking in their department, it is in this area. One approach is to become more aggressive with regards to fire investigations internally, train and certify select battalion chiefs and select, interested officers and/or firefighters in cause and origin investigations and create an in-house cause and origin/arson task force in close cooperation with BPD.

Recommendation 62: Form a stronger in-house cause and origin/arson task force that does not rely so heavily on BPD involvement and utilizes the ability of fire prevention personnel to have peace officer status.

Training and Professional Development

The BFRD training division is located at the newly constructed Boulder Regional Fire Training Center. This state-of-the-art facility is located on a 10 acre parcel at 63rd Street and Diagonal Hwy (Hwy 119). The center opened in July 2010, and replaces the old regional training facility located on Lee Hill Rd. This new 15,800 sq. ft. facility was developed as a cooperative effort between the city and Boulder County. It houses multiple classrooms, administrative offices, an extensive interior apparatus bay area, a training tower, propane training prop, drill areas and a Class A-burn building. The training center is located in a rural area northeast of Boulder. The location is good from the standpoint of being able to conduct live training exercises away from residential areas; however, the distance that units need to travel to reach the center necessitates special considerations for coverage in the city when units are assigned to this remote location. BFRD does not routinely utilize web-based training, or video conferencing in

delivering training programs and this shortcoming will be addressed in a later section of the report.

The BFRD training division provides essential firefighter training and EMS continuing education. Presently lacking is training for officers, especially for chief officers and civilian managers. This is a common problem in many fire organizations and one that compounds its effectiveness in expanding the diversity of future leadership and in succession planning efforts.

As it exists, the BFRD training division is an excellent resource in providing most of the essential fire and EMS training. However, it is neither staffed nor budgeted to meet the professional development needs of the department and there was a noticeable gap in its emphasis on wildland fire training.

The training division has only two uniformed training staff: a division chief and a captain. To supplement its small full-time cadre, the division relies at times on instructors that are assigned from operations or brought in from outside agencies. Boulder belongs to the Front Range Fire Consortium which is a cooperative effort between eight fire service agencies in northern Colorado and Wyoming. The primary focus of the Consortium is the delivery of recruit fire training in these communities. This commitment requires one of BFRD's instructors to participate in the delivery of recruit training classes throughout the region. This further reduces the availability of the department's training staff for internal needs.

Organization and Budget – The division chief of training reports to the deputy chief of administrative services. Presently fire and rescue related training is delivered in a classroom setting, supplemented with practical exercises or drills. The training division is supported entirely by the general fund budget. In FY 2011, the division's budget has an appropriation of just under \$278,000, the majority of which is for personnel salaries and benefits. The division has expended, on average, just over \$300,000 in the past 3 fiscal years for training purposes. With such a small budget, BFRD is not able to provide much beyond the core training that is required and it is not able to provide any specialized training.

Staffing – The BFRD has a training staff of two: one division chief and a training captain. The training division does not employ any administrative support or clerical staff. Subsequently, the training chief and captain are often tasked with administrative duties including answering the telephone, copying and assembling documents. The division chief of training also spends a considerable portion of his time entering training record into the computer system, a job that should be delegated to a staff support person as well. This further compounds the ability to deliver field instruction or developing lesson plans. Likewise, the chief of prevention spends much time entering inspection records. There is an immediate need for at least a part-time person

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to share clerical duties between prevention and training. Given the isolation of the training center, prudently splitting clerical support between BFRD headquarters and the Training Center on prescribed days might be explored.

Recommendation 63: The city should pursue options for providing clerical support to the fire training division. We suggest adding one FTE administrative support person to be shared between prevention and training.

BFRD has not developed a sub-structure within its operations division in which line personnel have a formal role in guiding the training process. When this topic was discussed with the training chief, he indicated that he has utilized a number of line officers to provide input into the types of curriculums that were needed and some feedback on training delivery methods. However, this input varied considerably depending on the topic and the interests of the individuals involved.

Training is the lifeblood of a fire/EMS system. In many instances, emergency responders spend in excess of 2-hours each work day involved in training activities. For this reason it is critical that BFRD develop a training steering committee to guide the department on the focus of its training. Internal members of an organization know first-hand the needs of the organization. Through their personal observations and feedback received from co-workers, members develop a keen insight into the strengths and weaknesses of the service. When placed in a formal setting, where company officers can guide the focus of training, they develop key organizational and interpersonal skills essential for future leadership roles. In addition, the formulation of training goals from key field officers provides a certain validation as to the merit of these training efforts.

Recommendation 64: The fire department should establish a training steering committee to guide the training curriculum and to provide input on the content and delivery methods utilized.

Most fire departments have considerable latitude in developing the content of its annual training curriculum. BFRD utilizes the Colorado Division of Fire Safety guidelines as a backdrop for content hours and job performance requirements. These are valid nationally recognized guidelines. The key however to the quality of any training is its relevance to the organization and the quality of its delivery. For this reason it is critical that the department utilize its most creative and energetic personnel in steering this process. Training is a responsibility of the company officer and when line personnel are placed into key decision-making roles, it gives the up-and-coming supervisor the opportunity to influence departmental actions in a positive way. It also provides an opportunity to support an already stretched training staff by providing needed assistance and fresh ideas.

Fire Training – BFRD utilizes a multi-layered approach in the delivery of its fire training. The core delivery method is company based training (CBT), and this is an essential delivery method that is utilized in many fire service organizations. It provides a decentralized delivery process that is conducive to the logistical considerations a modern fire department must address. In a system like Boulder in which there are seven separate fire stations that operate on three separate shifts, it is extremely difficult to offer training at a common location or in a single session. In addition, as personnel move from one station to another and because of absences and alarm activity, the process of delivering training to all personnel is extremely cumbersome.

Company based training is delivered by the individual company officers in conjunction with curriculums that originate from NFPA 1001-Fire Fighter II course curriculum. Officers are responsible for ensuring that their assigned members complete the training. These are fundamental firefighting skills that cover a wide range of topics. This is a voluntary certification process and BFRD is not mandated to utilize this format or training guideline. We found however, this to be a very comprehensive training program and well suited for the BFRD system.

The curriculum is delivered in multiple sections over a multi-year progression. The training division issues a training calendar, usually in 6-month increments, that marches out the training schedule for that timeframe. Over the course of time all the recommended components of the Fire Fighter II curriculum are covered. Topics are generally presented as refresher training, designed to keep the fire fighter familiar with previously learned skills. The training division may add new topics to the CBT curriculum as deemed necessary. Additional training topics address new equipment or new procedures that have been instituted.

Most sessions are introduced through a video recording or a written narrative that provides an overview of the learning objectives. In addition, the training materials include some type of demonstration regarding the proper technique and related safety considerations. Officers are charged with overseeing this process and may add other elements to the training that reinforce the learning process. Because each officer is different in their approach, the overall quality of the training will vary from company to company.

In an effort to ensure a consistent outcome, the training division normally conducts a skills assessment for each training module. Skills assessment are based on job performance requirements (JPR'S) which are published by the Colorado Division of Fire Safety. The JPR's provide a very structured task assessment from which the student must demonstrate a learned competency. This assessment is administered by the training staff and ultimately insures a level of proficiency throughout the department. It is a very lengthy process and in general each module takes nearly 1 month to complete.

The Colorado Division of Fire Safety also publishes a number of JPR's for other job classifications. More notable are those for Driver Operator and Fire Officer. BFRD has chosen to focus on the Fire Fighter II classification during the current cycle. It previously completed the Fire Fighter I certification process. This has been a monumental and commendable effort. The department is nearly complete in achieving this comprehensive training effort. Once BFRD has fully certified all personnel to the FF-I and FF-II levels, they should begin the process of implementing the Driver Operator and Fire Officer I certification process for all engineers and lieutenants.

Recommendation 65: The fire department should move towards certifying all Engineers in the Driver Operator certification program and all Lieutenants as Fire Officer I, as established by the Colorado Division of Fire Safety.

The process of training and certifying all company officers and engineers will be another lengthy and complex process. It will require the full commitment of the department and an extensive work program for the training division. It is inherent that this process be guided by BFRD members and the Training Steering Committee that was recommended earlier. It is also recommended that the achievement of this goal be done in part through the utilization of web-based training and an extensive self-study requirement on the part of these employees.

Wildland Fire Training – There was a very noticeable and distinct separation between wildland fire training and other fire training offered through the training division. The fire training division has very little involvement in wildland fire training for BFRD personnel. The 2010/2011 training calendar had no reference for wildland training. Though all BFRD personnel have been trained in wildland firefighting tactics and have a complete ensemble of wildland protective equipment, there is no identifiable focus or training in this discipline. This was very surprising given the threat that wildfire has on the Boulder community and the history of complex and significant wild fires in the surrounding areas. There is an annual refresher program, that at the very least should be continued, but a more aggressive approach should also be pursued.

Recommendation 66: The fire department should continue the practice of providing an annual wildland firefighting refresher program for all line personnel.

Wildland firefighting tactics are markedly different from those typically utilized in structural firefighting. The guidelines for wildland firefighting training similarly have different origins from that of structural firefighting. While structural firefighting is guided by the National Fire Protection Agency (NFPA) and the International Fire Service Training Association (IFSTA), wildland firefighting training guidelines have their origins from the US Forest Service and the National Wildfire Coordination Group (NWCG).

NWCG guidelines for training and qualifications are mandated when wildland firefighting is conducted on federal lands. Local jurisdictions are not required to adhere to these standards when operating in their own jurisdiction or in other jurisdictions that are outside federal lands. NWCG guidelines are extensive and require a composite of both formal course work and field apprenticeship prior to achieving the recognized qualifications. NWCG breaks out its curriculum into three levels, Entry, Mid-Level and Advanced level training. The training is structured so that an individual must progress from the lower levels in order to achieve advance level status. Each qualification requires the completion of a task book which tracks specified performance based achievements for each position. In addition, wildland qualifications require an annual fitness component, commonly referred to as a “Red Card” qualification. The US Forest Service has utilized this process for nearly 75 years and it provides a universal system that assigns people from throughout the nation to incidents based on their qualifications. Table 23 is a listing of the NWCG suppression courses that are core requirements for position qualifications.

Table 23: NWCG Suppression Courses

Course No.	Description
Entry Level	
S-110	Basic Wildland Fire Orientation
S-130	Firefighter Training
S-130	Firefighter Training (Spanish Version)
S-130	Firefighter Training (Online Version)
S-130	Firefighter Training (Self-Paced CD Version)
S-131	Firefighter Type 1
S-133	Look Up, Look Down, Look Around
S-134	LCES
S-190	Introduction to Wildland Fire Behavior
S-190	Introduction to Wildland Fire Behavior (Spanish Version)
S-190	Introduction to Wildland Fire Behavior (Online Version)
S-190	Intro to Wildland Fire Behavior (Self-Paced CD Version)
S-200	Initial Attack Incident Commander
S-203	Introduction to Incident Information
S-211	Portable Pumps and Water Use
S-212	Wildland Fire Chain Saws
S-215	Fire Operations in the Wildland/Urban Interface
S-230	Crew Boss (Single Resource)
S-231	Engine Boss (Single Resource)
S-232	Dozer Boss (Single Resource)
S-233	Tractor/Plow Boss (Single Resource)
S-234	Ignition Operations

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Course No.	Description
S-244	Field Observer
S-245	Display Processor
S-245	Display Processor
S-248	Status/Check-in Recorder
S-258	Incident Communications Technician
S-260	Interagency Incident Business Management
S-261	Applied Interagency Incident Business Management
S-270	Basic Air Operations
S-271	Helicopter Crewmember
S-273	Single Engine Air Tanker Manager
S-290	Intermediate Wildland Fire Behavior
Mid-Level	
S-300	Extended Attack Incident Commander
S-330	Task Force/Strike Team Leader
S-336	Tactical Decision Making in Wildland Fire
S-339	Division/Group Supervisor
S-340	Human Resource Specialist
S-341	GIS Specialist for Incident Management
S-346	Situation Unit Leader
S-349	Resources Unit Leader/Demobilization Unit Leader
S-354	Facilities Unit Leader
S-355	Ground Support Unit Leader
S-356	Supply Unit Leader
S-357	Food Unit Leader
S-358	Communications Unit Leader
S-359	Medical Unit Leader
S-360	Finance/Administration Unit Leader
S-371	Helibase Manager
S-372	Helicopter Management
S-375	Air Support Group Supervisor
S-378	Air Tactical Group Supervisor
S-390	Introduction to Wildland Fire Behavior Calculations
Advanced Level	
S-400	Incident Commander
S-403	Information Officer
S-404	Safety Officer
S-420	Command and General Staff
S-430	Operations Section Chief
S-440	Planning Section Chief
S-445	Incident Training Specialist
S-450	Logistics Section Chief
S-460	Finance/Administration Section Chief

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Course No.	Description
S-470	Air Operations Branch Director
S-481	Incident Business Advisor
S-482	Advanced Fire Management Applications
S-490	Advanced Fire Behavior Calculations
S-491	Intermediate National Fire Danger Rating System
S-495	Geospatial Fire Analysis, Interpretation, and Application
S-520	Advanced Incident Management
S-590	Advanced Fire Behavior Interpretation
S-620	Area Command

Wildland Team Training: BFRD maintains a group of 15 personnel who have been designated as the wildland team. These personnel hold various qualifications under the NWCG guidelines that allow them to participate on wildland team assignments. Wildland teams are utilized by State and National Forests to recruit qualified personnel to respond to wild fires across the nation. When personnel are assigned to these incidents they receive additional pay based on their qualifications. The employing agency that provides these personnel serve as the pass through and are reimbursed for payments that are made to team members and any back-fill of personnel necessary to cover these absences. Personnel assigned to these incidents are typically deployed for up 14 days. Team members are re-assigned on a rotation as needs arise.

Though individual participation in the wildland team is voluntary, the department assists team members by offering training opportunities and providing specialized tools, vehicles and equipment utilized when resources are deployed outside the Boulder area. In addition, the city enters into pre-arranged agreements with the state and federal agencies in order to establish the terms of this relationship. These agreements include the rate of pay for team members, equipment and vehicle rental charges, and travel and per diem rates when members are deployed. All team members and vehicles assigned to federal assignments must meet rigid federal standards. Boulder personnel and vehicles go through an extensive review at check-in at the assignment and if the credentials are out of order or the equipment does not meet standards, the team members may be turned away.

The use of BFRD personnel for wildland team assignments is a viable and effective process that benefits the city, its employees, and outside agencies. City personnel receive additional wages for these assignments that are paid from outside sources. In addition, personnel who fill in for those team members deployed also receive overtime wages that are fully reimbursed to the city. All vehicle rental charges are paid directly to the city. In total, the city on varying years can receive hundreds of thousands of dollars through the wildfire team assignments. The majority of these monies are direct reimbursements for personnel expenses and

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equipment costs. Team members are also well trained in wildland firefighting tactics and these skills are useful in the training and deployment of resources within city limits and in surrounding open-space areas.

Recommendation 67: The city should continue its use of wildland team members for out of area assignments and consider an expansion of the number of personnel who hold NWCG credentials.

Boulder is a wildland interface area that is vulnerable to wildfire. It is essential that all BFRD personnel are fully versed in wildland firefighting tactics. As recommended above, the training division should expand its wildland fire training efforts on an annual basis. It may also be prudent to expand wildland coursework and NWCG position qualifications as part of BFRD's promotional processes.

The collective bargaining agreement between the city and IAFF Local 900 clearly states that "Promotional Procedures is not negotiable but subject to change or modification through the seek and consider process of Article XIV-Management's Rights and Responsibilities." It is recommended that the city utilize this "seek and consider" process to explore the types of training and position qualifications that should be considered for Engineer and Lieutenant/Captain promotions. It is also recommended that additional wildland position qualifications be incorporated into the promotional process for battalion chief.

Recommendation 68: The city should utilize the "seek and consider" provision of the current collective bargaining agreement to expand the promotional requirements for Engineer, Lieutenant, and Captain positions. Battalion chief promotional requirements should also be modified to include wildland fire position qualifications as pre-requisites for promotion. This is a long term goal that will have to be phased in over a number of years. The requirements are rigorous and take a number of years to attain, but for future and enhanced BFRD and Wildland Division system integration it is essential for the long term sustainability of the department.

The promotional testing process is an extremely effective method in developing skills and learned competencies amongst employees. The initiative to study and to compete in the promotional process is unmatched in effectiveness in training personnel. The current reading lists for Lieutenant/Captain include course work in S-200 (Initial Attack-Incident Commander) and S-215 (Fire Operations in WUI). Engineers are also encouraged to know and understand S-215 as a precursor for promotion. We believe that this is an excellent start; however, other training requirements should be added, including making the above important training modules pre-requisites. The following wildland training and position qualification are provided as examples that may be considered.

Table 24: Wildland Training Position Qualifications

Engineer	Lieutenant/Captain	Battalion Chief
Advanced FFT-I	Engine Boss	IC-Type 3
Squad Boss	I-300	Task Force Leader
S-131	S-300	Strike Team Leader
S-190	S-330	I-400
S-211		S-336

Interaction with Wildland Division: The wildland division of BFRD has been charged with the fuel management efforts within city limits. In addition to these mitigation and stewardship efforts, the wildland division is also a major contributor in wildland suppression efforts both within city limits and in adjacent unincorporated areas of Boulder County. The Boulder corporate structure has established a unique open space buffer in areas surrounding city limits. Through a series of land acquisitions, made possible by a funding source authorized by Boulder residents, the city has purchased and now manages more than 50,000 acres of open space. The City of Boulder Open Space and Mountain Parks (OSMP) has oversight on these properties and works in strong collaboration with BFRD’s wildland division in providing fuel management activities in these areas.

Task book completion is accomplished in two possible ways. The primary is during actual incidents when the employee is in a “Trainee” status and the other is during prescribed burns or fuel mitigation efforts. Because the wildland division works throughout the year on prescribed burns, this becomes a viable way for employees to complete task book assignments. In addition, wildland division employees have extensive skills and instructor credentials that can be utilized in the delivery of the associated NWCG course instruction.

Recommendation 69: Expand the utilization the wildland division personnel in the training and oversight of BFRD line personnel in NWCG course work and credentialing.

As stated above there was a notable disconnect in the BFRD training efforts as they relate to wildland fire training. We believe that the wildland division is well suited to expand its responsibilities in wildland training efforts for BFRD line personnel. We also believe the Regional Fire Training Center is an ideal facility to greatly expand the offering of NWCG coursework for the Front Range communities and rural fire districts. BFRD should pursue an option to expand the mission of the Front Range Fire Consortium to include a full range of NWCG course offerings for the region.

Recommendation 70: BFRD should explore the expansion of wildland fire training opportunities for the Front Range communities and urban and rural fire districts inside and outside of the state through the expanded scope of training activities offered through its wildland division and the Front Range Fire Consortium.

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Wildland fire training is an essential responsibility of the training division. There are opportunities to expand the capabilities of the fire department in its wildland firefighting skills and at the same time improve the cohesiveness and cooperation between the wildland division, training and line personnel. There are also opportunities to offset some of the costs associated with providing this coursework by charging fees for outside agencies and through the acquisition of grant funding.

EMS Training – EMS training is regulated in the State of Colorado by the Department of Public Health and Environment. The State’s Emergency Medical Services Division, which is a part of Public Health, has been charged with the oversight of rules pertaining to EMS. As with fire training, the BFRD training division is responsible for the delivery of the EMS continuing education curriculum. EMS training is calendared on an annual basis and the delivery format is consistent with fire training. It is delivered as company based training (CBT) and broken into monthly training modules that are introduced by a training video and followed with a practical skills review.

EMT-Basic certifications are valid for a three-year period. BFRD utilizes a State EMS Division sanctioned continuing education program for re-certifying its employees. The state specifies that a minimum of 36-hours of re-certification instruction be completed within the 3-year period. The department’s latitude in modifying the content of its EMS continuing education curriculum is much more restrictive. The categories of course content prescribed by state is as follows.

- 1 hour – Preparatory content including, scene safety, quality improvement, health and safety of the EMT or medical legal concepts
- 3 hours – OB and pediatric assessment and treatment
- 6 hours – Trauma patient assessment and treatment
- 5 hours – Patient assessments
- 3 hours – Assessment and management
- 6 hours – Medical/behavioral emergency patient assessment and management
- 12 hours – Elective content that is relevant to the practice of emergency medicine

BFRD has required all new fire fighters to be trained and certified as EMT’s since the early 1990’s. EMS training provides a significant workload for the training division and because of the rigid oversight and formal certification requirements, this training requires considerable focus. The BFRD system appears very adept and effective in fulfilling this mission.

Recruit Training – BFRD is a participant and charter member of the Front Range Fire Consortium. This institution is a progressive initiative by eight municipalities in the northern Colorado and Wyoming that have entered into a cooperative agreement to provide recruit fire training. The Recruit Fire Academy has been operational since 1998. This academy provides entry-level training for new career fire fighters. The standard curriculum is 14 weeks long and that follows the National Fire Protection Association (NFPA) Standard 1001 (Standard for Fire Fighter Professional Qualifications). This training includes Firefighter I and II, Hazardous Materials Awareness and Operations and NWCG Basic Wildland Firefighter (Red Card) certification. This academy is offered twice a year, depending on the hiring needs of the member departments. The academy staff is comprised of member department training personnel.

The fire academy curriculum includes classes and learning activities in the following subjects:

Fire Safety	Wellness
Public Education	Personnel Protective Equipment
Ropes and Knots	Building Construction
Fire Alarms and Protection Systems	Communications
Incident Management System	Fire Behavior
Loss Control / Evidence Protection	Fire Extinguishers
Water Supply	Hoses
Ladders	Fire Streams
Fire control	Ventilation
Search and Rescue	Forcible entry
High/Low Angle Rescue	Confined Space Rescue
Trench Rescue	Vehicle Extrication
Car Fires	Child Passenger Safety

The Fire Academy delivers a rigorous program designed to prepare entry-level firefighters for assignment to an engine company. An EMT-Basic certification is a pre-requisite for admission into the academy. The instructional focus of the Academy is hands-on experience. Approximately 80 percent of their time is spent on the drill ground and 20 percent in the classroom. Upon graduation, the recruits have the basic skills, knowledge, and abilities that enable them to be assigned in their member agency. All recruits must maintain a score of 80 percent or better on all written exams. They must continually demonstrate proficiency in all practical skills and the ability to follow orders. They must demonstrate the ability to work collectively with other recruits as a team member and maintain a positive attitude.

The training consortium appears very effective in its training of recruit fire fighters. The curriculum is comprehensive and the learning environment is consistent with career development at this initial stage of the training process. We received feedback that the time commitment training personnel commit to the recruit training academy is excessive and takes valuable time away from in-service training for BFRD employees. Because of the cut-back in new recruit hiring and the potential for further reductions in the future, it is recommended that BFRD minimize its commitment of training personnel in the delivery of recruit training.

Recommendation 71: BFRD should pursue a reduction in its participation in the delivery of fire academy instruction by its training division personnel.

The class size of the most recent recruit academy has been reduced. The true economy of scale in this process is the graduation of recruit classes that have class sizes that are in excess of 12 students. The consortium should re-evaluate its class offerings to ensure that class size is sufficient to justify the commitment of time and resources for this training. BFRD should also evaluate the level of its participation as related to the other eight members. It may be advisable to reduce class offerings to only once each year.

Training Facilities – The BFRD training division facility is first-rate. While the number of staff is limited, the production and efficiency of training operations is excellent. Few fire departments can match the quality of the training facility that BFRD has at its disposal. We saw tremendous potential for this facility to expand its capabilities through the expanded use of partnership and technology based training. Several areas of potential expansion include:

- Intra-departmental TV; a capability that allows live video conferencing and taped broadcasts to be transmitted on a closed-circuit network from the training division repeatedly and upon demand.
- Subscription to the emergency services training networks that enable the distribution of programming in multiple arenas (i.e., Fire Training, EMS, Teambuilding, Officer Development, Wildland, Special Operations, and Public Education).
- Utilizing a portal intranet system to produce continuing education programs and to track continuing education hours for re-certification.
- Simulation Training; enables interactive video training scenarios in which members can be presented with changing situations that mimic real-time events. Simulations are available for driver operations, command and control, hazardous materials incident management, and components for promotional test preparations.

The physical layout of the training center is excellent. It has ample space to handle the training that is conducted now and it will serve BFRD for many more years. There is also

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adequate space to increase the training opportunities offered, specifically in the area of wildland fire training. As indicated above, we highly recommend an expansion of wildland fire training. The training center provides an excellent opportunity to co-locate the wildland division and the training division at this new facility. A relocation of the wildland division and a new alignment with the training division will provide a cost-effective approach that will foster alignment between training, wildland and line operations.

Recommendation 72: BFRD should explore the opportunity to co-locate the wildland division at the new regional fire training center, or a new building on-site. Since the fire training center is not a city facility, this will require negotiations with Boulder County.

There are a number of justifications to align wildland operations with the regional fire training center. Wildland activities are provided in direct cooperation with the Boulder Sheriff's Office, unincorporated Boulder County, rural fire districts and Boulder Open Space and Mountain Parks. The city has played a leadership role in fuel management efforts since the early 1990's and there is a critical need to expand and unify the training efforts in this discipline. In addition, the necessity to expand wildland preparedness efforts from a public education perspective is critical throughout the Boulder area and surrounding Boulder County. Finally, the current station utilized for the seasonal crew known as "the Cache" is in abysmal condition and needs to be closed down if not razed. There are two possible ways to achieve this goal. One is to negotiate with Boulder County to provide existing office space to the Wildland Division, the second is to build a new building on site.

Health, Fitness, and Wellness Programs

The success of fire service wellness programs depends on accessibility, participation, funding. There must also be a reasonable return on investment. To be a successful program, each component should be periodically assessed. Based on the assessments, changes can be made to the individual programs to improve the city's return on investment.

The City of Boulder is pro-active in its support of employee wellness and has adopted a comprehensive employee wellness program called "Wellness Works." This program has achieved recognition by the American Heart Association as a Platinum Level-Fit-Friendly program. The program is free to employees, offers an on-line health management plan, includes health screenings, establishes an individual health report and action plan, and offers a 24-hour nurse call-in line. In addition, members are eligible to receive monetary rewards for their participation.

Unfortunately, BFRD has not taken a progressive approach in recognizing the importance in investing in firefighter health and wellness programs. Fire fighters regularly participate in

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fitness activities on a voluntary basis but the department has not instituted a mandatory fitness program for its employees. Physicals are not provided on any regular basis, and BFRD is out of compliance with National Institute for Occupational Safety and Health (NIOSH) requirements/guidelines.

Recommendation 73: BFRD should take an aggressive approach in implementing a mandatory wellness and fitness program for all emergency response personnel. One aspect of the program would be to require medical physicals to be in compliance with NIOSH.

Typically we would recommend a joint labor management approach in developing a comprehensive fitness and wellness program. This is generally an area where mutual interests and benefits can be achieved between labor and management. There seems to be a general interest from many BFRD members to actively participate in an organized wellness effort. In fact many employees were engaged in fitness activities during our station visits. We did, however, sense a marked resistance from the union leadership in instituting a mandatory program. This is not uncommon and we frequently hear complaints that mandatory fitness programs will be punitive rather than remedial. We also frequently hear that the station facilities are either ill equipped or ill-suited for safe workouts.

The implementation of a comprehensive wellness and fitness program requires leadership and perseverance. We feel that this program offers an opportunity to utilize the future leadership of the organization to orchestrate a comprehensive program in light of and in spite of the limited and shortsighted opposition. Indeed, the IAFF is in full support of Health and Wellness programs for the long term health of its membership through its Wellness Fitness Initiative, as its mission statement demonstrates:

“An overall wellness/fitness system must be developed to maintain fire fighters’ physical and mental capabilities and should be the objective of every fire department in cooperation with its local IAFF affiliate. While such a program may be mandatory, agreement to initiate it must be mutual between the administration and its members represented by the local union. Any program of physical fitness must be positive and not punitive in design; require mandatory participation by all uniformed personnel in the department once implemented; allow for age, gender and position in the department; allow for on-duty-time participation utilizing facilities provided or arranged by the department; provide for rehabilitation and remedial support for those in need; contain training and education components, and be reasonable and equitable to all participants.”

It therefore behooves management to engage the union leadership initially with the clear message that a fitness program will be established and that the union has the opportunity to participate in its design and implementation. However if their efforts are unproductive and they

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choose to delay or obfuscate the process, management should institute the program with or without their input.

The key is to design a comprehensive program that follows the tenants of the NFPA 1582 and 1583 guidelines (Standard on Health-Related Fitness Programs for Fire Fighters) and the Joint IAFC/IAFF Wellness-Fitness initiative. In addition, the fire chief should lead this effort and indicate that the process is all inclusive (mandatory for all response personnel). Other considerations can include:

- A multi-year phased implementation
- Commitment to equipment and facility improvements
- Close alignment with city's wellness program
- Incorporation of a qualified physician in this area
- Utilization of a professional exercise physiologist to guide prescriptive efforts
- Strict adherence to patient/employee confidentiality
- Mandatory participation
- Remedial not punitive
- Guided by annual assessments and evaluations

Medical and Fitness Assessments – A core component of a viable fitness program is its close alignment with a clinical medical and fitness assessment. All employees who are subject to emergency response should be required to undergo a mandatory NFPA 1582-compliant comprehensive medical assessment each year. These exams are designed to catch medical anomalies before they have the opportunity to present themselves in a situation that may compound the wellbeing of the individual or co-worker.

The comprehensive medical and fitness evaluation should consist of a medical history exam, and tests for muscular endurance (push-up and curl-up tests), flexibility (sit-and-reach test), body composition (Jackson and Pollack 7-site skinfold). It also should include a biannual treadmill test (15-lead Bruce Protocol). These components are utilized in establishing an overall fitness rating. Adjustments can be made in establishing local standards that take into consideration the impacts of altitude and the composition of body fat as it relates to larger more muscular physiology.

Wellness – The city's Wellness Works offers a very viable program that can be adapted with minimal adjustment to have application with fire fighter wellness. Because this program is offered at no additional costs to employees, it provides an established program for BFRD employees. The core components of the program include:

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- Onsite health screening
- Comprehensive Lab Work
- Individual health report & action plan
- Online Health Assessments
- 24-hour nurse call line
- Online medical records
- Online health questionnaire
- Personalized healthy lifestyle coaching and Counseling sessions
- Self-tracking of health maintenance and measures
- Health Pregnancy Program
- Monthly wellness newsletter and Educational modules
- Health and Wellness Education Programs
- Mental Health Programs

Collectively, these programs allow employees to gauge their health status from which they can select health improvement tools. It also offers numerous discounts on wellness products and services, tracks health progress, and it provides numerous interactive resources for health and wellness education.

A part from their individual participation, Chief Officers and supervisors should only be involved in the oversight of a mandatory fitness program in order to insure that subordinates are actively participating. This can be accomplished through periodic audits that are generated by the individual in tracking their activities. Progressive discipline should be administered only in cases where logs are not properly completed. How an employee is progressing in their achievements or their level of fitness should not be evaluated as a component of performance. All efforts must be made to insure that the confidentiality of an individual's fitness status or health implications are fully preserved.

Fleet Maintenance

Apparatus maintenance is an integral part of any fire department and budget wise it is invariably a large ticket item—it takes a big chunk of the budget to maintain a fleet. As fleets age, it is logical and sound planning to conclude that repairs and costs will increase exponentially. There are two proven ways to mitigate the long term and short term costs associated with repairs and replacements. The primary way is to have a sound, dedicated Preventative Maintenance (PM) program that is on a regular cycle for each and every vehicle in a department's respective fleet. This strategy not only saves money, but saves lives by keeping the number of viable fleet apparatus ready to respond to emergencies. The other method is to have a realistic Capital Improvement Plan (CIP) replacement plan for new apparatus when the old has

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outlived its usefulness. NFPA 1911 Appendix D, which sets standards for Guidelines for First-Line and Reserve Fire Apparatus, has changed and adapted over the years to reflect the changes in industry standards. It states:

“The length of that life depends on many factors, including vehicle maintenance, engine hours, quality of the preventive maintenance program, quality of driver training program, whether the fire apparatus was used within the design parameters ...there are fire apparatus with 8 to 10 years of service that are simply worn out. There are also fire apparatus ...that have excellent maintenance, and that have responded to a minimum number of incidents that are still in serviceable condition after 20 years. ...the care of fire apparatus while being used and the quality and timeliness of maintenance are perhaps the most significant factors in determining how well a fire apparatus ages.”⁸

Having set the stage with the benchmark/standard established by NFPA 1911, BFRD has an acceptable PM program that seems to work for the department both financially and logistically.

Apparatus maintenance in the City of Boulder is managed by Facilities and Asset Management (FAM) and is run very much like a business. \$850,000 per year goes into the fire department’s budget and immediately goes back out and is transferred to a specially designated fund line in BFRD’s apparatus replacement fund. Every year in the operations budget, city departments contribute at a 3 percent rate to replace fleet as part of their respective CIP. Until recently all departments did this except the BFRD.

Currently, BFRD’s replacement cycle, money comes out of de-Bruced⁹ dollars. The previous policy used to fund BFRD apparatus replacement was not financially sound. It took money from other departments in the city to fund apparatus purchases for the replacement of fire apparatus. The fund was always in the hole, which caught up with the department debt-wise with a vengeance in terms of monies owed back to the city fund. The system was changed in 2009.

⁸ NFPA 1911 – Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus; Appendix D.

⁹ The Taxpayers Bill of Rights (better known as TABOR), was adopted statewide in 1992. It was largely characterized as “no increase in taxes without a vote.” Such a concept was and is very popular. Unfortunately, there was more to this amendment. TABOR sets a cap on the amount of revenue a municipality can receive regardless of its tax rate structure. This means that if the sales tax and property tax rates stay absolutely constant from one year to the next, but the businesses that generate sales tax and the value of property grows faster than the Consumer Price Index (CPI) plus population growth, that additional revenue must be returned (to whom is another matter that was not specified in the amendment and will not be discussed here). Municipalities may keep this revenue above the cap, but only through a vote of the residents. One strategy employed by many Colorado municipalities is to vote to lift the revenue cap. The process is known as “de-Bruicing” after Douglas Bruce, an author of TABOR. (Taken from City of Boulder Blue Ribbon Commission.)

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With the current system the BFRD owes FAM \$1.6M with \$365K per year payments allocated to FAM from their budget. BFRD can pay back FAM by 2014. The system has greatly improved with the approval of de-Bruced monies. The payoff expected by 2014 will be short-lived because the department plans to buy a new ladder (quint) within the next 5 years. There is a current city policy against leasing fire apparatus so that is not an option. The following chart shows the entirety of the BFRD fleet:

Table 25: BFRD Apparatus

Apparatus Number	Vehicle Description	Year
12109	Trailer 22' Tandem Axle	
12115	Trailer 8' Single Axle	
3093	Chevrolet K-30	1982
2501	Pierce Dash Pumper	2002
2502	Pierce Arrow XT	2010
2503	Pierce Dash 55' Skyboom	2004
2504	Pierce Puc Velocity	2008
2505	Pierce Pumper	2007
2506	Pierce Arrow 75' Quint	2005
2507	HME Pumper	2000
2513	Pierce Dash Pumper	1995
2514	Pierce Dash Pumper	1995
2515	Saulsbury/Spartan Pumper	1997
2516	Pierce Dash 100' Aerial Platform	2001
2521	Chevrolet Dive Van	1996
2523	Pierce Contender Rescue	2009
2531	Ford Brush Truck Station	1991
2532	Ford Brush Truck	2000
2535	Pierce Contender Wildland	2010
2542	Kaiser Tender	1973
2551	Ford F550 SD	2005
2552	GMC Pick up	1993
2559	GMC Suburban	1997
2561	Subaru Legacy	2004
2562	GMC 1500	2008
2563	Subaru Legacy	1998
2565	Ford Explorer	1994
2565	Ford Ranger	
2570	Ford F150 Station	2004
2581	Toyota Highlander	2003
2582	GMC 1500	
2583	Ford Ranger	2005
2584	GRAND CARAVAN	2005

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Apparatus Number	Vehicle Description	Year
2585	Ford Ranger	
2591	Ford F350	2004
2592	Ford F250 SD	
2593	Ford F350	2004
NONE	Haulmark Box trailer (Hazmat)	2000

BFRD considers 10 years to be the replacement cycle for its engines. With an already good preventative maintenance program and modifying response protocols such that light duty rescues (recommended in the EMS section of our report) could handle many of the medical calls, the life of engines could easily be extended to 15 years (including time in reserve status). The use of light duty rescues will also decrease the ecological impact on the environment.

BFRD's smaller support vehicle fleet appears to be in good shape and we heard very few complaints or concerns about this part of the fleet from either BFRD personnel or FAM. These smaller support vehicles are on a seven year replacement cycle. Their replacement is funded by a pay in advance system for all new vehicles. The amount paid in advance by BFRD is based on the replacement make and model of the vehicle once it is purchased, plus an added inflation factor. The vehicle being replaced is sold at auction, and the monies acquired in the sale are recycled back into the fund.

BFRD brush trucks are in need of replacement, and given the nature of the wildland fire potential in Boulder, serious consideration should be given to coming up with a short term CIP to replace the current brush truck fleet.

Recommendation 74: BFRD and the City of Boulder should reconsider its fire apparatus replacement strategy, and also consider an aggressive plan with additional money set aside to replace the current brush truck fleet.

Fleet is staffed with three heavy duty mechanics, four light duty mechanics and one light duty temp. Currently they have no dedicated fire apparatus mechanic. The shop currently has no one on staff ASE/EVT certified. Every time FAM gets someone ASE/EVT certified they are snatched up by someone else, so they are reluctant to hire anyone right now and certify them or certify an of their existing staff. The system FAM currently has in place seems to be working, and they do most of the work on the apparatus in house. They do contract out some services like transmission rebuilds and major engine rebuilds as well as pump and ladder certifications.

The Preventive Maintenance (PM) schedule is three times a year or every four months for each vehicle in the fleet. Maintenance costs are priced out per unit and BFRD backed charged for PM. Parts for all repairs come out of fleet and BFRD is charged markup on a sliding scale. Fire apparatus do not use bio-diesel (they do use B5). They change fuel grades based on seasonal

conditions and always keep in the forefront of their efforts, the City of Boulder's environmental sustainability goals.

Recommendation 75: Given the City of Boulder's heavy emphasis on environmental sustainability, all future fire apparatus purchases should be researched to meet the highest GHG standard for lowest emissions possible.

Up until 2010, all PM was contracted out, but with the new arrangement with FAM performing all the PM the system is working out much better, from both a fiscal and efficiency standpoint.

Fleet Focus is used for billing software and for tracking the PM program. It also tracks all repairs, fuel usage parts and preventive maintenance schedules. The maintenance shop is promoting uniformity of apparatus and parts and the program is working well. By and large, they are purchasing Pierces and plan to continue to follow that plan. FAM also installs, maintains and repairs all radios and lights. This is a very advantageous maintenance and fleet replacement program for BFRD, and is certainly one that we recommend should continue.

Facilities

FAM also handles all facility maintenance for BFRD. They manage 136 buildings out of 330 of city owned structures. The facilities maintenance section of FAM staffs seven FTEs who act as facility maintenance personnel, three construction managers, and three administrative personnel. The arrangement FAM has with BFRD is that they do all building PM and they do janitorial duties. FAM does landscaping, major and minor repairs, and renovations. \$3,000 or more is considered a major repair.

Based on our tour of the stations and reports from FAM, we found buildings in the system overall to be in fair condition. Station 3 is in the poorest condition of all of the stations in addition to being in the 100 year flood plain. Station 7 is in good condition with the remaining stations in good to fair condition. This assessment does not include "the Cache" which is in poor condition and needs to be replaced. Because stations are essential to public safety, they are a top priority of FAM. Station 1 has had a recent kitchen renovation, Station 6 has had recent renovations in the kitchen, as well as the HVAC system. Station 4 has had recent kitchen and bathroom renovations. PM is done as needed, and FAM has a work order system that is adhered to and is on schedule. Related to environmental sustainability, any new construction would

follow the city policy to meet, at least Leadership in Energy and Environmental Design¹⁰ (LEED) Silver standards. For example, the new Fire Training Center meets the LEED Gold standards. The city is considering changing the policy to require new construction to meet LEED Gold standards and major renovations to meet LEED Silver standards.

Emergency Communications - 911 Dispatch Center

Emergency dispatch services are provided through the Boulder Police Department. The Communications Center is supervised by a full-time communications manager and is staffed by 26 dispatchers, 4 dispatcher supervisors, a system administrator and an administrative assistant. The center provides dispatch services, including the receipt of 9-1-1 emergency calls, handles non-emergency calls for police services and radio dispatching for police, fire, OSMP, parking control and animal control. The center also provides dispatch services for Pridemark Paramedic Services, when they respond into the city for 9-1-1 medical emergencies. Fire and EMS communications services were incorporated into the Boulder Communication Center (BCC) in 2006.

On a daily basis the center operates with 5 personnel: 2 call-takers, 1 fire dispatcher, 1 police dispatcher, and 1 operator on the data channel. Minimum staffing for the dispatch center is 4 personnel. Staffing levels adjust as the need arise and additional staff are brought in during major events. The center handles approximately 20,000, emergency calls each year. Staffing levels and the distribution of duties appear very appropriate for the Boulder system. The center did not however keep records on the telephone call volume it handles.

Dispatch services are a key component in emergency service delivery. In addition to receiving the call from the complainant, they sound the initial alarm and page out the appropriate units. While in route the dispatcher provides key information regarding the nature of the incident, its location, information regarding the structure or its contents, any known hazards and instructions regarding routing or road conditions. Throughout the incident, the center is the primary link for the incident commander and responding units, serving as the point of contact for obtaining additional resources. The center also tracks all vehicle movements. This is beneficial in quantifying response times, time at scene, unit availability and other critical data sets related to the incident and the units assigned to the various events. The center also tracks non-emergency vehicle movements including inspections activities, training, maintenance, etc.

¹⁰ In short, LEED is a rating system for buildings, equivalent to a gas mileage rating for cars. Under LEED, buildings accumulate points for things such as saving energy, having accessible mass transit, and mitigating storm water runoff. Once the points are tallied, the building earns a LEED rating. The higher the tally, the more sustainable a building is. LEED is an internationally recognized green building certification system which provides third-party verification that a building or community was designed and built using strategies aimed at increasing performance, reducing waste, and improving quality of life.

Alarm Handling Time – Standards for dispatch operations are provided in NFPA 1221- Emergency Services Communications Systems. In addition to equipment redundancy and maintenance, this standard provides recommendations regarding the time required to handle 9-1-1 calls. This standard recommends that calls into the center be answered within 15 seconds, 95 percent of the time and not more than 40 seconds, 99 percent of the time. The BCC does not produce reports that quantify call handling times.

Recommendation 76: The Boulder Communications Center should develop the ability in its CAD system to track and report on call handling time for all 9-1-1 calls.

This standard also provides guidance regarding the total handling time for calls into a 9-1-1 center. After the call is answered, Section 4.1.2.3.3 recommends that the entire processing time not exceed 60 seconds, 90 percent of the time. This standard further recommends that total call handling time is less than 90 seconds for 99 percent of the calls. This time interval includes the time from when a call is first answered to the time that the call is paged out and annunciated to the appropriate responding unit. As noted above, the Boulder Communication Center does not track its call handling times for 9-1-1 calls. It is our understanding that currently the CAD system is being upgraded, and that this needed feature is not a part of the scope of the project. This is a lost opportunity and if possible should be revisited immediately.

Emergency Medical Dispatching – A key component of the emergency dispatching process is emergency medical dispatching (EMD). EMD is also referred to as per-arrival instructions. This service is intended to identify the critical nature of the complaint and to provide guidance to the caller in delivering first-aid until first responders arrive. The dispatcher runs through a series of medically-approved questions that identify the nature of the incident and gives guidance to the caller on how to administer life saving techniques. The Medical Priority Dispatching System (MPDS) is the most utilized system nationally and has been very effective in providing structure to the dispatchers in an orderly and comprehensive process to query the callers. When used effectively, MPDS can be a tool in assisting dispatch centers in altering their response assignments based on the nature of the reported information.

The Boulder Communication Center currently utilizes EMD in its dispatch operations. At the time of our visit they were unable to produce reporting regarding EMD compliance and quality assurance efforts. This is a key aspect of the 9-1-1 dispatch system and every effort should be made to enhance the center's effort in the EMD process.

Recommendation 77: The Boulder Communication Center should make a concerted effort in expanding its use and evaluating the effectiveness of the EMD process.

Radio Frequencies and Tactical Channels – The city has made excellent efforts in expanding its radio system for public safety responders. This technology has undergone significant change in the last 15 years and the costs associated with upgrades to digital and 800-900 MHz framework is significant. The system currently uses a VHF radio frequency for fire communications. Recent efforts have moved this frequency to a narrow band format, which is required by a FCC mandate. At the time of our visit the Boulder Communication Center was moving towards the implementation of additional repeated and simplex channel that will foster improved communications when multiple incidents are being handled by fire and EMS responders.

The center appears to have an excellent working relationship with BFRD and Pridemark. They interact well in day-to-day communications and were seen to be very effective during major incidents. They participate in regular training activities and utilize fire liaison officers to follow-up on and to address problems that arise in this arena.

APPENDIX A: PROFESSIONAL DEVELOPMENT RESOURCES AND ACTIVITIES

Leadership Development, Officer Development, Self-Awareness and Intercultural Development Recommended Training Programs

Command Officer Training Curriculum (COTC) 160-hour management and leadership development program developed by the National Fire Academy and handed off to state fire-training agencies. The curriculum has 4 modules (Leadership development, human resources, emergency incident management and community risk assessment and management). The leadership and HR modules are based on the book *Leadership on the Line* by Heifetz and Linsky cited in the leadership segment of this report. The curriculum is public domain and should be available through your state fire-training director. If not, check the best practices section of this appendix for Colorado's state fire training information since they implemented the program several years ago. They could also provide information about the instructors they use for this program.

Two Week On-Campus National Fire Academy Programs

<http://www.usfa.dhs.gov/nfa/resident/2week/index.shtm>

Effective Leadership Skills for Fire and EMS Organizations is a two-week on-campus course at the National Fire Academy in the Management Science program that is available to civilian and fire service personnel. It is an excellent leadership and self-awareness program that is one of the best in the country for emergency services personnel.

Executive Development and **Executive Leadership**, while also in the EFO program are also available to non-EFO students who can take each of these two-week classes without being enrolled in the EFO program.

Executive Fire Officer Program (EFO) is a four-year program available to lieutenants and up and is highly recommended for career development programs for upper level management tracks. This program requires a minimum of a bachelor's degree to be eligible for admission.

Since all **National Fire Academy** curriculums are within the public domain, these same classes can be done by a variety of NFA instructors on a contractual basis, however, NFA certificates are not generally provided in those instances.

Two-day National Fire Academy Programs generally available through each state and there are numerous instructors who can also teach this program on-site for fire departments.
<http://www.usfa.dhs.gov/nfa/resident/swp/index.shtm>.

The following are excellent leadership and management development courses:

- Executive Skill Series: Leading Diverse Communities Beyond Conflict
- Executive Skill Series: Managing and Leading Change
- Executive Skill Series: Influencing
- Shaping the Future
- Managing in a Changing Environment

Landmark Education (www.landmarkeducation.com) is highly recommended for senior officers (Battalion Chief and up). “The Landmark Forum” is a 3-day program and is the initial foundational course that is a pre-requisite for all others. Also highly recommended is attending their “Advanced”, “Self Expression and Leadership Program” and “The Landmark Communication Curriculum”.

Understanding Intercultural Conflict Styles is a two-day program that increases participant's ability to appropriately respond to cultural differences in conflict style. In addition, participants learn the five intercultural conflict skill sets identified by Dr. Mitch Hammer that are most effective in bridging conflict style differences across cultural communities. In this program participants are given the Intercultural Conflict Style Inventory Assessment tool in order to understand their own conflict style preferences. (Dr. Hammer is also the owner of the Intercultural Development Inventory used for assessing PTFD’s intercultural development level.)

Individual and/or Group Development Activities

The following books contribute to leadership development, intercultural development and/or cultural competency:

- “Outliers” by Malcomb Gladwell
- “Leadership on the Line” by Heifetz and Linsky
- “Good to Great” by Jim Collins
- “Preparing the Next Generation: A Guide for Current and Future Local Government Managers”

http://bookstore.icma.org/Preparing_the_Next_Generation__P1050C141.cfm?UserID=949688&jsessionid=4e30168142106c733443

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Add a practical component to recruit school, officer training and/or firefighter training that includes each participant being responsible for interviewing a member of a community group to which they do not belong (e.g. homeless, seniors, teens, African-American, Latino, Native American, Asian American, etc.) and researching that group's culture. They would then be responsible for giving a 10-minute presentation in the next meeting or training session on what they learned.

Conduct self-study exercises on a team or organizational level. For instance, everyone can be assigned select readings or case studies to be reviewed as a team/organizational exercise facilitated by the supervisor. The topics can focus on technical and interpersonal issues. Fire journals provide an endless list of relevant, industry-related material. The self-study exercises can be organized under the auspicious of the training division with creative assistance from a couple of company officers willing to assume lead responsibility. We are always greatly impressed by the testimonials some participants convey regarding the quality of leadership provided by their officers or other supervisors. We are confident the talent is available to undertake such an effort in the BFRD. There are a number of benefits including cost effective education, promoting better communication amongst team members, fostering continuous learning, and assisting supervisors in developing their facilitation skills.

APPENDIX B: PLAN AND FINANCIAL PRIORITIZATION LIST

Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
II. ORGANIZATION AND MANAGEMENT			
1. *Consider adding an administrative battalion chief position. The position is needed for the long-term health of the department.	Short Term	Action Plan	Approximately \$130,260 per year for new position salary with benefits
2. Move the city's EM Assistant position to the county under the EM Director and have the county assume 100 percent responsibility for OEM. The city's Fire Chief and Police Chief are already on the Board of Directors thus the city's interests would be considered on major plans and decisions. The move would improve coordination on day-to-day operations within EM where it is crucial.	Mid Term	Action Plan	Current salary and benefits
3. *Move the shift battalion chiefs to headquarters where they can be more active in the day-to-day administration of the department. To make this change, the Wildland Division would have to be relocated, as we recommend later in this report. At the time a new fire station is constructed, space should be included to move the administrative staff to the new station, which should include adequate space for records storage too. The recommendation to move and build a new Station 3 out of the 100-year floodplain is a great opportunity to explore this further. (See Chapter IV, Recommendation 20.)	Mid Term	Action Plan	Contingent on immediacy of going through with CIP to build a new Station 3.
4. *Construct a work plan that identifies the tasks, resources, timetable, and position requirements for implementation of the recommendations in this report. For each of the recommendations contained in this report, project plans will need to be developed along with the specific tasks that would be associated with each. To coordinate all these projects, an overall work plan will be necessary.	Short Term	Fiscally Constrained Plan	** (see key at end of Appendix B)
5. *Implement a communication, leadership, and accountability system that strengthens organizational and team oversight for interpersonal, operational, and administrative performance. It will be important to implement a system that proactively defines and addresses key communication and performance issues on a regular, ongoing basis. Further, the system should be designed to enhance individual, team, operational, administrative, and interpersonal functions by supporting strong communication practices, continuous quality improvement, and, most importantly, leadership development. The system would routinely engage everyone in the department on a quarterly or trimester schedule in an assessment exercise. The	Short Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
outcome of the exercise would then be reviewed and triaged at the middle and upper levels of the department, enabling a sharp and systematic focus on issues that inhibit performance. Moreover, this systematic approach will promote effective, sustained changes in individual and organizational practices.			
6. *Create the opportunity for all managers, middle managers and current and future officers to enroll or engage in leadership development programs that include a significant self-awareness component, as well as development of general leadership skill sets. The foundation of leadership development is self-awareness. Leaders must understand how their personal and/or professional style impacts the people around them. They must have a clear understanding of their personal value system and how it aligns with organizational values before they are capable of assisting others in doing the same. Leaders must have a clear view of the difference between self and role to ensure that they do not let personal feelings or friendships interfere with needed actions.	Mid-Long Term	Action Plan	Additional potential overtime cost for time off must be calculated. \$60,000 projected cost estimated by BFRD. (All efforts should be made to negotiate concessions for mutual benefits training will provide to the department.)
7. *Top department managers and command staff should regularly conduct open forums with all personnel and employee groups, and then record and respond to concerns. Direct, personal communication in a department the size of the BFRD is an ongoing challenge. Some participants stated a strong perception that the department leadership is out of touch with its members. Other members report that information does not appear to flow up and down the chain of command as effectively as it should. A number have recommended that top leaders conduct more station and workgroup visits to discuss issues first-hand.	Short Term	Fiscally Constrained Plan	**
8. *Implement monthly company level drills, officer development sessions and maximize existing self-training opportunities. First, establish regular training schedules for company level drills where each company officer, with the assistance of their respective battalion chiefs, determines the subject matter and lesson plan. Each session should include a classroom segment and practical application exercise. Coordination of subjects between each shift's battalion chiefs is strongly encouraged. All training modules should also be coordinated with and reviewed by the training division to enhance continuity between department training goals.	Short Term	Fiscally Constrained Plan	**
9. *Establish and implement core competencies for all managers and supervisors that will enable them to effectively manage and supervise a diverse work force. Essential core skills need to be developed across the supervisory ranks. The department, with assistance from the human resources department, should be moving toward strengthening professional development for new officers. It needs to do the	Short Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
same for all supervisors. And, in recognition that one course does not accomplish or sustain behavioral change, learning needs to happen on an advanced and repetitive basis.			
10. Conduct a skills inventory for all positions starting at the top of the department. As a tie into the previous recommendation, this is an initial step in developing an upward mobility approach and related to the preceding recommendation. Conducted in a non-discriminatory manner, a skills inventory determines individual needs and the type and substance of training courses. It will begin to build a strategic focus into the direction training must take and increase individual and organizational expectations and accountability for a higher level of operational and interpersonal performance.	Short Term	Fiscally Constrained Plan	**
11. Continue the practice of conducting department-wide training on basic discrimination and sexual harassment subjects. Understanding and preventing discriminatory and harassing behavior is one of the responsibilities of supervisors. It is also an essential knowledge and skill area for all employees, which should be repeated every 2-3 years to remind and assist members with supporting healthy teamwork practices. In addition to discrimination and harassment training, a segment on the appropriate use of email should be incorporated. This area warrants proactive attention as too many organizations have had negative experiences with the inappropriate use of email.	Mid Term	Fiscally Constrained Plan	**
12. Continue to foster and develop ways to enhance a formal performance appraisal process. There is a compelling need to encourage direct one-on-one conversations about performance issues and accomplishments. A formal performance system is one way of fostering improved communication, professional development and performance behaviors. While an appraisal system may foster honest feedback, it is not a panacea as personal and organizational behaviors will have to change if such an approach is going to work. The change part is going to rest on the commitment of every person to make it happen.	Mid Term	Fiscally Constrained Plan	**
13. *Develop a community education and outreach plan in the spirit and philosophy of the city's sustainability efforts. There may be many moving parts to this recommendation. The first is who is going to do it. It could become a joint project of the operation and administrative staffs, as it will ultimately lead to coordinated education efforts that tie in both groups. We suggest that our proposed administrative battalion chief position would be a perfect fit to tie these pieces together. It will also entail doing some surveys, perhaps internal and external. In the end, the plan ought to ensure internal focus on community issues and develop a stronger relationship with community members and with the entirety of the city departments and staff.	Mid Term	Action Plan	Cost of developing and funding new Administrative BC position. (See Recommendation 1.)

Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
III. POPULATION GROWTH, RISK, AND DEMAND ANALYSIS			
14. Setup up a system by which en route data and eventually coordinates (once there is an updated CAD system in place) are placed into the NFIRS database as special fields. This will effectively allow in-house analysts and consultants to use a single database for conducting performance measurement and risk analysis. This will lead to more accurate information than having to try to cobble together several different data sources.	Mid Term	Action Plan	\$4,800. This is the approximate cost of the software needed to make the recommended changes.
15. Upgrade the CAD system so that GPS coordinates are collected for all incidents. We understand this process is currently in progress, and BFRD should continue this important initiative.	Short Term	Fiscally Constrained Plan	**
IV. STATION LOCATION AND RESPONSE TIME ANALYSES			
16. Consider expanding incident benchmarks transmitted and analyzed to include activities such as primary search complete; ventilation completed; extinguishment started (complete) and begin tracking vertical response time as part of incident data collection, especially for medical calls.	Short Term	Fiscally Constrained Plan	**
17. Revisit the analysis of turnout times and take the necessary steps to improve them where possible. Establish a performance goal for each time segment and assess them monthly. Evaluate turnout times by fire station and shift.	Short Term	Fiscally Constrained Plan	**
18. Use NFPA 1710 (and other standards) to develop performance goals, but consider each planning area on the merits of its particular situation.	Short Term	Fiscally Constrained Plan	**
19. BFRD should familiarize themselves and use the performance measurement methodologies outlined in the CPSE Standards of Cover Manual.	Short Term	Fiscally Constrained Plan	**
20. *Consider relocating Station 3 just far enough North to clear the floodplain and moving the ladder truck from Station 1 to Station 3.	Short Term	Action Plan	Approximately \$3.5M
21. In the long term for future city planning consider moving Station 5 closer to the intersection of Iris Avenue and North Broadway Street.	Long Term	Vision Plan	Approximately \$3.5M
V. ANALYSIS OF FIRE AND EMS OPERATIONS			
22. *The BFRD should institute and formalize the National IMS model into its fire operations, incorporating on-scene accountability measures.	Short Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
23. The City of Boulder and BFRD should continue using the 48/96 schedule for the immediate future, and closely monitor the use of sick leave and overtime. If the current trend discontinues in these areas then the department and the City can reevaluate the plus and minuses of the schedule and retool if necessary.	Mid Term	Fiscally Constrained Plan	**
24. Centralize the specialty team for hazmat, water and technical rescue to one station with the staff of Engine companies and Ladder companies trained in these areas. Augment the specialty team and train a few personnel on each shift in hazmat, water and technical rescue, and detail these personnel to the designated central station when vacancies must be filled.	Mid to Long Term	Action Plan	**
25. Consider providing premium pay for personnel with the required certifications in those areas.	Long Term (negotiable Item with Collective Bargaining)	Vision Plan	Typically \$3K-\$4K per person, per year \$120,000 per year total
26. BFRD should continue its plan to conduct a public information campaign regarding the upcoming deadline for replacing wood-shake or wood-shingle roofs.	Mid Term	Fiscally Constrained Plan	Minimal cost; can be facilitated through BFRD and City of Boulder public education efforts
27. The city should consider the reclassification of the Wildland Fuels Manager and Fire Management Coordinator positions in order to align their titles and pay scales with other fire response positions.	Mid Term	Action Plan	\$76,345 with increased salary and benefits
28. The city should examine options, including an increase in the fund transfer from the open space fund, in order to move to a year-round fuel crew.	Long Term	Vision Plan	\$64,462 with increased salary and benefits
29. Consider the use of the fuel management program as a recruiting process for future firefighter positions.	Long Term	Action Plan	**
30. Modify the job descriptions for all line positions in operations to include knowledge, skills and abilities in both wildland firefighting and fuel mitigation efforts.	Mid Term	Fiscally Constrained Plan	**
31. BFRD should consider in the future that a ranked battalion chief be assigned to manage the wildland section.	Long Term	Action Plan	Possible training expenses : \$20,000
32. The BFRD wildland division should be more aggressive in its pursuit of wildland mitigation grants.	Mid-Long Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
33. The wildland division should spearhead a comprehensive public awareness and preparedness program that promotes community efforts to incorporate Firewise concepts that increase a residential structure's ability to withstand wildland fire without fire service intervention.	Short-Mid Term	Fiscally Constrained Plan	**
34. The wildland division should work with private vendors in providing instruction and assistance on grant requirements for mitigation and treatment projects on private lands.	Mid Term	Vision Plan	\$75-\$85 per acre; if grant driven 50 percent is picked up by Federal govt.
35. BFRD should consider the adoption of code provisions that require vegetation mitigation and fire resistive construction practices for residential properties.	Long Term	Fiscally Constrained Plan	**
36. The city should consider the adoption of a wildland interface code for its jurisdiction.	Mid-Long Term	Fiscally Constrained Plan	**
37. *BFRD and OSMP should consider the purchase of two Type-3 engines (one per agency) to be added to their wildland response fleet.	Long Term	Vision Plan	\$250K per vehicle fully loaded with equipment
38. The city should consider the appointment of an EMS contract administrator from within the mid-management ranks of the fire department to have oversight on contract administration and compliance of the ambulance provider.	Short Term	Action Plan	We recommend that the proposed Administrative BC fill this role. (See Recommendation 1.)
39. At this time, the expansion of the fire department EMS delivery system to the Advanced Life Support level is not justified. The current working relationship with the private ambulance provider is good and response times are in line with national standards.	Short Term	Fiscally Constrained Plan	**
40. *The city should consider the use of 2-person rescue vehicles in its busiest fire stations, running in tandem with fire apparatus.	Short-Mid Term	Action Plan	Approximately \$175K per vehicle fully loaded with equipment. Staffing options would determine any additional costs.

Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
41. *BFRD should send key personnel to the National Fire Academy in order to participate in EMS management programs.	Mid Term	Action Plan	BFRD estimates \$28,000 in overtime. A better approach might be to have discussions with BCs to attend with time off and travel expenses.
42. The city should explore the option of incorporating a first responder fee as part of its new RFP for ambulance services.	Short Term	Fiscally Constrained Plan	**
43. Begin to expand the use of Medical Priority Dispatch in determining the prioritization of response between fire and ambulance units.	Short Term	Fiscally Constrained Plan	**
44. *The city should include in the development of its ambulance RFP a requirement that the ambulance medical director provide oversight regarding medical guidelines in the dispatch center and for both police and fire first responders.	Short Term	Fiscally Constrained Plan	**
45. *The future ambulance service contract for the city should require reporting requirements concerning precise performance measures for ambulance activities.	Short Term	Fiscally Constrained Plan	**
46. *The city should adopt a structured list of sanctions and warnings to be negotiated into the ambulance contract.	Short Term	Fiscally Constrained Plan	**
47. Create a planning committee within OEM and begin discussions with all fire departments on the best way to improve response and mutual aid. A system such as MABAS might not be the most appropriate system as far as volunteers go, but the response system should be more formalized than it is at present.	Mid Term	Fiscally Constrained Plan	**
VI. BFRD ENVIRONMENTAL SUSTAINABILITY ANALYSIS			
48. *BFRD should better understand and promote the significance of its current and potential future contribution to the <i>Boulder Valley Comprehensive Plan</i> and triple-bottom-line sustainability in the Boulder community.	Short Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
49. *City sustainability staff should work with the BFRD leadership to help them better understand the City's sustainability program, goals, and expectations. BFRD leadership should increase internal sustainability awareness through frequent direct communication and/or a formal firefighter awareness training program.	Short Term	Fiscally Constrained Plan	**
50. BFRD should set a goal of becoming a zero-waste department.	Short Term	Fiscally Constrained Plan	**
51. BFRD should aggressively continue to implement basic sustainability practices such as recycling, energy conservation, employee commuting reduction, fuel conservation, and employee awareness at all facilities.	Short Term	Fiscally Constrained Plan	**
52. BFRD should further evaluate additional sustainability practices and develop an implementation program for those that provide the best environmental, community, and financial benefits.	Short Term	Fiscally Constrained Plan	**
53. *With the help of the City sustainability staff, BFRD should perform an environmental baseline assessment and develop a department sustainability plan.	Short Term	Fiscally Constrained Plan	**
54. *BFRD should designate an internal sustainability program leader.	Short Term		See Recommendation 1
55. BFRD should develop a firefighter green team.	Short Term	Fiscally Constrained Plan	**
56. BFRD should increase the environmental and sustainability awareness of all personnel.	Short Term	Fiscally Constrained Plan	**
57. BFRD should track its sustainability actions and report the results to the city sustainability staff and City Council.	Short Term	Fiscally Constrained Plan	**
VII. SUPPORT SERVICES			
58. Create a community-oriented risk management program where fire companies complete fire inspections and pre-planning activities in their response area, and then use the information from the inspection and pre-plans for battalion chiefs to develop risk management programs for each district.	Mid Term	Fiscally Constrained Plan	**
59. The City of Boulder should consider hiring a full-time hazmat inspector for BFRD FP division.	Mid Term	Action Plan	\$60K per year

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
60. The City of Boulder should consider civilianizing the Assistant Fire Marshal and Fire Inspector positions in the BFRD FP division.	Long Term	Vision Plan	Salary and benefits for two new FTEs. The city will also pay a higher percentage of salary into the civilian PERA than it pays as a match into the public safety defined contribution plan (12.8% vs. 11 %).
61. Conduct a fire training familiarization program for elected officials similar to that of the Greek Academy/Leadership program.	Mid Term	Fiscally Constrained Plan	**
62. Form a stronger in-house cause and origin/arson task force that does not rely so heavily on BPD involvement and utilizes the ability of fire prevention personnel to have peace officer status.	Mid-Long Term	Fiscally Constrained Plan	**
63. *The city should pursue options for providing clerical support to the fire training division. We suggest adding one FTE administrative support person to be shared between prevention and training.	Short Term	Action Plan	Approximately \$70K per year with benefits
64. *The fire department should establish a training steering committee to guide the training curriculum and to provide input on the content and delivery methods utilized.	Short Term	Fiscally Constrained Plan	**
65. The fire department should move towards certifying all Engineers in the Driver Operator certification program and all Lieutenants as Fire Officer I, as established by the Colorado Division of Fire Safety.	Mid Term	Fiscally Constrained Plan	**
66. The fire department should continue the practice of providing an annual wildland firefighting refresher program for all line personnel.	Short Term	Fiscally Constrained Plan	**
67. The city should continue its use of wildland team members for out of area assignments and consider an expansion of the number of personnel who hold NWCG credentials.	Short Term	Fiscally Constrained Plan	**
68. The city should utilize the “seek and consider” provision of the current collective bargaining agreement to expand the promotional requirements for Engineer, Lieutenant and Captain positions. Battalion chief promotional	Long Term	Fiscally Constrained Plan	**

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
requirements should also be modified to include wildland fire position qualifications as pre-requisites for promotion. This is a long term goal that will have to be phased in over a number of years. The requirements are rigorous and take a number of years to attain, but for future and enhanced BFRD and Wildland Division system integration it is essential for the long term sustainability of the department.			
69. Expand the utilization of the wildland division personnel in the training and oversight of BFRD line personnel in NWCG course work and credentialing.	Short Term	Fiscally Constrained Plan	**
70. BFRD should explore the expansion of wildland fire training opportunities for the Front Range communities and urban and rural fire districts inside and outside of the state through the expanded scope of training activities offered through its wildland division and the Front Range Fire Consortium.	Short Term	Fiscally Constrained Plan	**
71. BFRD should pursue a reduction in its participation in the delivery of fire academy instruction by its training division personnel.	Mid Term	Fiscally Constrained Plan	**
72. BFRD should explore the opportunity to co-locate the wildland division at the new regional fire training center, or a new building on-site. Since the fire training center is not a city facility, this will require negotiations with Boulder County.	Mid Term	Fiscally Constrained Plan or Vision Plan	There are two possible ways to achieve this goal. One is to negotiate with Boulder County to provide existing office space to the Wildland Division, the second is to build a new building on site at a projected cost of \$650,000
73. * BFRD should take an aggressive approach in implementing a mandatory wellness and fitness program for all emergency response personnel. One aspect of the program would be to require medical physicals to be in compliance with NIOSH.	Short Term	Action Plan	\$62,500 per year for yearly medical physicals
74. *BFRD and the City of Boulder should reconsider its fire apparatus replacement strategy, and also consider an aggressive plan with additional money set aside to replace the current brush truck fleet.	Mid Term	Fiscally Constrained Plan	**
75. Given the City of Boulder’s heavy emphasis on environmental sustainability, all future fire apparatus purchases should be researched to meet the highest GHG standard for lowest emissions possible.	Mid Term	Vision Plan	Approximately 750K to \$1M per apparatus

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Recommendation	Plan Priorities	Financial Priorities	Approximate Cost
76. *The Communication Center should develop the ability in its CAD system to track and report on call handling time for all 9-1-1 calls.	Short Term	Fiscally Constrained Plan	**
77. The Communication Center should make a concerted effort in expanding its use and evaluating the effectiveness of the EMD process.	Short Term	Fiscally Constrained Plan	**

*All asterisked recommendations are immediate action items which require special prioritization. These identified areas are crucial to the future organizational and operational sustainability of the Boulder Fire and Rescue Department.

**Key for shaded boxes:

-  Costs are included in the current budget. If additional resources and staff time are needed to implement the recommendation, then costs will be allocated based on the department and city-wide priority based budgeting needs.
-  Costs are anticipated to be covered by budgets as appropriated at that time. If additional resources and staff time are needed to implement the recommendation, then costs would be allocated based on the department and city-wide priority based budget needs and appropriations.

APPENDIX C: EVALUATING RELOCATION SITES FOR STATION 6

We looked at whether it would make sense to move Station 6 to an area where it could provide contract service to non-Boulder areas in addition to providing fire service for the Gunbarrel community. Figure 22, Figure 23, and Figure 24 show theoretical travel times from the current Station 6 location, the Boulder County Regional Fire Training Center, and the fire barn located at Jay Road and 51st Street.

The Boulder County Regional Fire Training Center provides very little response coverage area because of long response times out of the reservoir area and is a bad location for a fire station. The fire barn and land owned by Open Space at the corner of Jay Road and 51st Street (next to the old Rural Boulder Station), could conceivably provide some coverage if the land could be acquired and a new station could be built at that location for Gunbarrel and may allow for contract service north the station. However, the location is not great.

Based on these maps, it appears that Station 6 is best located where it is now. Assuming that Boulder wants to continue to provide good fire service coverage for Gunbarrel, the station should remain at its current location.

Figure 22: Theoretical Travel Times from Current Station 6 Location

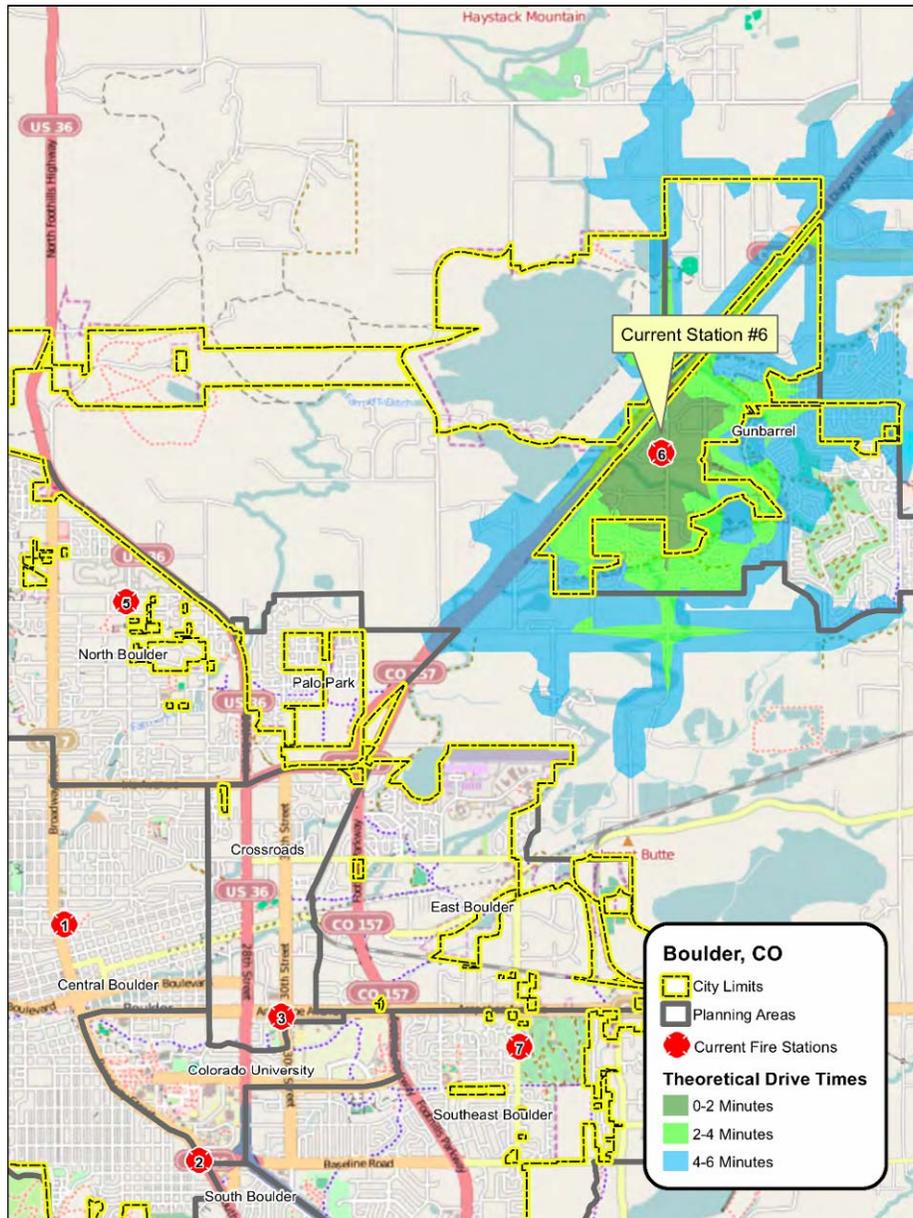


Figure 23: Theoretical Travel Times from Fire Training Center

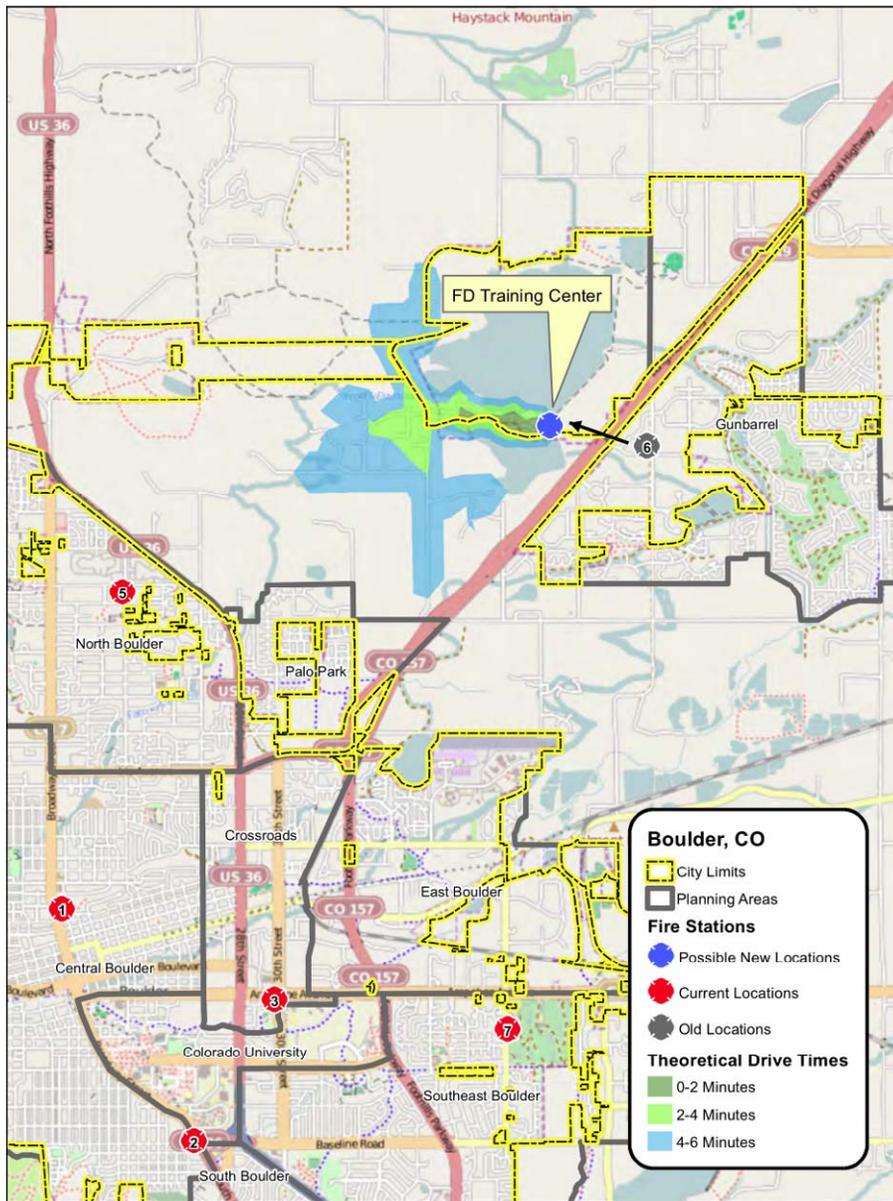
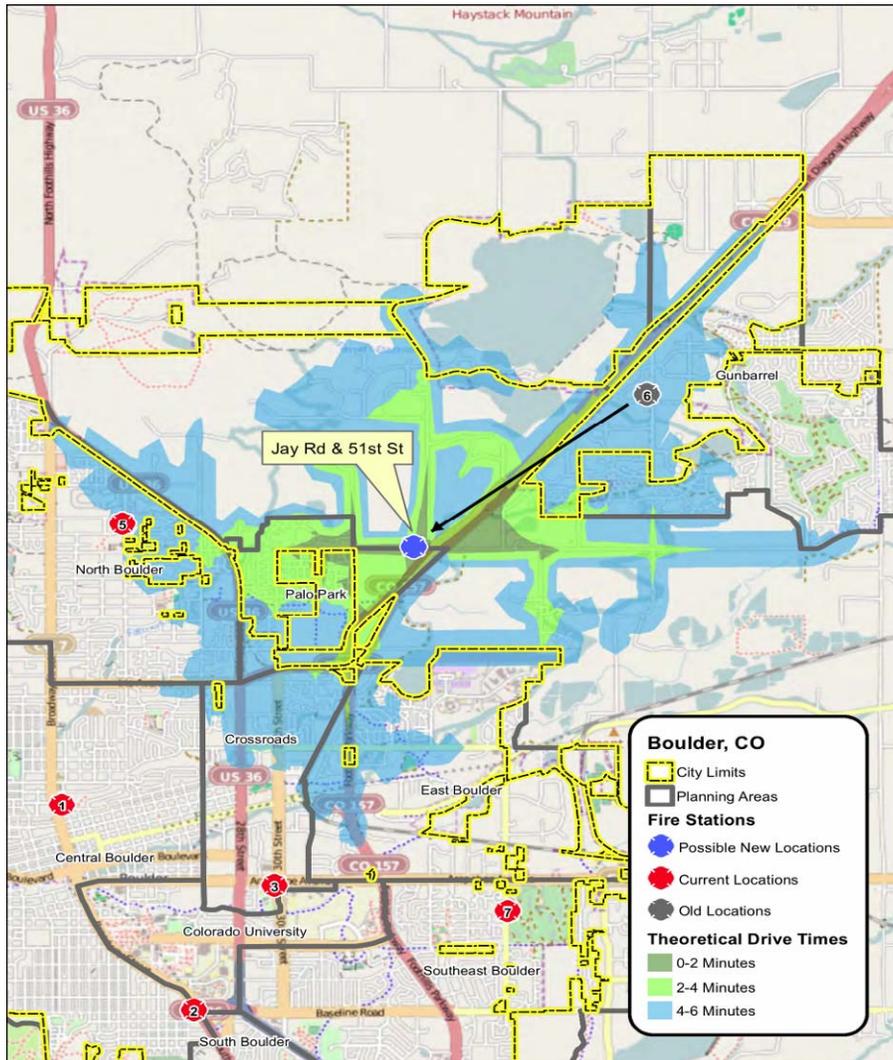


Figure 24: Theoretical Travel Times from Jay Rd & 51st St



APPENDIX D: POSSIBLE MERGER SITES FOR STATION 3 AND STATION 7

We reviewed possible locations where Station 7 and Station 3 could be merged outside of the 500-year floodplain, but could not find any ideal locations. Unfortunately all areas where these stations could be merged leave significantly larger parts of Boulder covered by six-minute rather than four-minute theoretical response time coverage. Figure 25, Figure 26, and Figure 27 show three possible locations for a merged station outside of the 500-year floodplain.

Another concern with this merger is that Stations 1, 2, and 3 have relatively high workloads and serve the high-risk, high-demand part of town. It is not clear that if Station 3 and Station 7 are merged that Station 1 and Station 2 could handle any extra workload without affecting their performance. In a financial bind, this merger would be the best way to eliminate a station and unit, but it is not a great solution. If these two stations were merged, it would likely require a peak-load rescue unit that does predominantly EMS first-response and sits somewhere between Stations 1, 2, and the current Station 3. Before merging Station 3 and Station 7, we would also recommend BFRD conduct an in-house performance vs. unit availability analysis to determine the impact of busier engines (the result of eliminating a station) on response times performance.

Figure 25: Merged Station at Arapahoe Ave & 48th St

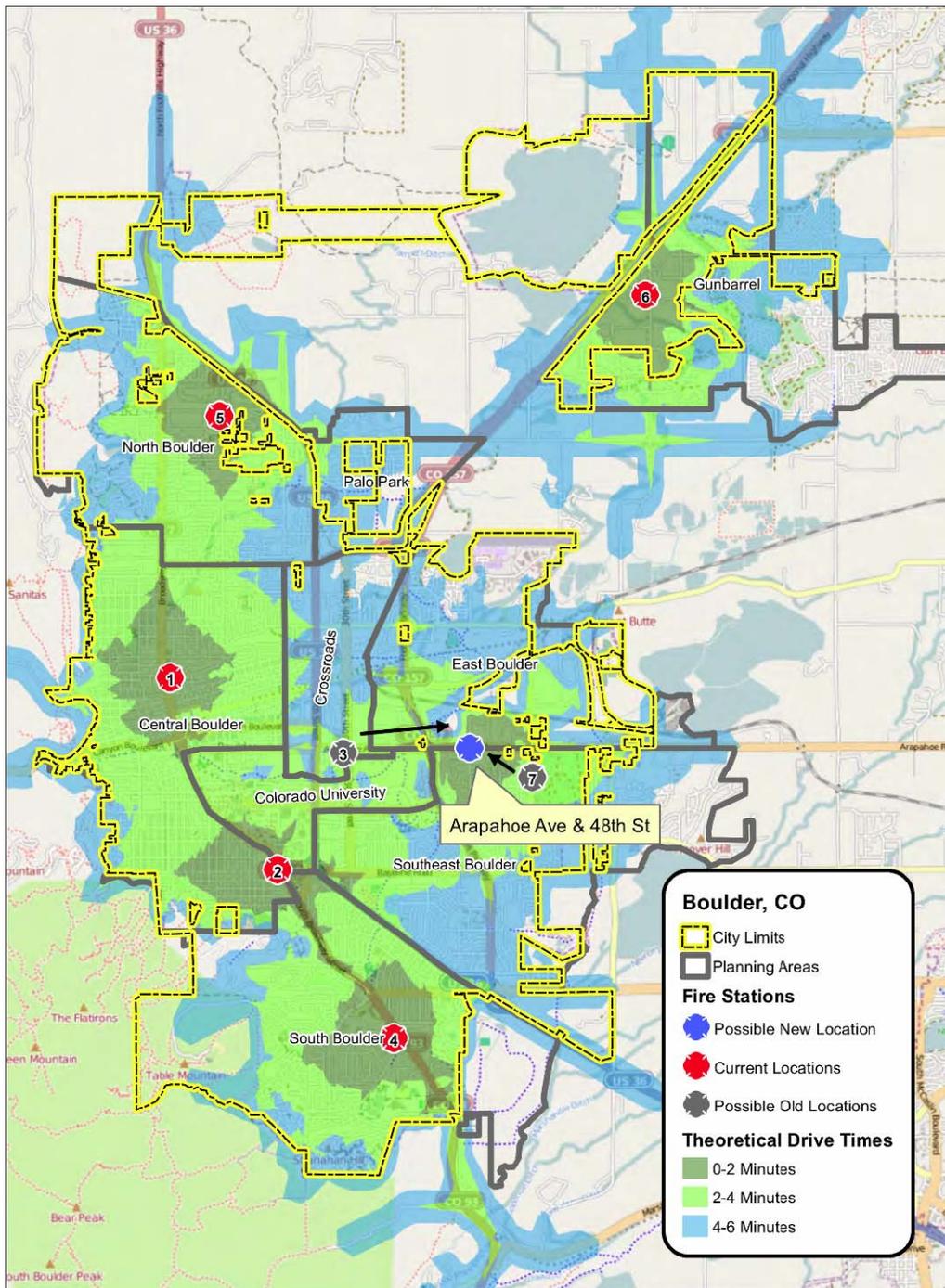


Figure 26: Merged Station at Pearl Pkwy & Foothills Pkwy

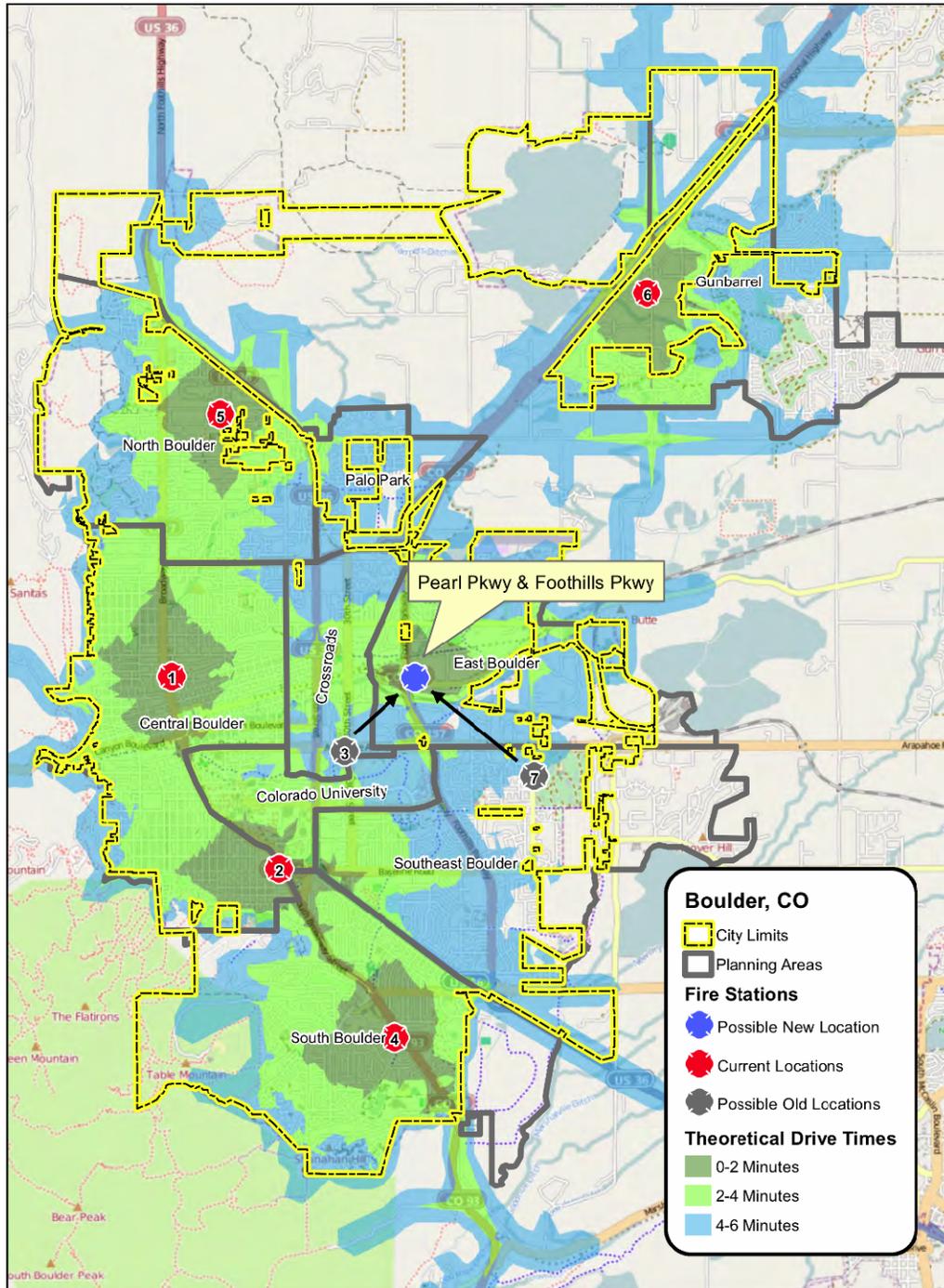
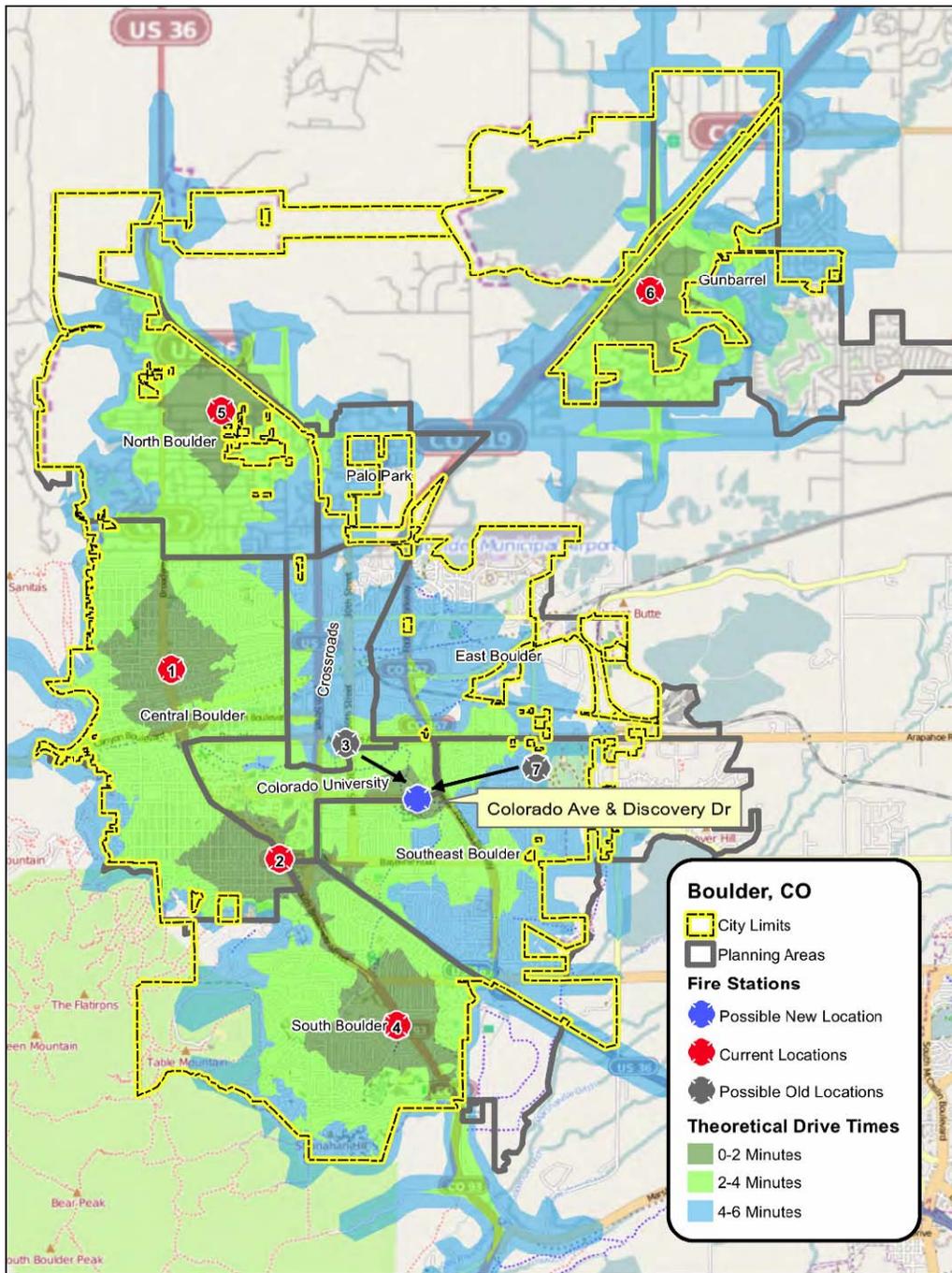


Figure 27: Merged Station at Colorado Avenue & Discovery Drive



APPENDIX E: STAFFING OPTIONS FOR THE USE OF TWO-PERSON RESCUE UNITS

We propose that this two person rescue configuration can be achieved through several options. We propose these options for the purpose of further discussions to reach the desired goal of having a rescue squad configuration for its future emergency response needs in the following ways:

Option 1

1. Currently minimum staffing for each shift is 25. 24 firefighters and 1 shift commander (BC) per shift. Six extra personnel per shift are staffed to cover vacations, sick leave, etc. equaling 31 persons per shift.
2. There are 7 engines (1 of which is technically a quint) and 1 ladder/quint located in seven stations. There are 3 persons staffing each of these apparatus per shift equaling 24.
3. Place the engine (2501) at Station 1 out of service (O.S.S) and replace it with one rescue unit which requires 2 person staffing.
4. This will change staffing from 6 to 5 (3 on the ladder two on the rescue) and free up one person per shift.
5. With the placing of 2501 O.O.S and adding another rescue unit to an additional station, minimum staffing will go from 25 to 26 by reducing the number of coverage staff from 31 to 30 and adding the extra firefighter to the minimum staffing roster (25 firefighters and 1 shift commander (BC)).
6. This will reduce the number of extra personnel per shift for coverage from 6 to 5.

Overall, we feel that the current staffing configuration has the ability to provide coverage with 5 extra personnel instead of the current 6. This should be predicated on a thorough evaluation of the department's leave authorization process that leads to better managerial practices. Additionally if the overtime reduction trend continues, the system will be able to further absorb this change.

Option 2

This option would embody all of the recommendations in Option 1, except that it would also include the hiring of three additional personnel. These three personnel would fill the vacant extra coverage personnel that would be lost through the above proposed re-staffing plan from 5 back to the original 6.

Option 3

This option would include hiring additional personnel to staff two – two person rescue units at two stations, and include the hiring of 9 additional personnel. These 9 personnel would staff two units per shift (3 shifts) totaling a 6 per shift minimum. The additional 3 personnel would be extra personnel per shift added to cover vacations, sick leave, etc., totaling 9. This staffing configuration would not require putting any current units out of service.