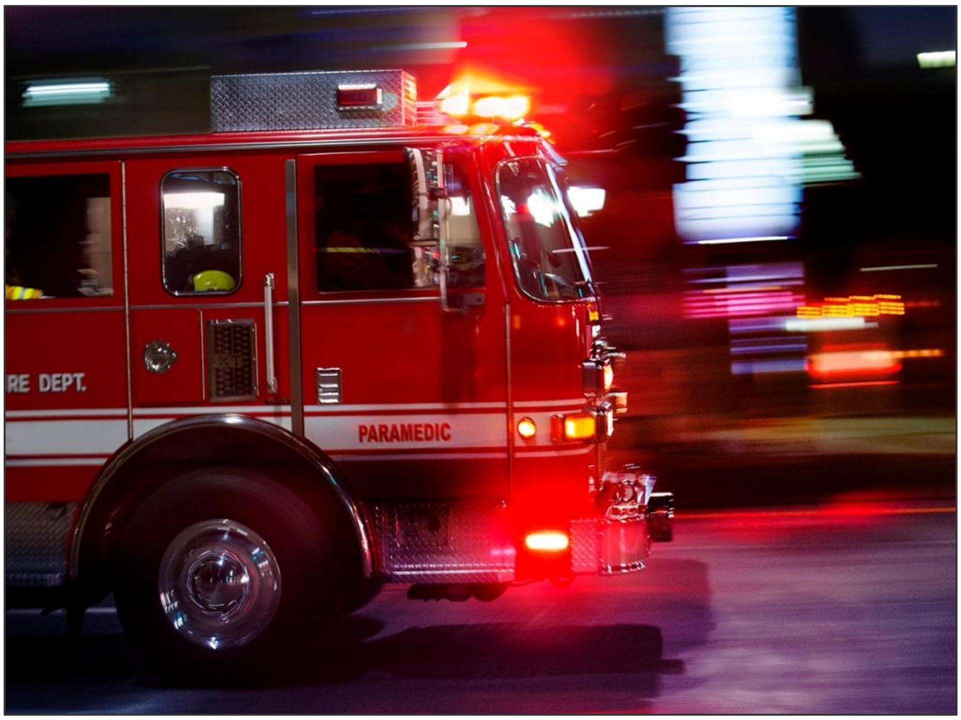
CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

FIRE & EMS MASTER PLAN

BOZEMAN, MONTANA

Final Report – August 2017



CPSM®

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ICMA

Exclusive Provider of Public Safety Technical Services for
International City/County Management Association

THE ASSOCIATION & THE COMPANY

The International City/County Management Association (ICMA) is a 100-year-old, nonprofit professional association of local government administrators and managers, with approximately 9,000 members spanning thirty-two countries.

Since its inception in 1914, ICMA has been dedicated to assisting local governments in providing services to their citizens in an efficient and effective manner. Our work spans all of the activities of local government — parks, libraries, recreation, public works, economic development, code enforcement, Brownfields, public safety, etc.

ICMA advances the knowledge of local government best practices across a wide range of platforms including publications, research, training, and technical assistance. Its work includes both domestic and international activities in partnership with local, state, and federal governments as well as private foundations. For example, it is involved in a major library research project funded by the Bill and Melinda Gates Foundation and is providing community policing training in Panama working with the U.S. State Department. It has personnel in Afghanistan assisting with building wastewater treatment plants and has had teams in Central America providing training in disaster relief working with SOUTHCOM.

The **ICMA *Center for Public Safety Management (*ICMA/CPSM*)*** was one of four Centers within the Information and Assistance Division of ICMA providing support to local governments in the areas of police, fire, EMS, emergency management, and homeland security. In addition to providing technical assistance in these areas we also represent local governments at the federal level and are involved in numerous projects with the Department of Justice and the Department of Homeland Security. In each of these Centers, ICMA has selected to partner with nationally recognized individuals or companies to provide services that ICMA has previously provided directly. Doing so will provide a higher level of services, greater flexibility, and reduced costs in meeting members' needs as ICMA will be expanding the services that it can offer to local governments. For example, The Center for Productivity Management (CPM) is now working exclusively with SAS, one of the world's leaders in data management and analysis. And the Center for Strategic Management (CSM) is now partnering with nationally recognized experts and academics in local government management and finance.

Center for Public Safety Management, LLC (CPSM) is now the exclusive provider of public safety technical assistance for ICMA. CPSM provides training and research for the Association's members and represents ICMA in its dealings with the federal government and other public safety professional associations such as CALEA. The Center for Public Safety Management, LLC maintains the same team of individuals performing the same level of service that it has for the past seven years for ICMA.

CPSM's local government technical assistance experience includes workload and deployment analysis using our unique methodology and subject matter experts to examine department organizational structure and culture, identify workload and staffing needs, and identify and disseminate industry best practices. We have conducted more than 269 such studies in 37 states and 204 communities ranging in size from 8,000 population (Boone, Iowa) to 800,000 population (Indianapolis, Ind.).

Thomas Wieczorek is the Director of the Center for Public Safety Management. Leonard Matarese serves as the Director of Research & Program Development. Dr. Dov Chelst is the Director of Quantitative Analysis.

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SECTION 1. EXECUTIVE SUMMARY

The Center for Public Safety Management, LLC (CPSM) was retained by the City of Bozeman to conduct a Master Plan for its fire department, including a detailed review of department operations, workload, staffing, deployment, and fire station locations. This analysis includes a thorough review of the organization structure, training, performance measures, prevention activities, and interactions with mutual aid partners. Specifically, CPSM was tasked with providing recommendations and alternatives regarding fire department operations, staffing levels, and alternative modes of operation referencing both the current service demand and options that can position the department to best manage the community's anticipated growth.

During the study, CPSM analyzed performance data provided by the Bozeman Fire Department (BFD) and also examined firsthand the department's operations. Fire departments tend to deploy resources utilizing traditional approaches, which are rarely reviewed. To begin the review, project staff asked for certain documents, data, and information. The project staff used this information/data to familiarize themselves with the department's structure, assets, and operations. The provided information was supplemented with information collected during an on-site visit to determine the existing performance of the department, and to compare that performance to national benchmarks. CPSM will typically utilize benchmarks that have been developed by organizations such as the National Fire Protection Association (NFPA), Center for Public Safety Excellence, Inc. (CPSE), the ICMA Center for Performance Measurement, as well as others.

Project staff conducted a site visit on April 17-19, 2017, for the purpose of observing fire department and agency-connected support operations, interviewing key department staff, and reviewing preliminary data and information. Telephone conference calls as well as e-mail exchanges were conducted between CPSM project management staff, the city, and the fire department so that CPSM staff could affirm the project scope, and elicit further discussion regarding this analysis.

The Bozeman Fire Department is a highly skilled and progressive organization that is making exceptional progress in dealing with a rapidly growing service responsibility. The personnel with whom CPSM interacted are truly interested in serving the city to the best of their abilities and demonstrated a unified goal in achieving excellence in service delivery. As service demands increase and the fire department is required to provide expanded services, it is essential that the organization continue its strategic planning efforts, organizational team building, performance measurement, and goal setting. The challenges in Bozeman are not insurmountable and CPSM will provide a series of observations and recommendations that we believe can allow the BFD to become ***more efficient*** and ***smarter*** in the management of its emergency and nonemergency responsibilities.

RECOMMENDATIONS

The BFD provides an excellent range of services to its citizens, local businesses, the university, and visitors to the area. The department is well-respected in the community and by city leadership. For organizations of the caliber of the BFD, the recommendations provided in our analysis will be minor in comparison to the department's performance and do not denote major flaws in its day-to-day operations or overall efficiencies. In organizations such as Bozeman which are achieving a high level of performance, the real challenge becomes the drive to maintain — in its line personnel and managerial staff — the continued pursuit of excellence and ongoing improvement.

Forty-two recommendations are listed below and in the applicable sections within this report. The recommendations are based on best practices derived from the NFPA, CPSM, ICMA, the U.S. Fire Administration, the International Association of Emergency Managers (IAEM), and the Federal Emergency Management Agency (FEMA).

These recommendations are listed in five categories; I. *Organization, Management and Personnel*; II. *Facilities and Capital; III. Planning and Risk Management; IV. Operations, Dispatch and V. Deployment; Training and Prevention*. There is a page reference after each recommendation which indicates the page of the report on which the recommendation is found.

I. Organization, Management and Personnel:

1. During the remaining term of the current labor agreement, the city and the fire union should consider an amendment or side agreement that formalizes the Kelly Day arrangement.(p.9)
2. In future negotiations with the IAFF, the city should pursue the elimination of the Kelly Day and move to a 56-hour workweek for all line fire personnel. (p.9)
3. Bozeman should review its interpretation of "in paid status" when considering overtime eligibility for 53-hour fire personnel and consider the exclusion of any leave time as hours worked when calculating overtime eligibility.(p.12)
4. BFD should consider the expansion of program management duties for field personnel and utilize these assignments for career development and consideration in promotional testing.(p.13)
5. BFD should institute a periodic meeting forum (weekly/monthly/quarterly) to discuss departmental initiatives and new directives. The forum should include all on-duty members of the organization and chief officers and should be conducted through an Internet-based conference calling or video conferencing application.(p.14)
6. Bozeman should establish a practice that institutes the regular scheduling of promotional testing processes for Driver Engineer and Captain**.**(p.14)
7. BFD should improve and expand the use of the employee performance appraisal process in the career development of all personnel.(p.15)
8. BFD should work with the city's Human Resources office to institute periodic and post-accident drug testing for all fire personnel.(p.15)
9. The City should consider a restructuring of supplemental pay for EMT-Basic, EMT-Advanced, and Paramedic in future negotiations with the IAFF Local 613.(p.54)
10. BFD should implement a series of performance measures that enable ongoing review of service outcomes. The process of developing these measures should utilize input from BFD members, the community, the Mayor and City Commission, and city administration.(p.77)
11. The city should officially designate an alternative Emergency Management Director and ensure that this individual is fully trained and well versed in the duties of the Emergency Management Director.(p.88)

II. Facilities and Capital:

12. Bozeman should consider the relocation of Fire Stations 1 and 2 to address the significant structural and design issues related to these aging structures and to better position these resources to serve the burgeoning growth that is occurring in the southwestern areas of the city.(p.18)
13. Relocate Station 1 north to N. Rouse Ave. and E. Oak St.(p.26)
14. The City and Montana State University should explore the option for a joint fire station / training facility on the university campus.(p.29)
15. The City should adopt a fire apparatus replacement schedule that includes an evaluation process that takes into account vehicle age, miles/hours of usage, maintenance records, and historical repair costs.(p.32)
16. BFD should consider the assignment of vehicle apparatus maintenance and recordkeeping to an existing Driver Engineer as a project management assignment.(p.34)
17. BFD should consider the relocation of its fire training structure to a more appropriate location and a possible colocation at a fire station site.(p.87)

III. Planning and Risk Assessment:

18. Continue to use the VISION product to conduct a community risk assessment and analyze/utilize the results in the planning of fire station locations, apparatus needs, and staffing requirements.(p.38)
19. The Bozeman Fire Department should continue its efforts to implement a prefire planning process for all target hazards and ensure these documents are stored in the onboard mobile data terminals (MDTs) for ease of accessibility by company and chief officers during a response.(p.42)
20. Bozeman should consider CPSE fire accreditation in the future.(p.42)
21. The Bozeman-Gallatin County Emergency Management Plan should include department and agency critical action checklists.(p.88)
22. The Bozeman-Gallatin County Emergency Manager should lead an effort for every city and county department to develop a Continuity of Operations Plan (COOP).(p.88)

IV. Operations, Dispatch and Deployment:

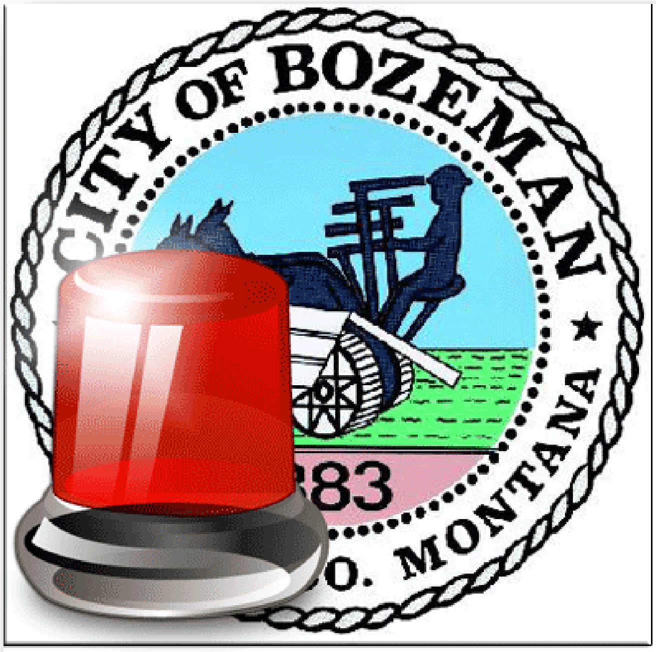
23. BFD should expand the effectiveness of its interagency cooperation with mutual aid partners through increased joint training activities, annual multi-agency drills, and move-up operations.p.45)
24. BFD should work with the 911 dispatch center and the EMS ambulance provider to develop methodologies that improve the call screening process in order to alter response patterns when calls are determined to be minor or nonemergency.(p.50)
25. BFD should work with the 911 dispatch center to develop a monthly report that identifies the distribution of emergency and nonemergency response activities for both fire and EMS responses.(p.51)
26. BFD and AMR should evaluate options for jointly staffing a peak-period ambulance squad to supplement both the city's and AMR's current deployment of resources.(p.55)

27. BFD should move to a permanent cross-staffing model for the operation of its ladder truck with the AMR medic unit assigned to Station 3.(p.58)
28. BFD should continue to work with the 911 dispatch center to implement a pre-alerting system for fire and EMS notifications.(p.67)
29. BFD and the 911 dispatch center should work cooperatively on efforts to improve dispatch handling and turnout times for emergency responses.(p.74)
30. The City of Bozeman should work through the 911 dispatching cooperative to take the steps necessary to ensure that the 911 dispatch center operates with a dedicated 911 call taker.(p.90)
31. The 911 dispatch center should institute a regular program that tests the transfer of its operations to its alternate 911 center located within the City/County Emergency Coordination Center.(p.91)
32. The 911 dispatch center should adopt dispatching performance measures and these should be reported to both fire and city administration on a monthly basis.(p.91)

V. Training and Prevention:

33. BFD should pursue, through its contractual arrangement with AMR, expanded joint training activities and cooperative purchasing agreements for medical equipment.(p.55)
34. The Fire and Building Departments should re-assess their coordination of work assignments of the two Building Fire Life Safety Specialists to insure the clarity of direction and prioritization of assignments.(p.80)
35. BFD should develop an integrated risk management plan that focuses on structure fires throughout the community.(p.49)
36. The City should redesign and update the business licensing system so that information regarding each occupancy is correctly listed and retrievable through this data base.(p.80)
37. BFD should expand the fire loss determination and damage assessment training for its company officers and fire investigators.(p.83)
38. The BFD should establish a training steering committee composed of Battalion Chiefs, Captains, Drivers, Firefighters, and EMS staff to conduct a training needs assessment, develop priorities, and provide direction regarding the training efforts of the department.(p.85)
39. BFD should consider assigning a designated rank to the Training Officer that is consistent with the authority and duties assigned to this position.(p.85)
40. The Bozeman Fire Department should institute written and practical skills testing as part of the department's comprehensive fire training program.(p.86)
41. BFD should designate a Fire Captain on each shift to serve as the shift training coordinator to help facilitate in-service training activities, both for fire and EMS.(p.86)
42. BFD should continue in its effort to institute online training software to assist in the coordination and monitoring its training efforts.(p.86)

SECTION 2. SCOPE OF PROJECT



The scope of this project was to provide an independent review of the services provided by the Bozeman Fire Department (BFD) so that city officials, including officials of BFD, could obtain an external perspective regarding the city's fire and EMS delivery system. This study provides a comprehensive analysis of the BFD, including its organizational structure, workload, staffing, overtime, deployment, training, fire prevention, emergency communications (911), planning, and public education efforts. In addition, CPSM will provide assistance in developing a comprehensive community risk assessment and a determination as to the appropriateness of the level of response in meeting both current and projected future demand. Local government officials often attempt to understand if their fire department is meeting the service demands of the community, and commission these types of studies to measure their department against industry best practices. In this analysis, CPSM provides recommendations where appropriate, and offers input on a strategic direction for the future.

Key areas evaluated during this study include:

- Fire department response times (using data from the city's computer-aided dispatch system and the BFD records management systems).
- Deployment, staffing, and overtime.
- Organizational structure and managerial oversight.
- Fire and EMS workloads, including unit response activities.
- BFD support functions (training, fire prevention/code enforcement, and 911 dispatch).
- Essential facilities, equipment, and resources.
- Community risk assessment and an evaluation of the capacity of the organization to best position itself in meeting anticipated demand

SECTION 3. ORGANIZATION AND MANAGEMENT

GOVERNANCE AND ADMINISTRATION

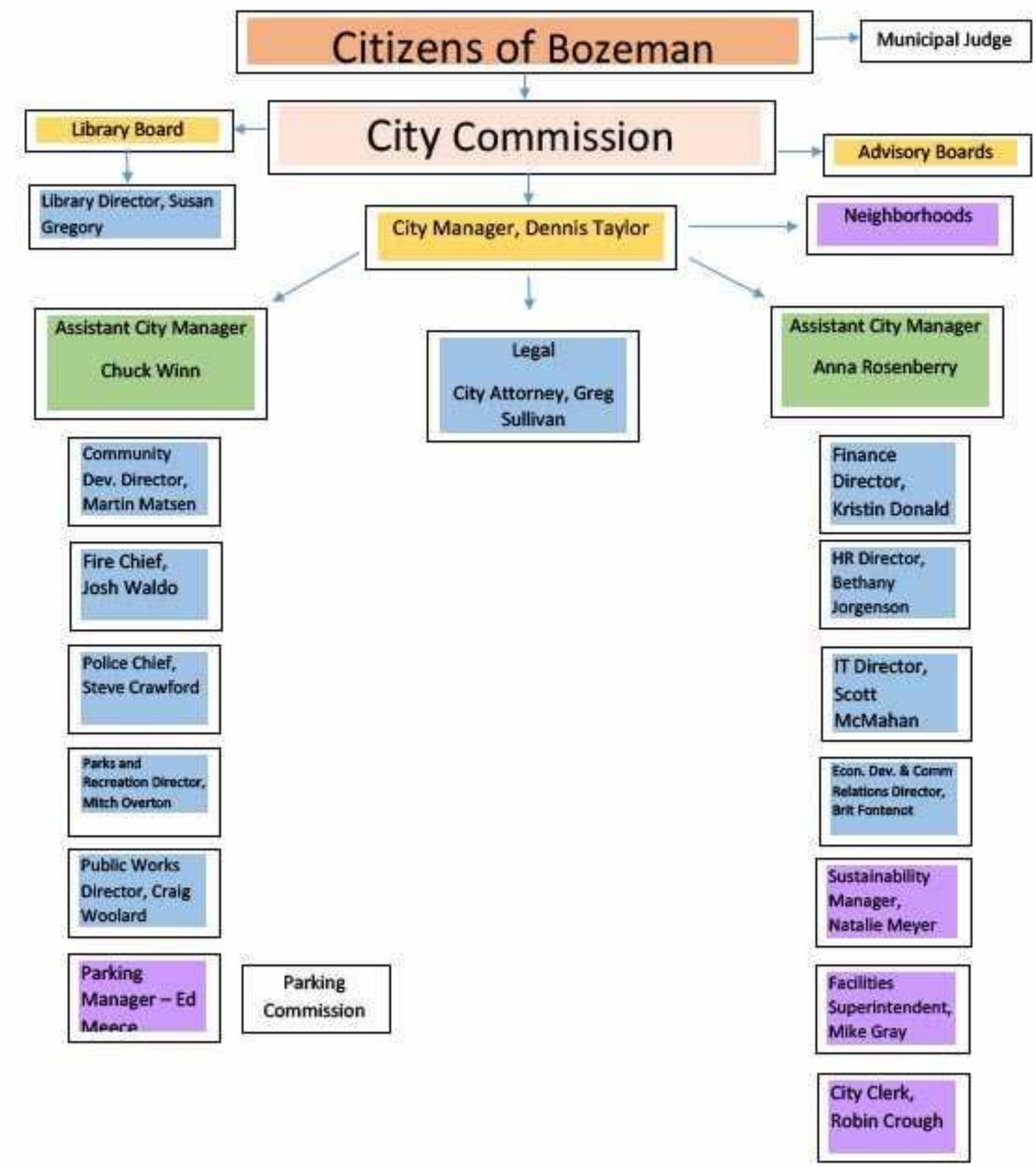
Bozeman is located in the Gallatin valley in southwestern Montana, approximately 84 miles east of Butte, 125 miles west of Billings, and 93 miles north of Yellowstone National Park. Bozeman is located along Interstate 90, which is the predominant east-west thoroughfare in the United States between Chicago and Seattle. Bozeman is a rapidly growing community and the county seat of Gallatin County. The city has a diverse and growing economy that includes a number of business and research centers including; high-tech manufacturing, photonics and optics, the outdoor industry, bioscience, pharmaceuticals, and healthcare. In 2015 the city had an estimated population of 43,405, according to the U.S. Census Bureau. Bozeman is the home of Montana State University, which is the largest university in Montana, with a student body estimated to be in excess of 16,400 students. Bozeman is an outdoor and recreational mecca located in the northern Rocky Mountains, featuring magnificent hiking, trophy trout fishing rivers, skiing, and the northern gateway to Yellowstone National Park. The corporate limits of the city encompass a land area of approximately 19.15 square miles.

Bozeman is an incorporated Montana city that operates under a commission/manager form of government. This form of government combines the political leadership of elected officials in the form of the Bozeman City Commission with the managerial experience of an appointed city administrator. The Bozeman City Commission is comprised of a Mayor, a Deputy Mayor, and three City Commissioners. Together, these elected officials form the Bozeman City Commission. All members of the Commission are elected at-large and serve four-year staggered terms. The Mayor is also elected at-large and serves a four-year term. Municipal elections are held in odd numbered years. The Mayor is the formal representative for the city and presides over Commission meetings and serves as a voting member. The City Commission serves as the legislative body for the city. Its responsibilities include enacting laws that govern the city, adopting the annual budget, and appropriating funds to provide city services. The City Commission also establishes policies executed through the administration. Most transactions require only a quorum or simple majority be present.

The City Manager is responsible for the business, financial, and property transactions of the city, as well as preparation of the annual budget, appointment and supervision of personnel, enforcement of city ordinances, and the organization and general management of city departments. As chief administrator, the City Manager has no vote on the Commission, but may take part in discussions of matters coming before this legislative body.

Bozeman is typical of many cities and towns across the United States in that it operates its own public works department, library, parks and recreation, and several internal functions including finance and human resources. Bozeman operates its own police department and fire department. Emergency 911 dispatch services are provided by the 911-Communication Center of Gallatin County.

FIGURE 3-1: City of Bozeman Table of Organization



BOZEMAN FIRE AND RESCUE

The Bozeman Fire Department (BFD) is a career fire department comprised of 47 personnel, of which 45 are sworn, uniformed fire rescue personnel and 2 are civilian support staff. The department is led by a Fire Chief, who has overall responsibility for managing the department's day-to-day operations and administrative oversight. The Fire Chief is assisted by two Deputy Fire Chiefs, one who oversees the Operations Division and one who is the Fire Marshal and who oversees the Inspections Division. The Operations Division utilizes a staff (40-hour) Training Captain to supervise EMS and fire training. The Inspections Division includes two Building Fire Life Safety Specialists. In addition, the department utilizes a Staff Captain to coordinate the city's emergency management duties and a clerical assistant. The Operations Division is broken into three shifts, each supervised by a field (24-hour) Battalion Chief.

The Operations Division is responsible for providing the department's emergency response functions for a wide array of fire, rescue, and emergency medical incidents. The BFD operates from three fire stations. The department staffs two engines, one ladder truck, and a Battalion Chief-command vehicle. These units are operational 24 hours per day, 7 days a week. BFD staffs its engines and the ladder company each with three personnel. On occasion BFD will staff a medic unit to provide EMS transport and back-up services when AMR ambulance units are unavailable to respond. This unit is staffed with off-duty personnel who are brought in for limited timeframes on an overtime basis. CPSM estimates that this medic unit was operational in Bozeman for nearly 700 hours in the 12-month analysis period and responded 161 times. AMR provides an estimated $50,000 annually to the fire department for the staffing costs associated with the operation of the medic units. The daily minimum staffing for the city is typically 10 personnel. This includes nine personnel to staff the two engines and ladder and a Battalion Chief for the BC/Command unit. On occasion, and only for a limited period in the 24-hour shift, the minimum staffing may drop to nine personnel during such time the BC/Command unit is not operational. Operating a Fire and EMS service without a dedicated command presence (Battalion Chief) is somewhat of an anomaly a not a situation we often encounter. Though this practice is a recent development, ***CPSM believes that BFD should monitor those occasions in which a Battalion Chief is not on-duty and document any administrative or operational situations that are problematic as a result of this vacancy.***

During the one-year period from January 1, 2016 through December 31, 2016, BFD responded to 4,248 incidents, of which 62 percent were EMS-related. All fire department personnel are cross-trained to at least the emergency medical technician (EMT) level with a significant number possessing advanced life support/paramedic certifications. The department provides engine-based advanced life support services on all of its primary first response apparatus. BFD operates in what is often termed a ***two-tiered EMS delivery system***. In this arrangement the fire department provides EMS first response and a private ambulance provider (AMR) provides advanced life support services (ALS) and ambulance transport.

In addition to their emergency response duties, emergency services personnel also provide a wide range of customer service and community outreach efforts, including blood pressure screenings, child car seat installations, tours of fire stations and apparatus, smoke detector installations, and fire and life safety presentations. In-service emergency personnel also conduct periodic fire inspections at select occupancies in the city.

Operations personnel work a three-platoon system in which personnel are on duty for 48 consecutive hours followed by 96 hours off. Typically, a work schedule of this type equates to a 56-hour workweek if averaged throughout the year. In Bozeman, however, through a negotiated agreement with the IAFF Firefighters Local 613, line fire personnel (excluding Battalion Chiefs), base their annual salary on a 53-hour workweek or 2,756 hours per year. The 48/96 schedule, if worked for an entire year, equates to a total of 2,912 hours. Given this stipulation in the labor agreement, 156 hours of the scheduled work hours would be eligible for premium overtime pay (time and one-half). In lieu of overtime payment the city and the fire union have established an accumulated relief schedule in which line employees bank these excess hours and then are granted a relief period (usually 24-hours) in which they are scheduled to be off duty. This is called a ***Kelly Day*** and it is intended to reduce the actual hours worked in the payroll cycle to comply with the U.S. Department of Labor guidelines which specify a 53-hour weekly maximum before an overtime premium pay is required. Overtime guidelines relating to municipal fire personnel are specified in the Fair Labor Standards Act (FLSA) and the "***7(k) exemption***" allow municipal fire personnel to work up to 53 hours each week before an overtime premium is required.[1] The Kelly Day concept is not unique to the Bozeman system. CPSM has observed a number of fire departments nationally which utilize the Kelly Day to reduce the hours worked during the payroll cycle. What is unique in the Bozeman system is that this provision is not specified in the current collective bargaining agreement and is implemented though an informal, unwritten agreement between the parties.

> ***Recommendation: During the remaining term of the current labor agreement, the city and the fire union should consider an amendment or side agreement that formalizes the Kelly Day arrangement.***

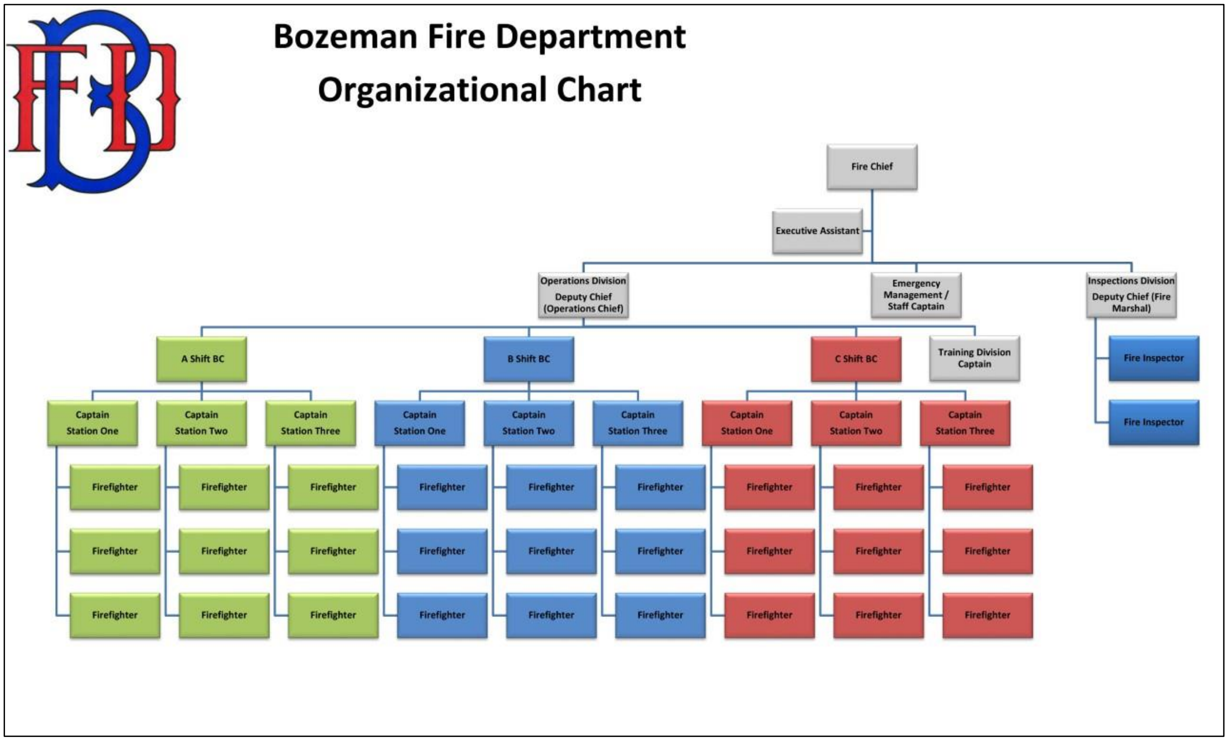
Each line fire employee covered under the collective bargaining agreement accrues approximately 156 hours annually, which equates to six and one-half 24-hour shifts off each year. Considering that BFD currently employees 36 personnel who receive Kelly days, the total amount of lost time annually attributable to Kelly Days is in excess of 5,400 hours, or approximately 14.8 hours daily. We estimate that for nearly 26 percent of the time someone is off on a Kelly Day (approximately 1,400 hours annually), and overtime duty is required to offset this lost time. On an annual basis the overtime cost attributable to the Kelly Day agreement is estimated to be more than $50,000. CPSM believes that with the elimination of the Kelly Day and a renegotiation of the firefighter annual hours worked to 2,912 hours, there would be a net increase in on-duty staffing equivalent to 0.6 FTEs daily.

> ***Recommendation: In future negotiations with the IAFF, the city should pursue the elimination of the Kelly Day and move to a 56-hour workweek for all line fire personnel.***

Each 24-hour platoon is supervised by an operational Battalion Chief, who reports to the Deputy Fire Chief of Operations. Each engine and the ladder truck is supervised by a Captain. Figure 3-2 illustrates the current organizational structure within the Bozeman Fire Department.

[1] See 29 USC §207(k)

FIGURE 3-2: Bozeman Fire Department Table of Organization



STAFFING AND DEPLOYMENT

Individual unit staffing and minimum daily staffing levels are perhaps the most contentious aspects of managing fire operations in the U.S. There are a number of factors that have fueled the staffing debate. Aside from FAA requirements for minimum staffing levels at commercial airports***, there are no state or federal requirements for the staffing of fire apparatus.*** The U.S. Occupational Safety and Health Administration (OSHA) has issued a standard that has been termed the ***"Two-in-Two-Out"*** provision. This standard affects most public fire departments across the U.S., including BFD. Under this standard, firefighters are required to operate in teams (of no fewer than two personnel) when engaged in ***interior structural firefighting.*** The environment in which interior structural firefighting occurs is further described as areas that are immediately dangerous to life or health (an IDLH atmosphere) and subsequently require the use of self-contained breathing apparatus (SCBA). When operating in these conditions, firefighters are required to operate in pairs and they must remain in visual or voice contact with each other and must have at least two other employees located outside the IDLH atmosphere. This assures that the "***two in***" can monitor each other and assist with equipment failure or entrapment or other hazards, and the "***two out***" can monitor those in the building, initiate a rescue, or call for backup if a problem arises.[2] This standard does not specify staffing on individual apparatus but instead specifies a required number of personnel be assembled on-scene when individuals are in a hazardous environment. There, is however, a provision within the OSHA standard that allows two personnel to make entry into an IDLH atmosphere without the required two back-up personnel

[2] OSHA-Respiratory Protection Standard, 29CFR-1910.134(g)(4).

outside. This is allowed when they are attempting to rescue a person or persons in the structure before the entire team is assembled.[3]

A second factor that contributes to the staffing debate is the NFPA's 1710 publication, *Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016 Edition Sec., 5.2.1.*), which specifies that the staffing level on responding engine and ladder companies be established at a minimum of four on-duty personnel. Unlike the OSHA guideline, which is a mandatory provision, the NFPA 1710 guideline is advisory; communities (including Bozeman) are not required to adhere to this NFPA guideline. NFPA 1710 also provides guidance regarding staffing levels for units responding to EMS incidents; however, the provision is less specific and does not specify a minimum staffing level for EMS response units. Instead the standard states; "*EMS staffing requirements shall be based on the minimum levels needed to provide patient care and member safety.*"[4] The difficulty that many agencies have is the co-utilization of fire companies and EMS companies in responding to both fire and EMS calls. Working fires involving hazardous environments are labor intensive and more personnel are needed to effectively manage these incidents. EMS calls are typically managed with fewer personnel, and the majority of EMS calls can be handled with a single rescue company of two fire personnel. In the call screening process, those calls that require additional personnel are typically identified at the dispatch level and additional personnel can be assigned when needed.

Within Bozeman there are three fire suppression companies that are staffed on a daily basis. Normal staffing for the two engines and one ladder is set at a minimum of three personnel each. Some companies will occasionally operate with four personnel, depending upon the number of personnel on various types of leave. The BFD delivers field operations and emergency response services through a clearly defined division of labor that includes a middle manager (Battalion Chief), first-line unit supervisors (Captains), and technical specific staff: Drivers, Firefighters, and Paramedics.

As noted, BFD operates four emergency response units with a minimum daily staffing that has been established at 10 personnel. Table 3-1 identifies the equipment and personnel assigned daily to each fire station.

TABLE 3-1: BFD Fire Stations, Response Units, and Assigned Personnel

Station #	Response Units	Minimum Assignment
1	1 Engine 1 BC/Command 1 Medic Unit	3 1 2*
2	1 Engine	3
3	1 Ladder Truck 1 Medic Unit	3 2*

***Note:** Medic Units are not staffed on a daily basis, they are staffed on an overtime basis only when needed.

The Fair Labor Standards Act (FLSA), which regulates overtime for municipal employees, only requires overtime pay when the actual hours worked are in excess of the designated workweek. FLSA does not require that this calculation include time not worked, such as vacation time, sick

[3] Ibid, Note 2 to paragraph (g).

[4] (NFPA) 1710, *Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2016 Edition Sec., 5.3.32.).

leave, or holidays (federal or otherwise).[5] Bozeman has chosen to include all leave as time worked in the calculation for overtime eligibility.

Recommendation: Bozeman should review its interpretation of "in paid status" when considering overtime eligibility for 53-hour fire personnel and consider the exclusion of any leave time as hours worked when calculating overtime eligibility.

It is difficult to estimate the actual savings that would be realized if Bozeman were to modify its interpretation of "time worked" and thus excluding all leave taken when determining overtime eligibility. If adopted, CPSM believes that there would be a significant reduction in the amount of overtime paid given the estimated 22,600 hours of leave time that was taken in the past fiscal year.

Many agencies often assign the oversight of program management duties to those staff officers and chief officers who are assigned to 40-hour assignments. It is critical that many of the program management duties required in the operation of a modern fire and EMS organization be delegated and under the direction of field personnel. This is especially important in smaller organizations as Bozeman in which there are a limited number of 40-hour support personnel. BFD has made a number of assignments of support duties to line personnel and this is commendable. These assignments are limited, however, and in many instances do not include all Captains and Battalion Chiefs. The ability to properly manage key organizational duties is beneficial from a career development perspective. CPSM believes that many of these duties are best assigned to line personnel because of the managerial experience it provides. In addition, the assumption of program management duties and the effectiveness with which individuals perform in these assignments, are viable considerations in the promotional testing process. Table 3-2 shows a number of program management duties that could be considered for assignment to field personnel.

[5] U.S. Department of Labor., Wage and Hour Division, Overtime Pay: General Guidance.

TABLE 3-2: Program Assignment Duties

Program Description	Assignment Level
Promotional Testing	Battalion Chief
Performance Appraisals	Battalion Chief
Haz Mat/Technical Rescue	Battalion Chief
Employee Recognition/Awards	Battalion Chief
CISM/EAP	Battalion Chief
Sick Leave/Absenteeism Review	Battalion Chief
Budget Committee	Battalion Chief
Payroll/ExecuTime Auditing	Battalion Chief
Police Department Liaison	Battalion Chief
EMS Protocols	Captain
Station Maintenance/Upkeep	Captain
Fire Reporting QA	Captain
Hose Testing	Captain
Hydrant Testing	Captain
Radio Programming	Captain
Mapping	Captain
Fire Pre-Incident Planning	Captain
Infectious Disease Control	Captain
EMS Supplies/Decon/Bio Disposal	Captain
911 Liaison	Captain
Station Response Area Designation	Captain
Response Protocols	Captain
Fire Investigations	Captain
Safety/ReHab/Risk Management	Captain
SOP/Ops Committee	Captain /Driver/FF
Fitness Committee	Captain /Driver/FF
Recruit Training/Proctoring	Captain
Public Information Officer	Captain /Driver/FF
Driver Training/EVOC	Captain /Driver
Fleet Maintenance/Repair Record Keeping	Captain/Driver
Internal Communications/Newsletter	Captain /Driver/FF
Social Media/FD Web Page	Captain /Driver/FF
FF/EMS Recruitment Committee	Captain /Driver/FF
Car Seat Installation	Captain /Driver/FF
Smoke Detector Replacement	Captain /Driver/FF

Recommendation: BFD should consider the expansion of program management duties to field personnel and utilize these assignments for career development and consideration in promotional testing.

The ability to communicate work assignments, new program initiatives, or merely to update employees on departmental programs or the strategic direction of the organization requires ongoing outreach, specifically from the Fire Chief and the Deputy Chiefs in the organization. BFD utilizes a number of informal methods for information outreach but there are limited opportunities to have direct interaction with the membership and to answer questions or to have an open dialog to ask and answer questions. There are a number of communication tools currently available that can be used to conduct video conference calls and information exchanges among multiple work settings (for example, see GoTo Meeting™, WebEX™, Skype for Business™, and AnyMeeting™, etc.). These tools are inexpensive and in some cases, once the initial software is purchased, there are no recurring charges. CPSM was advised the BFD is considering the application of WebEx™ as a communication tool in the organization. We believe that BFD would benefit greatly from an expanded information exchange, which would also prove useful in coordinating daily training assignments, shift activities, personnel and vehicle movements, etc.

Recommendation: BFD should institute a periodic meeting forum (weekly/monthly/quarterly) to discuss departmental initiatives and new directives. This forum should include all on-duty members of the organization and chief officers and should be conducted through an Internet-based conference calling or video conferencing application.

Essential to any master planning effort is the concept of career and personnel development. Fire service organizations are extremely regimented in the oversight of personnel issues, typically guided by civil service rules, collective bargaining stipulations, and public personnel guidelines. The fire service promotional process is very competitive and provides an exceptional opportunity to develop individual skills and to institute organizational philosophies. The ability to direct the learning effort in developing the needed skill sets is a key function that can be orchestrated through the promotional process. This factor is essential in the development of the future workforce and in creating the culture of an organization. In the promotional and testing process, management has the ability to identify and utilize the source materials for testing and to establish the prerequisite training criteria for promotional eligibility. The ability to establish prerequisites that include components such as college coursework, associate and bachelor degrees, specific training certifications, project management experience, fitness, and performance appraisal achievements are extremely important. For this reason CPSM believes that BFD should conduct its promotional testing processes for Driver Engineer and Captain on a regular basis and expand the prerequisite requirements for testing.

Recommendation: Bozeman should establish a practice that institutes the regular scheduling of promotional testing processes for Driver Engineer and Captain.

The testing processes for Driver Engineer and Captain should be comprehensive, utilizing both written and practical testing. The Driver Engineer position is a more technical assignment and its weighting should reflect the technical aspects of driver operations, pump practices, aerial operations, wildland operations, drafting, etc. The Captain position is more supervisory in nature and its testing process should include more subjective testing components utilizing simulations and role-play scenarios involving tactical command, the review of project management assignments, training approaches, performance appraisal, employee safety, and supervising the work environment. We suggest that testing be conducted regularly, with engineer and captain testing being held at least every two years, each scheduled intermittently so that one testing process is held at a minimum annually.

Closely aligned with promotional testing is a comprehensive and structured employee performance appraisal system. Performance appraisals that utilize a series of personal development tools that are built around goal setting and career development can be instrumental in the master planning effort. The performance appraisal process requires an ongoing review and interaction between the supervisor and subordinate. Periodic meetings are needed (monthly-quarterly) to review the progress that is being made with regard to established goals and the ability to provide feedback or remediation in the process. Supervisors must be trained in the administration of a good subordinate performance review and must be fully appraised in the steps necessary in making observations and writing a narrative that is constructive and realistic. Finally, the performance appraisal process must be all-inclusive in the organization with all levels and ranks having reviews done; the scoring of these review is a consideration in the promotional process.

Recommendation: BFD should improve and expand the use of the employee performance appraisal process in the career development of all personnel.

Drug testing is an unfortunate, necessary reality in today's workforce. A public safety organization must have some degree of assurance that public safety employees who make regular entry in people's homes and have direct access to personal information and valuables they are operating at peak performance and uninhibited by illegal drugs or substance abuse. BFD utilizes pre-employment drug testing but does not utilize periodic or post-accident drug testing.

Recommendation: BFD should work with the city's human resources office to institute periodic and post-accident drug testing for all fire personnel.

FIRE STATIONS

Fire department capital facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied 24 hours a day and 7 days each week.[6] The Bozeman Fire Department operates out of three fire stations with four staffed emergency response apparatus. Department administrative offices are located in Fire Station 1 and the department training center is at 1812 N. Rouse Ave. Table 3-3 shows the location, year built, and size of the department's stations.

TABLE 3-3: Station Locations, Year Built, and Size

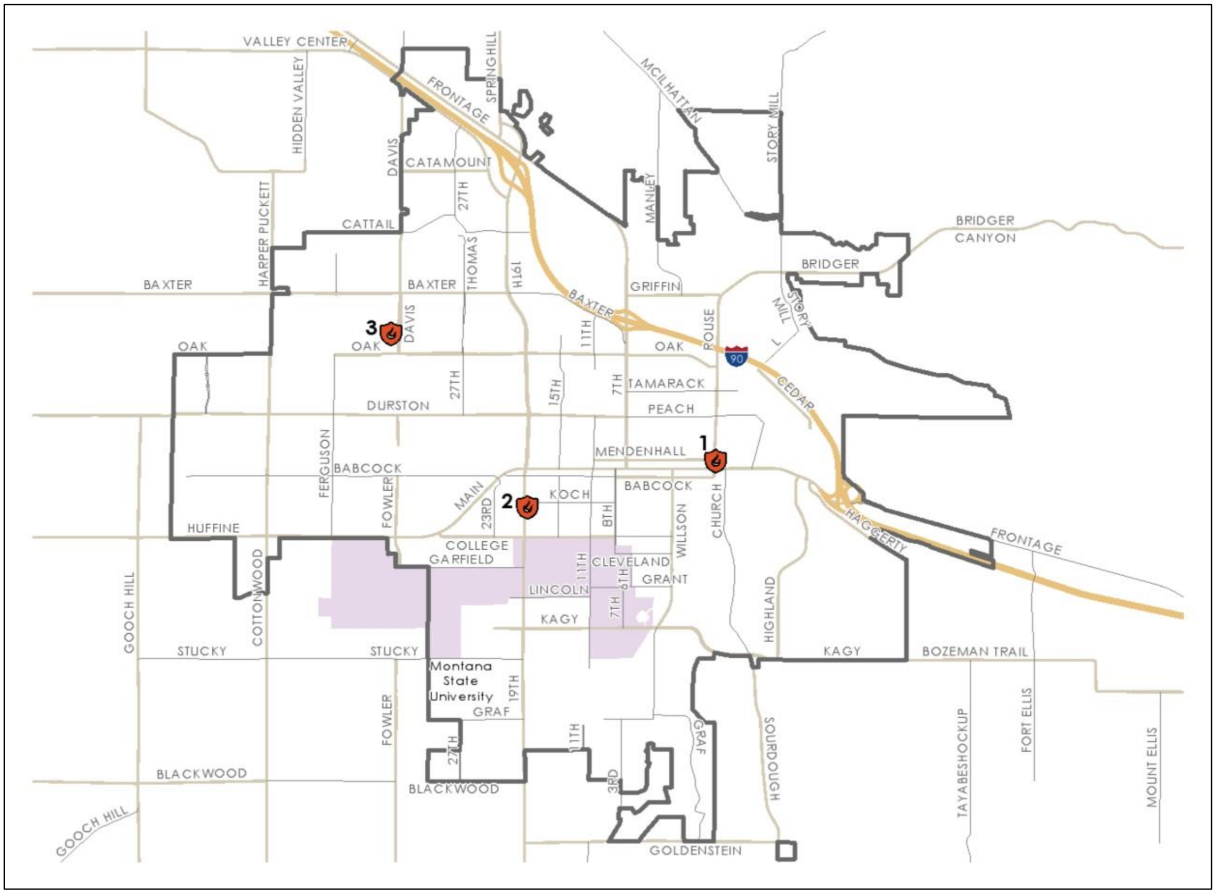
Building	Address	Year Built	Size/Sq.Ft.
Fire Station #1	34 N. Rouse Ave.	1964	9,716
Fire Station #2	410 S. 19th Ave.	1976	3,785
Fire Station #3	1705 Vaquero Pkwy.	2010	17,225*

***Note:** Station 3 also houses a Police Office area

Figure 3-3 is the graphic depiction of the location of the city's three fire stations and Bozeman's municipal boundaries.

[6] Compton and Granito, eds., *Managing Fire and Rescue Services*, 219.

FIGURE 3-3: City of Bozeman Fire Department Station Locations



Station Location Analysis

CPSM was asked to conduct a comprehensive review of the BFD fire station locations and provide recommendations regarding the current configuration of the existing facilities and the potential for anticipated facilities that will be needed as the community grows. The BFD serves an estimated population of 43,405 people and a total service area of 19.15 square miles. This equates to an average service area for each fire station of approximately 6.4 square miles.

In a FY 2011 *ICMA Data Report*, ICMA tabulated survey information from 76 municipalities with populations ranging from 25,000 to 100,000 people. In this grouping the average fire station service area was 11 square miles.[7] The median service area for this grouping was 6.67 square miles per fire station.[8]

In addition, the NFPA and ISO have established different indices in determining fire station distribution. The ISO Fire Suppression Rating Schedule, Section 560, indicates that first-due engine companies should serve areas that are within a 1.5-mile travel distance.[9] The placement of fire stations that achieves this type of separation creates service areas that are approximately 4.5

[7] *Comparative Performance Measurement*, FY 2011 Data Report - Fire and EMS, ICMA Center for Performance Measurement, August 2012.
[8] Ibid.
[9] Insurance Services Office. (2003) Fire Protection Rating Schedule (edition 02-02). Jersey City, NJ: Insurance Services Office (ISO).

square miles in size, depending on the road network and other geographical barriers (rivers, lakes, railroads, limited access highways, etc.). The National Fire Protection Association (NFPA) references the placement of fire stations in an indirect way. It recommends that fire stations be placed in a distribution that achieves the desired minimum response times. NFPA Standard 1710, Section 5.2.4.1.1, suggests an engine placement that achieves a 240-second (four-minute) travel time.[10] Using an empirical model called the "piece-wise linear travel time function" the Rand Institute has estimated that the average emergency response speed for fire apparatus is 35 mph. At this speed the distance a fire engine can travel in four minutes is approximately 1.97 miles.[11] A polygon based on a 1.97 mile travel distance results in a service area that on average is 7.3 square miles.[12]

From these comparisons, it can be seen that the average 6.4 square-mile service area per station in Bozeman is very consistent with the noted references. When we examine a city map showing the location of the existing Bozeman's stations, it appears that a relocation of fire Stations 1 and 2 may provide a distribution that will prolong the need for building a fourth facility. In addition, the current condition and configuration of Stations 1 and 2 merit significant renovation and possible expansion.

Fire and EMS services are extremely labor intensive. Typically the overwhelming share of the annual operating expenses are primarily attributable to personnel costs. In many systems it is not uncommon to see personnel costs account for as much as 85 to 90 percent of the annual budget expenditures. For this reason, fire departments will not deploy additional resources (new fire stations, new apparatus, and the assigned staffing) until the actual service demand exists. Unlike public water utilities, sewer systems, and transportation networks, where it is cost effective to develop this infrastructure prior to development, fire and EMS service enhancements are best established after growth has occurred and the service demand actually exists. Fire service demand is very predictable. In many systems, this demand is a by-product of population growth, the transportation network, and service demand generators related to commerce, institutions and tourist attractions.

Another important point when considering the expansion of the service network is that the increase in additional call volume is typically very gradual and can be tracked or monitored sufficiently to allow for a more orderly expansion of the service network. As housing subdivisions are built and commercial markets are developed, the corresponding call activities gradually follow these alarm generators. The ongoing ability to monitor response activities provides ample lead time to develop funding, construct new facilities, and deploy the needed resources. The only real difficulty in meeting future service expansion is when there is a rapid and block-type service increase associated with the assumption of service responsibilities from an existing development that typically occurs when there is an annexation or an addition of a contract service arrangement with a developed community or service district. Even in these scenarios, there is ample lead time to arrange temporary quartering or deployment strategies until permanent infrastructure and staffing can be established.

Stations are designed to adequately meet the needs of housing apparatus and necessary equipment. Typically, new fire stations have an anticipated service life of 50 years. However, we note that in many jurisdictions older facilities are being replaced in a 30- to 35-year time frame. In most cases facilities require replacement because of their size constraints, a need to relocate

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[10] National Fire Protection Association. (2010). NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. Boston, MA: National Fire Protection Association.
[11] University of Tennessee Municipal Technical Advisory Service, *Clinton Fire Location Station Study*, Knoxville, TN, November 2012. p. 8.
[12] Ibid, p. 9.

the facility to better serve changing population centers, the absence of needed safety features or service accommodations, and the general age and deterioration of the facility. BFD stations range in age from 53 years of age (station 1) to about 7 years of age (station 3). Station 2, which is 39 years of age, has a number of similar concerns regarding its structural components, finishes, and safety features. Problems have been identified with the foundations, plumbing, electrical system, HVAC, ADA access, and gender/privacy concerns. Station 3, built in 2010, is very well designed and suitable equipped to operate and even expand its service capacity. There have been minor finish and maintenance issues, but these are typical in housing an emergency services operation on a 24/7 basis.

CPSM has found that both fire stations 1 and 2, in general, are in need of significant renovation and redesign. In reality, it is our belief that these facilities are better suited for demolition and relocation in lieu of undertaking the extensive renovations that would be required. In addition, the relocation of these facilities can improve overall coverage and efficiency of the service network and delay the need for future fire stations for a 5- to 10-year time frame.

> ***Recommendation: Bozeman should consider the relocation of fire Stations 1 and 2 to address the significant structural and design issues related to these aging structures and to better position these resources to serve the burgeoning growth of the community that is occurring in the southwestern areas of the city.***

Methodology

CPSM employed used ArcGIS to analyze the coverage provided by the current stations and compared this with the coverage that would be provided under multiple other configurations were utilized. GIS data was provided by the city. Since new roads are being built and additional new roads are planned, this analysis includes those roads. Thus, analysis of the current station locations gives different results than analysis of the actual call data.

Coverage was measured as the percent of calls reached in four minutes, average and 90th percentile travel times, and distribution of workload among stations. Travel time was based on the distance from a station to a call and an estimated speed traveled along each segment of the road. Speeds for each road segment were calculated as 5 to 10 MPH below the posted speed limit. While emergency response vehicles travel above the speed limit when it is safe to do so, they must also slow for traffic, turns, intersections, weather, etc. This methodology was chosen over the flat 35 mph average discussed earlier for three reasons: speed limit data were available, comparison of actual travel times with travel distances showed enough difference in average travel speeds between different areas of the city to warrant using different speeds for those areas, and we would rather be a little conservative than overly optimistic in our estimation of the area a station can cover.

An initial set of station location scenarios were developed and reviewed. Three scenarios were presented to BFD, and a final set of scenarios were developed and evaluated based on this feedback. The station locations for the scenarios are presented in Figure 3-4 and Table 3-4.

Two potential sites were selected for Station 1: its current location or a location about one mile north at a site already owned by the city. This site was recommended by BFD due to the cost of land in the area served by Station 1. Three potential sites were selected for Station 2: its current location, a location one mile south east, and a location two miles east. In all scenarios, Station 3 remained at its current location. Two potential sites were evaluated for a fourth station. The proposed locations are at intersections in order to provide a general location without implying that a specific parcel is recommended. Placement of stations at locations up to one-quarter mile in any direction of the proposed sites would have minimal impacts on the projected outcomes.

FIGURE 3-4: Current and Proposed Alternative Station Locations

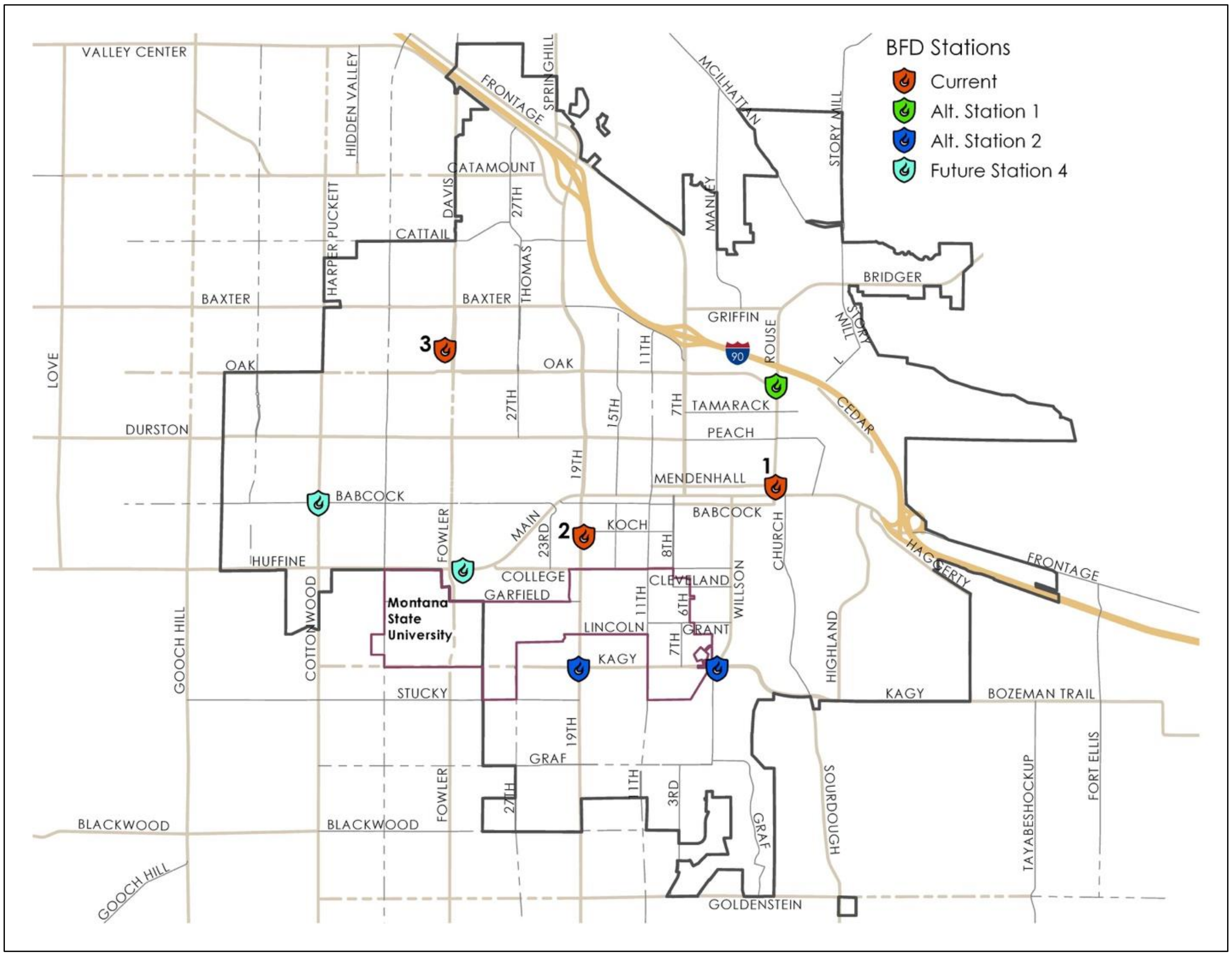


TABLE 3-4: Proposed Station Location Scenarios

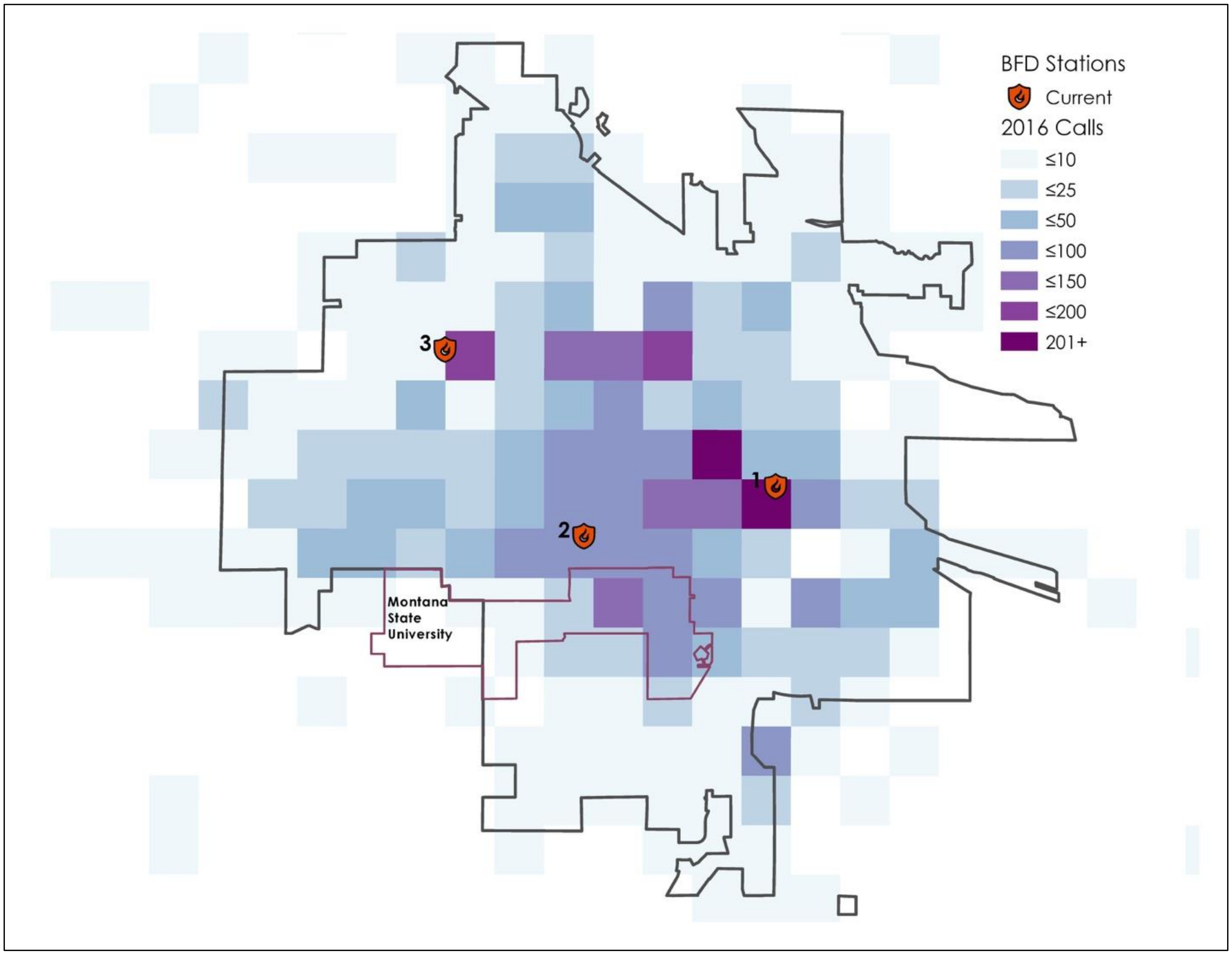
Scenario	Station 1	Station 2	Station 3	Station 4
Current	34 N. Rouse Ave.	410 S. 19th Ave.	1705 Vaquero Pkwy.	—
A1	Current Location	S. 19th Ave. & W. Kagy Blvd.	Current Location	Cottonwood Rd. & W. Babcock St.
A2	N. Rouse Ave. & E. Oak St.	S. 19th Ave. & W. Kagy Blvd.	Current Location	Cottonwood Rd. & W. Babcock St.
B1	Current Location	S. 3rd Ave. & W. Kagy Blvd.	Current Location	Cottonwood Rd. & W. Babcock St.
B2	N. Rouse Ave. & E. Oak St.	S. 3rd Ave. & W. Kagy Blvd.	Current Location	2950-3000 Blk Huffine Ln.
C1	N. Rouse Ave. & E. Oak St.	Current Location	Current Location	Cottonwood Rd. & W. Babcock St.
C2	Current Location	Current Location	Current Location	Cottonwood Rd. & W. Babcock St.

These scenarios were used to evaluate coverage (response times) and workload distribution. Scenario C1 denoted if only Station 1 is moved. Scenario C2 represents the anticipated outcome if no stations are moved. Scenarios A1 and B1 involve leaving Station 1 in its current location, but moving Station 2 south or southeast. Scenarios A2 and B2 move both Station 1 and Station 2. All scenarios include a fourth station added in the future at Cottonwood Road and West Babcock Street, except scenario B2, which includes a fourth station in the 2950 to 3000 block of Huffine Lane.

Results – Workload

Initially the scenarios were evaluated using 2016 call data. In this phase, the scenarios were evaluated without the fourth station. Figure 3-5 shows the distribution of calls in 2016.

FIGURE 3-5: 2016 Call Distribution



Note: Grid cells are 0.14 sq. mi. each.

Table 3-5 shows the percentage of runs and hours actively engaged on calls that each station would handle based on number of units dispatched to calls and which station was first, second, and third closest to each call. Runs and workload for the Battalion Chief are not included. The analysis assumes the brush units, hazmat unit, and medic stay in their current stations. The analysis also assumes the current relationship (two-tiered response) with AMR remains in place and unchanged.

TABLE 3-5: Workload Distribution by Station

Scenario	Runs (Percent of Total)			Time Active on Calls (Percent of Total)		
	Station 1	Station 2	Station 3	Station 1	Station 2	Station 3
Current/C2	41	32	26	40	30	30
A1	45	24	31	43	23	34
A2	37	31	31	35	30	35
B1	47	21	32	44	20	36
B2	34	31	35	32	29	39
C1	33	40	27	32	37	31

Note: Scenario C2 is the current configuration with a fourth station added later.

Relocating Station 2 without relocating Station 1 (scenarios A1 and B1) results in a greater disparity in workload distribution then currently exists. Relocating Station 1 without relocating Station 2 (scenario C1) shifts the existing disparity from Station 1 to Station 2. Relocating Station 1 and Station 2 (scenarios A2 and B2) result in a fairly even distribution of work among the three stations.

Results – Response Times

Travel times from each station to each call were calculated and used to generate average and 90th percentile travel times in two ways. The first method assumes a unit always responds from the closest station. The second method calculates how often in 2016 the first unit to arrive at a call was from the closest, second closest, and third closest station. Those ratios were then used to randomly select calls and the travel times for the first, second, or third closest stations. The simulation was run multiple times for each scenario and averaged.

TABLE 3-6: Average and 90th Percentile Response Times

	Average		90th Percentile	
Scenario	**Method 1**	**Method 2**	**Method 1**	**Method 2**
Current/C2	3.0	3.6	5.1	6.6
A1	3.1	3.9	4.9	6.8
A2	3.4	4.1	5.1	7.0
B1	3.2	3.9	5.2	6.7
B2	3.5	4.1	5.4	6.8
C1	3.2	3.8	5.5	6.9

Note: Scenario C2 is the current configuration with a fourth station added later.

Relocating any stations without adding a fourth results in an increase in response times of from 0.1 to 0.5 minutes (6 to 30 seconds). Moving Station 1 north and moving Station 2 south (scenarios A2 and B2) have a slightly larger impact on response times than moving only one or the other (scenarios A1, B2, and C1). The differences, however, are small (12 to 24 seconds depending on which measure is used.)

Results – Future

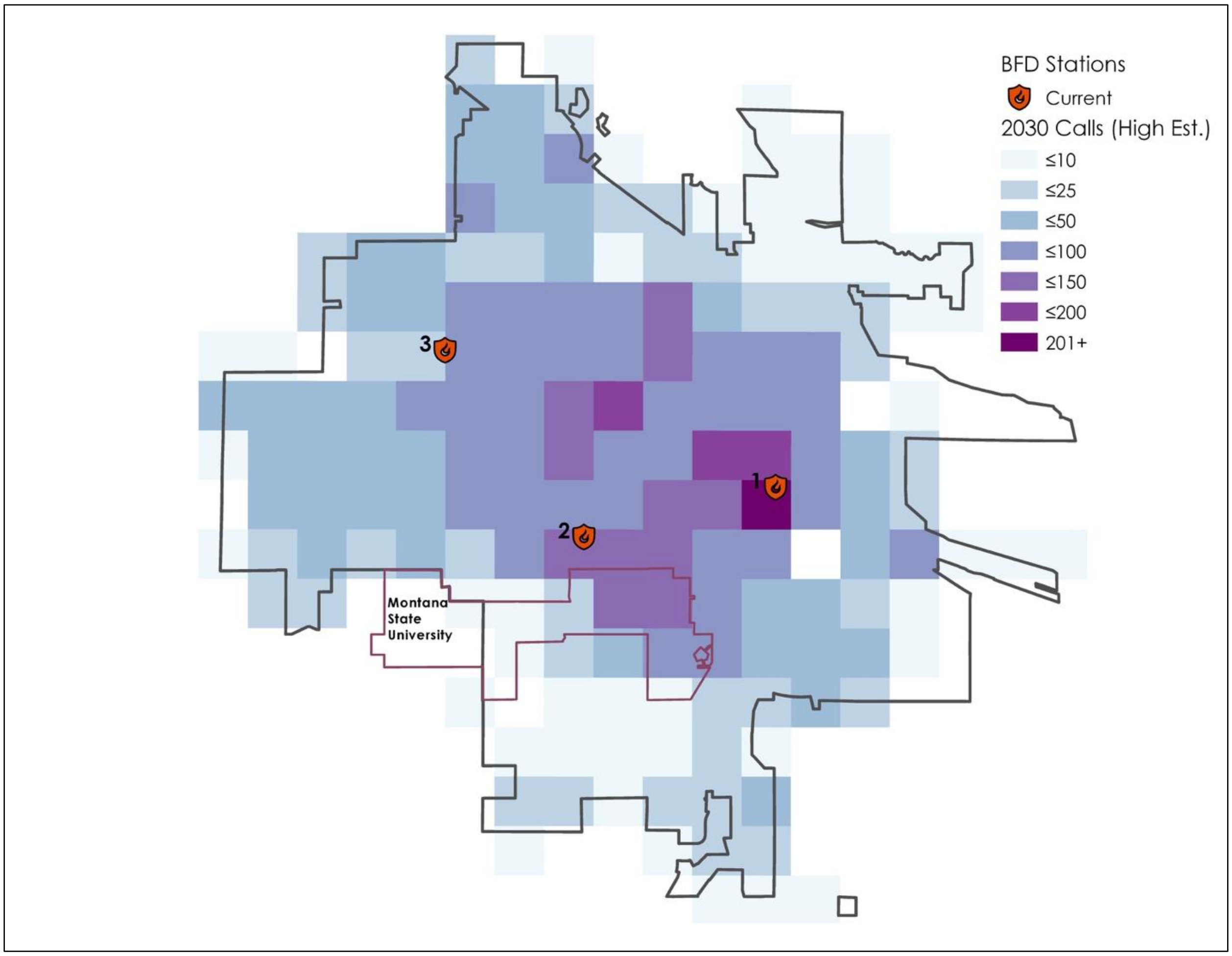
Future demand for service was estimated using past demand and population numbers and future population estimates. Demand was forecast by area using a grid made up of 0.14 sq. mi. cells and U.S. Census Block Groups. Two sets of forecasts were developed: low and high for 2020, 2025, and 2030. Estimates for future demand do not include mutual aid given to other departments.

The estimated future demand is shown in Figure 3-6 and detailed in Table 3-7 along with actual demand from 2016. For consistency and comparability, 2016 demand excludes mutual aid, including canceled mutual aid calls. Future workload estimates do not include the Battalion Chief and assume the brush and hazmat units and medic remain in their current stations. Again all scenarios assume the ongoing two-tiered response relationship with AMR.

TABLE 3-7: Future Demand and Overall Workload

Year	Calls		Runs		Work (Hours)	
	Low	High	Low	High	Low	High
2016	4,143		4,848		1,638.5	
2020	5,315	6,114	6,143	7,083	2,064.8	2,373.7
2025	5,729	6,634	6,674	7,739	2,233.8	2,583.8
2030	6,040	6,985	7,056	8,175	2,358.9	2,730.3

FIGURE 3-6: 2016 Call Distribution



Note: The methodology used to estimate demand resulted in some grid cells with lower totals in the future than in 2016. However, these calls are accounted for in the adjacent cells.

Table 3-8 shows the percentage of runs and work that each station would handle based on the average number of units dispatched to calls in each grid, average call duration by grid, and whether the station was first, second, or third closest as measured from station to center of each grid. Table 3-9 shows workload distribution with a fourth station. Results for 2020 and 2030 are given with 2025 percentages falling somewhere in between.

TABLE 3-8: Future Workload Distribution by Station – 3 Stations

2020						
	Runs %			Work %		
Scenario	Station 1	Station 2	Station 3	Station 1	Station 2	Station 3
Current/C2	42	33	24	30	33	24
A1	48	24	28	47	48	35
A2	40	30	30	25	23	40
B1	49	22	29	28	29	24
B2	40	27	33	38	39	40
C1	37	38	25	32	28	36
2030						
	Runs %			Work %		
Scenario	Station 1	Station 2	Station 3	Station 1	Station 2	Station 3
Current/C2	39	33	28	38	35	27
A1	45	23	32	44	25	31
A2	38	29	33	36	31	33
B1	46	21	33	46	22	32
B2	38	26	36	37	27	36
C1	35	37	29	33	39	28

TABLE 3-9: Future Workload Distribution by Station – 4 Stations

2020								
	Runs %				Work %			
Scenario	Station 1	Station 2	Station 3	Station 4	Station 1	Station 2	Station 3	Station 4
C2	41	32	20	7	39	34	19	7
A1	47	21	23	10	46	22	22	11
A2	39	27	24	10	37	28	24	11
B1	45	20	23	12	44	21	22	13
B2	36	20	26	19	34	21	25	21
C1	36	36	21	7	34	38	20	8
2030								
	Runs %				Work %			
Scenario	Station 1	Station 2	Station 3	Station 4	Station 1	Station 2	Station 3	Station 4
C2	38	31	23	8	37	33	22	8
A1	44	20	26	10	43	21	25	12
A2	36	26	27	11	35	27	26	12
B1	42	19	26	13	41	20	25	14
B2	33	19	29	19	32	19	28	21
C1	34	35	24	8	32	37	23	9

In the near term, Station 1 would handle a larger percentage of the overall workload than in 2016 with workload naturally becoming more evenly distributed in the future as demand begins to grow in the area west of Station 2.

To approximate future response times, we calculated the percent of estimated future calls that could be reached within four, six, and eight minutes. This was done by calculating the percent of each grid cell that could be reached and multiplying the estimated future demand by that percentage. The results are shown in Table 3-10. The methodology that was used means the percentage of calls reached remains the same regardless of the number of calls, and thus is the same for all three low and high estimates.

Figures 3-7, 3-8, and 3-9 show the difference in area covered in 4.5 minutes between the current and alternative locations for Station 1 (Figure 3-7), Station 2 (Figure 3-8), and a future Station 4 (Figure 3-9).

TABLE 3-10: Future Response Times, Percent of Calls Reached

3 Stations			
Scenario	**4 min**	**6 min**	**8 min**
Current	83	95	98
A1	77	96	99
A2	78	96	99
B1	73	96	99
B2	77	97	99
C1	88	96	98
4 Stations			
Scenario	**4 min**	**6 min**	**8 min**
C2	85	97	98
A1	79	97	99
A2	81	97	99
B1	75	97	99
B2	87	98	99
C1	89	97	98

FIGURE 3-7: Proposed Station 1 with 4.5 minutes Response Reach

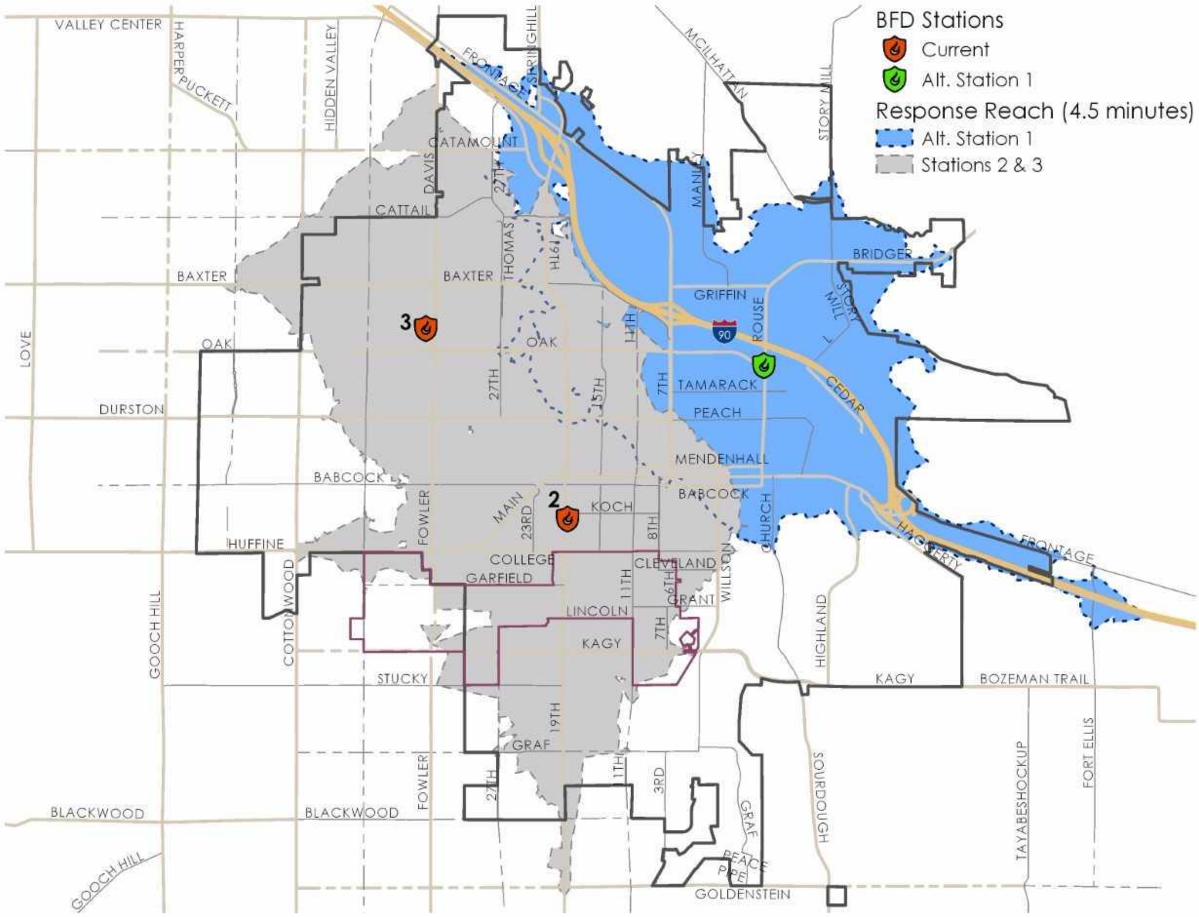


FIGURE 3-8: Proposed Station 2 Options with 4.5 minutes Response Reach

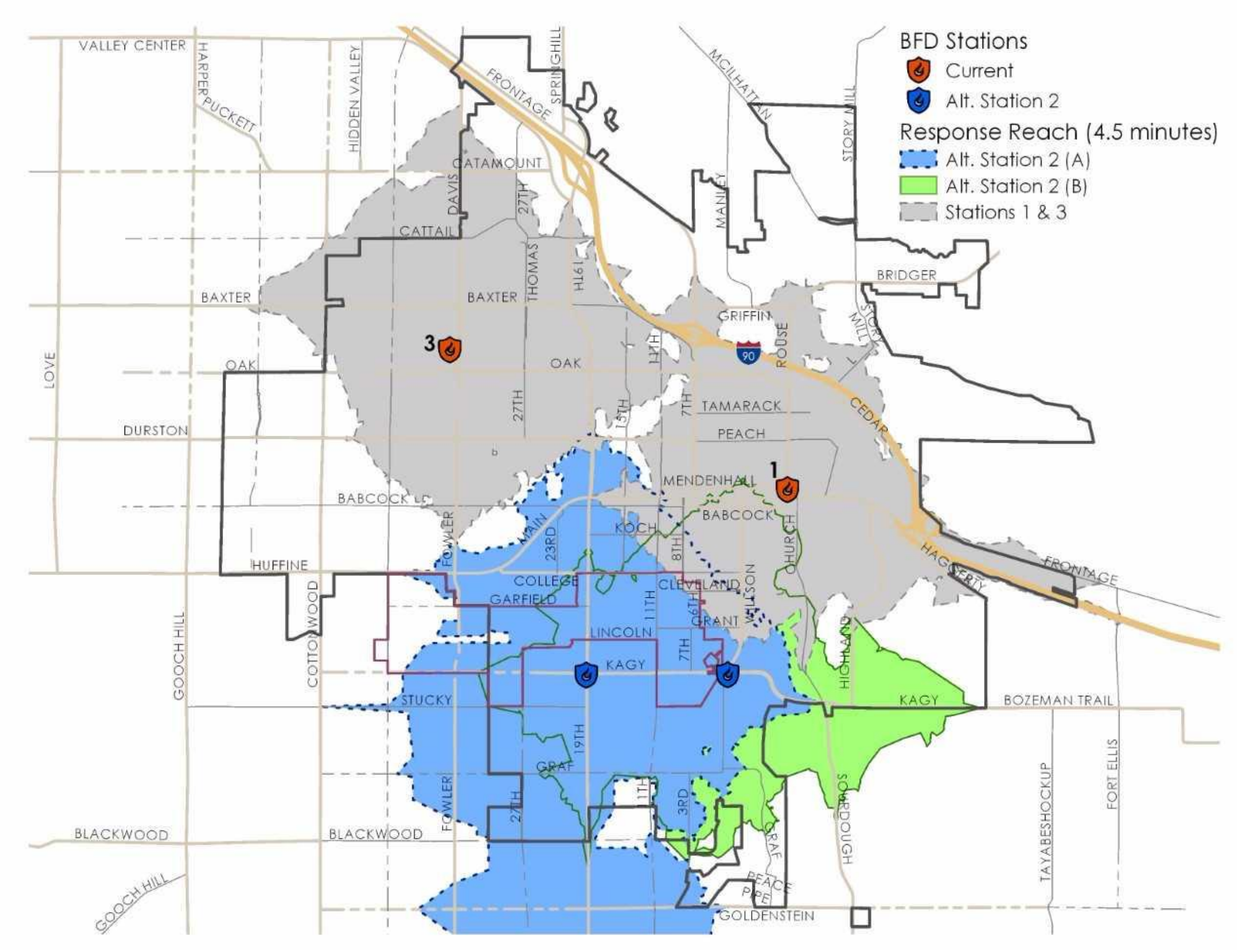
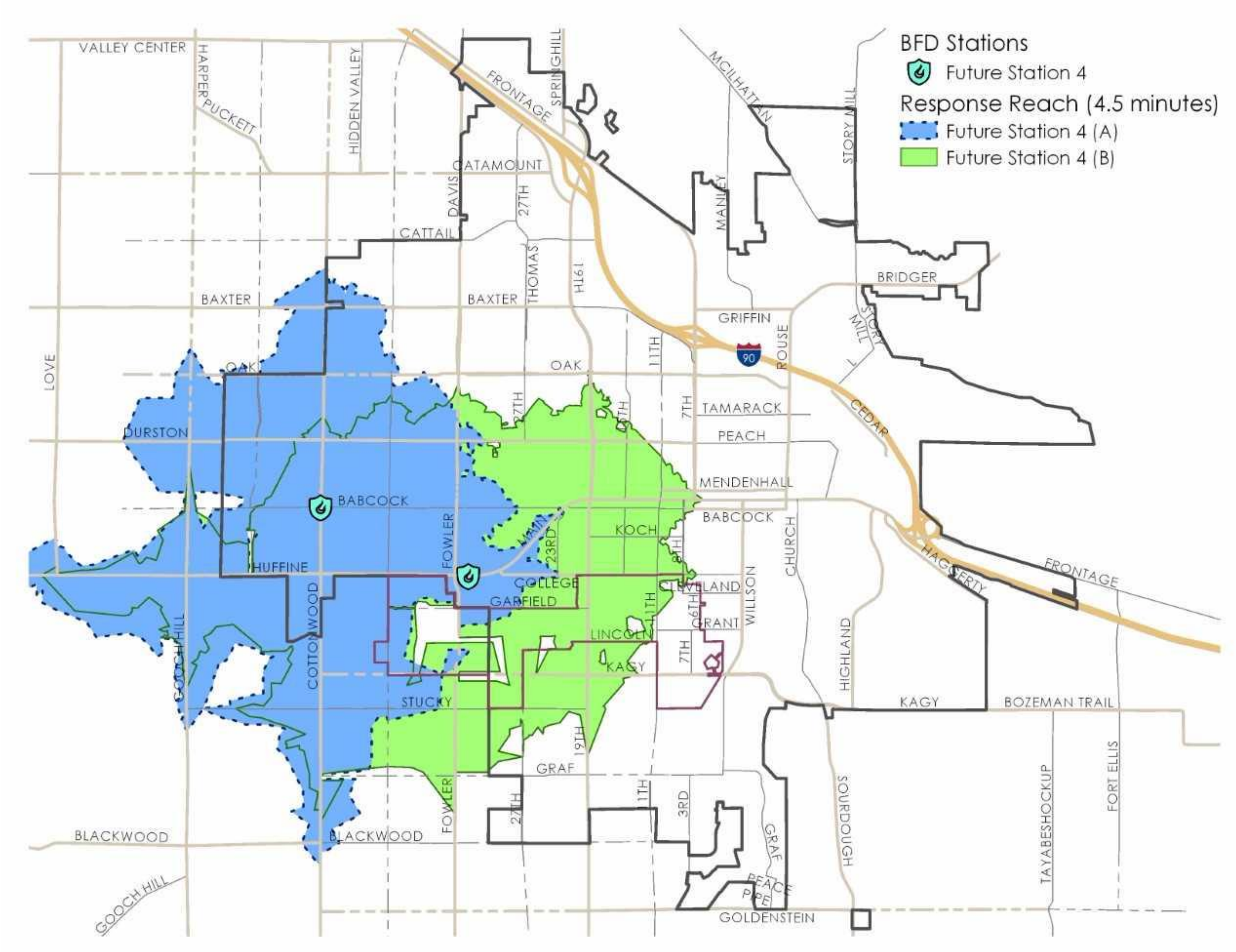


FIGURE 3-9: Future Station 4 Options with 4.5 minutes Response Reach



Conclusion

At a minimum, relocating Station 1 would provide a more even distribution of workload among stations and put more calls within four minutes of a station.

Recommendation: Relocate Station 1 north to N. Rouse Ave. and E. Oak St.

Under the high demand projections, there would be enough calls to support a fourth station by 2020; however, overall runs and time spent on calls would remain low enough for three stations to handle the anticipated call activity through 2030.

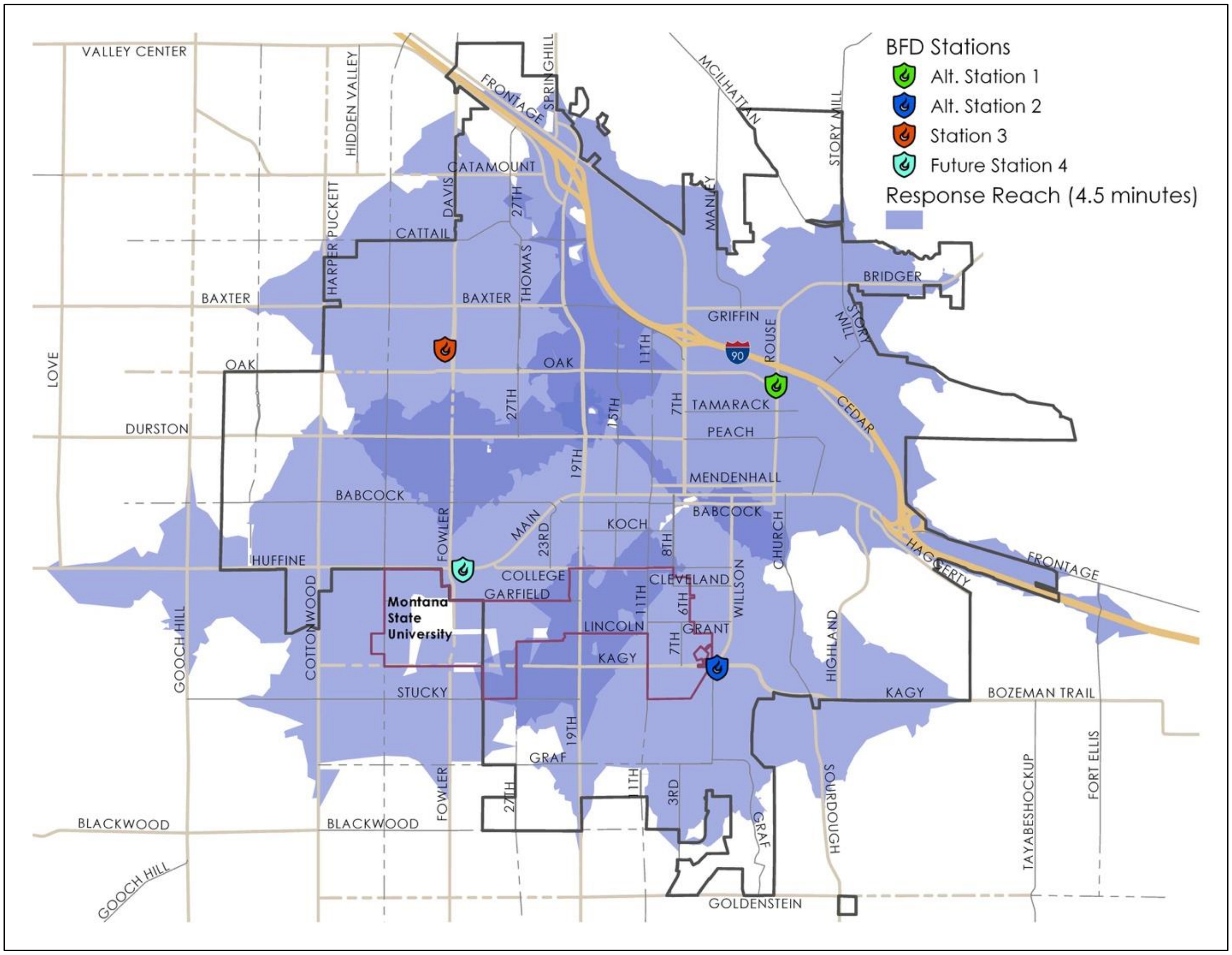
Based on this analysis, CPSM believes that once Station 1 has been relocated, it is best to gauge the timeline in which the relocation of Station 2 is needed on the basis of call activity. However, when the growth occurs and there is a corresponding increase in new call activity in the southern areas of the city, we would project the relocation of Station 2, south and east of its current location. In considering a future site for Station 2, CPSM believes that there is an opportunity to develop an expanded partnering relationship with Montana State University, including a possible co-located facility on the MSU campus.

Recommendation: The City and Montana State University should explore the option for a joint fire station-training facility on the University campus.

There are a number of cooperative ventures that can be explored in a city/MSU partnership. The university is a major generator for emergency call activity and this relationship is expected to expand as the university continues to grow. The areas adjacent to and surrounding the university are likely to be the future high-growth areas in the city. MSU is currently the host academic institution for the MSU Fire Services Training School, yet there are no fire training facilities or fire service-related courses offered on the Bozeman campus. In addition, many universities have established student response teams and emergency squads that provide initial response for on-campus incidents and this provides a viable training experience for students considering careers in emergency services. Finally, many high-tech simulation laboratories utilize emergency command and control concepts that are well-suited for advanced training at the university level.

The timeline for the construction of Station 4 should be similarly gauged by the increase in call activity within the western areas of the city. When this increased call volume is generating significant call activity and these calls are resulting in extended response times, a fourth station can be considered. Figure 3-10 is the recommend station configuration of a four-station alignment.

FIGURE 3-10: Recommended Future Station Configuration



Note: The gaps in coverage on the west side of the MSU campus and the one to the west of Cottonwood that extends north from Huffine are caused by small errors in how future roads are integrated with current roads.

APPARATUS AND FLEET MAINTENANCE

A fire department utilizes a wide range of fire apparatus, along with tools and equipment, to carry out its core mission. Apparatus generally include emergency response vehicles such as engines (pumpers), tenders/tankers (water supply vehicles), aerial apparatus, ARFF (Aircraft Rescue Fire Fighting) vehicles, heavy rescue vehicles, and ambulances. In addition, the typical fire fleet will include specialized apparatus such as brush trucks and off-road vehicles, along with water craft, trailers, portable air filling stations, scene lighting, foam units, and mass casualty supply units. Most departments also utilize a wide range of utility vehicles including command vehicles, staff vehicles, and maintenance trucks.

The mission, duties, demographics, geography, and construction features within the community all play a major role in the makeup of the apparatus and equipment inventory. These factors, as well as the funding available, are taken into consideration when specifying and purchasing apparatus and equipment. At the same time, every effort should be made to make new apparatus as versatile and multifunctional as possible.

The Bozeman Fire Department has a comprehensive inventory of apparatus and other vehicles. The department has two frontline engines and two reserve engines, one ladder truck, and two medic units. In addition, the department has two brush units, a hazardous material tractor and trailer, and a number of command and support vehicles.

Based on our review of the department fleet, it is CPSM's belief that the department is currently well-equipped to meet the types of emergency situations that it is likely to encounter. The age of the reserve apparatus is well within the standard and the number and type of reserve units appear to be suitable for the size of the operational fleet.

TABLE 3-11: Bozeman Apparatus Inventory

	Assignment	Type	Manufacturer	Year	Age
E-1	Station 1	Engine	Sutphen	2011	7yrs.
E-2	Station 2	Engine	Sutphen	2010	8 yrs.
T-3	Station 3	Ladder	Sutphen	2014	4 yrs.
E-3	Reserve	Engine	Pierce	2004	14 yrs.
H-1	Station 3	Haz Mat Tractor	Freightliner	2011	7 yrs.
BC-1	Station 1	BC/Command	Chevy Suburban	2001	17 yrs.
B-1	Station 1	Brush Truck	Ford Truck	1993	24 yrs.
B-2	Station 3	Brush Truck	Ford F-550	2004	14 yrs.
F-1	Fire Chief	Command	Ford Interceptor	2016	1 yr.
F-2	Ops Chief	Command	Chevy Tahoe	2000	18 yrs.
F-3	Fire Marshal	Command	Chevy Suburban	2002	16 yrs.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2016 edition, serves as a guide in the design of fire apparatus. The document is updated every five years using input from the public/stakeholders through a formal review process. The committee membership is made up of representatives from the fire service, manufacturers, consultants, and special interest groups. The committee monitors various issues and problems that occur with fire apparatus and attempts to develop standards that address those issues. A primary interest of the committee over the past years has been improving firefighter safety and reducing fire apparatus accidents.

The Annex Material in NFPA 1901 contains recommendations and work sheets to assist in decision making in vehicle replacement. With respect to recommended vehicle service life, the following excerpt is noteworthy:

> *"It is recommended that apparatus greater than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status and upgraded in accordance with NFPA 1912, Standard for Fire Apparatus Refurbishing, to incorporate as many features as possible of the current fire apparatus standard. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many improvements and upgrades required by the recent versions of the standards are available to the firefighters who use the apparatus."*[13]

[13] NFPA 1901, *Standard for Automotive Fire Apparatus*, 2016 Edition. Quincy, MA.

The standard goes on to state: *"Apparatus that were not manufactured to the applicable apparatus standards or that are over 25 years old should be replaced."*[14]

In a 2004 survey of 360 fire departments in urban, suburban, and rural settings across the nation, Pierce Manufacturing reported on the average life expectancy for fire pumpers.[15] The results are shown in Table 3-12.

TABLE 3-12: Fire Pumper Life Expectancy by Type of Jurisdiction

Demographic	First-Line Service	Annual Miles Driven	Reserve Status	Total Years of Service
Urban	15 Years	7,629	10 Years	25
Suburban	16 Years	4,992	11 Years	27
Rural	18 years	3,034	14 Years	32

Note: Survey information was developed by Added Value Inc. for Pierce Manufacturing in, "Fire Apparatus Duty Cycle White Paper," Fire Apparatus Manufacturer's Association (FAMA), August 2004.

The Bozeman Fire Department utilizes a replacement schedule that is based primarily on years of service (12 years or an odometer reading of 120,000 miles). Apparatus records, including the cost of repairs, frequency of break-downs, the absence of needed safety features, etc., are not typically considered in the prioritization for apparatus replacement. CPSM believes that a replacement schedule that looks at a number of key factors in assessing fire apparatus replacement schedules is most appropriate.

> ***Recommendation: The city should adopt a fire apparatus replacement schedule that includes an evaluation process that takes into account vehicle age, miles/hours of usage, maintenance records, and historical repair costs.***

The department should monitor apparatus performance, the cumulative cost of repairs, out-of-service time, frequency of breakdowns, and a host of performance-related issues to develop a scoring process that identifies the priority of replacement. Bozeman, unlike many communities which we have observed, has established a formal fire apparatus and capital equipment replacement fund. This fund utilizes a four-mill annual appropriation that is anticipated to generate an estimated $350,000 in FY-17. In FY-17 the total amount available in this fund is just over $1 million. The fund increases annually on the basis of the four-mill levy and the city's valuation. CPSM recognizes the establishment of the Fire Equipment and Capital Replacement Fund as a ***Best Practice***.

Capital Equipment

Fire apparatus are equipped with various types of tools and equipment that are utilized in providing fire and EMS services. Many of the tools and much of the equipment carried on fire apparatus are specified in NFPA and ISO guidelines. Fire and EMS equipment includes such items as hose, couplings, nozzles, various types of ladders, foam, scene lighting, oxygen tanks, AEDs, defibrillators, stretchers, small hand tools, fire extinguishers, mobile and portable radios, salvage covers, and medical equipment and supplies. Many of the small tools and equipment are considered disposable items and are replaced with ongoing operating funds. However, some

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[14] NFPA 1901, *Standard for Automotive Fire Apparatus*, 2016 Edition. Quincy, MA.
[15] Fire Apparatus Duty Cycle White Paper, Fire Apparatus Manufacturer's Association. August 2004.

pieces of equipment are very expensive, and thus require planning for their useful life and replacement. The more expensive capital items include:

- Self-contained breathing apparatus (SCBA) and fill stations.
- Firefighting PPE (personal protective equipment).
- Hydraulic/pneumatic extrication equipment.
- ECG Monitors/Defibrillators/AEDs.
- Ambulance stretchers.
- Thermal imaging cameras.
- Mobile/portable and base radios.
- Mobile data computers.
- Gas monitoring and detection devices.
- Watercraft/boats/outboard motors.

Much of the more expensive capital equipment is generally on a ten-year replacement cycle. The total cost of outfitting a department the size of the BFD for the capital items described is estimated to be in excess of $1 million; subsequently CPSM estimates that the annual replacement needs for these types of capital items is approximately $80,000 to $100,000.

The current fleet of first-line engines and aerial apparatus has a replacement value of more than $2.2 million in 2017 dollars ($600,000 per engine and $1 million for the ladder). A straight-line calculation utilizing the expected service life of the two apparatus types would indicate a need to earmark $150,000 annually for apparatus replacement. The fleet replacement fund is also utilized to replace the department's fire apparatus and capital equipment. This fund is also the primary funding source for new fire station construction, station renovations, and remodeling. ***Subsequently it appears that the Fire Equipment and Capital Replacement Fund is sufficient in meeting the anticipated cost of the organizations vehicle and capital equipment. However, when the costs for fire station renovations or replacement are included as expenditures from this fund, CPSM believes that the fund will be insufficient in meeting these combined costs.***

Fleet Maintenance

BFD utilizes an outside commercial vendor for repair and maintenance of is fire apparatus, staff vehicles, small engines, and power tools. The city's fleet maintenance services is unable to provide services to the larger fire apparatus nor does it maintain the number and types of mechanical staff needed to work on this type of equipment. The Fire Chief estimates that the annual repair and maintenance costs for fleet services is less than $35,000, with the bulk of these costs (approximately $20,000) being attributable to automotive parts. There were some concerns expressed regarding the level of preventive maintenance that was being carried out and the recordkeeping effort regarding these apparatus. BFD is fortunate to have a quality automotive mechanical service company in the city and the general sentiment that was provided to CPSM was that the quality of the repair work, the timeliness for these repairs, and the cost for these services were very satisfactory. CPSM does not believe that it would be beneficial at this time to change or alter the method in which fleet repair services are currently provided for the Bozeman Fire Department.

The proper recordkeeping regarding apparatus repair, service hours, out-of-service times, and service-related costs is not being managed as effectively as needed. Having a comprehensive chronological tracking of repair cost and preventive maintenance scheduling is essential in maintaining the viability of the city's fire fleet. This information is also critical for developing an appropriate apparatus replacement schedule. CPSM believes that this duty should be assigned to an existing Driver Engineer as a project management duty.

> ***Recommendation: BFD should consider the assignment of vehicle apparatus maintenance and recordkeeping to an existing Driver Engineer as a project management assignment.***

Radio Interoperability and Coverage

In general, interoperability refers to seamless radio communications between emergency responders using different communication systems or products. Wireless communication interoperability is the specific ability of emergency responders to use voice and data communication in real time, without delay. For example, police, fire, and emergency medical services responding to an incident are interoperable when they can all communicate with one another over their individual and perhaps shared communication channels. Interoperability makes it possible for first responders from any jurisdiction to communicate with one another at larger incidents and allows for emergency planners and personnel to coordinate their radio operations in advance of major events.[16]

The Bozeman Fire Department is transitioning its current VHF radio system to an 800MHz, trunked system. This migration, though difficult, will ultimately enhance the interoperability of the system and provide an expanded ability to utilize the latest technology in information transfer, coverage, and interoperability with law enforcement EMS and surrounding jurisdictions. There will be some limited patching requirements for mutual aid responses but these should not be problematic.

[16] SAFECOM, U.S. Department of Homeland Security, "Interoperability," http://www.safecomprogram.gov/SAFECOM/interoperability/default.htm.

SECTION 4. ANALYSIS OF PLANNING APPROACHES

FIRE RISK ANALYSIS

The cost of providing fire and EMS protection in many communities has increased steadily in recent years. This has been fueled in part by rising wages, additional special pay, and escalating overtime costs. In addition, funding requirements have been compounded by increasing health insurance premiums and spiraling pension contributions. At the same time the workforce has become less productive, largely because of the increases in lost time, specifically vacation leave, greater usage of sick leave, Kelly days and increases in other miscellaneous lost time categories (workers' compensation, light duty, FMLA, holiday leave, training leave, etc.). As a result, many jurisdictions are asking the fundamental question of whether the level of risk in their jurisdiction is commensurate with the type of protective force that is being deployed. To this end, a fire risk and hazard analysis can be helpful in providing a more objective assessment of a community's level of risk.

A fire risk analysis utilizes a "fire risk score," which is a rating of an individual property on the basis of several factors, including;

- Needed fire flow if a fire were to occur.
- Probability of an occurrence based on historical events.
- The consequence of an incident in that occupancy (to both occupants and responders).
- The cumulative effect of these occupancies and their concentration in the community.

The community risk and vulnerability assessment evaluates community properties and assigns an associated risk as either a high, medium, or low hazard. The NFPA *Fire Protection Handbook* defines these hazards as:

> **High-hazard occupancies:** Schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings, and other high life-hazard or large fire-potential occupancies.
>
> **Medium-hazard occupancies:** Apartments, offices, and mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces.
>
> **Low-hazard occupancies:** One-, two-, or three-family dwellings and scattered small business and industrial occupancies. [17]

Plotting the rated properties on a map will provide a better understanding of how the response matrix and staffing patterns can be used to ensure a higher concentration of resources for worse-case scenarios or, conversely, fewer resources for lower levels of risk.[18]

Hazard Analysis and Community Risk Assessment

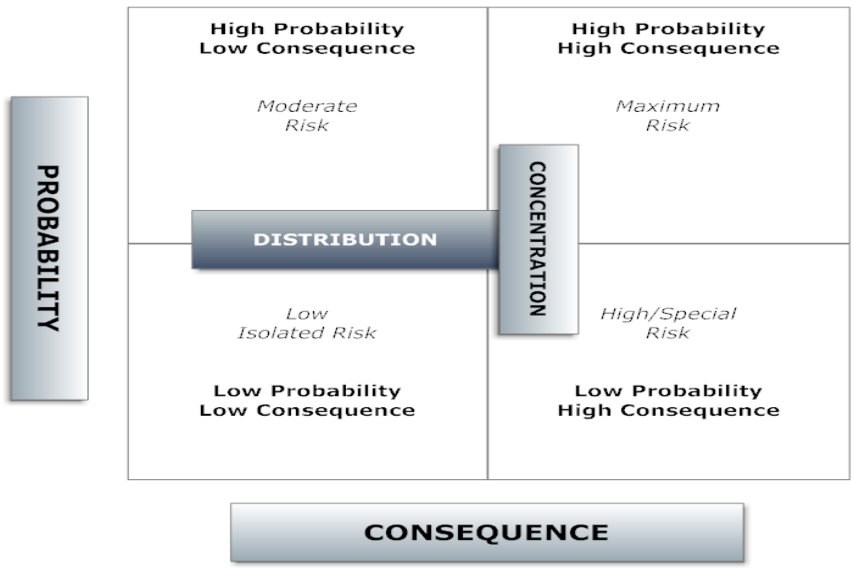
Hazard analysis and community risk assessment are essential elements in a fire department's planning process. The City of Bozeman and the BFD have recognized the need for a

[17] Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: NFPA 2008), 12.
[18] *Fire and Emergency Service Self-Assessment Manual,* Eighth Edition, (Center for Public Safety Excellence, 2009), 49.

comprehensive community risk and vulnerability assessment and are working diligently in pursuing this outcome to assist in defining the optimum arrangement in deploying department resources. Each jurisdiction should decide what degree of risk is acceptable to the citizens it serves. This determination is based on criteria that have been developed to define the levels of risk (e.g., of fire) within all sections of the community.[19] To this end, a comprehensive planning approach that includes a fire risk assessment and hazard analysis is essential in determining local needs.

The term *integrated risk management* refers to a planning methodology that recognizes that citizen safety, the protection of property, and the protection of the environment from fire and related causes must include provisions for the reasonable safety of emergency responders. This means assessing the risk faced, taking preventive action, and deploying the proper resources in the right place at the right time.[20] Figure 4-1 presents the two main considerations of a risk assessment: the probability of an event occurring and the consequence of that event occurring. The matrix in the figure divides the risk assessment into four quadrants. Each quadrant of the chart creates different requirements in the community for commitment of resources.

FIGURE 4-1: Community Risk Matrix



The Bozeman Fire Department has recently purchased and begun using the VISION Records Management System. VISION includes as a part of its platform the ability to analyze and categorize a community's risks. VISION generates an Occupancy Vulnerability Assessment Profile (OVAP) that identifies and categorizes building risk based on type of construction, event history, life safety, water demand, fire load, and value. VISION can be used to map the city's hydrant locations and identify the nearest hydrant as well as that hydrant's fire flow to calculate an OVAP risk score for each building.

In a citywide risk assessment, VISION can be used in combination with CAD data (calls for emergency service and response times), the fire department's existing deployment, and hydrant locations to analyze the distribution and concentration of a community's risks and can

[19] Compton and Granito, *Managing Fire and Rescue Services*, 39.
[20] National Fire Protection Association, *Fire Protection Handbook* (2008 Edition), 12-3.

graphically highlight response capabilities. VISION has the capability to generate a Standard of Response Coverage analysis, which is a requirement for fire department accreditation.

As part of the Master Planning process, CPSM provided assistance in the completion of a community risk assessment. A template was developed and presented to BFD for consideration in completing this process. This Template is presented in Table 4-2.

TABLE 4-1: Community Risk Assessment Template

CPSM Template for
Community Risk Assessment

- TASK 1: Establish a Risk Assessment Team
  - 5 to 6 members w/assorted skills
  - Team leader
  - Data analyst
  - Tactical/command expertise
  - City planning/growth management
  - Financial/economic
  - GIS/mapping

- TASK 2: Review and Plot Historical Workload (5 Years)
  - Breakout daily call distribution by type
    - Location/occupancy type
    - High volume/frequent use
      - Hospital
      - University
      - Adult living center
  - ID high-dollar fire loss events (>$25K)
    - Location/occupancy type
    - Cause & origin/demographic
  - ID high-manpower events (>20 people)
  - ID high time duration events (>2 hours)
  - ID events with significant economic impact (>$1 million)
  - ID events with multiple injuries or fatalities
  - ID events with significant environmental impacts (required remediation)

- TASK 3: Identify the Community Risks for High-profile Events
  - Transportation accidents (rail, air, roadway, port)
  - Occupancies with high OVAP scores
  - Wildfire events
  - Large, complex fire (dormitory, assisted living, jail, hospital, etc.)
  - Processing or manufacturing accident (chemical, radiologic, petroleum, electrical, etc.)
  - Mass casualty incident
  - Weather, flooding, or seismic event
  - Terrorist event
  - Driven by a community profile or demographic

➢ TASK 4: Identify Capacity Issues or Incidents in which Insufficient Resources Resulted in a Negative Outcome
- Related to daily activities
- Related to larger/significant events
- Related to incidents requiring the utilization of mutual aid or external resources
- Other incident types

➢ TASK 5: Identify Additional Service Demands Related to Anticipated Growth of the Service Area
- Affecting daily activities
- Related to larger/significant events
- Incidents that required specialized services or an currently unavailable expertise

➢ TASK 6: Identify Risk Reduction or Prevention Efforts that can Reduce or Eliminate Future Workload
- Related to daily activities
- Related to larger/significant events
- Related to new demand resulting from growth
- Develop cost/outcome analysis

➢ TASK 7: Identify Additional Training Needs to Better Manage Current or Anticipated Service Demand
- Develop cost/outcome analysis

➢ TASK 8: Identify Organizational or Tactical Capabilities Needed to Meet Current Shortfalls
- Develop cost/outcome analysis

Recommendation: Continue to use the VISION product to conduct a community risk assessment and analyze/utilize the results in the planning of fire station locations, apparatus needs, and staffing requirements.

In addition to examining risks faced by the community at large, the department needs to examine internal risks. The National Fire Protection Association's *Standard for a Fire Department Occupational Safety and Health Program* (NFPA 1500) requires a risk management plan for fire departments to be developed separately from those that are incorporated in the local government plan.[21] The Bozeman Fire Department does not have a written internal risk management program in place.

A fire department risk management plan is developed and implemented to comply with the requirements of NFPA 1500. The following components must be included in the risk management plan (see Figure 4-2):

Risk identification: Actual or potential hazards.

[21] Robert C. Barr and John M. Eversole, eds., *The Fire Chief's Handbook, 6th edition* (PennWell Books, 2003), 270.

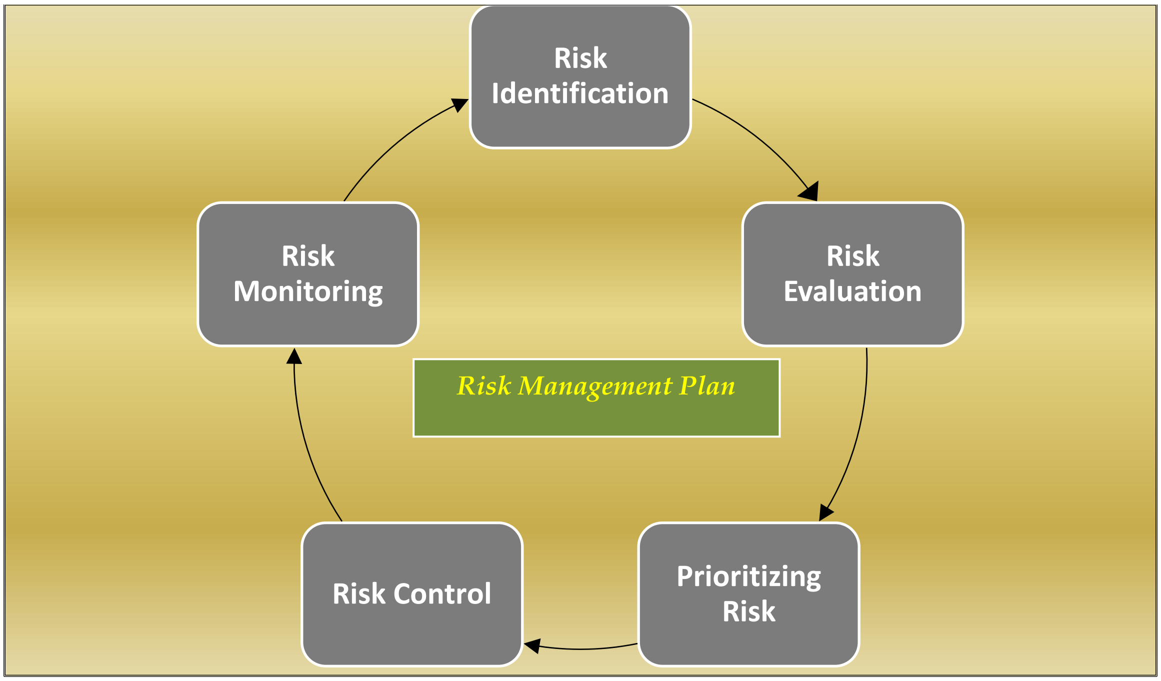
Risk evaluation: The potential of occurrence of a given hazard and the severity of its consequences.

Prioritizing risk: The degree of a hazard based upon the frequency and severity of occurrence.

Risk control: Solutions for elimination or reduction of real or potential hazards by implementing an effective control measure.

Risk monitoring: Evaluation of effectiveness of risk control measures. [22]

FIGURE 4-2: Risk Management Plan Model



The risk management plan establishes a standard of safety for the daily operations of the department. This standard of safety establishes the parameters in which the department conducts activities during emergency and nonemergency operations. The intent is for all members of the department to operate within this standard or plan of safety and not to deviate from the process that is specified. The VISION platform can facilitate this process by providing a means for the department to track the certification of all fire personnel and assess compliance with NFPA 1500 and NFPA 1710. The BFD Fire Marshal's office has begun the development of a risk assessment plan using VISION.

An important part of risk management in the fire service is the fire department's prefire planning inspections of large and complex buildings in each fire station's response area. The fire department's prefire planning can have a significant impact, potentially reducing both structural fire loss and firefighter injuries. Prefire planning inspections improve firefighters' understanding of complex building layouts, stand pipe locations, and other relevant aspects of a building. It also identifies structural changes and possible code violations. These activities

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[22] NFPA 1500, *Standard for a Fire Department Occupational Safety and Health Program* (2007 ed.), Annex D.

enable better fire suppression activities on the ground and provide critical information that can help avoid injury to the personnel involved.

The BFD Fire Marshal's office has begun conducting prefire planning surveys of commercial, industrial, institutional, and other buildings. However, this effort has been hampered by the lack of accurate information available in the business licensing system. To address this shortfall, each fire company has been assigned 20 prefire planning surveys to be completed each month; the information collected will be incorporated into the business licensing database. This issue will be discussed more fully in the *Fire Prevention and Code Enforcement* section of this report.

Hazardous Materials Response

Hazardous materials spills occur with limited frequency within the City of Bozeman; there are typically fewer than 20 hazmat-related calls of varying degree each year. Transportation-related spills are the most prevalent, along with chlorine spills resulting from accidents at swimming pools or water treatment facilities. Most incidents are directly attributable to roadway incidents on the interstate highway (I-90) and several multilane highways (Highways 191, 86, 345 and I-90 Frontage, etc.) that run through portions of the City of Bozeman. Another concern in the city is the Montana Rail Link, which travels through the city and connects to the BNSF railroad.

The types of hazardous materials incidents that occur at either fixed facilities or on transportation thoroughfares in the city have been limited in scope in recent years; however, the potential for a more significant event is always present. The presence of the interstate highway and multilane highways, with an unknown quantity of hazardous materials traveling through the city on a daily basis, poses a challenge in the development of adequate mitigation measures.

Response to hazardous materials incidents are defined in the BFD Standard Operating Procedures. The City of Bozeman is compliant with OSHA, Hazardous Waste Operations and Emergency Response, 29 CFR Part 1910.120 and NFPA 472, Professional Competence of Responders to Hazardous Materials Incidents. Level I incidents can be effectively managed and mitigated by the first response personnel without a hazardous materials response team or other special unit. These incidents include:

- Spills that can be properly and effectively contained/or abated by equipment and supplies immediately accessible to the Bozeman Fire Department.
- Leaks and ruptures that can be controlled using equipment and supplies accessible to the Bozeman Fire Department.
- Fires involving toxic materials and which can be extinguished and cleaned up with resources immediately available to the Bozeman Fire Department.
- Hazardous materials incidents not requiring civilian evacuation. (Example: A small pool supply spill that can be diluted with water for cleanup).

The Bozeman Fire Department is part of a statewide response network and operates regionally as one of six Type III hazardous materials response teams. This multijurisdictional team has been operational since 1986 and receives funding for training, equipment, and supplies from both the state of Montana and Gallatin County. Each BFD responder maintains hazardous materials operations-level certification, which provides for identification of hazards and defensive operations for those situations requiring Level II and III capability. CPSM recognizes the BFD's participation in the Montana response team as a ***Best Practice***, and the current level of response capability is very appropriate for Bozeman and the surrounding community.

Target Hazards and Fire Preplanning

The process of identifying target hazards and pre-incident planning are basic preparedness efforts that have been key functions in the fire service for many years. In this process, critical structures are identified based on the risk they pose. Then, tactical considerations are established for fires or other emergencies in these structures. Consideration is given to the activities that take place (manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped, imprisoned, etc.), and other specific aspects relating to the construction of the facility or any hazardous or flammable materials that are regularly found in the building. Target hazards are those occupancies or structures that are unusually dangerous when considering the potential for loss of life or the potential for property damage. Typically, these occupancies include hospitals, nursing homes, and high-rise and other large structures. Also included are arenas and stadiums, industrial and manufacturing plants, and other buildings or large complexes.

NFPA's 1620, *Recommended Practice for Pre-Incident Planning*, identifies the need to utilize both written narrative and diagrams to depict the physical features of a building, its contents, and any built-in fire protection systems. Information collected for prefire/incident plans includes, but is certainly not limited to, data such as:

- The occupancy type.
- Floor plans/layouts.
- Building construction type and features.
- Fire protection systems (sprinkler system, standpipe systems, etc.).
- Utility locations.
- Hazards to firefighters and/or firefighting operations.
- Special conditions in the building.
- Apparatus placement plan.
- Fire flow requirements and/or water supply plan.
- Forcible entry and ventilation plan.

The information contained in pre-incident fire plans allows firefighters and officers to have a familiarity with the building/facility, its features, characteristics, operations, and hazards, thus enabling them to more effectively, efficiently, and safely conduct firefighting and other emergency operations. Pre-incident fire plans should be reviewed regularly and tested by periodic table-top exercises and on-site drills for the most critical occupancies.

The City of Bozeman is home to one hospital, Bozeman Heath. In addition, there is the Bozeman Deaconess Physical Rehabilitation Center and the Mental Health Services and Treatment Center. There are a number of senior assisted living facilities, including Bozeman Lodge, Hillcrest Assisted Living, and Highgate Senior Living. The city has several petroleum storage, LP gas, processing and fabrication companies, including Northern Oil Production, Pezoldt Petroleum, Aspen Equipment, Montana Steel Industries, Amerigas, Northern Energy, and American Welding, along with multiple big-box retail and distributing centers. In addition, the campus of Montana State University has multiple laboratory, processing areas, and multi-occupancy dormitories, classrooms, auditoriums, and arenas.

Many fire departments establish a uniform and systematic program for prefire planning for critical buildings and occupancies by fire company personnel. The purpose of the program is for fire crews to familiarize themselves with a building or business's physical layout (preplan), understand its storage and processing activities, and to review any fire suppression or notification systems and their operability. This information provides a great benefit during a response to an actual emergency. The Bozeman Fire Department is reestablishing its efforts to catalog its critical occupancies and conduct prefire planning activities on a regular basis.

Recommendation: The Bozeman Fire Department should continue its efforts to implement a prefire planning process for all target hazards and ensure these documents are stored in the onboard mobile data terminals (MDTs) for ease of accessibility by company and chief officers during a response.

The BFD recognizes the need to fully implement this process and has begun the cataloging and information gathering effort towards this end. The preplanning process is critical from both an incident planning perspective and for responder familiarization. The critical aspect in preplanning is to ensure that these plans are kept up-to-date and that all critical facilities are visited and contact is made with the building manager to generate this information exchange.

Accreditation

Accreditation is a comprehensive self-assessment and evaluation model that enables organizations to examine past, current, and future service levels. It is used to evaluate internal performance and compares this performance to industry best practices. The intent of the process is to improve service delivery.

The Center for Public Safety Excellence (CPSE) provides an extensive evaluation process, on a fee basis, to member agencies and which ultimately leads to accreditation. CPSE is governed by the Commission on Fire Accreditation International (CFAI), an 11-member commission representing a cross-section of the fire service, including fire departments, city and county management, code councils, the U.S. Department of Defense, and the International Association of Firefighters.

The CPSE Accreditation Program is built around the following key measurements:

- Determine community risk and safety needs.
- Evaluate the performance of the department.
- Establish a method for achieving continuous organizational improvement.

Local government executives face increasing pressure to "do more with less" and justify expenditures by demonstrating a direct link to improved or measured service outcomes. Particularly for emergency services, local officials need criteria to assess professional performance and efficiency.

CPSE accreditation has national recognition and is widely used throughout the fire service. The key to its success is that it allows communities to set their own standards that are reflective of their needs and a service delivery model that is specific to these needs. In addition, it is a program that is based on ongoing improvement and continuous monitoring. The CPSE accreditation model may be well-suited for Bozeman.

Recommendation: Bozeman should consider CPSE fire accreditation in the future.

BFD has indicated that a by-product of this Master Planning effort and the completion of its community risk assessement is to undertake the fire accredidation proces in the near future. CPSM believes this will be a very worthwhile effort that should be pursued.

SECTION 5. OPERATIONAL RESPONSE APPROACHES

As mentioned previously, many agencies incorporate the use of prefire plans to provide a response and tactical strategy for those more critical or complex occupancies in the community. Figures 5-1 and 5-2 illustrate the critical tasks and resources required on low-risk incidents and moderate-risk structure fires. Understanding the community's risk greatly assists fire department planning; through ongoing training these activities improve overall effectiveness and responder safety.

FIGURE 5-1: Low-Risk Response–Exterior Fire Attack

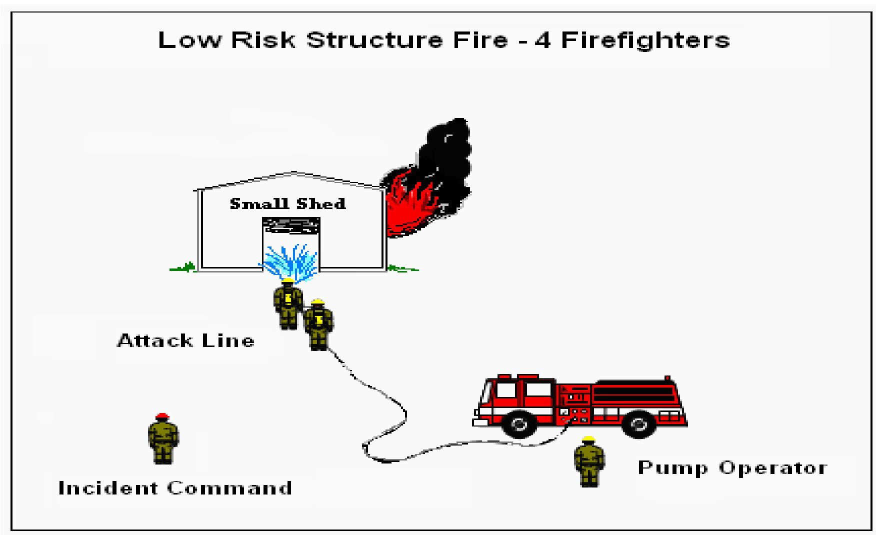
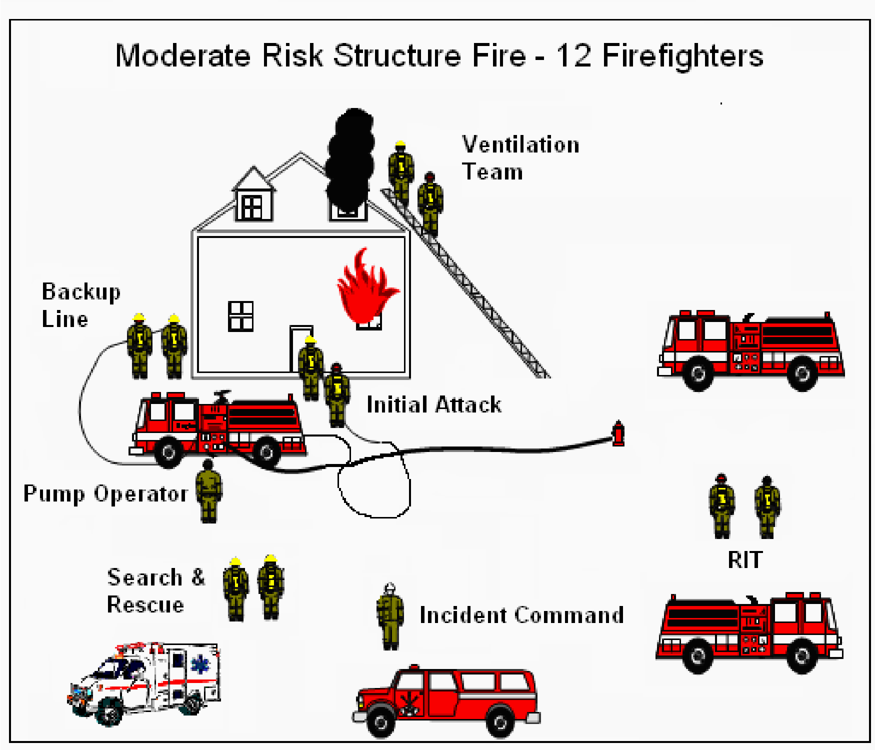


Figure 5-2 represents the critical task elements for a moderate-risk structure fire. Some jurisdictions add additional response resources to meet and in some cases exceed the national benchmarking provided by the National Fire Protection Association (NFPA) 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2014 Edition. NFPA 1710 calls for the initial assignment of 14 personnel on a single-family residential structure fire when an aerial ladder is not utilized. Bozeman is unable to assemble this complement of resources for a single-family residential structure fire from its on-duty resources. As stated earlier, the on-duty staffing level in Bozeman is ten personnel; subsequently on any reported residential structure fire or a fire at a commercial or industrial occupancy, Bozeman automatically requests the response of resources from neighboring agencies, primarily Central Valley, Hyalite, and Fort Ellis. Central Valley is a combination system, serving the City of Belgrade and neighboring communities in Gallatin County. In addition, during a working structure fire or other significant event, off-duty BFD personnel will be alerted and respond to provide additional resources. Hyalite and Fort Ellis are both fully volunteer fire departments. Hyalite is located in central Gallatin County, generally south of the City of Bozeman and Fort Ellis to the east. Though this process is automatic, because of the travel distances and the time frame to assemble response personnel, the arrival of additional units will typically be in the 15 to 20 minute time frame.

FIGURE 5-2: Moderate Risk Response–Interior Fire Attack



BOZEMAN RESPONSE PROTOCOLS

Fire Response

The ability to assemble the necessary resources to effectively manage even a smaller residential or commercial structure fire is critical. As mentioned above, the NFPA standard (NFPA 1710) recommends a minimum of 14 personnel as the initial response to a fire at single-family residential structure. An actual fire of any significance will require 14 to 17 personnel or more for extended periods of time. As the incident grows in size and complexity, it is not unusual to see staffing needs that can exceed 30 to 40 personnel. This would be the case in a fire at a big-box retail center like a Home Depot or Walmart, a wildfire, or a fire at an apartment complex. Though these larger incidents do not occur frequently, when they do occur, the ability to assemble sufficient resources rapidly can significantly impact the outcome.

The decision as to what is the proper staffing level for a specific community's protection is perhaps the most difficult assessment faced by policy makers and fire department leadership across the nation. As communities adjust this level of response, maintaining this level of readiness can have significant financial implications. CPSM believes that Bozeman is minimally staffed to manage its current workload. Though workload is not significantly high, and primarily EMS-related, the dependence on mutual aid resources is viable but should be continually evaluated to ensure its effectiveness.

> ***Recommendation: BFD should expand the effectiveness of its interagency cooperation with mutual aid partners through increased joint training activities, annual multi-agency drills, and move-up operations.***

When an actual fire occurs, many variables will impact the suppression outcomes. These variables include:

- The age and type of construction of the structure.
- The contents stored in the structure and its flammability.
- The presence of any flammable liquids, explosives, or compressed gas canisters.
- The time of detection, notification, and ultimately response of fire units.
- The presence of any built-in protection (automatic fire sprinklers) or fire detection systems.
- Weather conditions and the availability of water for extinguishment.

Subsequently, in those situations in which there are extended delays in the notification process or the fire has progressed significantly, there is actually very little that can be done to limit the extent of damage to the entire structure and its contents. In these situations suppression efforts will focus on the protection of nearby or adjacent structures with the goal being to limit the spread of the fire beyond the building of origin. This is often termed ***protecting exposures.*** When the extent of damage is extensive and the building becomes unstable, firefighting tactics typically move to what is called a ***defensive attack***, or one in which hose lines and more importantly personnel are on the outside of the structure and their focus is to merely discharge large volumes of water until the fire goes out. In these situations the ability to enter the building is very limited and if victims are trapped in the structure, there are very few safe options for making entry.

There is an active debate in the fire service about the options of interior firefighting vs. exterior firefighting. These terms are self-descriptive in that an ***interior fire attack*** is one in which firefighters enter a burning building in an attempt to find the seat of the fire and from this interior position extinguish the fire with limited amounts of water. An ***exterior fire attack*** is a tactic in which firefighters initially discharge water from the exterior of the building, either through a window or door and knock down the fire before entry in the building is made. The concept is to introduce larger volumes of water initially from the outside of the building, cool the interior temperatures and reduce the intensity of the fire before firefighters enter the building. An exterior attack is most applicable in smaller structures, typically single family, one-story detached units which are typically smaller than 2,500 square feet in total floor area.

There are a number of factors that have fueled this debate, the first and most critical of which are staffing levels. As fire departments operate with reduced levels of staffing, and this staff is arriving at the scene from greater distances, there is little option for a single fire unit with two, three, or four personnel but to conduct an exterior attack. When using an exterior attack, the requirement of having the four persons assembled on-scene prior to making entry would not apply. Recent studies by UL have evaluated the effectiveness of interior vs. exterior attacks in certain simulated fire environments. These studies have found that the exterior attack to be equally effective in these simulations.[23] This debate is deep-seated in the fire service and traditional tactical measures have always proposed an interior fire attack, specifically when there is a possibility that victims may be present in the burning structure. The long-held belief in opposition to an exterior attack is that this approach is thought to actually push the fire into areas that are not burning or where victims may be located. The counterpoint supporting the exterior attack centers on firefighter safety. The exterior attack limits firefighters from making entry into those super-heated structures that may be susceptible to collapse. BFD has recognized the importance of this tactical approach and has built the option of an exterior or

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[23] "Innovating Fire Attack Tactics", U.L.COM/News Science, Summer 2013.

transitional attack into its department SOPs and training regimens. CPSM recognizes this effort as a ***Best Practice***.

Table 5-1 shows the aggregate call totals for the 12-month period evaluated. EMS calls represent the largest percentage of calls for service at almost 60 percent. This predominance of EMS call activity is not unusual; however, the overall percentage of EMS-related calls as compared to the total number of incidents is somewhat lower than what CPSM has observed in many communities. Our experience is that EMS-related calls typically account for over 70 percent of the call activity and in some communities with a larger senior demographic may reach as high as 75 percent to 80 percent. While fire call types in Bozeman represent approximately 27 percent of all calls for service, actual fires (structural and outside) represent only 2.1 percent of the overall calls, with slightly more of the actual fires being outside or grass fires. Hazard, false alarms, good intent, and public service calls represent the largest percentage of the fire calls (92.4 percent). This is very typical in CPSM data and workload analyses of other fire departments.

TABLE 5-1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Breathing difficulty	147	0.4	3.5
Cardiac and stroke	243	0.7	5.7
Fall and injury	518	1.4	12.2
Illness and other	857	2.3	20.2
MVA	349	1.0	8.2
Overdose and psychiatric	45	0.1	1.1
Seizure and unconsciousness	390	1.1	9.2
EMS Total	**2,549**	**7.0**	**60.0**
False alarm	454	1.2	10.7
Good intent	63	0.2	1.5
Hazard	255	0.7	6.0
Outside fire	49	0.1	1.2
Public service	275	0.8	6.5
Structure fire	37	0.1	0.9
Fire Total	**1,133**	**3.1**	**26.7**
Canceled	508	1.4	12.0
Mutual aid	58	0.2	1.4
Total	**4,248**	**11.6**	**100.0**

In looking in more detail at the **37 structure fires**, it was determined that for **19** of these events, there was ***no reported fire damage***. When we looked at the time spent on structure fire incidents, we found that on 31 of the 37 structure fires and 45 of the 49 outside fires, the call duration for these incidents was 60 minutes or less. This is indicative of minor occurrences. However, six structure fire calls saw a duration of greater than one hour and three lasted for more than two hours. This would indicate more significant events.

There were 18 structure fires in which some degree of fire damage was noted in the incident report. The total fire loss (structure and contents) for all structural fires in the 12-month evaluation period was estimated to be $160,875. Fire damage estimates are done by BFD investigators.

There are a number of tools utilized by fire investigators to assist in properly assessing damage estimates.[24]

For the calls in which damage was reported (structure and contents), we estimate that the average damage for each fire was approximately $4,348. We can compare this experience to average fire loss nationwide for structure fires. NFPA estimates that in 2012 the average fire loss for a structure fire was $20,345.[25] From this perspective the average fire loss in Bozeman is much lower than the amount of loss found in many communities across the nation. Though the frequency of structure fires found was not exceptionally high, the amount of fire loss was much lower than the national average. Another indication of the fire loss evaluation is the frequency of individual events in which the combined loss exceeds $20,000. The $20,000 demarcation is relevant from two perspectives; first this is the national average for fire loss in a structure fire, and second, it indicates a fire loss that from CPSM's perspective is representative of a more significant fire event that requires fire department extinguishment. In the period evaluated, there were only three structure fires in which the combined fire loss exceeded $20,000. It is hard to fully determine the reasoning for the lower number of fires that resulted in significant fire loss. Much of this must be attributed to the quality of fire suppression skills exhibited by BFD and another factor must be the fire prevention efforts of the residents of the city and their ability to limit those factors that contribute to larger fire loss. This finding indicates that the fire experience in Bozeman is very low when compared to the national fire loss data.

Tables 5-2 and 5-3 provide an analysis of the Bozeman fire loss in the evaluation period.

TABLE 5-2: Content and Property Loss – Structure and Outside Fires

	Property Loss		Content Loss	
Call Type	**Loss Value**	**Number of Calls**	**Loss Value**	**Number of Calls**
Outside fire	$54,551	18	$18,806	9
Structure fire	$67,400	13	$93,475	15
Total	**$121,951**	**31**	**$112,281**	**24**

Note: This includes only calls with recorded loss greater than 0.

Observations:

Outside Fires

- Out of 49 outside fires, 18 had recorded property loss, with a combined $54,551 in loss.
- Nine outside fires also had content loss with a combined $18,806 in loss.
- The highest total loss for an outside fire was $40,000.

Structure Fires

- Out of 37 structure fires, 13 had recorded property loss, with a combined $67,400 in loss.
- Fifteen structure fires also had content loss with a combined $93,475 in loss.
- The average total loss for all structure fires was $4,348.
- The average total loss for structure fires with loss was $8,938.
- The highest total loss for a structure fire was $70,000.

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24 https://www.usfa.fema.gov/data/nfirs/support/nfirsgram_calculating_fireloss.html
https://www.oregon.gov/osp/SFM/docs/Data_Services/Fire_Loss_Reporting_Best_Practice.pdf

25 Michael J. Karter Jr., *Fire Loss in the United States during 2012*, NFPA September 2013, 13.

TABLE 5-3: Number of Fires with Loss Above and Below $20,000

Call Type	No Loss	Under $20,000	$20,000 plus
Outside fire	28	20	1
Structure fire	19	15	3
Total	**47**	**35**	**4**

Note: One outside fire had $1 in property loss and $1 in content loss.

Observations:

- 28 outside fires and 19 structure fires had no recorded loss.
- One outside fire and 3 structure fires had $20,000 or more in loss.

Integrated Risk Management

Fire suppression and response, although necessary to minimize property damage, have little impact on preventing fires. Rather, public fire education, fire prevention, and built-in fire protection and notification systems are essential elements in protecting citizens from death and injury due to fire. The term *integrated risk management*, first developed in the United Kingdom, refers to a planning methodology that focuses on citizen safety and the protection of property and the environment through a community-wide fire reduction effort. This is accomplished by assessing the risk faced, taking preventive action, and deploying the proper resources in the right place at the right time.[26]

An integrated risk management model uses incident data (location, construction types, population density, demographics, etc.) to assess all types of fire, health, and safety risk in the community. The model is then used to manage risk through targeted, community-based risk reduction strategies and flexible approaches to incident response (See Merseyside Fire and Rescue Service and Nanaimo Fire Rescue). It helps deploy the fire department's response and prevention resources to best meet the frequency and location of incidents. It also aids in all-hazard risk assessment, and increases the value of risk reduction efforts (such as fire prevention education for the elderly and children, the populations that are the most vulnerable to fire). Finally, the model measures the fire department services' workload, and assesses the efficiency and outcome of the delivery of each service, making adjustments as needed. In essence, integrated risk management pulls together all the different planning aspects of community hazard and vulnerability analysis, fire department risk management, resource allocation, and performance measurement into one unified, cohesive whole. ***The end product of this effort is the reduction of fire incidents.***

> ***Recommendation: BFD should develop an integrated risk management plan that focuses on structure fires throughout the community.***

During the period evaluated the frequency and magnitude of structure fires in the city were limited and do not appear to pose a significant problem nor elicit elevated concern. However, it behooves every agency to constantly monitor the frequency and types of fire in its community in an effort to recognize any trends or patterns that can then be the focus of fire prevention and code enforcement efforts. It is important that this vigil be ongoing and attempt to identify any up-tick in the occurrence of fire that merit an orchestrated response.

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[26] National Fire Protection Association, *Fire Protection Handbook* (2008 Edition), 12-3.

BFD is doing well in its handling of call activity and the management of its resources in responding to the cross-section of incidents occurring. It is important to note that in most emergency delivery systems, there are a large number of calls that are nonemergency in nature. Many of these are service-related calls in which the public utilizes emergency responders to mitigate situations that do not require an emergency response. Some of these responses are accidental or there is a perceived problem that when investigated are found to be nonemergency. Many calls, however, are public assists, in which individuals request assistance through the 911 system because they know the response will be immediate and there are typically no charges attached with these responses. It is the combined effort between the 911 dispatch center and the fire department that recognizes these occurrences and scales its response on the basis of the information at hand and the development of predetermined response procedures that reflect the different nature of the calls. Two key factors impact response activities and workload when responding to the range of citizen requests. The first is the number of units that respond to the various incident types and the second is the mode of response. BFD understands the necessity to adjust the number of units responding and its mode of response; however, the ability to properly screen calls and adjust response patterns is heavily dependent upon the ability of the 911 call center to effectively screen these calls and adjust the dispatching process accordingly.

Our assessment regarding the mode of response of BFD units is one which is in need of improvement. CPSM was unable to obtain from the most recent response data the frequency in which units are responding either hot or cold to emergency incidents. A ***"hot"*** response is when units respond with lights and sirens; in this mode they may pass red lights and stop signs, and utilize other response patterns that expedite their rate of travel. A ***"cold"*** response is when a unit responds without its lights and sirens and follows the normal flow of traffic, stopping for red lights, stop signs, etc. The ability to respond the fewest number of units and have these units respond in a "cold mode of response" results in the maximization of resources and improved responder safety. Emergency response units that are responding with lights and sirens are more susceptible to traffic accidents. Accidents involving fire vehicles responding to emergencies are the second highest cause for line-of-duty deaths of firefighters.[27] It is estimated that more than 30,000 fire apparatus are involved in accidents when responding to emergencies each year in the U.S.[28] Responding fewer units and having these units respond in a nonemergency mode makes sense in terms of safety and efficiency.

CPSM believes that BFD can improve its proficiency in the management of its mode of response to the myriad of incidents that typically occur. We have observed a number of systems nationally that, through the call screening process, have reduced the number of overall emergency responses to as low as 20 percent of their response activities. This is significant and requires improved cooperation between the fire department, the ambulance provider, and the 911 call center.

> ***Recommendation: BFD should work with the 911 dispatch center and the EMS ambulance provider in developing methodologies that improve the call screening process in order to alter response patterns when calls are determined to be minor or nonemergency.***

Both AMR and Gallatin County 911 recognize the necessity to improve the call screening process and the importance of altering response patterns on the basis of call severity. Actions

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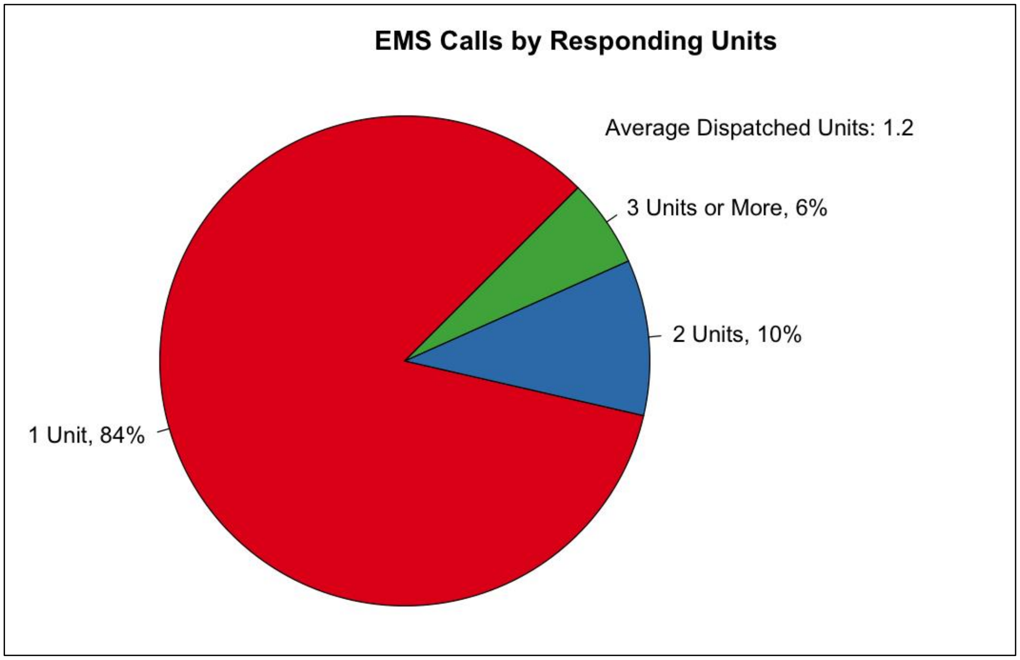
27 "Analysis of Firetruck Crashes and Associated Firefighter Injuries in the U.S." Association for the Advancement of Automotive Medicine. October 2012.
28 Ibid.

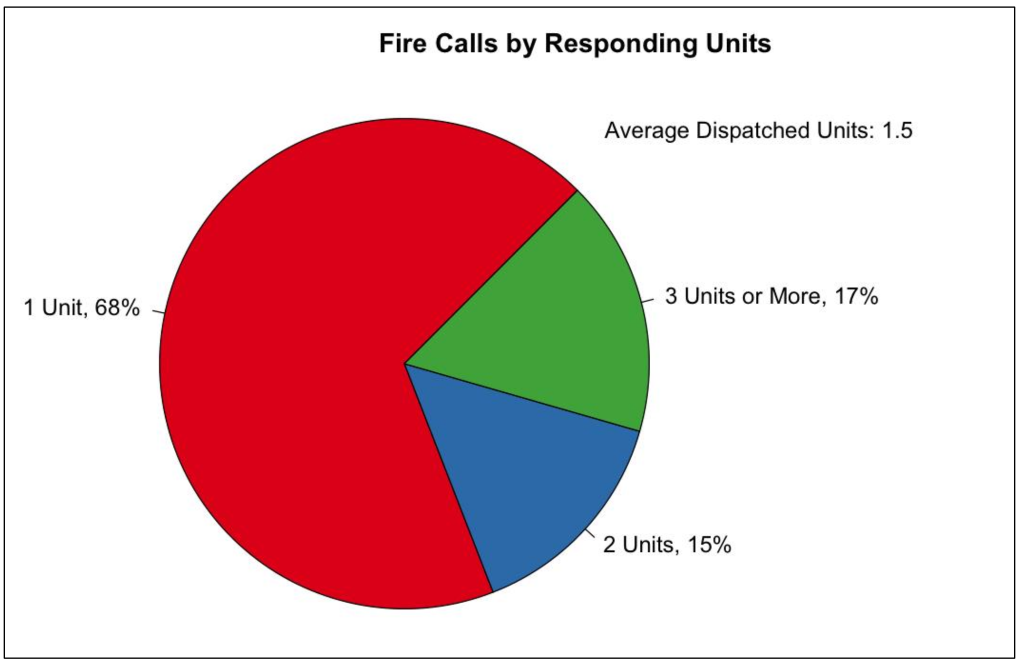
are actively being taken to improve these outcomes and CPSM believes that this effort should be continued.

> ***Recommendation: BFD should work with the 911 dispatch center to develop a monthly report that identifies the distribution of emergency and nonemergency response activities for both fire and EMS responses.***

The ability to improve outcomes is directly related to the level of reporting that is generated and the review of these findings on a regular basis. Towards this effort, the Gallatin County 911 Center has recently entered into a one-year agreement with Priority Dispatch Corporation of Salt Lake City, Utah, a very reputable distributor of EMD/call screening software systems, to review the effectiveness of the Gallatin 911 Center call screening process. This is a very commendable effort that ultimately will provide regular reporting regarding the effectiveness of the 911 center to properly screen calls and ultimately adjust response assignments on the basis of these findings.

FIGURE 5-3: Number of Units Dispatched to Calls





Note: EMS response activities include only BFD units and do not include AMR units.

TABLE 5-4: Number of Units Dispatched to Calls by Call Type

Call Type	Number of Units			Total Calls
	One	Two	Three or More	
Breathing difficulty	141	6	0	147
Cardiac and stroke	211	30	2	243
Fall and injury	486	31	1	518
Illness and other	793	56	8	857
MVA	103	112	134	349
Overdose and psychiatric	43	2	0	45
Seizure and unconsciousness	362	25	3	390
EMS Total	**2,139**	**262**	**148**	**2,549**
False alarm	267	88	99	454
Good intent	41	10	12	63
Hazard	179	38	38	255
Outside fire	28	9	12	49
Public service	255	13	7	275
Structure fire	5	8	24	37
Fire Total	**775**	**166**	**192**	**1,133**
Canceled	418	57	33	508
Mutual aid	30	24	4	58
Total	**3,362**	**509**	**377**	**4,248**
Percentage	**79.1**	**12.0**	**8.9**	**100.0**

Observations:

Overall

- On average, 1.3 units were dispatched to all calls, and for 79 percent of calls only one unit was dispatched.
- Overall, three or more units were dispatched to 9 percent of calls.

EMS

- On average, 1.2 BFD units were dispatched per EMS call.
- For EMS calls, one BFD unit was dispatched 84 percent of the time; two units were dispatched 10 percent of the time; and three or more units were dispatched 6 percent of the time.

Fires

- On average, 1.5 units were dispatched per fire call.
- For fire calls, one unit was dispatched 68 percent of the time; two units were dispatched 15 percent of the time; and three or more units were dispatched 17 percent of the time.
- For structure fire calls, three units were dispatched 19 percent of the time; four units were dispatched 32 percent of the time; five units were dispatched 11 percent of the time; and six or more units were dispatched 3 percent of the time.
- For outside fire calls, three or more units were dispatched 24 percent of the time.

EMS Response and Transport

EMS calls make up the predominant workload within the BFD system. As already mentioned, nearly 60 percent of all call activities reviewed in our analysis involve EMS responses. BFD provides EMS first response to 911 emergency calls within city limits and on limited occasions into mutual aid jurisdictions and on the MSU campus. In most cases BFD provides its first response service at the ALS (Advanced Life Support-Paramedic) level. The determinant as to whether the ALS service level is provided is dependent upon the assignment of a paramedic to that particular responding unit. At the time of the CPSM site visit, BFD employed nine certified paramedics and a tenth individual was actively enrolled in a paramedic training program. From this perspective, it is estimated that BFD operates at the ALS level on all units about 75 percent of the time. Many agencies often struggle whether to ensure that their fire EMS first response is maintained at the ALS level or if BLS (Basic Life Support) first response is more appropriate. CPSM has observed a number of ALS fire first response systems that have changed to a BLS level of response. In fact, a number of recent clinical studies have found limited impacts on patient outcomes when field services are at the BLS level vs ALS.[29] CPSM believes that the current delivery system that provides both ALS and BLS levels of care among its fire first responders is very appropriate in the Bozeman system.

BFD currently pays its fire personnel, under the terms of the current collective bargaining agreement, a $35 monthly supplement ($420 annually) for maintaining EMT-Basic certification. In addition, those with EMT-Advanced Certification receive $60 monthly ($720 annually) and Paramedics receive an additional supplement of $150 monthly ($1,800 annually). In many systems CPSM has observed, EMT-Basic is a minimum job requirement and a condition of employment. Subsequently, employees are required to possess and maintain this level of certification without added compensation. In addition, CPSM believes that the additional compensation for maintaining EMT-Advanced and Paramedic certifications is lower in the Bozeman system than what typically is paid in comparable systems.

> ***Recommendation: The city should consider a restructuring of supplemental pay for EMT-Basic, EMT-Advanced, and Paramedic in future negotiations with the IAFF Local 613.***

BFD and AMR operate in what is often termed a ***two-tier response system***. In this arrangement, the fire department is the immediate responding agency and typically arrives at the scene first and begins patient assessment and stabilization. The ambulance unit responds concurrently, but because of the distribution of ambulance resources and workload, it typically arrives after the BFD unit. The city has oversight of ambulance service licensure for services provided within the municipal jurisdiction. Under the Bozeman Municipal Code, the city requires the ambulance provider, currently AMR, to adhere to various standards and performance requirements. Currently these guidelines specify an eight-minute response time on 90 percent of all priority one responses (most critical).

BFD has entered into a supplemental agreement with AMR to provide backup ambulance and transport services in the city when AMR resources are unavailable. The fire department receives a full reimbursement for the additional personnel costs associated with these services. AMR also provides two transport-capable vehicles that are housed in city fire stations, supplies, and vehicle maintenance under this agreement. It is estimated that these backup services are required on approximately 160 occasions throughout the year. The fire department has been receiving an estimated $50,000 annually in reimbursable expenses for these backup services.

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29 https://www.amr.net/about/medicine/articles/outcomes-of-als-vs-bls.pdf, https://sjtrem.biomedcentral.com/articles/10.1186/1757-7241-18-62

Under the current backup ambulance agreement with AMR, transports carried out by the BFD medic units do not result in a patient billing for these services. As the frequency of this service expands, the amount of lost revenue to both the city and AMR can be significant. CPSM believes that options should be explored that jointly staffs a peak-period ambulance squad with AMR.

Recommendation: BFD and AMR should evaluate options for jointly staffing a peak-period ambulance squad to supplement both the city's and AMR's current deployment of resources.

CPSM believes that through a jointly staffed peak-period ambulance squad, AMR will be able to bill for transports carried out by this unit and realize additional revenues that can be used to off-set the costs of both the city and AMR for the operation of this unit. As noted earlier, the majority of response activity in the city today is predominantly EMS. CPSM anticipates this trend will continue and we also anticipate that EMS-related incidents will make up a larger proportion of the overall response activity in the future. This trend can be seen nationally by the growing impacts of more effective fire prevention activities, expanded code enforcement, and improved construction practices that combine to reduce the number of fires. In addition, like many communities Bozeman is experiencing a change in its demographics in which the population is growing older and thus more likely to utilize EMS services. This fact is compounded by the ever-evolving healthcare and medical insurance industry, prompting an increase in the frequency of residents first utilizing municipal-based emergency responders for their basic healthcare needs. The well-known nature of the 911 system and the more frequent utilization of this service to address for a full array of individual needs results in a higher utilization of the EMS first response network.

BFD is fortunate to have a very cooperative and effective working relationship with AMR. CPSM believes that this arrangement has the potential to be expanded and that additional funding can be generated through the billing of transport and inter-facility transports carried out by the BFD ambulance squad. In addition, there are also opportunities for BFD cost savings in the areas of EMS training and joint purchasing for medical equipment and pharmaceutical replacements through a cooperative arrangement with AMR.

Recommendation: BFD should pursue expanded joint training activities and cooperative purchasing agreements for medical equipment through its contractual arrangement with AMR.

Table 5-5 shows the average response time of the first arriving unit from each agency. This analysis shows that a BFD unit is first to arrive on scene 67 percent of the time and on these occasions, the BFD unit is arriving 2.2 minutes before the AMR unit. We also determined that an AMR unit arrives first on 33 percent of its responses and this arrival time is, on average, 1.8 minutes ahead of the BFD unit.

TABLE 5-5: Average Response Time of the First Arriving BFD or AMR Unit

Call Type	Arrival Order	Average Response Time			Number of Calls
		First Arriving	Second Arriving	Difference	
EMS	BFD First	6.7	8.8	2.2	1,392
	AMR First	6.9	8.7	1.8	695
	Total	**6.7**	**8.8**	**2.0**	**2,087**
Fire	BFD First	7.2	9.6	2.3	120
	AMR First	7.3	9.0	1.7	56
	Total	**7.3**	**9.4**	**2.1**	**176**
Overall	BFD First	6.7	8.9	2.2	1,512
	AMR First	6.9	8.7	1.8	751
	Total	**6.8**	**8.8**	**2.0**	**2,263**

Observations:

- BFD arrived on scene first 67 percent of the time, with an average response time of 6.7 minutes and an average arrival of 2.2 minutes before AMR.
- AMR arrived on scene first 33 percent of the time, with an average response time of 6.9 minutes and an average arrival of 1.8 minutes before BFD.
- Overall, the average response time for a unit from either BFD or AMR was 6.8 minutes.

Many fire service agencies and municipal governments struggle with the question of whether fire departments should assume EMS transport. CPSM believes there are a number key considerations that should be evaluated in making this decision. These include:

- The quality of care and reliability of services currently being provided by the private ambulance service.
- The impact of losing the added resources currently available from the private ambulance provider in dealing with mass casualty incidents and disasters.
- The additional personnel, vehicles, and equipment that would be required by the city if the fire department were to assume these added responsibilities.
- The timelines for transitioning the current ambulance contract and the timeline for hiring, procurement of resources, training, and putting the necessary organizational and supervisory oversight in place to assume transport duties.
- The anticipated revenues that would be available if the fire department assumed transport.
- State of Montana licensing requirements and the ability to equip the needed ambulance units to assume transport responsibilities within city limits.
- The added cost for billing and the responsibilities for managing accounts receivable and bank deposits.
- The political implications of ambulance collections and pursuing delinquent billings.
- The added medical and personal liability in dealing with patient transport, lost items in transport, and medical recordkeeping.

- The implications of removing municipal transport activities from the current county-wide service network and thus the county's ability to maintain service in the unincorporated areas of the county.
- How would nonemergency inter-facility transports be handled?
- The ability of the medical director to assume the additional responsibilities associated with EMS transports and any associated additional costs.
- The political implications of utilizing city resources to provide transport services outside municipal boundaries to remote hospital destinations.
- The impacts of transport duties and their receptiveness by organized labor and any additional cost implications or negotiated provisions.

Though BFD has not expressed any desire to assume EMS transport, the timing and implementation considerations for making this transition are significant. The added responsibilities and workload would require in-depth planning and preparation in order to allow a smooth transition. In addition, the rationale for making this change must be driven by the need to address a service deficit and a full understanding of the added cost expenditures that would be required to provide the level of care that is needed.

As noted earlier, the ladder truck is responding to nearly 1,100 calls each year, the majority of which are EMS-related (52 percent). The number of EMS responses being handled by the ladder and the associated wear and tear on this apparatus should cause some concern.

There is a cost benefit in utilizing smaller, more fuel-efficient vehicles for the more frequent EMS and public service call activity. In addition, the smaller units are more maneuverable and can achieve faster response times than the larger fire apparatus, especially ladder trucks. There is also a perceptional benefit in the community in responding an alternative response vehicle to EMS calls rather than larger fire apparatus. A number of communities are reexamining the deployment of ladders and fire trucks and opting instead to use an alternative response vehicle, ambulance, or squad unit (see, for example, Tualatin Valley Fire Rescue, "CARS" Program; and the Shreveport Fire Department, "SPRINT" Program). An analysis of repair costs for fire apparatus compared to lighter weight alternative response vehicle offers a striking contrast. The cost comparisons shown in Table 5-6 were utilized by the Shreveport Fire Department in helping to make its decision to initiate the Sprint program.

TABLE 5-6: Fire Apparatus vs. Small Vehicle Maintenance/Response Cost Comparison

Service	Fire Apparatus (Engine)	Alternative Response Vehicle
Oil and filter change	$175	$25.95
Set of tires	$1,800	$625
Complete brake job	$3,600	$270
Battery replacement	$429	$53.95
Alternator replacement	$1,195	$125
Windshield replacement	$2,400	$600
Fuel efficiency	3-5 MPG	15-20 MPG

CPSM believes that the percentage of EMS call activities will continue to grow and become a larger portion of the overall emergency response workload in the city. For this reason and also due to the increasing frequency in which BFD units are being called to backup AMR transport units, CPSM believes that BFD should consider the cross-staffing of its ladder truck with the AMR medic unit or some other comparable, light-weight EMS vehicle.

> ***Recommendation: BFD should move to a permanent cross-staffing model for the operation of its ladder truck with the AMR medic unit assigned to Station 3.***

BFD is currently utilizing a limited cross-staffing concept in its operation of the ladder company and the medic unit. The difference is that the medic unit is only cross-staffed when there is a transport call that AMR is unable to handle. In these situations, the crew from the ladder will move to the medic unit and respond. At that point, off-duty personnel will be called in to back-fill the ladder personnel. The above proposal is recommending that the ladder move to a permeant cross-staffing model so that the crew of Station 3 would automatically respond on the medic unit instead of the ladder, even if an AMR unit is available and responding. As a cross-staffed unit, CPSM recommends that BFD discontinue the practice of recalling a crew on an overtime basis to back-fill the ladder when the medic unit is placed into service and instead utilize these savings to fund the operation of the peak-period ambulance squad identified above.

The two-tier EMS delivery system appears very appropriate for the service demands that are currently being generated in the Bozeman area. AMR units serve both the city and much of Gallatin County. There are indications, however, that because of the frequency in which back-up services are warranted that AMR has been limiting its operational capacity in order to maintain profitability. The ongoing service viability of AMR can come into question if any of the adjacent communities or the city decides to undertake transport responsibilities within its jurisdiction. CPSM believes that the current two-tiered service model involving both BFD and AMR is the more efficient and cost-effective approach and efforts should be developed that support this public-private delivery system.

Mutual Aid/Automatic Response

Local governments use many types of intergovernmental agreements to enhance fire protection and EMS services. These arrangements take various shapes and forms and range from a simple automatic response agreement that will respond a single unit to a minor vehicle accident or EMS call, to a more complex regional hazardous materials team or a helicopter trauma service that involves multiple agencies and requires a high level of coordination. It is important that fire departments are able to quickly access extra and/or specialized resources to manage significant events. In addition, because these types of incidents do not respect jurisdictional boundaries, they often require a coordinated response. Sharing resources also helps departments reduce costs without impacting service delivery. All of these situations point to the need for good working relationships with other fire and EMS organizations.

BFD relies upon and utilizes mutual aid and automatic response with its neighboring jurisdictions regularly. According to our analysis BFD provided mutual aid on 92 incidents throughout the 12-month period evaluated. It received assistance during this time frame an estimated 73 times. BFD interacts primarily with Central Valley, Hyalite, and Fort Ellis in these arrangements. As mentioned in the response protocols section, one of these outside agencies is automatically added to the response assignment for all structure fires. In addition, BFD is part of a statewide regional hazardous materials response agreement and its team responds frequently throughout the region.

The mutual aid and automatic response arrangements utilized by Bozeman are very effective and essential in providing the needed resources during major incidents. CPSM recognizes these mutual aid and automatic response agreements as a ***Best Practice***.

Workload Analysis

The current workload that is being handled by the Bozeman Fire Department can be classified as being moderate. Overall, BFD units are responding to approximately 14 to 15 calls each day. These calls are basically evenly dispersed, with Engine 1 and 2 each handling about five calls each day and Ladder 1 (Station 3) averaging a little over three to four calls daily. The workload of each unit is reported in two ways: deployed time and runs. A dispatch of a unit is defined as a run; thus, one call might include multiple runs, as in a fire response where upwards of five to six units respond to a single incident. The deployed time of a run is from the time a unit is dispatched through the time the unit is cleared. The combined operational time that all units are active on alarm assignments on a typical 24-hour day is approximately 5.4 hours. Engine 1 is operational on alarm assignments for approximately one hour and 35 minutes each day, Engine 2 for about one hour and 39 minutes, and Ladder 1 for approximately one hour and ten minutes daily. On average, a call (both fire and EMS) takes approximately 21 to 22 minutes to complete.

Tables 5-7 and 5-8 show the annual runs, call types, and deployed time for the primary BFD response units.

TABLE 5-7: Call Workload by Unit

Station	Unit	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
1	Brush 1	30.8	1.5	0.3	3	0.0
	Engine 1	19.1	561.3	92.0	1,762	4.8
	Reserve Engine 3	18.5	18.5	3.0	60	0.2
	Total	**19.1**	**581.3**	**95.3**	**1,825**	**5.0**
2	Engine 2	19.7	589.9	96.7	1,799	4.9
	Reserve Engine 3	21.3	12.0	2.0	34	0.1
	Total	**19.7**	**602.0**	**98.7**	**1,833**	**5.0**
3	Brush 2	141.6	11.8	1.9	5	0.0
	Reserve Engine 3	20.8	17.3	2.8	50	0.1
	Ladder 1	20.9	373.4	61.2	1,074	2.9
	Hazmat	125.5	23.0	3.8	11	0.0
	Medic 1	44.3	119.5	19.6	162	0.4
	Total	**25.1**	**545.0**	**89.3**	**1,302**	**3.6**
Other	Battalion Chief 1	23.5	237.5	38.9	607	1.7

Note: Some units had such low total runs that average runs per day, when rounded to the nearest one-tenth, appears to be zero. Battalion Chief 1 moved from Station 3 to Station 1 in July 2016.

TABLE 5-8: Annual Runs and Deployed Time by Call Type

Call Type	Avg. Deployed Min. per Run	Total Annual Hours	Percent of Total Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Breathing difficulty	20.2	51.4	2.6	8.4	153	0.4
Cardiac and stroke	25.4	117.1	6.0	19.2	277	0.8
Fall and injury	21.8	200.4	10.2	32.8	551	1.5
Illness and other	21.4	331.4	16.9	54.3	929	2.5
MVA	21.0	257.0	13.1	42.1	735	2.0
Overdose and psychiatric	25.0	19.6	1.0	3.2	47	0.1
Seizure and unconsciousness	22.8	159.9	8.1	26.2	421	1.2
EMS Total	**21.9**	**1,136.8**	**57.8**	**186.4**	**3,113**	**8.5**
False alarm	15.6	194.7	9.9	31.9	749	2.0
Good intent	18.8	32.0	1.6	5.2	102	0.3
Hazard	26.0	162.1	8.2	26.6	374	1.0
Outside fire	29.3	42.0	2.1	6.9	86	0.2
Public service	21.1	106.4	5.4	17.4	303	0.8
Structure fire	39.1	75.5	3.8	12.4	116	0.3
Fire Total	**21.3**	**612.7**	**31.2**	**100.4**	**1,730**	**4.7**
Canceled	10.1	106.5	5.4	17.5	634	1.7
Mutual aid	73.2	109.8	5.6	18.0	90	0.2
Total	**21.2**	**1,965.8**	**100.0**	**322.3**	**5,567**	**15.2**

Observations:

Overall

- Total deployed time for the year was 1,966 hours. The daily average deployed time was 5.4 hours for all units combined.
- There were 5,567 runs, including 90 runs dispatched for mutual aid calls. The daily average was 15.2 runs.

EMS

- EMS calls accounted for 58 percent of the total workload.
- The average deployed time for EMS calls was 21.9 minutes. The deployed time for all units dispatched to EMS calls averaged 3.1 hours per day.

Fires

- Fire calls accounted for 31 percent of the total workload.
- There were 202 runs for structure and outside fire calls, with a total workload of 117 hours. This accounted for 6 percent of the total workload.
- The average deployed time for structure fire calls was 39.1 minutes, and the average deployed time for outside fire calls was 29.3 minutes.

When we look at the availability rates of the responding units in Bozeman the pattern observed is very positive. Many systems attempt to achieve an availability rate of between 85 and 90 percent. This means that on 85 to 90 percent of the calls, a unit is available to respond to an incident originating in its first due area. Availability rates are most often affected by simultaneous call activity, out-of-area training, vehicle maintenance, meetings, or other reasons in which a unit is temporarily unavailable to respond to a call in its primary response area. Table 5-9 shows the availability rates for the responding units in BFD. As one can see from this graphic, BFD units are readily available to respond to calls in their primary response areas. Overall BFD units have a 90.6 percent availability rate for calls occurring in their response area. Another indicator of workload is the frequency distribution of calls in the Bozeman system. Table 5-10 is a compilation of calls in Bozeman and it reveals that in most instances (approximately 98.3 percent of the time), there are two or fewer calls occurring each hour. The number of EMS calls and fire-related incidents in which only one unit is dispatched to the call would indicate that there are very few instances in which a Bozeman unit is unavailable to respond to an incident.

TABLE 5-9: First-Due Availability to Respond to Calls

Station Area	Number of Calls	Percent Responded to by First Due	Percent First Due Arrived First
1	1,773	89.3	86.9
2	1,513	91.5	90.4
3	836	91.7	87.9
Total	**4,122**	**90.6**	**88.4**

Note: The percent of calls where unit from the first-due station arrived first is based off the number of calls where at least one unit arrived on scene.

Observations:

- Overall, a unit from the first-due station was available to respond to 91 percent of calls in its area.
- Units from Station 1 were available to respond to calls in their first-due area least often (90 percent of calls) and were least likely to arrive first.
- Units from Station 3 were available to respond to calls in their first-due area most often (97 percent of calls).

TABLE 5-10: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	5,508	62.7
1	2,482	28.3
2	648	7.4
3	123	1.4
4+	23	0.3

There were a number of instances observed throughout the year in which a cluster of calls occurred within a given hour. We observed a total of 146 times (2 percent of all hours) in which three or more calls occurred in an hour. It must be pointed out, however, that given the average call duration of approximately 21 minutes for both EMS- and fire-related calls, there is a good possibility that even though multiple calls occurred in a given hour there was still a unit available to respond. However, as we expect in most systems, there were and will be instances when multiple calls do overlap and there are delays in responding to all calls. The frequency of this happening in the Bozeman system is somewhat limited and is not occurring with any level of frequency that would merit a heightened concern.

SECTION 6. RESPONSE TIME ANALYSIS

Response times are typically the primary measurement used in evaluating Fire and EMS services. Most deployment models attempt to achieve a four-minute initial travel time for EMS calls and an eight-minute, full-force travel time for fire calls. A full-force travel time indicates the time it takes for the initial response of all resources assigned for the call to arrive on the scene. Though these times have validity, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four minutes of the onset. However, cardiac arrests occur very infrequently; on average they are 1 percent to 1.5 percent of all EMS incidents.[30] There are also other EMS incidents that are truly life-threatening and the time of response can clearly impact the outcome. These involve drownings, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls are limited.

Regarding response times for fire incidents, the frequency of actual fires in Bozeman (structure and outside fires) is very low, approximately 2.1 percent of all responses. Actual structure fires were less than one percent of all calls, or 37 in the 12-month period evaluated. The criterion for fire response is based on the concept of "flashover." This is the state at which super-heated gasses from a fire in an enclosed area results in a near-simultaneous ignition of the combustible material in the area. In this situation, usually after an extended period of time (eight to twelve minutes), the fire expands rapidly and is much more difficult to contain. When the fire reaches this hazardous state, a larger and more destructive fire occurs. Figure 6-1 illustrates the flashover phenomenon and its potential for increased damage.

Another important factor in the whole response time question is what we term "detection time." This is the time it takes to detect a fire or a medical situation and notify 911 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are unavailable or inoperable, the detection process can be extended. Fires that go undetected and are allowed to expand in size become more destructive and are difficult to extinguish.

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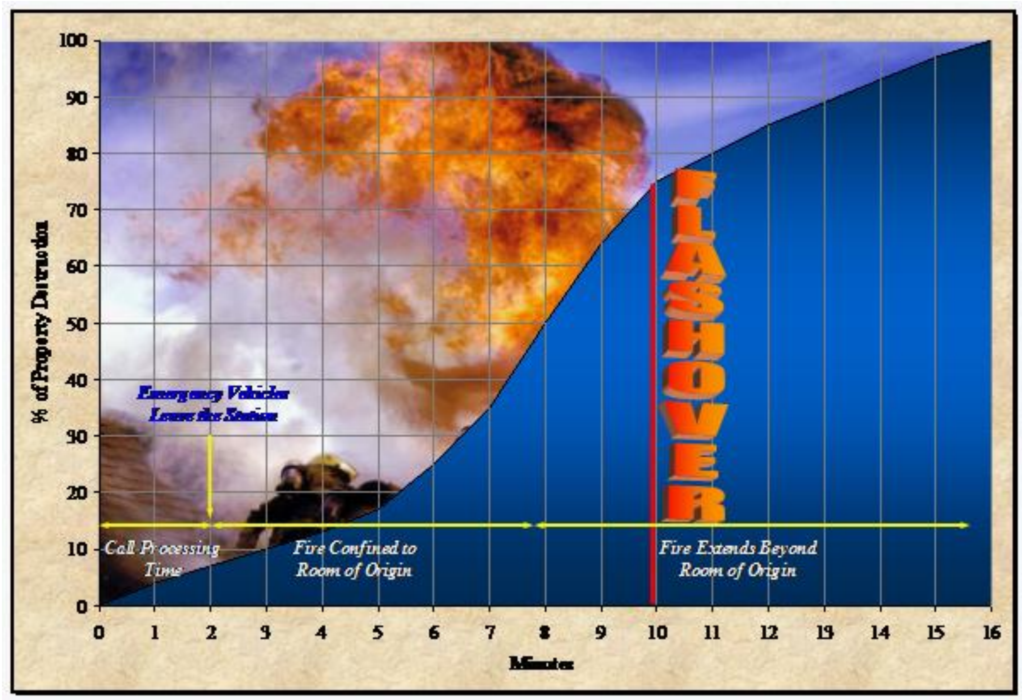
30 Myers, Slovis, Eckstein, Goodloe et al. (2007). "Evidence-based Performance Measures for Emergency Medical Services System: A Model for Expanded EMS Benchmarking." *Pre-hospital Emergency Care*.

FIGURE 6-1: Fire Propagation Curve



MEASURING RESPONSE TIMES

There have been no documented studies that have made a direct correlation between response times and outcomes in fire and EMS events. No one has been able to show that a four-minute response time is measurably more effective than a six-minute response time. The logic has been "faster is better," but this has not been substantiated by any detailed analysis. Furthermore, the ability to measure the difference in outcomes (patient saves, reduced fire damage, or some other quantifiable measure) between a six-minute, eight-minute, or ten-minute response is not a performance measure often utilized in the fire service. So, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is perceived to exist. This requires a "fire risk assessment" and a political determination as to the desired level of protection for the community. It would be imprudent, and very costly, to build a deployment strategy that is based solely upon response times.

For the purpose of this analysis, ***response time*** is a product of three components: ***dispatch time***, ***turnout time***, and ***travel time***.

- *Dispatch time* is the time interval that begins when the alarm is received at the communication center and ends when the response information is transmitted via voice or electronic means to the emergency response facility or emergency response units in the field. Dispatch time is the responsibility of the 911 center and outside the control of BFD officials.
- *Turnout time* is the time interval that begins when the notification process to emergency response facilities and emergency response begins through an audible alarm or visual announcement or both and ends at the beginning point of travel time. The fire department has the greatest control over this segment of the total response time measurement.

- *Travel time* is the time interval that initiates when the unit is en route to the call and ends when the unit arrives at the scene.
- *Response time*, also known as total response time, is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit arrives on the scene to initiate action.

BOZEMAN RESPONSE TIMES

For this study, and unless otherwise indicated, response times measure the first arriving unit only. Typically we track only those responses in which the unit is responding with lights and sirens (hot). ***In the Bozeman system we were unable to distinguish when units were running hot and when they ran cold.*** Bozeman officials were aware of this discrepancy and were taking steps in their new reporting system to rectify this occurrence. Subsequently, the response time data available for our analysis includes both emergency and nonemergency responses. We believe that the tabulation of both emergency and nonemergency responses in a combined response time calculation will likely result in an increased overall time than if only emergency call types were recorded. We also excluded from these totals any canceled calls and mutual aid responses. In addition, calls with a total response time of 30 minutes or more were also excluded as these are likely the result of reporting errors. Finally, we focused on units that had complete time stamps, that is, units with all response components recorded so as to be able to calculate each segment of response time. Based on the methodology above, there were 566 canceled and mutual aid calls, 20 non-canceled calls where no unit recorded an on-scene time, 4 calls with response times over 30 minutes, and 155 calls with missing en route or arrival times. As a result, in this section, a total of 3,503 calls are included in the analysis that took place during the 12-month period between January 1, 2016 and December 31, 2017. The average dispatch time for all calls within city corporate limits was 1.8 minutes (108 seconds). The average turnout time was 1.9 minutes (114 seconds). The average travel time was 3.9 minutes. The average response time for EMS calls in the city was 7.4 minutes. The average response time for fire category calls was 7.9 minutes. The average response time for structure fire calls was 7.4 minutes. The average response time for outside fire calls was 7.8 minutes.

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2014 Edition, the alarm processing time or dispatch time should be less than or equal to 60 seconds 90 percent of the time. This standard also states that the turnout time should be less than or equal to 80 seconds (1.33 minutes) for fire and special operations 90 percent of the time, and travel time shall be less than or equal to 240 seconds for the first arriving engine company 90 percent of the time.

TABLE 6-1: Average Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch	Turnout	Travel	Total	Number of Calls
Breathing difficulty	1.6	1.7	3.6	6.9	144
Cardiac and stroke	1.9	1.7	3.8	7.5	239
Fall and injury	1.9	1.8	3.9	7.5	502
Illness and other	1.7	1.8	3.7	7.3	829
MVA	1.9	1.9	3.7	7.6	327
Overdose and psychiatric	1.4	1.9	4.5	7.8	44
Seizure and unconsciousness	2.0	1.5	3.6	7.1	379
EMS Total	**1.8**	**1.8**	**3.8**	**7.4**	**2,464**
False alarm	1.6	2.2	3.7	7.5	414
Good intent	1.7	1.9	3.8	7.4	58
Hazard	1.6	2.1	4.3	8.1	242
Outside fire	1.8	2.2	3.8	7.8	48
Public service	1.8	1.9	4.8	8.5	243
Structure fire	1.8	2.3	3.3	7.4	34
Fire Total	**1.7**	**2.1**	**4.1**	**7.9**	**1,039**
Total	**1.8**	**1.9**	**3.9**	**7.5**	**3,503**

TABLE 6-2: Bozeman 90th Percentile Response Times, Minutes

Call Type	Dispatch	Turnout	Travel	Total	Number of Calls
Breathing difficulty	2.6	2.9	5.5	9.3	144
Cardiac and stroke	3.0	3.0	6.1	10.4	239
Fall and injury	2.9	2.8	6.5	10.6	502
Illness and other	3.0	3.1	6.2	10.7	829
MVA	3.0	3.1	6.4	10.8	327
Overdose and psychiatric	2.8	2.8	6.8	12.0	44
Seizure and unconsciousness	3.0	2.7	6.2	9.9	379
EMS Total	**2.9**	**3.0**	**6.3**	**10.4**	**2,464**
False alarm	2.5	3.2	6.2	10.3	414
Good intent	3.5	3.0	6.3	9.9	58
Hazard	2.6	3.1	7.3	11.3	242
Outside fire	3.1	3.5	6.0	11.1	48
Public service	3.0	3.1	7.8	12.0	243
Structure fire	2.7	4.0	5.5	9.3	34
Fire Total	**2.7**	**3.2**	**6.9**	**11.2**	**1,039**
Total	**2.9**	**3.1**	**6.4**	**10.7**	**3,503**

Observations:

- The average dispatch time was 1.8 minutes.
- The average turnout time was 1.9 minutes.
- The average travel time was 3.9 minutes.
- The average response time was 7.5 minutes.
- The average response time was 7.4 minutes for EMS calls and 7.9 minutes for fire calls.
- The average response time for structure fires was 7.4 minutes, and for outside fires was 7.8 minutes.
- The 90th percentile dispatch time was 2.9 minutes.
- The 90th percentile turnout time was 3.0 minutes.
- The 90th percentile travel time was 6.4 minutes.
- The 90th percentile response time was 10.7 minutes.
- The 90th percentile response time was 10.4 minutes for EMS calls and 11.2 minutes for fire calls.
- The 90th percentile response time for structure fires was 9.3 minutes, and for outside fires was 11.1 minutes.

The standard further states the initial first alarm assignment (a total of 14 personnel for a single family residential structure) should be assembled on scene in 480 seconds (8 minutes), 90 percent of the time (not including dispatch and turnout time). ***NFPA 1710 response time criterion is utilized by CPSM as a benchmark for service delivery and in the overall staffing and deployment of fire departments, and is not a CPSM recommendation.*** It is also our observation that agencies are seldom able to achieve the response time criteria established in this standard.

Dispatch and turnout times in Bozeman both on average and at the 90th percentile are high. CPSM officials were advised by BFD that it is aware of these extended times and it is attempting to implement a pre-alerting process by the dispatch center which would improve these outcomes.

> ***Recommendation: BFD should continue to work with the 911 dispatch center to implement a pre-alerting system for fire and EMS notifications.***

The ability to do a pre-alert for responding units can be extremely effective in expediting the dispatching and turnout process. CPSM was advised that the 911 center recently initiated a pre-alerting process for the Big Sky Fire Department and has the capability to implement a similar process for Bozeman.

The fire station is a critical link in service delivery and where these facilities are located is the single most important factor in determining overall response times and workload management. As noted previously, the fire department operates from three fire stations, which are located as follows:

- Station 1: 34 N. Rouse Ave.
- Station 2: 410 S. 19th Ave.
- Station 3: 1705 Vaquero Parkway

Figures 6-2, 6-3, and 6-4 illustrate these station locations along with 240-second (indicated by the green overlay), 360-second (indicated by the amber overlay), and 480-second (indicated by the red overlay) travel time benchmarks, respectively.

FIGURE 6-2: Bozeman Station Locations and Travel Distances (Green = 240 seconds)

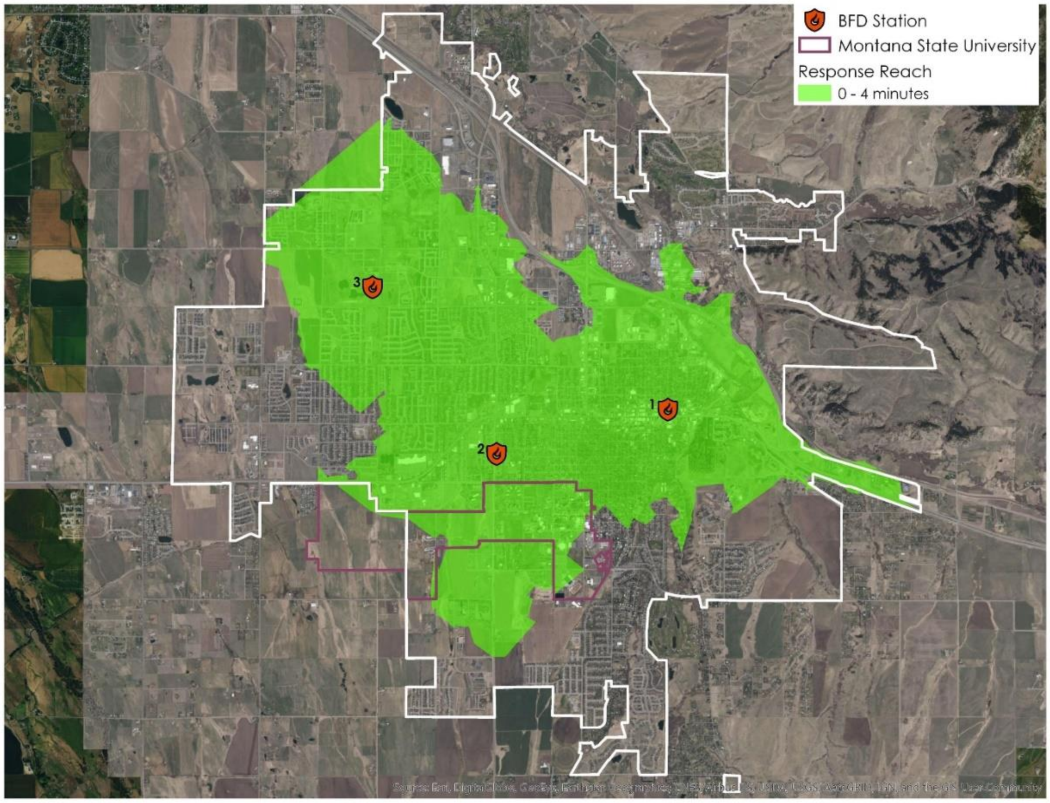


FIGURE 6-3: Bozeman Station Locations and Travel Distances (Amber = 360 seconds)

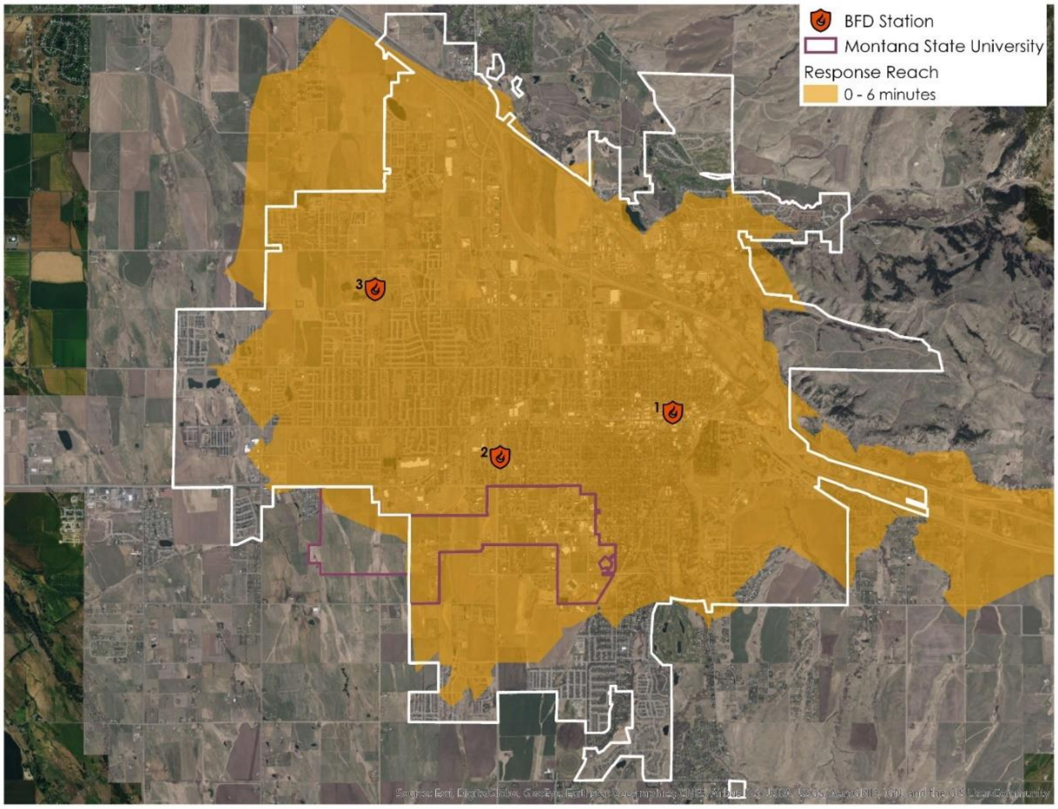


FIGURE 6-4: Bozeman Station Locations and Travel Distances (Red = 480 seconds)

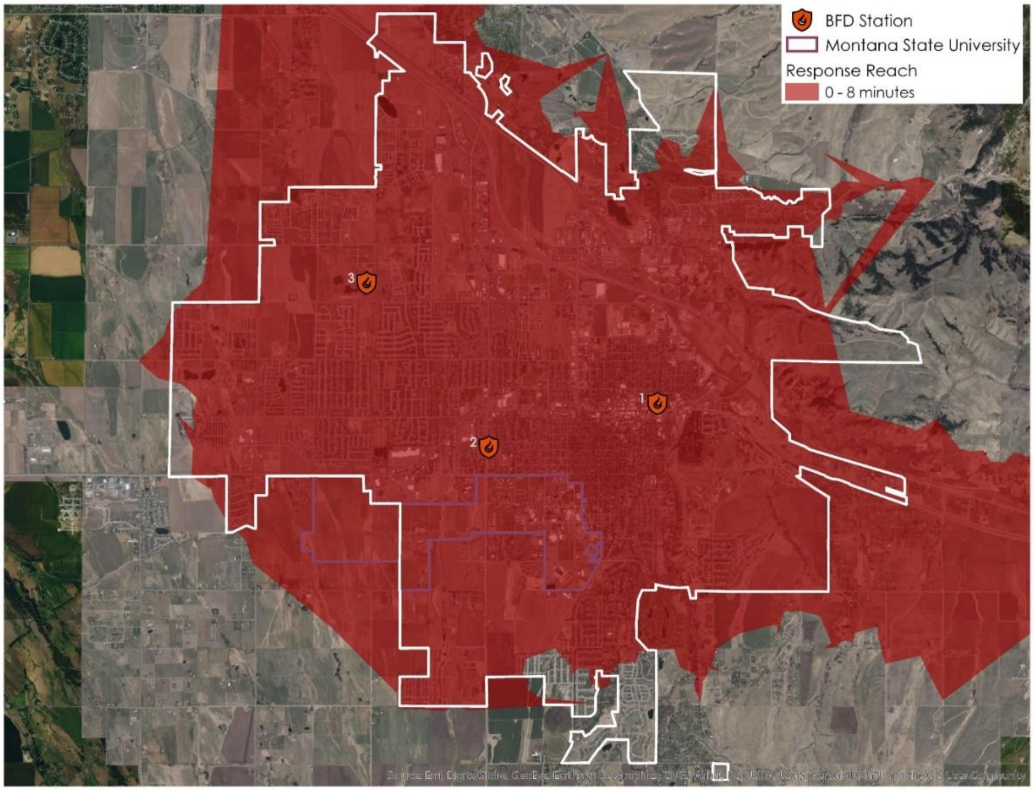


FIGURE 6-5: Bozeman Station Locations and Composite Travel Distances

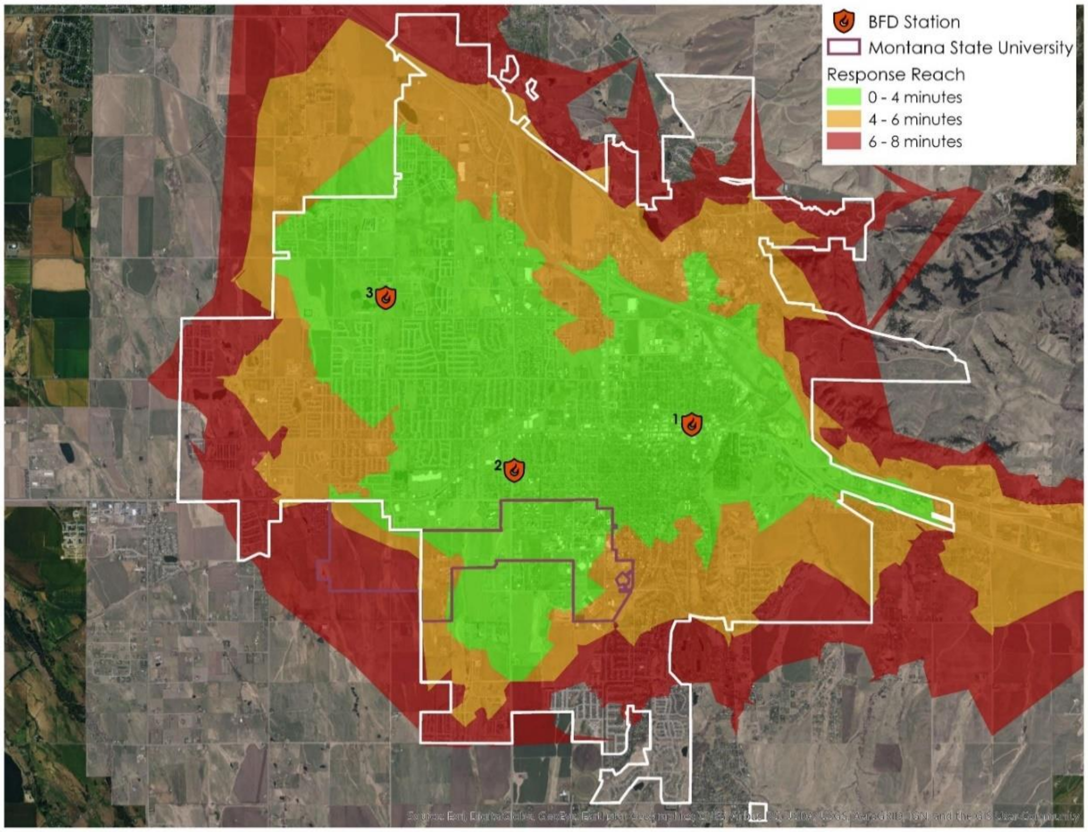


Figure 6-2 shows that approximately 80 percent of the developed areas of the city are covered under the 240-second benchmark. We would estimate that approximately 90 percent of the developed area of the city is covered under the 360-second overlay and virtually the entire city is covered under the 480-second benchmark. The majority of the city, the commercial, and more built-upon areas, are within the 360- and 480-second benchmarks. It is only a small section of the city in the extreme southern area of the existing city limits—in the areas west of Sourdough and north of Goldenstein—that is beyond the eight-minute travel distance. This finding is confirmed by the information in Table 6-2, which shows 90th percentile travel times. It can be seen that more than 90 percent of the calls handled by BFD within city limits result have a travel time under 6.5 minutes. ***These maps only depict travel distances and not actual response times.***

Figures 6-6, 6-7, and 6-8 show the actual locations of fire, EMS, and other emergency responses carried out by the Bozeman Fire Department. It is apparent from this graphic that most responses in Bozeman should result in travels times that are within four to five minutes. This graphic also reveals that a three-station configuration appears very appropriate in managing the existing workload. Most calls are occurring in the central core of the existing municipal boundaries and few calls are occurring along the periphery of the exiting City limits. It also appears that the overall distribution of calls are generally equally dispersed throughout the existing service boundaries.

FIGURE 6-6: BFD Fire Runs

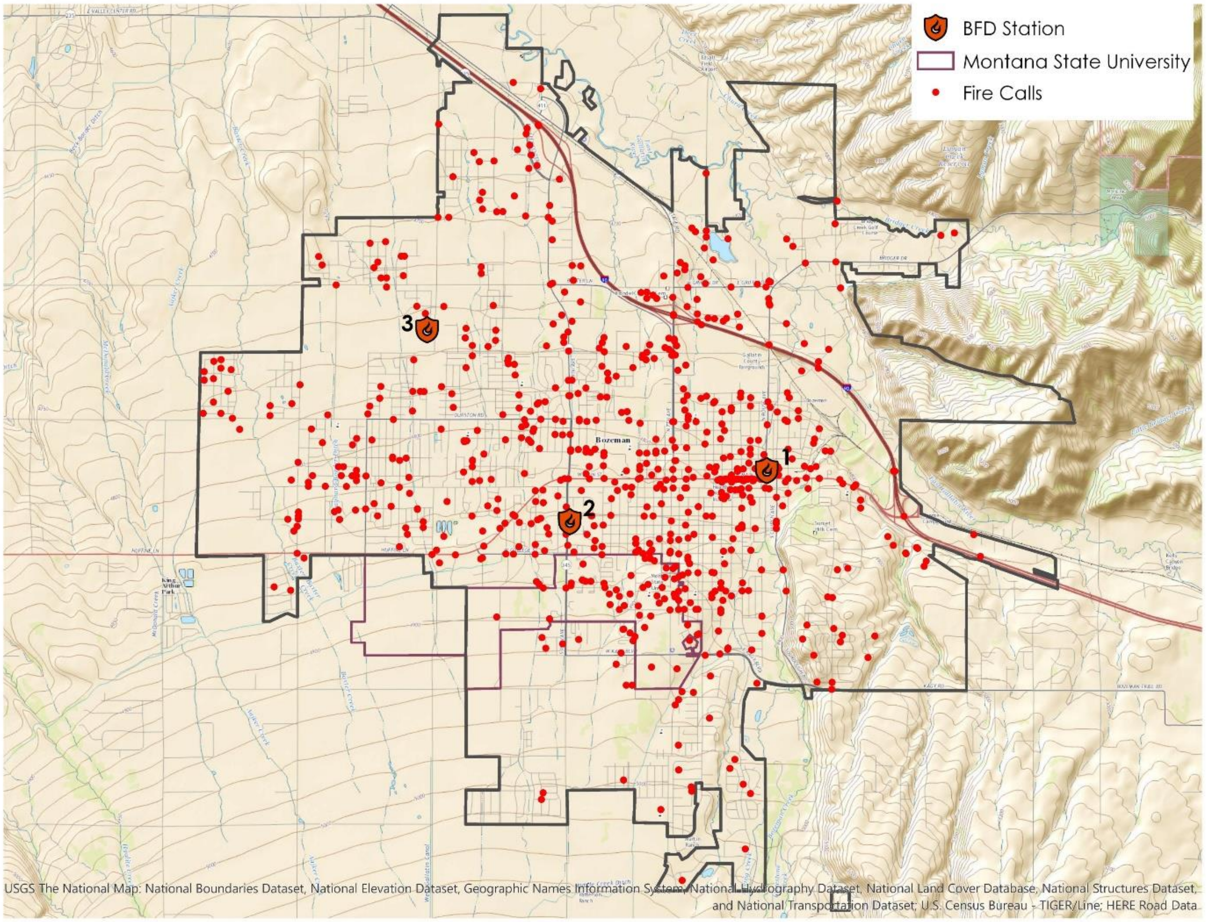


FIGURE 6-7: BFD EMS Runs

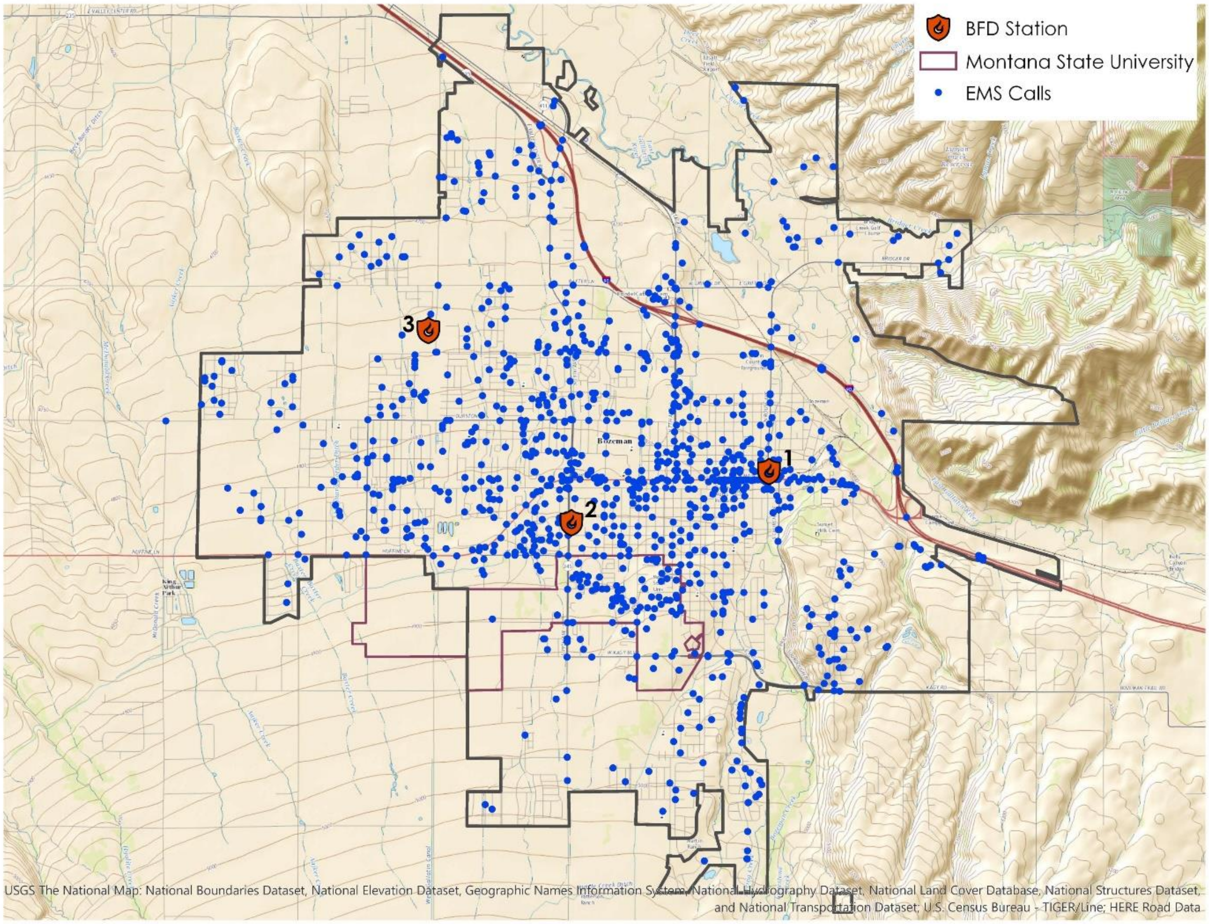
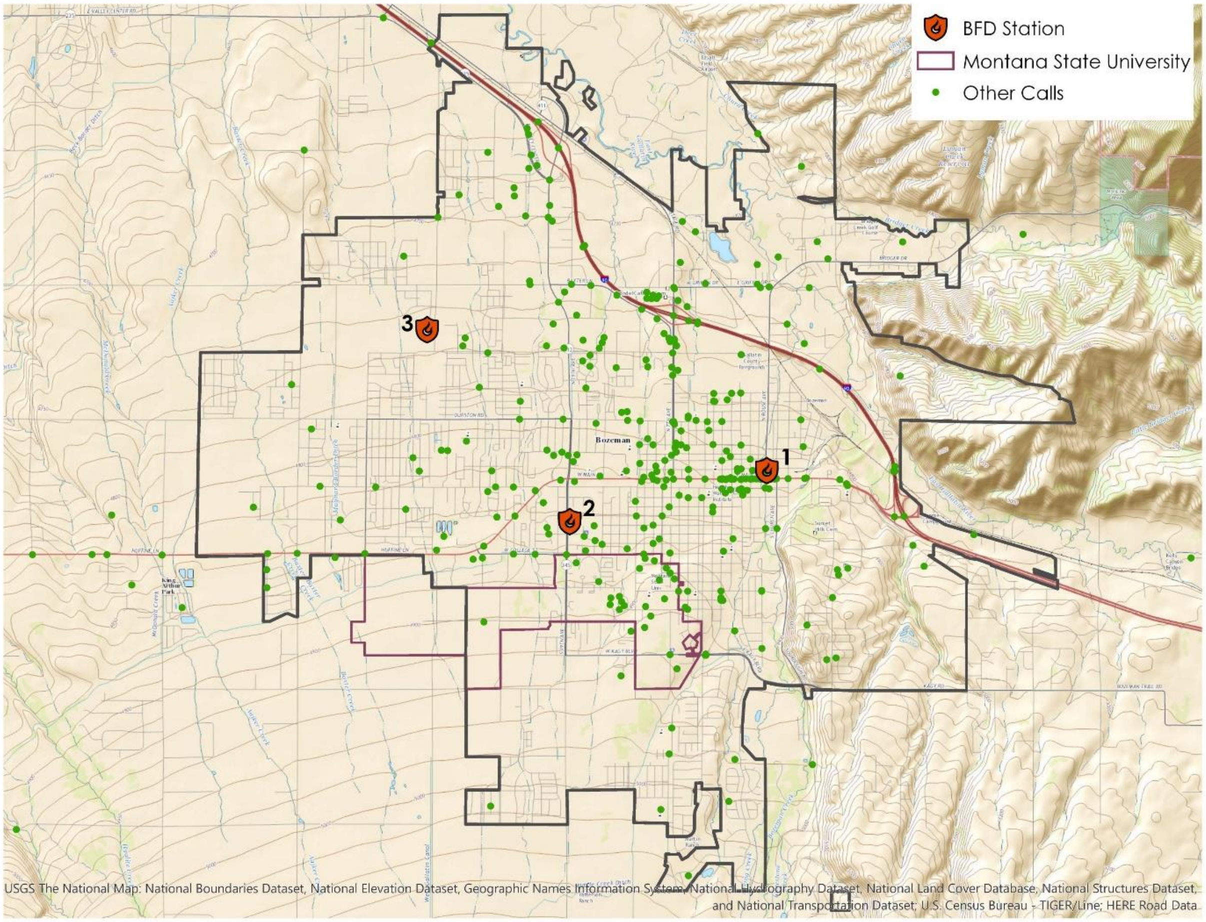


FIGURE 6-8: BFD Other Runs



From this analysis it appears that the times recorded for dispatch handling and turnout times can be improved. At the 90th percentile, these combined times are upwards of six minutes. Even when looking at the average time for these combined activities, the times are still excessive, nearly 3.7 minutes. CPSM has indicated that improved monitoring and regular reporting of these times will assist in improving outcomes. In addition, it is our belief that instituting a pre-alerting process and separating out nonemergency calls will improve these results. Overall, at the 90th percentile level, CPSM believes that the combined dispatch handling and turnout time should be 2.5 minutes or less.

> ***Recommendation: BFD and the 911 dispatch center should work cooperatively in an effort to improve dispatch handling and turnout times for emergency responses.***

SECTION 7. PERFORMANCE MEASUREMENT

Fire suppression, prevention programs, and EMS service delivery need to be planned and managed so that these efforts achieve specific, agreed-upon results. This requires establishing a set of goals for the activities of any given program. Determining how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. This is the goal of performance measurement.

Simply defined, performance measurement is the ongoing monitoring and reporting of progress toward pre-established goals. It captures data about programs, activities, and processes, and displays data in standardized ways that help communicate to service providers, customers, and other stakeholders how well the agency is performing in key areas. Performance measurement provides an organization with tools to assess performance and identify areas in need of improvement. In short, ***what gets measured gets improved***.

The need to continually assess performance requires adding new words and definitions to the fire service lexicon. Fire administrators need to be familiar with the different tools available and the consequences of their use. In *Managing the Public Sector*, business professor Grover Starling applies the principles of performance measurement to the public sector. He writes that the consequences to be considered for any given program include:

Administrative feasibility: How difficult will it be to set up and operate the program?

Effectiveness: Does the program produce the intended effect in the specified time? Does it reach the intended target group?

Efficiency: How do the benefits compare with the costs?

Equity: Are the benefits distributed equitably with respect to region, income, gender, ethnicity, age, and so forth?

Political feasibility: Will the program attract and maintain key actors with a stake in the program area?[31]

Performance measurement systems vary significantly among different types of public agencies and programs. Some systems focus primarily on efficiency and productivity within work units, whereas others are designed to monitor outcomes produced by major public programs. Still others track the quality of services provided by an agency and the extent to which citizens are satisfied with these services.

Within the fire service, performance measures tend to focus on inputs (the amount of money and resources spent on a given program or activity) and short-term outputs (the number of fires, number of EMS calls, response times, etc.). One of the goals of any performance measurement system should be also to include efficiency and cost-effectiveness indicators, as well as explanatory information on how these measures should be interpreted. An explanation of these types of performance measures are shown in Table 7-1.

[31] Grover Starling, *Managing the Public Sector*, (Cengage Learning), 396.

TABLE 7-1: The Five GASB Performance Indicators[32]

Category	Definition
Input indicators	These are designed to report the amount of resources, either financial or other (especially personnel), that have been used for a specific service or program.
Output indicators	These report the number of units produced or the services provided by a service or program.
Outcome indicators	These are designed to report the results (including quality) of the service.
Efficiency (and cost-effectiveness) indicators	These are defined as indicators that measure the cost (whether in dollars or employee hours) per unit of output or outcome.
Explanatory information	This includes a variety of information about the environment and other factors that might affect an organization's performance.

One of the most important elements of performance measurement within the fire service is to describe service delivery performance in a way that both citizens and those providing the service have the same understanding. The customer will ask, "Did I get what I expected?" the service provider will ask, "Did I provide what was expected?"

Ensuring that the answer to both questions is "yes" requires alignment of these expectations and the use of understandable terms. The author of the "Leadership" chapter of the 2012 edition of ICMA's *Managing Fire and Emergency Services* "Green Book" explains how jargon can get in the way:

> *Too often, fire service performance measures are created by internal customers and laden with jargon that external customers do not understand. For example, the traditional fire service has a difficult time getting the public to understand the implications of the "time temperature curve" or the value of particular levels of staffing in the suppression of fires. Fire and emergency service providers need to be able to describe performance in a way that is clear to customers, both internal and external. In the end, simpler descriptions are usually better.*[33]

The BFD has instituted a number of performance measures in analyzing its services. There are a number of performance measures that are part of the annual budget process and which are updated quarterly. These include overall response times, fire safety inspections, and a fairly robust series of training measures. These measures have limited distribution and were known only by the executive staff in the BFD and city administration but rarely have been distributed among line personnel and community stakeholders.

It is critical that BFD develop a series of internal reporting processes that provide a direct link to department goals or specific target measures. It is also critical that these measures be both quantitative and qualitative in nature and reflect on multiple areas of service delivery within the

[32] From Harry P. Hatry et al., eds. *Service Efforts and Accomplishments Reporting: Its Time Has Come* (Norwalk, CT: GASB, 1990).
[33] I. David Daniels, "Leading and Managing," in *Managing Fire and Emergency Services* (ICMA: Washington, DC: 2012), 202.

organization. This type of ongoing analysis and the monitoring of trends are most useful to justify program budgets and to measure service delivery levels.

In developing any measure, staff throughout the organization should participate in their development. In addition to helping facilitate department wide buy-in, this could provide an opportunity for upper management to better understand what the line staff believes to be critical goals—and vice versa. For the same reason, the process of developing performance measures should include citizen input, specifically with regard to service level preferences. Translating this advice from the citizens into performance measures will link the citizens and business community to the department and will identify clearly if the public's expectations are being met.

> ***Recommendation: BFD should implement a series of performance measures that enable ongoing review of service outcomes. The process of developing these measures should utilize input from BFD members, the community, the Mayor and City Commission, and city administration.***

The following are a number of performance measures that may be considered:

Operations:

- Response times (fire and percentile/average/frequency of excessive times).
  - Alarm/Dispatch handling times.
  - Turnout times.
  - Travel times.
  - On-scene time.
  - Call duration.
  - Canceled en route.
- Workload measures.
  - Emergency vs. nonemergency responses.
  - EMS transports–ALS/BLS.
  - Response to automatic fire alarms/frequency and outcomes.
  - Company inspections/area occupancy familiarization.
  - Fire preplanning.
  - Public education: contact hours/numbers by age group.
- Outcome measures
  - EMS/save rates/action taken.
  - Successful IVs and Intubations.
  - EMS protocol compliance.
  - Fire loss/limit of fire spread–point of origin, room of origin, etc.
  - On-duty injuries/workers' comp claims.
  - Lost time–sick/injury.
  - Vehicle accidents.

    - Equipment lost or broken.

Training:

- Fire and EMS hours.
- Officer development.
- Skills assessment compliance.
- Specialty training.
- Professional development/formal education/certifications.
- Fitness performance.

Prevention:

- Plans review (numbers/valuation amount/completion time).
- Inspections (new and existing).
    - Numbers.
    - Completion time.
    - Violations (found/corrected).
    - Quantification by type of violation and occupancy type.
- Fire investigations.
    - Numbers and determinations.
    - Occupancy types, time of occurrence, ignition source.
    - Fire loss/structure and contents.
    - Arson arrests/convictions.
    - Fire deaths (demographics/occupancy type/cause and origin).

Miscellaneous:

- Customer service surveys (by engine/by shift).
    - Following emergency response.
    - Public assist.
    - Inspections (prevention and company).
    - Public education.
    - In-service training (employee assessments).
- Financial/budgetary.
    - Overtime expenditures and cause.
    - Apparatus repair costs and out-of-service time.
    - EMS transport back-up activities.

SECTION 8. ESSENTIAL RESOURCES

FIRE PREVENTION AND CODE ENFORCEMENT

Fire suppression and response are necessary to protect property, but unfortunately they do little to prevent fire deaths and injury. In contrast, public fire education programs, fire prevention programs, and built-in fire protection systems are essential elements in protecting citizens from death and injury due to fire, smoke inhalation, and carbon monoxide poisoning. Each year, smoke detectors save thousands of lives from fires in the United States. Without properly installed and working smoke detectors, victims usually die of smoke inhalation before structural fires are reported to fire departments or before first responders arrive on the scene.

Fire prevention and code enforcement services also can have an impact on the city's ISO Public Protection Classification (PPC) number(s). The 2012 edition of the ISO guide (released in July 2013) now awards a potential 5.5 points additional credit for fire prevention, public fire and life safety education, and code enforcement activities.

The City of Bozeman has adopted the International Fire Code (IFC) and the International Building Code. As prescribed by the state of Montana Uniform Fire Code and Building Code, the city currently uses the 2012 edition of the International Fire Code (IFC) and the International Building Code (IBC). The state uniform fire and building code delineates the minimum code standards that local jurisdictions must adopt.[34] The Bozeman Fire Department is responsible for plan reviews, fire inspections, and public fire education.

Under Section 2.04.300 of the city code, the Fire Chief is the chief administrative authority in all matters affecting the inspection and regulation of, the erection, maintenance, repair and occupancy of buildings including the inspection of plumbing and electrical wiring in buildings, and has charge of the enforcement of all ordinances of the city regulating such matters, and shall see that the laws of the state in respect thereto are enforced within the city.[35]

The Deputy Fire Chief/Fire Marshal oversees fire inspections, public safety education, and fire investigations. As part of her responsibilities, the Fire Marshal meets weekly with developers and contractors to review initial site plans. She is assisted by two Building Fire Life Safety Specialists, who are responsible for field inspections, plan review, and building finals. These specialists also receive direction and assignments from the building department. Their daily inspection workload is issued by the building department each morning. Although the two specialists and their vehicles are paid out of the building fund, the specialists are actually supervised by the Fire Marshal. They submit monthly inspection reports, and the Fire Marshal monitors their inspections, public education events and demonstrations, and fire department training such as CPR training and prefire company inspection training. An example of a specialist's monthly inspection report is shown in Table 8-1.

[34] MCA 50-61-101.
[35] Ord. No. 1640, § 2, 6-6-2005.

TABLE 8-1: April 2017 Monthly Inspection Report, Building Fire Life Safety Specialist

Month/Days	Stops	Inspections	Commercial	Multi-Res	Daycare
January-17	85	192	63	16/123	6
February-15	80	189	57	24/207	4
March-18	89	147	77	12/70	0
April-16	82	265	52	24/207	6
Total: 66 days	336 stops	Insp. 793	249 Bldgs.	71/528 units	16 daycares
Average stops	5.09				
Average Insp.	12.01				
Plan reviews	15/31 hrs.				
DRC/meetings	0/24 hrs.				
Training hours	57 hrs.				
Emails/phone	16 hrs.				
Code research hrs.	13 hrs.				
Vehicle maint.	3 hrs.				
Days off	5 days				
Total plan reviews	48 plans/110 hrs.				

Recommendation: The Fire and Building Departments should re-assess their coordination of work assignments of the two Building Fire Life Safety Specialists to insure the clarity of direction and prioritization of assignments.

The BFD uses the Emergency Reporting Incident Reporting System. Every company is assigned preplanning inspection responsibilities using MDTs and tablets. They use a 10 to 15 item checklist for an inspection. Each company is responsible for completing 20 inspections per month. A major problem area in the business inspection process has been an erroneous business licensing system which has left some businesses off the list entirely and many businesses listed with inaccurate license numbers. This problem has severely hampered the business inspection process. Only 27 percent of the approximately 3,500 businesses in the city have been inspected.

Recommendation: The city should redesign and update the business licensing system so that information regarding each occupancy is correctly listed and retrievable through this data base.

Bozeman's largest employer and property owner is Montana State University (MSU). MSU has a student population of nearly 16,400 and a faculty of over 3,400. The university employs its own Fire Marshal and code enforcement personnel. The MSU Fire Marshal (FM) is a Special Deputy State Fire Marshal deputized through the Montana Department of Justice Division of Criminal Investigation. The MSU Fire Marshal answers directly to the Director of MSU Safety and Risk Management and the Montana State Fire Marshal.

The MSU Fire Marshal is responsible for overseeing and ensuring that fire and life safety concerns on campus are addressed. MSU has more than 130 buildings on the Bozeman campus, of which 59 have automatic fire sprinkler systems. There are also 31 special agent systems on campus. Each of these fire suppression systems are inspected and tested annually. In addition, because MSU owns its own water system, the MSU Fire Marshal annually tests each of the 88 fire hydrants located on campus. Although the MSU Fire Marshal's personnel work independently from the

Bozeman Fire Department, there is a service agreement between the university and the city that is renewed annually. This service agreement pays the Bozeman Fire Department $165,000 to provide fire protection, emergency medical response, hazardous materials response, assistance with fire code inspections, and assistance with three fire drills that are conducted each year.

The Bozeman Fire Marshal meets regularly and works closely with the MSU Fire Marshal to familiarize Bozeman FD engine crews with building locations, fire sprinkler and alarm systems and special hazards within each building. The MSU Fire Marshal has created a response book showing building locations, floor plans, and panel and sprinkler information. Bozeman company crews assist the MSU FM in conducting approximately 45 MSU fire code inspections per year. In addition to having an excellent working relationship with the Bozeman Fire Marshal, the MSU Fire Marshal also consults and works closely with the Bozeman Building Department on new campus construction and renovation projects to secure city issued building permits and plan reviews. The current working relationship between BFD and MSU in the areas of emergency response, fire prevention, inspection, code enforcement and emergency planning appears extremely effective and is considered to be a ***Best Practice***.

In 2016, the BFD responded to 190 emergency calls to the MSU campus as shown in Table 8-2.

TABLE 8-2: BFD Responses to MSU

Categories	2006	2007	2008	2009	2010	2013	2014	2015	2016
MSU Structure Fire Calls Smoke/Fire/Odor	1	3	1	5	1	0	1	0	5
Dollar Loss	$100	$12,000	$200	0	$100	0	$16,500	0	$300
MSU Vehicle Fires	1	0	1	0	0	2	0	2	2
Dollar Loss	$1,000	0	$500	0	0	$10,500	0	$1,000	$100
MSU Dumpster/Trash Fires	1	1	0	0	0	0	1	2	2
Dollar Loss	0	0	0	0	0	0	0	0	0
MSU Other Fires (Grass/Outside)	0	0	0	0	0	0	0	0	0
Dollar Loss	0	0	0	0	0	0	0	0	0
MSU False Fire Calls	4	44	79	110	24	52	34	52	36
Total MSU Fire Calls	**6**	**48**	**81**	**115**	**25**	**54**	**36**	**56**	**45**
Total Fire Dollar Loss	**$1,100**	**$12,000**	**$700**	**0**	**$100**	**$10,500**	**$16,500**	**$1,000**	**$400**
MSU EMS Calls	74	84	72	86	56	53	28	167	116
MSU Service Calls	4	13	10	16	23	6	3	8	23
MSU Hazmat Calls	1	2	8	9	3	1	1	9	2
MSU Bomb Scares	0	0	0	0	0	0	0	0	0
MSU Gas Line Rupture/Leak	0	0	0	0	2	5	0	3	4
Total MSU Calls	95	149	171	226	109	119	67	243	190
Total City Calls	**2,096**	**2,440**	**2,711**	**2,775**	**2,817**	**3,563**	**3,663**	**3,919**	**4,311**
MSU Calls as % of Total Calls	**4.53**	**6.11**	**6.31**	**8.14**	**3.87**	**4.00**	**1.78**	**6.20**	**4.40**
Average MSU Response Time	**7.4**	**6.27**	**6.4**	**6.5**	**6.5**	**5.5**	**5.39**	**5.39**	**5.19**

Public Safety Education

The Bozeman Fire Department offers a full array of public fire and life safety education programs to its citizens. The Bozeman Fire Marshal leads and manages the public fire and life safety program. Activities include firefighter outreach, bike safety, car seat installation, smoke detector installation, CO2 detector installation, wildfire prevention and education, holiday safety tips, home evacuation plans, fire extinguisher training, basic first aid, CPR training, Scotty Smoke Trailer demonstrations, and concussion training.

Fire Investigations

The Bozeman fire and police departments work together in the area of fire investigation. Bozeman police officers are trained in the determination of fire cause and origin. If a fire is deemed suspicious the Bozeman Police Department is responsible for the fire investigation. All fire department personnel are trained in initial fire investigations, securing evidence, and scene security. Six firefighters are qualified as fire investigators to assist police personnel.

BFD fire investigators have received limited training in determining fire loss and conducting damage assessments. These aspects of the investigations process are key components of the investigation process and should be jointly shared by the emergency responder (company officer) and the BFD fire investigators.

> ***Recommendation: BFD should expand the fire loss determination and damage assessment training for its company officers and fire investigators.***

ISO Rating

ISO collects data for more than 48,000 communities and fire districts throughout the country. These data are then analyzed using a proprietary Fire Suppression Rating Schedule (FSRS). This analysis then results in a PPC (Public Protection Classification) score between 1 and 10 for the community, with Class 1 representing "superior property fire protection" and Class 10 indicating that an area doesn't meet the minimum criteria set by the ISO. In 2013, the revised FSRS was released; it adds an emphasis on a community's effort to limit loss before an incident occurs (fire prevention).

In developing a PPC, the following major categories are evaluated:

- Emergency Communications: Fire alarm and communication systems, including telephone systems, telephone lines, staffing, and dispatching systems.
- Fire Department: The fire department, including equipment, staffing, training, and geographic distribution of fire companies.
- Water Supply: The water supply system, including the condition and maintenance of hydrants and the amount of available water compared to the amount need to suppress fires.
- Fire Prevention: Programs that contain plan review; certificate of occupancy inspections; compliance follow-up; inspection of fire protection equipment; and fire prevention regulations related to fire lanes on area roads, hazardous material routes, fireworks, barbecue grills, and wildland-urban interface areas.
- Public Fire Safety Education Programs: Fire safety education training and programs for schools, private homes, and buildings with large loss potential or hazardous conditions, and a juvenile fire setter intervention program.

The City of Bozeman was last reviewed in October 2011 and received a Class 3 rating. A Class 3 rating is a significant achievement for a community the size of Bozeman and is a tribute to the fire department, the 911 communications system, and the water utility system. ISO estimated in 2015 that fewer than 4,000 agencies nationwide received a Class-3 or better rating. This puts Bozeman in the top 10 percent of those agencies reviewed by ISO

The actual scoring for the city in the 2011 review was in the lower end of the Class 3 designation, with the city receiving an overall score of 73.34; 80 or more points is the threshold for a Class 2 designation. It is important to note that BFD has an opportunity to improve its scoring in the areas of fire training, where it received 4.04 points out of 9 points possible. Also, in the area relating to the dispatch center, the city received 8 out of 10 possible points; in the area of fire company personnel (staffing) the city received 6.69 points out of the possible 15 points. Overall, CPSM recognizes the city's achievement in its last ISO review; however, with improvements — primarily in the above noted areas — Bozeman should be able to improve its rating to a Class-2.

EDUCATION AND TRAINING PROGRAMS

Training is one of the most important functions that a fire department should be performing on a regular basis. One could even make the argument that training is, in some ways, more important than emergency responses because a department that is not well trained, prepared, and operationally ready will be unable to effectively and safely fulfill its emergency response obligations. A comprehensive, diverse, and ongoing training program is absolutely critical to the fire department's level of success.

An effective fire department training program must cover all of the essential elements of that department's core missions and responsibilities. The program must include an appropriate combination of technical/classroom training, manipulative or hands-on/practical evolutions, and training assessment to gauge the effectiveness of these efforts. Most of the training, but particularly the practical, hands-on training evolutions, should be developed based upon the department's own operating procedures while remaining cognizant of widely accepted practices and standards.

Certain Occupational Safety and Health Administration (OSHA) regulations dictate that minimum training must be completed on an annual basis, covering various topics that include:

- A review of the respiratory protection standard, self-contained breathing apparatus (SCBA) refresher and user competency training, SCBA fit testing (29 CFR 1910.134).
- Blood Borne Pathogens Training (29 CFR 1910.1030).
- Hazardous Materials Training (29 CFR 1910.120).
- Confined Space Training (29 CFR 1910.146).
- Structural Firefighting Training (29 CFR 1910.156).

In addition, National Fire Protection Association (NFPA) standards contain recommendations for a minimum of 24 hours of structural firefighting training annually for each fire department member. The state of Montana does not specify annual training requirements for firefighters who are employed by local government. It is the responsibility of the local government to establish the level of training it requires of its new and existing personnel. In the absence of a required state mandate, many agencies chose to utilize a nationally recognized training curriculum either through the International Fire Service Accreditation Congress (IFSAC) or the National Fire Protection Agency (NFPA). Bozeman recently instituted a very aggressive and comprehensive approach to its firefighter training. In 2016 it completed IFSAC Firefighter 1 and Firefighter 2 certification training for all active employees. The IFSAC Firefighter 1 & 2 training curriculums are very comprehensive and follow the NFPA 1001 "Standard for Firefighter Professional Qualifications." All employees were required to complete classroom instruction and skills assessments that were monitored by the MSU Fire Services Training School. CPSM recognizes the Firefighter 1 & 2 training program instituted for all existing Bozeman firefighters to be a ***Best Practice***.

Education and training programs also help to create the character of a fire service organization. Agencies that place a real emphasis on their training have a tendency to be more proficient in carrying out day-to-day duties. The prioritization of training also fosters an image of professionalism and instills pride in the organization. Overall, the Bozeman Fire Department has recognized the need for an aggressive and comprehensive training program. In 2017 it published its Annual Training Plan, which identifies a broad-ranging curriculum and specified training programs for all firefighting personnel. CPSM recognizes the 2017 Annual Training Plan as a ***Best Practice,*** and recommends the full implementation and support of this effort.

The training functions of the BFD are managed by a departmental training officer. This individual, who is newly assigned to the training function, has limited staff support and is responsible, under the direction of the Deputy Fire Chief of Operations, to develop and implement the training program for the entire organization.

CPSM believes it is essential that the training effort ensure consistency in the competencies of its employees to perform those activities that are needed to operate successfully in emergency settings. This requires a comprehensive review of training activities and a more regimented process to ensure that all employees receive consistent updates and refresher training in those activities that are not regularly performed in day-to-day operations. The BFD Training Officer, as noted earlier, is a recently assigned to this position. This position has not been designated with a specific fire services rank. This position is a key officer in the organization and has the responsibility to direct training efforts for field personnel. CPSM believes that BFD should consider an assignment of a rank for the Training Officer that is consistent with their level of responsibility and consistent with the organizational structure within the BFD system.

> ***Recommendation: BFD should consider assigning a designated rank to the Training Officer that is consistent with the authority and duties assigned to this position.***

The CPSM team was informed that the department uses a number of ad-hoc or informal groups to develop specific training related programs and materials. Most training directives are on a cyclical basis and injected into the curriculum through a rotational process. CPSM believes that it will be beneficial for the organization to establish a key group of its leadership to identify and direct the training efforts of the organization.

> ***Recommendation: The BFD should establish a training steering committee composed of Battalion Chiefs, Captains, Drivers, Firefighters, and EMS staff to conduct a training needs assessment, develop priorities, and provide direction regarding the training efforts of the department.***

The training steering process must be a dynamic effort that is used continuously to review training priorities and align the focus of training to organizational needs. The delivery of multiple training programs alone does not ensure that skills are developed and the needed proficiencies are achieved. The BFD training programs typically assign a skills assessment component to the company officer who is in charge of the training delivery to their crew. Typically this skills assessment does not include a formal testing process and a recording of test scores for individual employees. Many aspects of the EMS training curriculum require a skills assessment in order to obtain the necessary continuing education credits required for certification. Fire and other related service training typically does not include a skills assessment and a recorded scoring to determine individual proficiency.

Recommendation: The Bozeman Fire Department should institute written and practical skills testing as part of the department's comprehensive fire training program.

The ability to monitor and record training test scores is beneficial from an overall proficiency standpoint. In addition, training scores should be incorporated into the annual performance appraisal process for both the employee, the supervisor, and the training officer. In addition, the inclusion of a testing process to each training evolution adds to the importance and seriousness in which these activities are carried out.

The training process requires daily coordination among the various shifts and the multiple work sites in the Bozeman system. It is critical to have a centralized training program that is orchestrated and administered by the training officer and guided by a training steering committee. It is also important that there be a training liaison on each shift to help facilitate this effort and monitor overall effectiveness. BFD does not utilize a shift training coordinator in its training process and CPSM believes that assigning this responsibility to select individuals on each shift will greatly improve the delivery of training outcomes. Earlier in the report, CPSM recommended that BFD consider a number of individual program management assignments to aid in the delegation of the workload and to provide career development among line personnel. The training liaison role is one such assignment that should be considered for this purpose.

Recommendation: BFD should designate a Fire Captain on each shift to serve as the shift training coordinator to help facilitate in-service training activities, both for fire and EMS.

At the time of this assessment, BFD was moving towards the implementation of a new online training delivery and recording system through Target Solutions. CPSM strongly supports the implementation of a self-paced and coordinated training software and Target Solution can be very effective in fulfilling this need.

Recommendation: BFD should continue in its effort to institute an online training software to assist in the coordination and monitoring of its training efforts.

In conjunction with an online training software, BFD was also moving towards implementation of an on-line communication forum utilizing WebEx™. This program when implemented can facilitate real-time video communications from all BFD stations to support both in-service training and organizational communications. This cloud-based technology is essential and a very viable method to link and facilitate real-time communication in today's workplace. CPSM believes that the implementation of the WebEx format will enhance both training delivery and internal communications.

Bozeman utilizes a fire training structure that is a manufactured steel container type design that is located at 1812 N. Rouse Ave. This structure provides a suitable area in which fire and smoke drills can be carried out in a safe environment. CPSM was advised that the current location of the training structure is not ideal because of its proximity to an active rail line, which can impede the response of units from this location should an incident occur when units are involved in training drills. Because of the modular design of this structure, it can be disassembled and relocated to a more appropriate site. As the city begins to evaluate its options for fire station relocation and the building of new fire stations, it should consider the relocation of its training structure to a co-located site with a new fire station.

Recommendation: BFD should consider the relocation of its fire training structure to a more appropriate location and a possible colocation at a fire station site.

EMERGENCY MANAGEMENT

Emergency management is the discipline and profession of applying science, technology, planning, and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life. When such events do occur and cause extensive harm, they are called disasters.[36]

Gallatin County is responsible for providing emergency management services for Belgrade, Bozeman, Three Forks, West Yellowstone, and the unincorporated areas of Gallatin County. The county seat is Bozeman. Gallatin County has a total area of over 2,600 square miles and a current population of nearly 100,000. The County is in the southwestern part of Montana, abutting Yellowstone National Park.

In February 2012, the Gallatin County Commission by statute formally designated the Gallatin County Emergency Management Department (GCEM) as the "exclusive agency for emergency and disaster prevention, preparedness, and coordination under Title 10, Chapter 3, Parts 1 through 4, MCA.[37] Under the same resolution, the County Commission designated GCEM as the local emergency response authority under the Montana Response to Hazardous Material Incidents Act. This gave the GCEM the responsibility for "emergency operations planning and other requirements to satisfy the Act and the Federal Emergency Planning and Community Right to Know Act of 1986 (EPCRA)."[38] The Director of the GCEM is appointed by and serves at the pleasure of the Board of Gallatin County Commission.

Under an inter-local agreement between Gallatin County and the City of Bozeman dated August 2014, the county has contracted for services to provide and centralize emergency management and hazardous materials response to the City of Bozeman Fire Department.[39] The agreement specifies a scope of services that include the maintenance of the adopted County Emergency Management Plan, the staffing of the Gallatin County Coordination Center, yearly exercises and training, coordination with public and private agencies, compliance with the requirements of MCA 10-3 and the requirements of the Emergency Planning and Community Right to Know Act (EPCRA), and quarterly reporting to the County Commission. The county pays (quarterly) the city a set annual fee for these services, which are set forth in the agreement through 2019.

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[36] *Emergency Management: Principles and Practice for Local Government*. Eds. Thomas E. Drabek, Gerard J. Hoetmer. International City Management Association, 1991. p. xvii

[37] Resolution 2012-014. "A Resolution Creating the Gallatin County Emergency Management Department And Authorizing Its Director To Act Pursuant To Law" Gallatin County Commission, February 21, 2012.

[38] Ibid.

[39] Inter-local Agreement between Gallatin County and The City of Bozeman For Emergency Management and Hazardous Materials Program Management, August 18, 2014.

Gallatin County Emergency Management

The Bozeman Fire Department contractually provides emergency management and hazardous materials response for Gallatin County. The contract specifies that the City of Bozeman provide an individual to act as the Director of the GCEM. The director of GCEM is a Captain in the Bozeman Fire Department, who operationally reports to the BFD Fire Chief. The current Director, who has served as the County's Director for ten years, appears well-qualified for the position and is extremely organized in this effort. The Director's authority and responsibilities are outlined in the February 2012 statute that created the GCEM and in the Gallatin County emergency management plan.

The Director does not have a permanent backup officer to serve as acting director when he is on leave or unavailable to respond. The current practice when the Director is off duty or on leave is for a duty officer from another agency to temporarily serve as Director.

> ***Recommendation: The city should officially designate an alternative Emergency Management Director and ensure that this individual is fully trained and well versed in the duties of the Emergency Management Director.***

Emergency Management Plan

The Gallatin County Emergency Management Plan (EMP) is a usable and thorough document that was last updated and distributed in August 2016. The plan is designed in a modular format that includes a basic plan, which outlines high-level operations, and 20 functional annexes, which identify the primary responsible agencies, legal references, and key definitions. The basic plan clearly defines what a major emergency is and what a disaster is. The plan defines the various roles and authorities of the key decision-making group (Executive Group). This group includes the Principal Executive Officers (County Commission and Mayors), County and City Managers, and the Emergency Manager.

The Gallatin County EMP utilizes the Incident Command System, which is an integral part of the National Incident Management System. The plan includes clearly defined and assigned responsibilities for policy, coordination, and operational groups, as well as the detailed tasks and responsibilities for the individual departments and agencies involved. Operationally the plan is based upon the concept that the emergency functions of the plan align closely with the normal day-to-day responsibilities of the agency or department assigned those duties. CPSM considers the Bozeman-Gallatin approach towards emergency management as being very effective and a ***Best Practice***.

Although the EMP outlines the primary responsibilities of key departments and agencies, CPSM believes the plan can be improved with the addition of department and agency critical action checklists.

> ***Recommendation: The Bozeman-Gallatin County Emergency Management Plan should include department and agency critical action checklists.***

The EMP does not refer or include individual department continuity of operations plans (COOPs). It is vital that each department provide details on its plans for continuity of operations, the succession of leadership, and the preservation of records.

> ***Recommendation: The Bozeman-Gallatin County Emergency Manager should lead an effort for every city and county department to develop a Continuity of Operations Plan (COOP).***

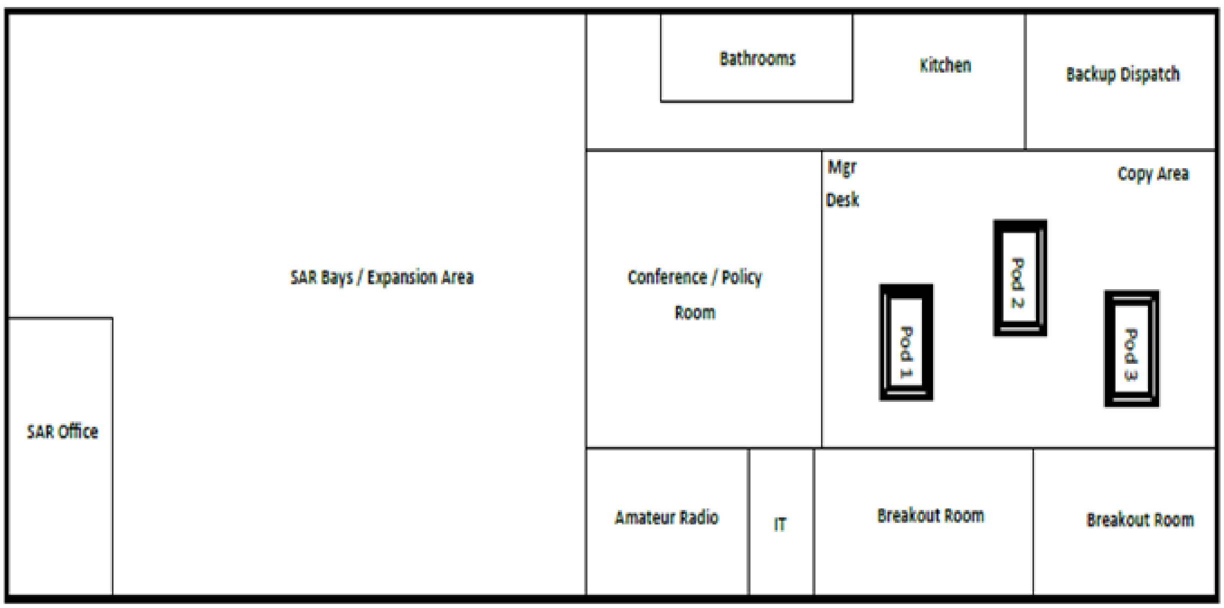
A COOP details how a particular agency will continue to operate under adverse conditions including under circumstances where its primary operating locations are no longer functional or the normal staffing levels have been reduced so that an altered service model is required. FEMA provides a very functional guide in developing agency-specific COOP planning documents. (See: http://www.fema.gov/pdf/about/org/ncp/coop/continuity_plan_federal_d_a.pdf).

Emergency Coordination Center

Under the services agreement with the City of Bozeman, Gallatin County is required to provide and maintain a Gallatin County Coordination Center that is equipped with phone lines, office supplies and equipment mutually agreed upon between the city and the county. As described in the EMP, the center is activated for all major emergencies and disasters.

The center is spacious and has designated locations for specific emergency functions and support groups. The center has auxiliary power from an on-site generator that allows the center to be operational during power outages. The center also serves as the backup 911 dispatch center. The center's layout is shown in Figure 8-1.

FIGURE 8-1: Layout of Gallatin County EMC



Hazard Mitigation Plan

The Gallatin County Hazard Mitigation Plan was developed and adopted by the participating jurisdictions in July 2012. The plan was approved by the Federal Emergency Management Agency (FEMA) in September 2012 with the acknowledgement that the plan meets the requirements of the Stafford Act and Title 44 Code of Federal Regulations 201.6 for a local hazard mitigation plan. This makes the jurisdictions adopting the plan eligible for FEMA Hazard Mitigation Assistance Grants. The jurisdictions adopting the plan are Gallatin County; the cities of Belgrade, Bozeman, and Three Forks; and the town of West Yellowstone. Jurisdictions that have not adopted the plan are not eligible for federal hazard mitigation assistance grants. The mitigation plan is approved through September 2017. A contract to the firm RESPEC is expected to be awarded in June 2017 for the revision of the plan. That work will begin in July and is expected to be completed by 2019.

EMERGENCY COMMUNICATION CENTER (911)

The 911 Communications Center of Gallatin County provides dispatching services for the Bozeman Fire Department along with more than 20 other police, fire, and EMS agencies throughout the county. The center is staffed 24 hours a day, seven days a week, with a minimum of three personnel on duty at any given time. During peak periods of operation the center staffing is typically four personnel; however, the Center Manager has indicated that the system is designed to operate with a minimum of five on-duty personnel, which would include one supervisor, two police dispatchers, a fire/EMS position, and one 911 call taker. Because of difficulties in maintaining sufficient numbers of dispatching personnel, it is not uncommon for the center to operate with only three personnel and in these situations the Fire/EMS position will have the dual responsibility to manage both the fire and EMS radio communications and answer incoming 911 calls from the public.

> ***Recommendation: The City of Bozeman should work through is 911 dispatching cooperative with Gallatin County to take the steps necessary to ensure that the 911 dispatch center operates with a dedicated 911 call taker.***

The 911 dispatching system is a key element in all emergency service delivery. The ability to effectively deal with incoming 911 calls from the public, including the provision of pre-arrival instructions, requires concentration and attentiveness to this process. Expecting an individual to be responsible for both receiving incoming 911 calls and to maintain direct radio communications with responding personnel is unrealistic. Given the volume of call activity in the Gallatin system, the current structure is subject to error, can result in hastened or garbled communications, is prone to incomplete data entry, and generally will diminish the overall ineffectiveness of this service.

Emergency medical dispatch protocols are defined using the Pro QA Priority Dispatch System. This system is designed to screen and categorize incoming EMS calls as either low, medium, or high acuity in nature. The center has been unable to fully implement and utilize the call screening process to determine the severity of the call types. Subsequently, most EMS responses are handled by responding personnel as being an emergency; thus, fire and EMS units will respond hot on all calls. It is essential that BFD work directly with the 911 center, AMR, and law enforcement agencies to develop ways to improve the ability of the 911 center to effectively screen and categorize 911 calls on the basis of their severity.

The 911 center in cooperation with its partners has recently entered into a 12-month agreement with the Priority Dispatching Corporation for the purpose of evaluating the level of proficiency of its call-screening process. The parties recognize the need for improvement in this area and appear to be taking the initial steps to rectify these outcomes.

The center utilizes the Hexagon ™ computer-aided dispatch (CAD) software; however, it has recently issued a request for proposal (RFP) for a new CAD system and was actively reviewing proposals at the time of the CPSM site visit. The center is attempting to initiate a QA process (Quality Assurance) regarding dispatcher performance and this effort will be included as part of the priority dispatching review process.

All critical ECC equipment is on an uninterrupted power supply (UPS). The City/County Emergency Coordination Center serves as the backup for the 911 center in the event of a disruption in service. However, the process for transferring center operations to the backup center is not exercised at any specified frequency.

Recommendation: The 911 dispatch center should institute a regular program that tests the transfer of its operations to the alternate 911 center located at the Emergency Coordination Center.

The dispatch handling times observed in the CPSM analysis are extended. Average dispatch handling times were 1.8 minutes and nearly 3 minutes at the 90th percentile. The center does not report call processing times to the city nor are performance measures established for these operations.

Recommendation: The 911 dispatch center should adopt dispatching performance measures and these should be reported to both fire and city administration on a monthly basis.

The utilization of performance measures for dispatch operations is very appropriate and provides a comprehensive review of center performance. However, the absence of these types of measures in Gallatin County creates an inability to properly monitor these critical operations and improve performance.

The effective interrogation of a 911 caller is a comprehensive process that when done correctly can take several minutes to complete. Most call screening systems allow a quick assessment component that identifies the nature of the call in a more expedited fashion, enabling the opportunity to notify responding units to initiate response (pre-alert) while the dispatcher completes the full inquiry. The pre-alerting process is necessary to provide the most expeditious call processing effort at the dispatch center. Gallatin County has initiated a pre-alerting process for some of its service providers but has not implemented a pre-altering process for BFD. BFD has indicated that they have initiated efforts to work with the 911 Center in implementing a pre-alerting process for BFD. CPSM supports this effort and recommends that a pre-alerting process be instituted.

SECTION 9. DATA ANALYSIS

This data analysis was prepared as a key component of the study of the Bozeman Fire Department (BFD), which was conducted by the Center for Public Safety Management, LLC. This analysis examines all calls for service between January 1, 2016, and December 31, 2016, as recorded in the Gallatin County 911 Dispatch Center's computer-aided dispatch (CAD) system and the BFD's National Fire Incident Reporting System (NFIRS).

This analysis is made up of five parts. The first part focuses on call types and dispatches. The second part explores time spent and workload of individual units. The third part presents an analysis of the busiest hours in the year studied. The fourth part provides a response time analysis of BFD units. The fifth and final part analyzes calls where both BFD and an American Medical Response (AMR) unit responded.

During the year covered by this study, BFD operated out of three stations utilizing two engines, one ladder, one medic, two brush units, one hazmat unit, one battalion chief, two reserve engines, and five administrative units.

During the year studied, the Bozeman Fire Department responded to 4,248 calls, of which 60 percent were EMS calls. The total combined workload (deployed time) for all BFD units was 1,966 hours. The average dispatch time for the first arriving BFD unit was 1.8 minutes and the average response time of the first arriving BFD unit was 7.5 minutes. The 90th percentile dispatch time was 2.9 minutes and the 90th percentile response time was 10.7 minutes.

Methodology

In this report, CPSM analyzes calls and runs. A call, sometimes referred to as an incident, is an emergency service request (i.e., a call to 911). A run is a dispatch of a unit (i.e., a unit responding to a call). Thus, a call can include multiple runs.

We received CAD data and NFIRS data for the Bozeman Fire Department. We first matched the NFIRS and CAD data based on incident numbers provided. Then, we classified the calls in a series of steps. We first used NFIRS incident type to identify canceled calls and to assign EMS, motor vehicle accident (MVA), and fire category call types. EMS calls were then assigned detailed categories based on the CAD incident nature. Mutual aid calls were identified based on the NFIRS mutual aid code, the CAD dispatch group for the call, and the call location. Descriptions of call types are included in Attachment IV.

Finally, units with no corresponding call and units with no en route or arrival time were removed. Then, calls with no responding BFD units were removed. In addition, a total of two incidents to which the command or administrative units were the sole responders are not included in the analysis sections of the report. However, the workload of administrative units is documented in Attachment III.

Since both BFD and AMR units are dispatched by the Gallatin County 911 Dispatch Center, calls to which both agencies responded were identified as calls to which at least one unit from both agencies was dispatched and went en route. Calls where units from both agencies were dispatched but only units from one agency responded were not considered shared calls for this analysis.

In this report, canceled and mutual aid calls are included in all analyses other than the response time analyses.

AGGREGATE CALL TOTALS AND RUNS

In this report, each citizen-initiated emergency service request (usually a 911 call) is considered a call. During the year studied, BFD responded to 4,248 calls. Of these, 37 were structure fire calls and 49 were outside fire calls within BFD's jurisdiction. Each unit dispatched to a call is considered a separate "run." As multiple units are dispatched to some calls, there are more runs than calls. The department's total runs and workload are reported in the second part of this analysis.

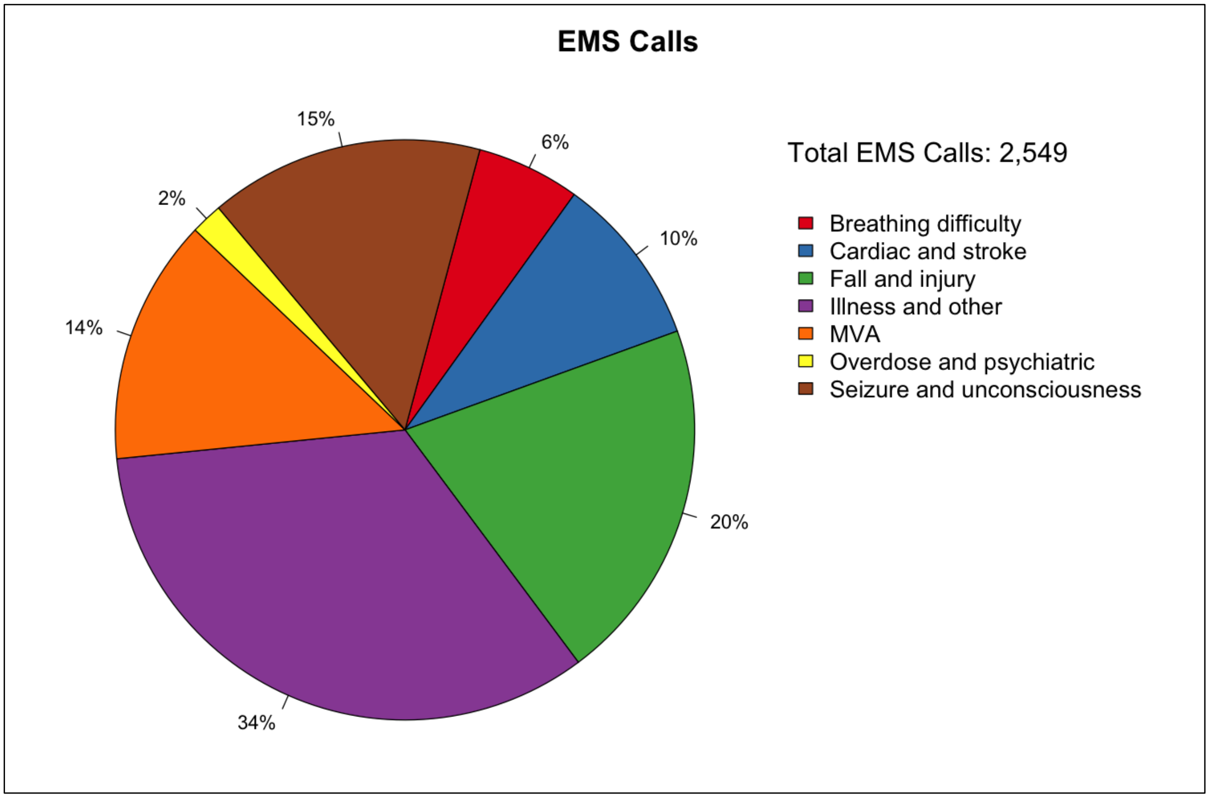
Calls by Type

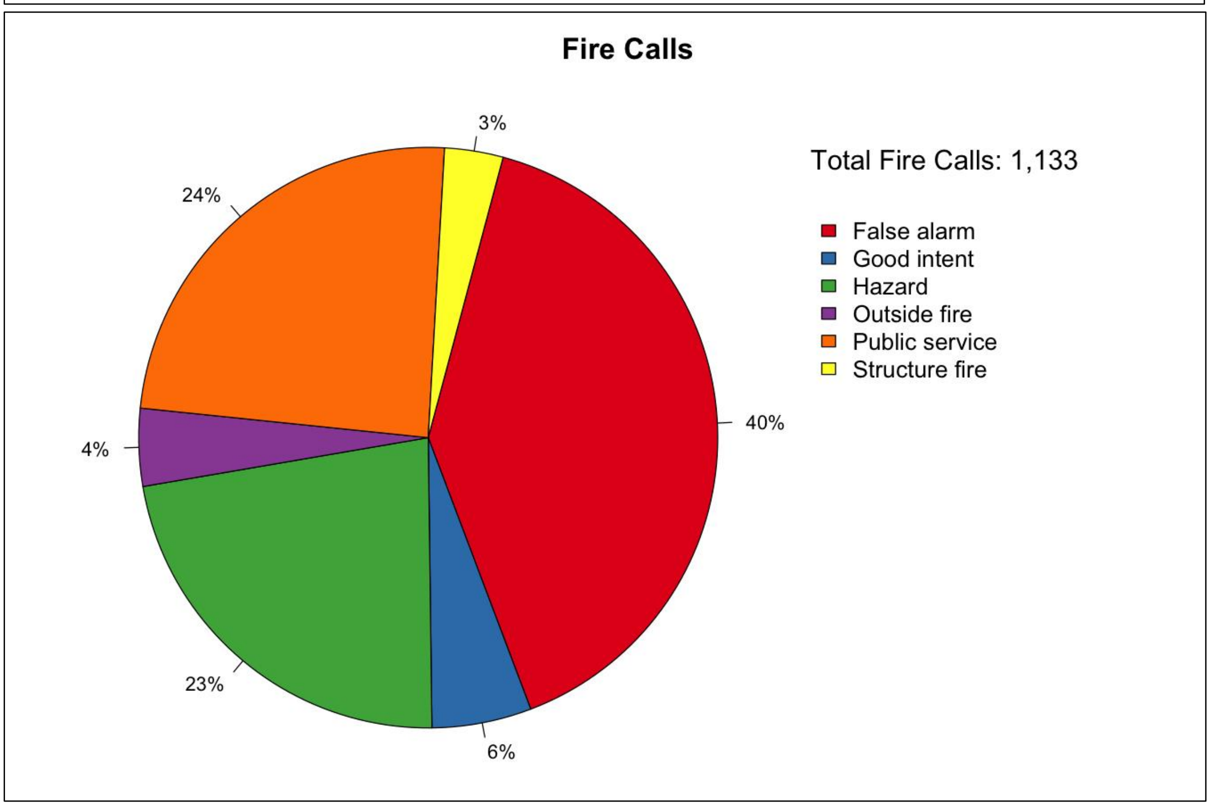
Table 9-1 and Figure 9-1 show the number of calls by call type, average calls per day, and the percentage of calls that fall into each call type category for the 12-month period.

TABLE 9-1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Breathing difficulty	147	0.4	3.5
Cardiac and stroke	243	0.7	5.7
Fall and injury	518	1.4	12.2
Illness and other	857	2.3	20.2
MVA	349	1.0	8.2
Overdose and psychiatric	45	0.1	1.1
Seizure and unconsciousness	390	1.1	9.2
EMS Total	**2,549**	**7.0**	**60.0**
False alarm	454	1.2	10.7
Good intent	63	0.2	1.5
Hazard	255	0.7	6.0
Outside fire	49	0.1	1.2
Public service	275	0.8	6.5
Structure fire	37	0.1	0.9
Fire Total	**1,133**	**3.1**	**26.7**
Canceled	508	1.4	12.0
Mutual aid	58	0.2	1.4
Total	**4,248**	**11.6**	**100.0**

FIGURE 9-1: EMS and Fire Calls by Type





Observations:

Overall

- The department received an average of 11.6 calls, including 1.4 canceled and 0.2 mutual aid calls, per day.
- EMS calls for the year totaled 2,549 (60 percent of all calls), an average of 7.0 per day.
- Fire calls for the year totaled 1,133 (27 percent of all calls), an average of 3.1 per day.

EMS

- Illness and other calls were the largest category of EMS calls at 34 percent of EMS calls.
- Cardiac and stroke calls made up 10 percent of the EMS calls.
- Motor vehicle accidents made up 14 percent of the EMS calls.

Fires

- Structure and outside fires combined for a total of 86 calls during the year, an average of one call every 4.3 days.
- A total of 37 structure fire calls accounted for 3 percent of the fire calls.
- A total of 49 outside fire calls accounted for 4 percent of the fire calls.
- False alarm calls were the largest fire call category, with 40 percent of the fire calls.

Calls by Type and Duration

Table 9-2 shows the duration of calls by type using four duration categories: less than 30 minutes, 30 minutes to one hour, one to two hours, and more than two hours.

TABLE 9-2: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	More than Two Hours	Total
Breathing difficulty	132	15	0	0	147
Cardiac and stroke	196	39	8	0	243
Fall and injury	453	49	15	1	518
Illness and other	741	97	16	3	857
MVA	240	79	25	5	349
Overdose and psychiatric	37	6	1	1	45
Seizure and unconsciousness	330	51	8	1	390
EMS Total	**2,129**	**336**	**73**	**11**	**2,549**
False alarm	415	30	6	3	454
Good intent	54	6	2	1	63
Hazard	199	42	6	8	255
Outside fire	36	9	2	2	49
Public service	235	29	10	1	275
Structure fire	22	9	3	3	37
Fire Total	**961**	**125**	**29**	**18**	**1,133**
Canceled	499	5	2	2	508
Mutual aid	23	10	14	11	58
Total	**3,612**	**476**	**118**	**42**	**4,248**

Observations:

EMS

- A total of 2,465 EMS category calls (97 percent) lasted less than one hour, 73 EMS category calls (3 percent) lasted between one and two hours, and 11 EMS category calls (less than 1 percent) lasted more than two hours.
- On average, there were 0.2 EMS category calls per day that lasted more than one hour.
- A total of 235 cardiac and stroke calls (97 percent) lasted less than one hour, and 8 cardiac and stroke calls (3 percent) lasted more than an hour.
- A total of 319 motor vehicle accidents (91 percent) lasted less than one hour, and 30 motor vehicle accidents (9 percent) lasted more than an hour.

Fire

- A total of 1,086 fire category calls (96 percent) lasted less than one hour, 29 fire category calls (3 percent) lasted between one and two hours, and 18 fire category calls (2 percent) lasted more than two hours.
- On average, there were 0.1 fire category calls per day that lasted more than one hour.

- A total of 31 structure fires (84 percent) lasted less than one hour, 3 structure fires (8 percent) lasted between one and two hours, and 3 structure fires (8 percent) lasted more than two hours.
- A total of 45 outside fires (92 percent) lasted less than one hour, 2 outside fires (4 percent) lasted between one and two hours, and 2 outside fires (4 percent) lasted more than two hours.
- A total of 445 false alarms (98 percent) lasted less than one hour, and 9 false alarms (2 percent) lasted more than an hour.

Average Calls per Day and per Hour

Figure 9-2 shows the monthly variation in the average daily number of calls handled by the BFD during the year studied. Similarly, Figure 9-3 illustrates the average number of calls received each hour of the day over the course of the year.

FIGURE 9-2: Average Calls per Day, by Month

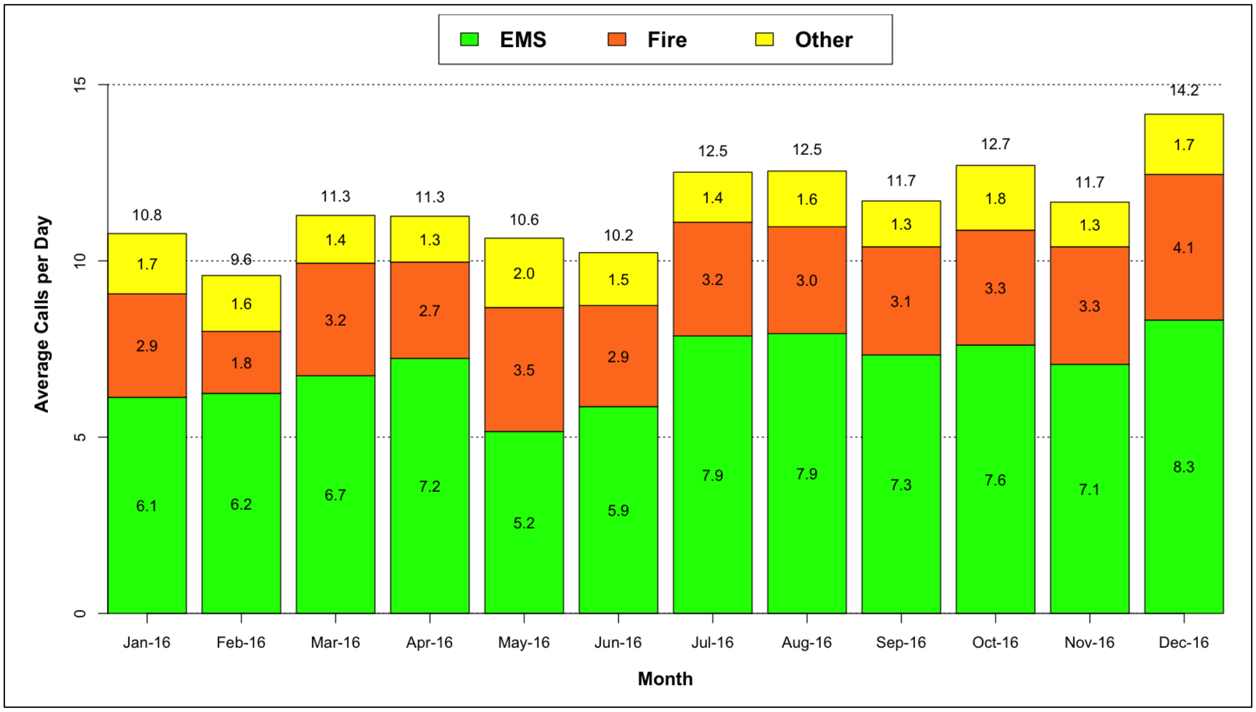
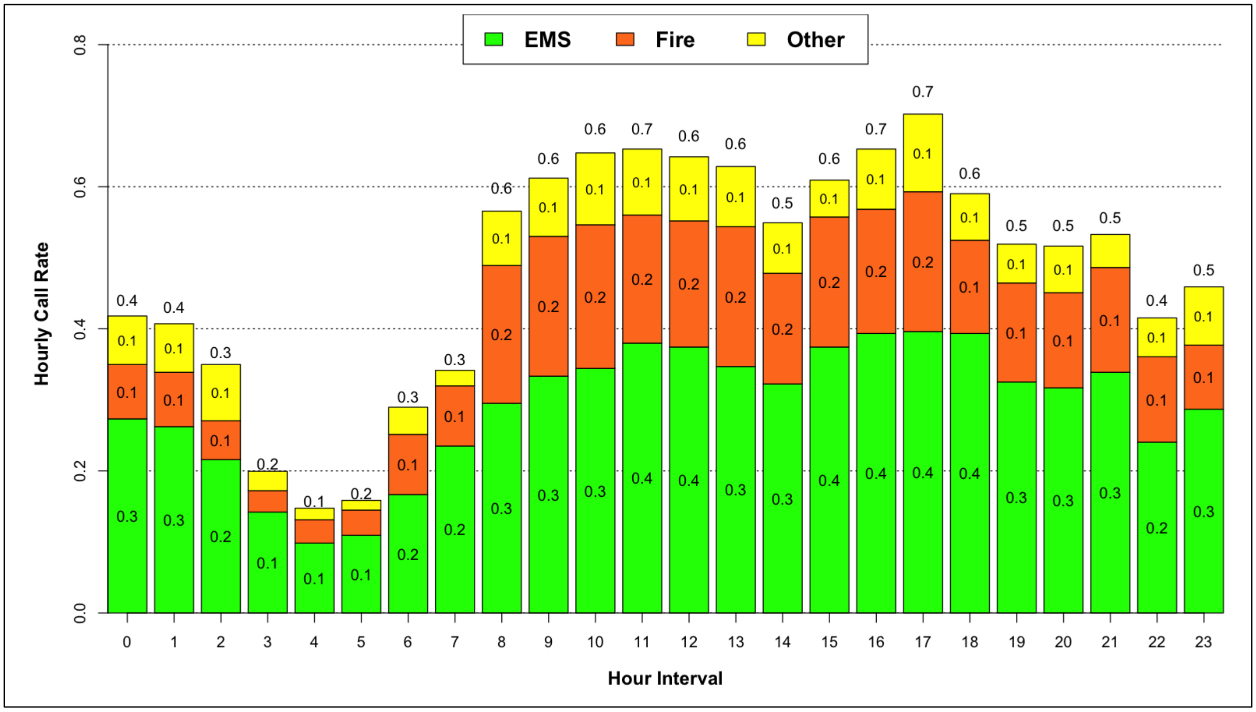


FIGURE 9-3: Calls by Hour of Day



Note: Values below 0.05 are not labeled.

Observations:

Average Calls per Day

- Average calls per day ranged from a low of 9.6 calls per day in February 2016 to a high of 14.2 calls per day in December 2016. The highest monthly average was 48 percent greater than the lowest monthly average.
- Average EMS calls per day ranged from a low of 5.2 calls per day in May 2016 to a high of 8.3 calls per day in December 2016.
- Average fire calls per day ranged from a low of 1.8 calls per day in February 2016 to a high of 4.1 calls per day in December 2016.
- Average other calls per day ranged from a low of 1.3 calls per day in April 2016, September 2016, and November 2016 to a high of 2.0 calls per day in May 2016.
- The highest number of calls received in a single day was 24, which occurred on December 10, 2016.

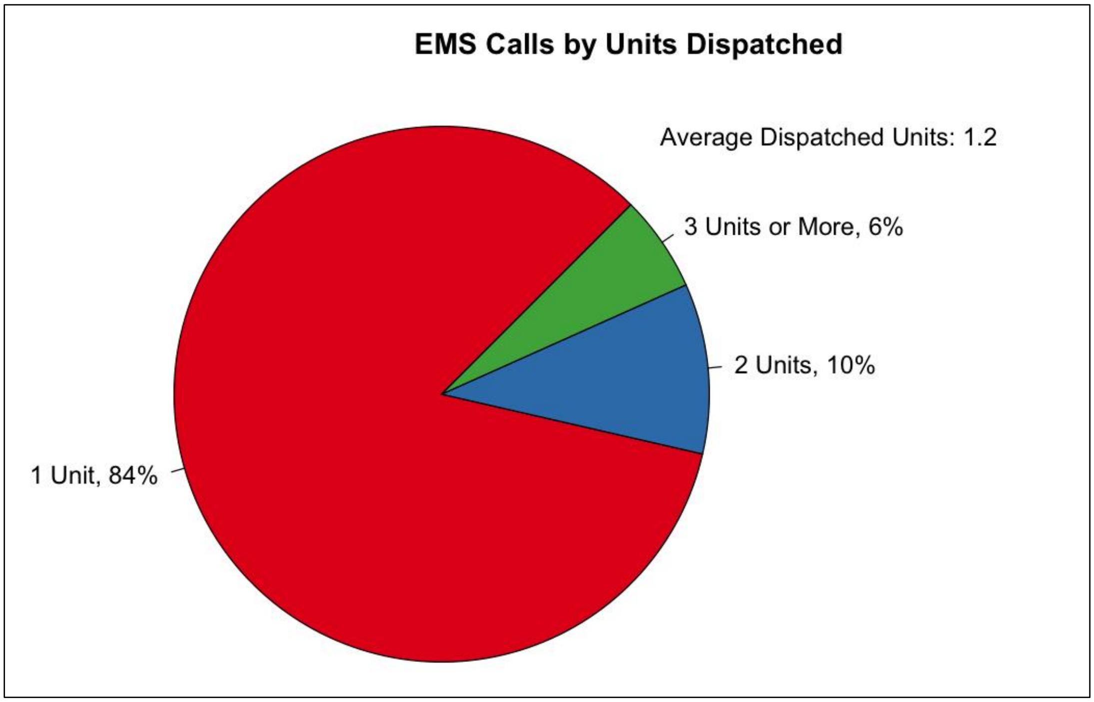
Average Calls per Hour

- Average hourly call rates ranged from 0.1 to 0.7 calls per hour.
- Call rates were highest between 11:00 a.m. and 6:00 p.m., averaging 0.7 calls per hour.
- Call rates were lowest between 4:00 a.m. and 5:00 a.m., averaging 0.1 calls per hour.

Units Dispatched to Calls

Figure 9-4 and Table 9-3 detail the number of BFD calls with one, two, or three or more units dispatched overall and broken down by call type.

FIGURE 9-4: Calls by Number of Units Dispatched



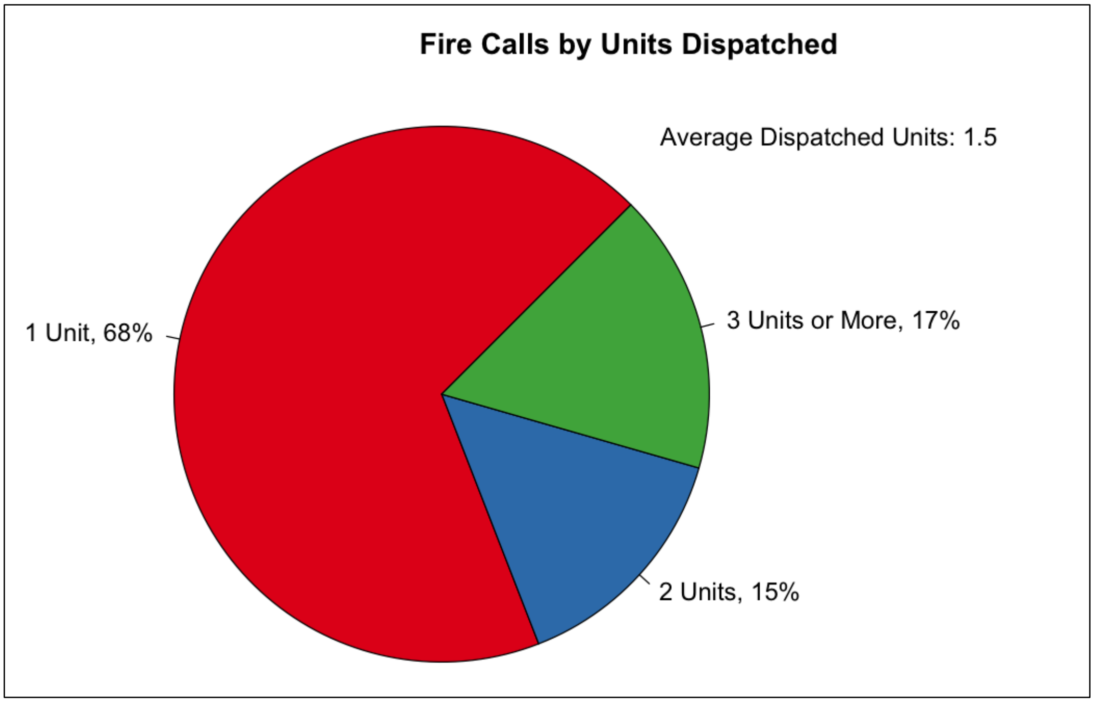


TABLE 9-3: Calls by Call Type and Number of Units Dispatched

Call Type	Number of Calls			Total Calls
	One Unit Dispatched	Two Units Dispatched	Three or More Units Dispatched	
Breathing difficulty	141	6	0	147
Cardiac and stroke	211	30	2	243
Fall and injury	486	31	1	518
Illness and other	793	56	8	857
MVA	103	112	134	349
Overdose and psychiatric	43	2	0	45
Seizure and unconsciousness	362	25	3	390
EMS Total	**2,139**	**262**	**148**	**2,549**
False alarm	267	88	99	454
Good intent	41	10	12	63
Hazard	179	38	38	255
Outside fire	28	9	12	49
Public service	255	13	7	275
Structure fire	5	8	24	37
Fire Total	**775**	**166**	**192**	**1,133**
Canceled	418	57	33	508
Mutual aid	30	24	4	58
Total	**3,362**	**509**	**377**	**4,248**
Percentage	**79.1**	**12.0**	**8.9**	**100.0**

Observations:

Overall

- On average, 1.3 units were dispatched to all calls, and for 79 percent of calls only one unit was dispatched.
- Overall, three or more units were dispatched to 9 percent of calls.

EMS

- On average, 1.2 units were dispatched per EMS call.
- For EMS calls, one unit was dispatched 84 percent of the time, two units were dispatched 10 percent of the time, and three or more units were dispatched 6 percent of the time.

Fires

- On average, 1.5 units were dispatched per fire call.
- For fire calls, one unit was dispatched 68 percent of the time, two units were dispatched 15 percent of the time, and three or more units were dispatched 17 percent of the time.
- For structure fire calls, three units were dispatched 19 percent of the time, four units were dispatched 32 percent of the time, five units were dispatched 11 percent of the time, and six or more units were dispatched 3 percent of the time.
- For outside fire calls, three or more units were dispatched 24 percent of the time.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of each unit is measured in two ways: runs and deployed time. Each time a unit responds (is dispatched) to a call it is counted as a run. Some calls result in the dispatch of more than one unit, which results in a higher total number of runs than total number of calls. The deployed time of a run is from the time a unit is dispatched through the time the unit is cleared.

Runs and Deployed Time – All Units

Deployed time, also referred to as deployed hours, is the total deployment time of all units deployed on all runs. Table 9-4 shows the total deployed time, both overall and broken down by type of run, for BFD units during the year studied.

TABLE 9-4: Annual Runs and Deployed Time by Run Type

Run Type	Avg. Deployed Min. per Run	Total Annual Hours	Percent of Total Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Breathing difficulty	20.2	51.4	2.6	8.4	153	0.4
Cardiac and stroke	25.4	117.1	6.0	19.2	277	0.8
Fall and injury	21.8	200.4	10.2	32.8	551	1.5
Illness and other	21.4	331.4	16.9	54.3	929	2.5
MVA	21.0	257.0	13.1	42.1	735	2.0
Overdose and psychiatric	25.0	19.6	1.0	3.2	47	0.1
Seizure and unconsciousness	22.8	159.9	8.1	26.2	421	1.2
EMS Total	**21.9**	**1,136.8**	**57.8**	**186.4**	**3,113**	**8.5**
False alarm	15.6	194.7	9.9	31.9	749	2.0
Good intent	18.8	32.0	1.6	5.2	102	0.3
Hazard	26.0	162.1	8.2	26.6	374	1.0
Outside fire	29.3	42.0	2.1	6.9	86	0.2
Public service	21.1	106.4	5.4	17.4	303	0.8
Structure fire	39.1	75.5	3.8	12.4	116	0.3
Fire Total	**21.3**	**612.7**	**31.2**	**100.4**	**1,730**	**4.7**
Canceled	10.1	106.5	5.4	17.5	634	1.7
Mutual aid	73.2	109.8	5.6	18.0	90	0.2
Total	**21.2**	**1,965.8**	**100.0**	**322.3**	**5,567**	**15.2**

Observations:

Overall

- Total deployed time for the year was 1,966 hours. The daily average was 5.4 hours for all units combined.
- There were 5,567 runs, including 90 mutual aid runs. The daily average was 15.2 runs.

EMS

- EMS runs accounted for 58 percent of the total workload.
- The average deployed time for an EMS run was 21.9 minutes. The deployed time for all EMS runs averaged 3.1 hours per day.

Fires

- Fire runs accounted for 31 percent of the total workload.
- There were 202 structure and outside fire runs, with a total workload of 117 hours. This accounted for 6 percent of the total workload.
- The average deployed time for a structure fire run was 39.1 minutes, and the average deployed time for an outside fire run was 29.3 minutes.

FIGURE 9-5: Average Deployed Minutes by Hour of Day

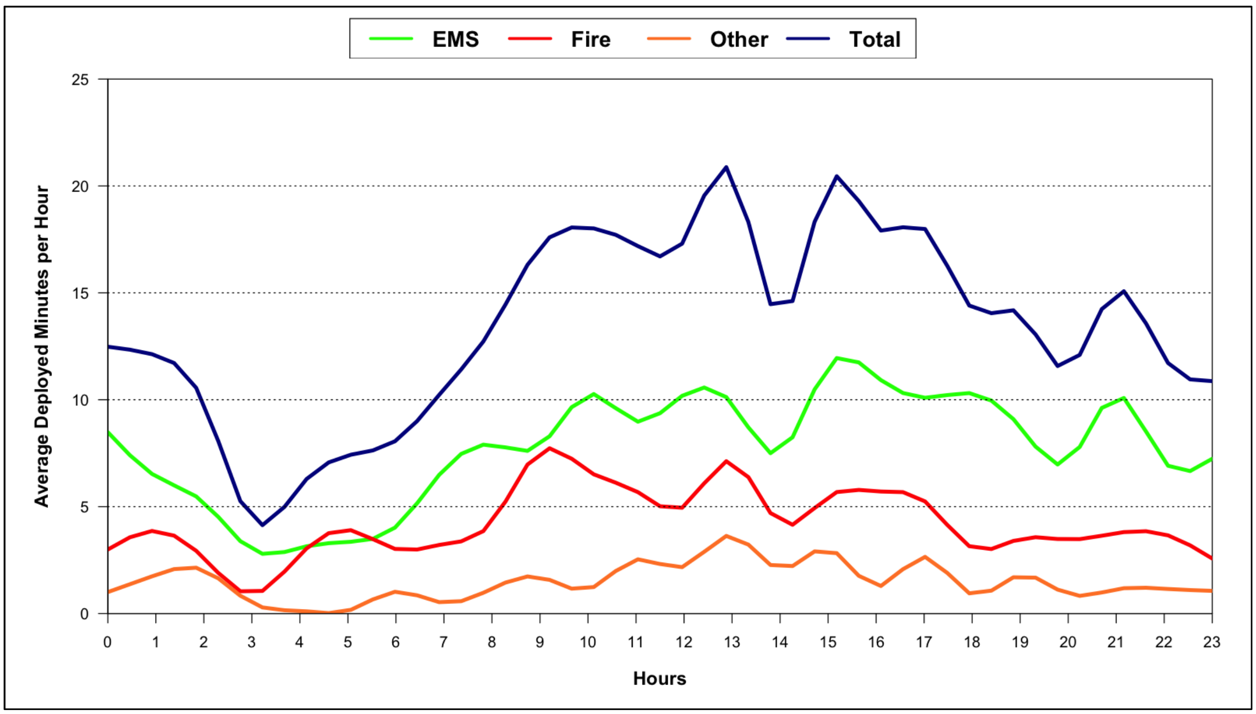


TABLE 9-5: Average Deployed Minutes by Hour of Day

Hour	EMS	Fire	Other	Total
0	8.5	3.0	1.0	12.5
1	6.4	3.9	1.8	12.1
2	5.2	2.6	2.0	9.8
3	3.0	0.9	0.5	4.4
4	3.1	2.7	0.1	5.9
5	3.3	3.9	0.1	7.4
6	4.1	3.0	1.0	8.1
7	6.7	3.2	0.5	10.5
8	7.9	4.3	1.2	13.3
9	7.8	7.6	1.7	17.2
10	10.3	6.7	1.1	18.1
11	9.0	5.7	2.5	17.2
12	10.2	5.0	2.2	17.4
13	9.8	7.1	3.7	20.6
14	7.5	4.2	2.1	13.8
15	11.6	5.5	3.0	20.1
16	11.1	5.7	1.3	18.1
17	10.1	5.3	2.7	18.0
18	10.3	3.1	0.9	14.3
19	8.7	3.5	1.8	14.0
20	7.1	3.5	0.9	11.5
21	10.2	3.8	1.1	15.1
22	7.1	3.7	1.2	12.0
23	7.2	2.6	1.1	10.9
Daily Avg.	**186.4**	**100.4**	**35.4**	**322.3**

Observations:

- Hourly deployed time was highest during the day from 9:00 a.m. to 2:00 p.m. and 3:00 p.m. to 6:00 p.m., averaging between 17 and 21 minutes.
- Average deployed time peaked between 1:00 p.m. and 2:00 p.m., averaging 21 minutes.
- Hourly deployed time was lowest between 3:00 a.m. and 4:00 a.m., averaging 4 minutes.

Workload by Unit

Table 9-6 provides a summary of each unit's workload overall. Tables 9-7 and 9-8 provide a more detailed view of workload, showing each unit's runs broken out by run type (Table 9-7) and the resulting daily average deployed time by run type (Table 9-8).

Reserve Engine 3's workload was calculated separately for each station based on where the unit was assigned when the run occurred. The average deployed time per day and average runs per day, however, are based on the full 12 months. To understand the actual average daily workload of Reserve Engine 3, the per day averages from each station must be added together. Because Reserve Engine 3 normally replaced the local station's engine rather than assisted it, daily averages can be added to the workload of the primary unit to understand the average daily workload for the engine or ladder company.

Reserve Engine 4 had one run which is included with Reserve Engine 3.

TABLE 9-6: Call Workload by Unit

Station	Unit	Avg. Deployed Min. per Run	Total Annual Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
1	Brush 1	30.8	1.5	0.3	3	0.0
	Engine 1	19.1	561.3	92.0	1,762	4.8
	Reserve Engine 3	18.5	18.5	3.0	60	0.2
	Total	**19.1**	**581.3**	**95.3**	**1,825**	**5.0**
2	Engine 2	19.7	589.9	96.7	1,799	4.9
	Reserve Engine 3	21.3	12.0	2.0	34	0.1
	Total	**19.7**	**602.0**	**98.7**	**1,833**	**5.0**
3	Brush 2	141.6	11.8	1.9	5	0.0
	Reserve Engine 3	20.8	17.3	2.8	50	0.1
	Ladder 1	20.9	373.4	61.2	1,074	2.9
	Hazmat	125.5	23.0	3.8	11	0.0
	Medic 1	44.3	119.5	19.6	162	0.4
	Total	**25.1**	**545.0**	**89.3**	**1,302**	**3.6**
Other	Battalion Chief 1	23.5	237.5	38.9	607	1.7

Note: Some units had such low total runs that average runs per day, when rounded to the nearest one-tenth, appears to be zero. Battalion Chief 1 moved from Station 3 to Station 1 in July 2016.

TABLE 9-7: Total Annual Runs by Run Type and Unit

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Mutual Aid	Total
1	Brush 1	0	1	0	0	0	0	0	1	1	3
	Engine 1	1,005	198	35	101	22	109	24	259	9	1,762
	Reserve Engine 3	27	10	0	7	1	2	3	10	0	60
	Total	**1,032**	**209**	**35**	**108**	**23**	**111**	**27**	**270**	**10**	**1,825**
2	Engine 2	1,109	205	30	115	29	103	32	167	9	1,799
	Reserve Engine 3	15	4	1	9	0	2	1	1	1	34
	Total	**1,124**	**209**	**31**	**124**	**29**	**105**	**33**	**168**	**10**	**1,833**
3	Brush 2	0	1	0	0	1	0	0	0	3	5
	Reserve Engine 3	27	3	1	7	2	2	2	6	0	50
	Hazmat	1	0	0	3	0	0	4	0	3	11
	Ladder 1	573	180	16	75	17	66	24	101	22	1,074
	Medic 1	121	4	2	0	0	3	1	11	20	162
	Total	**722**	**188**	**19**	**85**	**20**	**71**	**31**	**118**	**48**	**1,302**
Other	Battalion Chief 1	235	143	17	57	14	16	25	78	22	607

Note: Battalion Chief 1 moved from Station 3 to Station 1 in July 2016.

TABLE 9-8: Daily Average Deployed Minutes by Run Type and Unit

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Mutual Aid	Total
1	Brush 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.3
	Engine 1	56.0	8.3	1.9	6.6	1.9	6.5	2.5	6.5	1.7	92.0
	Engine 3	1.3	0.3	0.0	1.1	0.1	0.0	0.1	0.1	0.0	3.0
	Total	**57.2**	**8.6**	**1.9**	**7.7**	**2.0**	**6.6**	**2.6**	**6.9**	**1.8**	**95.3**
2	Engine 2	62.3	9.4	1.3	7.0	2.2	5.7	3.1	4.1	1.6	96.7
	Engine 3	0.7	0.2	0.1	0.6	0.0	0.1	0.1	0.0	0.2	2.0
	Total	**63.1**	**9.6**	**1.3**	**7.6**	**2.2**	**5.8**	**3.1**	**4.2**	**1.9**	**98.7**
3	Brush 2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.8	1.9
	Engine 3	1.5	0.1	0.0	0.5	0.1	0.1	0.3	0.2	0.0	2.8
	Hazmat	0.1	0.0	0.0	2.0	0.0	0.0	0.5	0.0	1.2	3.8
	Ladder 1	34.4	7.1	0.7	5.7	1.8	3.6	2.0	2.8	3.0	61.2
	Medic 1	15.0	0.1	0.1	0.0	0.0	0.2	0.2	0.4	3.6	19.6
	Total	**51.0**	**7.3**	**0.7**	**8.2**	**2.0**	**4.0**	**3.0**	**3.4**	**9.6**	**89.3**
Other	Battalion Chief 1	15.0	6.4	1.3	3.1	0.7	1.1	3.6	3.0	4.7	38.9

Note: Some units had such low total deployed time that average deployed time per day, when rounded to the nearest one-tenth, appears to be zero. Battalion Chief 1 moved from Station 3 to Station 1 in July 2016.

Observations:

- Engine 2 made the most runs (1,799 or an average of 4.9 per day) and had the highest total annual deployed time (590 hours or an average of 97 minutes per day).
  - EMS runs accounted for 62 percent of the runs and 64 percent of deployed time.
  - Structure and outside fires combined accounted for 3 percent of the runs and 5 percent of deployed time.
- Engine 1 made the second most runs (1,762 or an average of 4.8 per day) and had the second highest total annual deployed time (561 hours or an average of 92 minutes per day).
  - EMS runs accounted for 57 percent of the runs and 61 percent of deployed time.
  - Structure and outside fires combined accounted for 3 percent of the runs and 5 percent of deployed time.
- When the Battalion Chief workload is excluded, Stations 1 and 2 were each responsible for 37 percent of overall runs, and Station 3 was responsible for the remaining 26 percent. Units from Station 1 were responsible for 34 percent of total deployed time; units from Station 2 were responsible for 35 percent of total deployed time; and units from Station 3 were responsible for 32 percent of total deployed time.

ANALYSIS OF BUSIEST HOURS

There is significant variability in the number of calls from hour to hour. One special concern relates to the resources available for hours with the heaviest workload. We tabulated the data for each of the 8,784 hours in the year. Table 9-9 shows the number of hours in the year in which there were zero to four or more calls during the hour. Table 9-10 shows the 10 one-hour intervals during the year with the most calls.

TABLE 9-9: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	5,508	62.7
1	2,482	28.3
2	648	7.4
3	123	1.4
4+	23	0.3

TABLE 9-10: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
12/09/2016 – 8:00 a.m. to 9:00 a.m.	6	10	1.6
04/13/2016 – Noon to 1:00 p.m.	6	9	1.8
05/05/2016 – 11:00 a.m. to Noon	6	8	7.8
10/20/2016 – 5:00 p.m. to 6:00 p.m.	6	8	2.3
10/30/2016 – Midnight to 1:00 a.m.	5	5	1.8
09/18/2016 – 2:00 a.m. to 3:00 a.m.	4	10	9.4
12/16/2016 – 4:00 p.m. to 5:00 p.m.	4	9	1.9
08/28/2016 – 4:00 p.m. to 5:00 p.m.	4	8	2.7
07/26/2016 – 4:00 p.m. to 5:00 p.m.	4	8	1.0
03/28/2016 – 5:00 p.m. to 6:00 p.m.	4	8	0.9

Note: Total deployed hours is the total time spent responding to calls received in the hour, and which may extend into the next hour or hours. Number of runs and deployed hours only includes BFD units.

Observations:

- During 146 hours (2 percent of all hours), three or more calls occurred; in other words, the department responded to three or more calls in an hour roughly once every three days.
- The highest number of calls to occur in an hour was six, which happened four times.
- The hour with the most calls and resulting runs was 8:00 a.m. to 9:00 a.m. on December 9, 2016. The hour's six calls involved 10 individual dispatches resulting in 1.6 hours of deployed time. The six calls included three hazard calls, one fall and injury call, one false alarm call, and one motor vehicle accident.
- The hour with the most calls and most resulting deployed time was 11:00 a.m. to noon on May 5, 2016. The hour's six calls involved eight individual dispatches resulting in 7.8 hours of deployed time. The six calls included three hazard calls, two public service calls, and one canceled call.

RESPONSE TIME

In this part of the analysis we present response time statistics for different call types.

Different terms are used to describe the components of response time. Dispatch time is the difference between the time a call is received and the time a unit is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and types of resources to dispatch. Turnout time is the difference between dispatch time and the time a unit is en route. Travel time is the difference between the time en route and arrival on scene. Response time is the total time elapsed between receiving a call to arriving on scene.

In this response time analysis, we included all calls to which at least one non-administrative BFD unit responded, excluding canceled and mutual aid calls. For the response time analysis, Battalion Chief 1 was treated as an administrative unit. Calls with a total response time of more than 30 minutes were also excluded. Finally, we focused on units that had complete time stamps, that is, units with all components recorded so as to be able to calculate each segment of response time.

Based on the methodology above, 566 canceled and mutual aid calls, 20 non-canceled calls where no unit recorded an on-scene time, 4 calls with response times over 30 minutes, and 155 calls with en route or arrival times missing or of zero seconds were excluded. As a result, in this section, a total of 3,503 calls are included in the analysis.

Response Time by Type of Call

Table 9-11 provides average dispatch, turnout, travel, and total response time for the first arriving unit to each call in the city, broken out by call type. Figures 9-6 and 9-7 illustrate the same information. Table 9-12 gives the 90th percentile time broken out in the same manner. A 90th percentile time means that 90 percent of calls had response times at or below that number. For example, Table 9-12 shows a 90th percentile response time of 9.3 minutes for breathing difficulty calls, meaning 90 percent of the time a breathing difficulty call had a response time of no more than 9.3 minutes.

TABLE 9-11: Average Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch	Turnout	Travel	Total	Number of Calls
Breathing difficulty	1.6	1.7	3.6	6.9	144
Cardiac and stroke	1.9	1.7	3.8	7.5	239
Fall and injury	1.9	1.8	3.9	7.5	502
Illness and other	1.7	1.8	3.7	7.3	829
MVA	1.9	1.9	3.7	7.6	327
Overdose and psychiatric	1.4	1.9	4.5	7.8	44
Seizure and unconsciousness	2.0	1.5	3.6	7.1	379
EMS Total	**1.8**	**1.8**	**3.8**	**7.4**	**2,464**
False alarm	1.6	2.2	3.7	7.5	414
Good intent	1.7	1.9	3.8	7.4	58
Hazard	1.6	2.1	4.3	8.1	242
Outside fire	1.8	2.2	3.8	7.8	48
Public service	1.8	1.9	4.8	8.5	243
Structure fire	1.8	2.3	3.3	7.4	34
Fire Total	**1.7**	**2.1**	**4.1**	**7.9**	**1,039**
Total	**1.8**	**1.9**	**3.9**	**7.5**	**3,503**

FIGURE 9-6: Average Response Time of First Arriving Unit, by Call Type – EMS

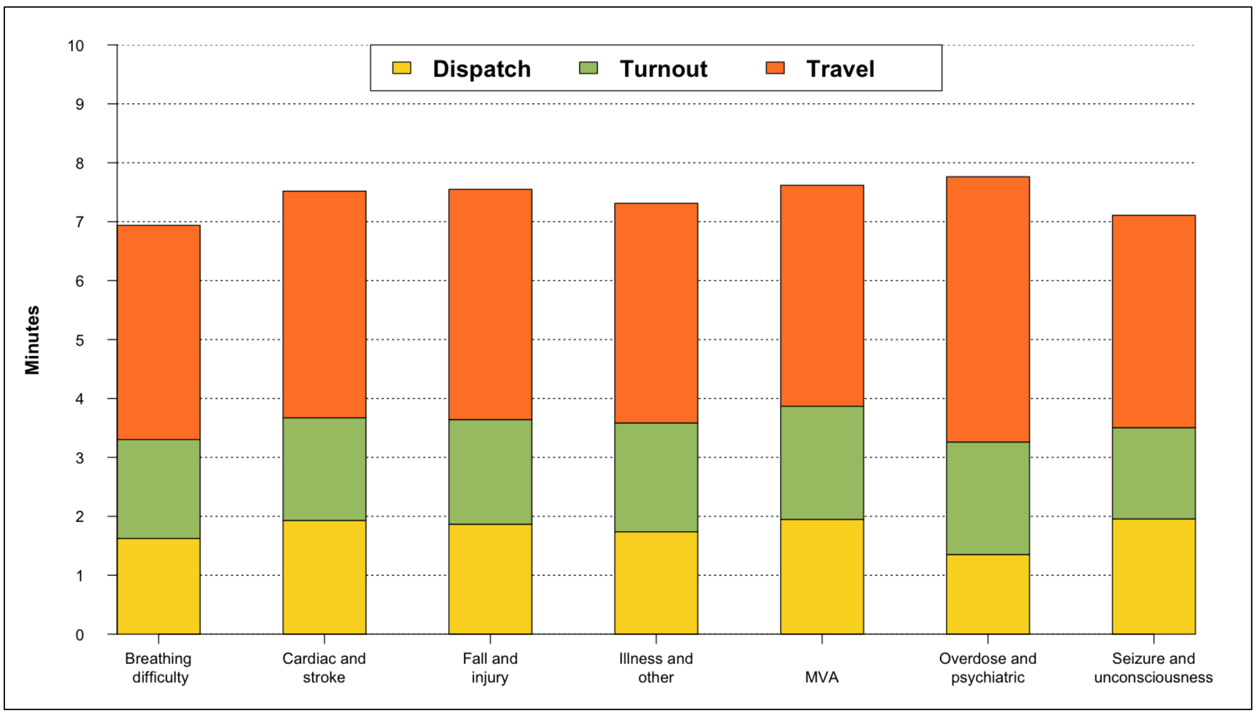


FIGURE 9-7: Average Response Time of First Arriving Unit, by Call Type – Fire

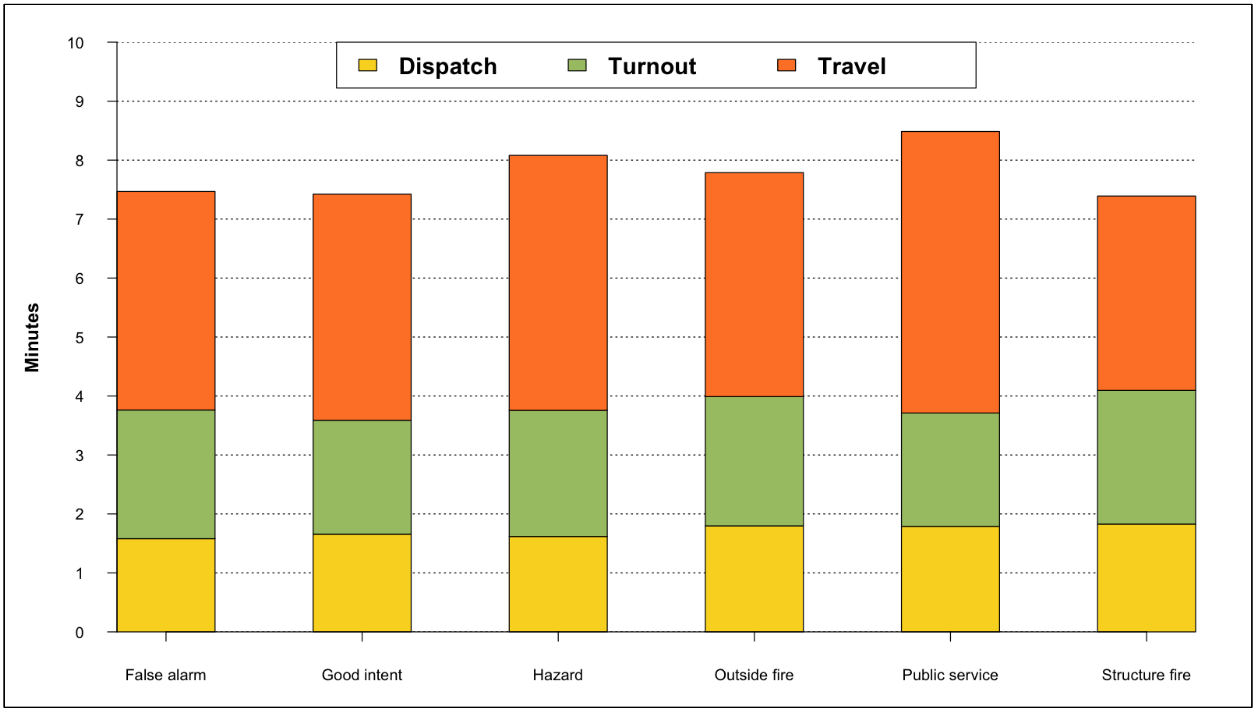


TABLE 9-12: 90th Percentile Response Time of First Arriving Unit, by Call Type (Minutes)

Call Type	Dispatch	Turnout	Travel	Total	Number of Calls
Breathing difficulty	2.6	2.9	5.5	9.3	144
Cardiac and stroke	3.0	3.0	6.1	10.4	239
Fall and injury	2.9	2.8	6.5	10.6	502
Illness and other	3.0	3.1	6.2	10.7	829
MVA	3.0	3.1	6.4	10.8	327
Overdose and psychiatric	2.8	2.8	6.8	12.0	44
Seizure and unconsciousness	3.0	2.7	6.2	9.9	379
EMS Total	**2.9**	**3.0**	**6.3**	**10.4**	**2,464**
False alarm	2.5	3.2	6.2	10.3	414
Good intent	3.5	3.0	6.3	9.9	58
Hazard	2.6	3.1	7.3	11.3	242
Outside fire	3.1	3.5	6.0	11.1	48
Public service	3.0	3.1	7.8	12.0	243
Structure fire	2.7	4.0	5.5	9.3	34
Fire Total	**2.7**	**3.2**	**6.9**	**11.2**	**1,039**
Total	**2.9**	**3.1**	**6.4**	**10.7**	**3,503**

Observations:

- The average dispatch time was 1.8 minutes.
- The average turnout time was 1.9 minutes.
- The average travel time was 3.9 minutes.
- The average response time was 7.5 minutes.
- The average response time was 7.4 minutes for EMS calls and 7.9 minutes for fire calls.
- The average response time for structure fires was 7.4 minutes, and for outside fires was 7.8 minutes.
- The 90th percentile dispatch time was 2.9 minutes.
- The 90th percentile turnout time was 3.0 minutes.
- The 90th percentile travel time was 6.4 minutes.
- The 90th percentile response time was 10.7 minutes.
- The 90th percentile response time was 10.4 minutes for EMS calls and 11.2 minutes for fire calls.
- The 90th percentile response time for structure fires was 9.3 minutes, and for outside fires was 11.1 minutes.

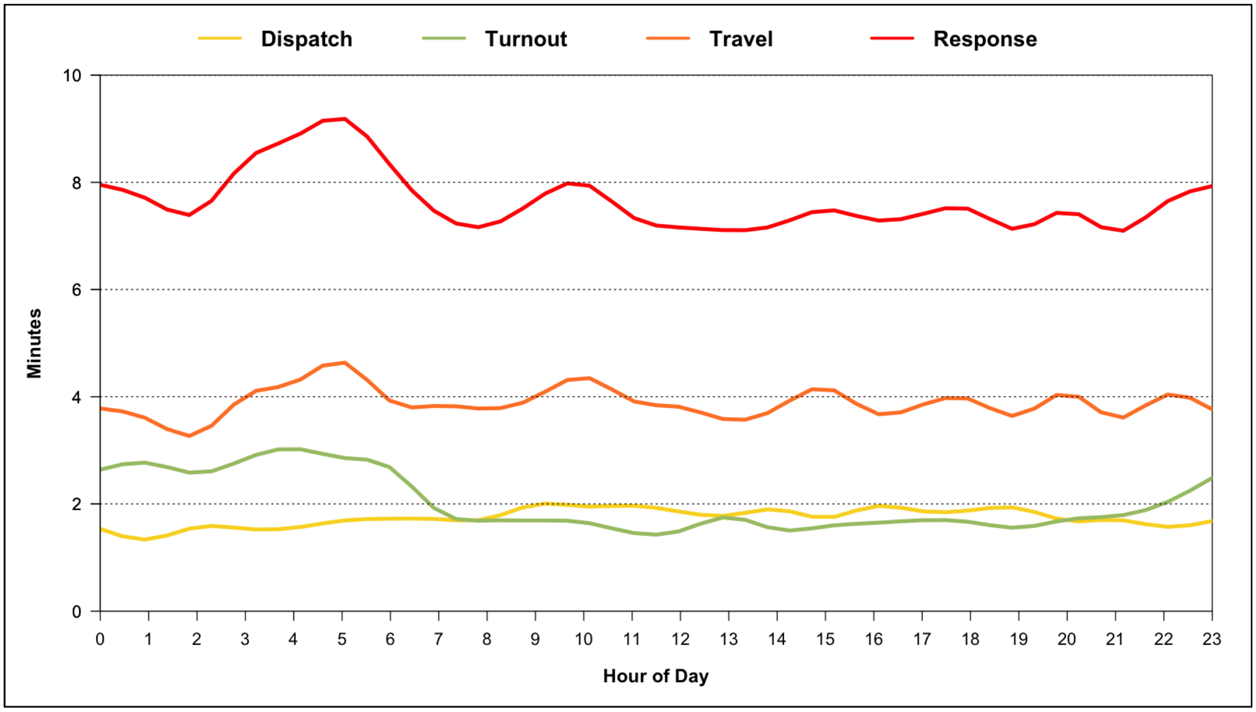
Response Time by Hour

Average dispatch, turnout, travel, and total response time by hour for calls in the city are shown in Table 9-13 and Figure 9-8. The table also shows 90th percentile time.

TABLE 9-13: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day

Hour	Dispatch	Turnout	Travel	Response Time	90th Percentile Response Time	Number of Calls
0	1.5	2.6	3.8	8.0	11.4	124
1	1.3	2.8	3.6	7.7	11.1	122
2	1.6	2.6	3.3	7.4	11.2	93
3	1.5	2.8	4.0	8.4	10.7	61
4	1.6	3.0	4.3	8.8	11.3	47
5	1.7	2.9	4.7	9.2	11.4	53
6	1.7	2.7	3.9	8.3	11.0	90
7	1.7	1.9	3.8	7.4	9.6	112
8	1.7	1.7	3.8	7.2	10.1	172
9	2.0	1.7	4.0	7.7	11.2	179
10	2.0	1.7	4.4	8.0	10.7	190
11	2.0	1.5	3.9	7.4	11.2	190
12	1.9	1.5	3.8	7.2	10.1	192
13	1.8	1.8	3.6	7.1	9.7	185
14	1.9	1.5	3.8	7.2	10.3	163
15	1.7	1.6	4.2	7.5	10.6	193
16	2.0	1.6	3.7	7.3	10.6	195
17	1.9	1.7	3.8	7.4	10.6	205
18	1.9	1.7	4.0	7.5	10.3	184
19	1.9	1.6	3.6	7.1	10.1	162
20	1.7	1.7	4.1	7.5	11.0	159
21	1.7	1.8	3.6	7.1	9.9	169
22	1.6	2.0	4.0	7.6	11.0	128
23	1.7	2.5	3.8	7.9	10.3	135

FIGURE 9-8: Average Response Time of First Arriving Unit, by Hour of Day



Observations:

- Average dispatch time was between 1.3 minutes (1:00 a.m. to 2:00 a.m.) and 2 minutes (9:00 a.m. to noon and 4:00 p.m. to 5:00 p.m.).
- Average turnout time was between 1.5 minutes (11:00 a.m. to 1:00 p.m. and 2:00 p.m. to 3:00 p.m.) and 3 minutes (4:00 a.m. to 5:00 a.m.).
- Average travel time was between 3.3 minutes (2:00 a.m. to 3:00 a.m.) and 4.7 minutes (5:00 a.m. to 6:00 a.m.).
- Average response time was between 7.1 minutes (multiple times of day) and 9.2 minutes (5:00 a.m. to 6:00 a.m.).
- 90th percentile total response time by hour ranged from 9.6 minutes (7:00 a.m. to 8:00 a.m.) and 11.4 minutes (midnight to 1:00 a.m. and 5:00 a.m. to 6:00 a.m.).

Response Time Distribution

A more detailed look at how response times to calls are distributed is presented here. The cumulative distribution of total response time for the first arriving unit to EMS calls is shown in Figure 9-9. Figure 9-10 shows response times for the first arriving BFD unit to EMS calls as a frequency distribution in whole minute increments. The same information from Figures 9-9 and 9-10 is given in Table 9-14. Figures 9-11 and 9-12 and Table 9-15 provide the same information for structure and outside fires combined.

The cumulative percentages here are read in the same way as a percentile. In Figure 9-9, the 90th percentile of 10.4 minutes means that 90 percent of EMS calls had a response time of 10.4 or less. In Table 9-14, the cumulative percentage of 50.9 means that 50.9 percent of EMS calls had a response time under 7 minutes.

FIGURE 9-9: Cumulative Distribution of Response Time – First Arriving Unit – EMS

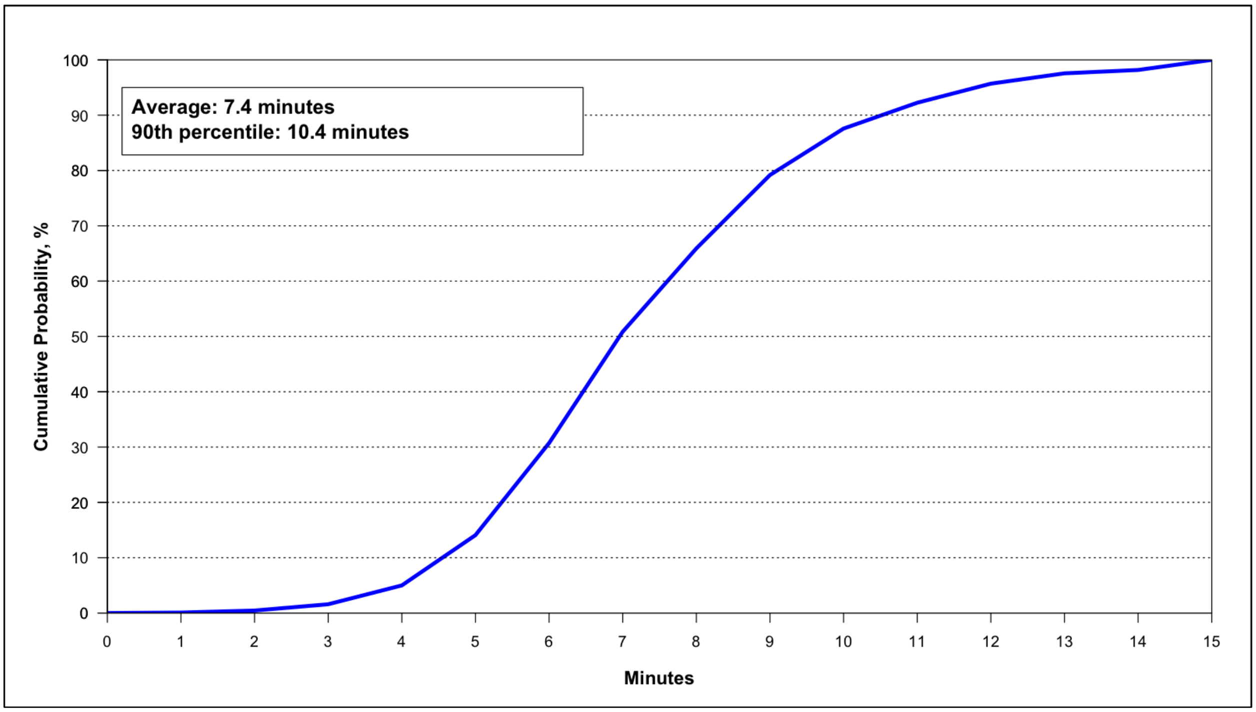


FIGURE 9-10: Frequency Distribution of Response Time – First Arriving Unit – EMS

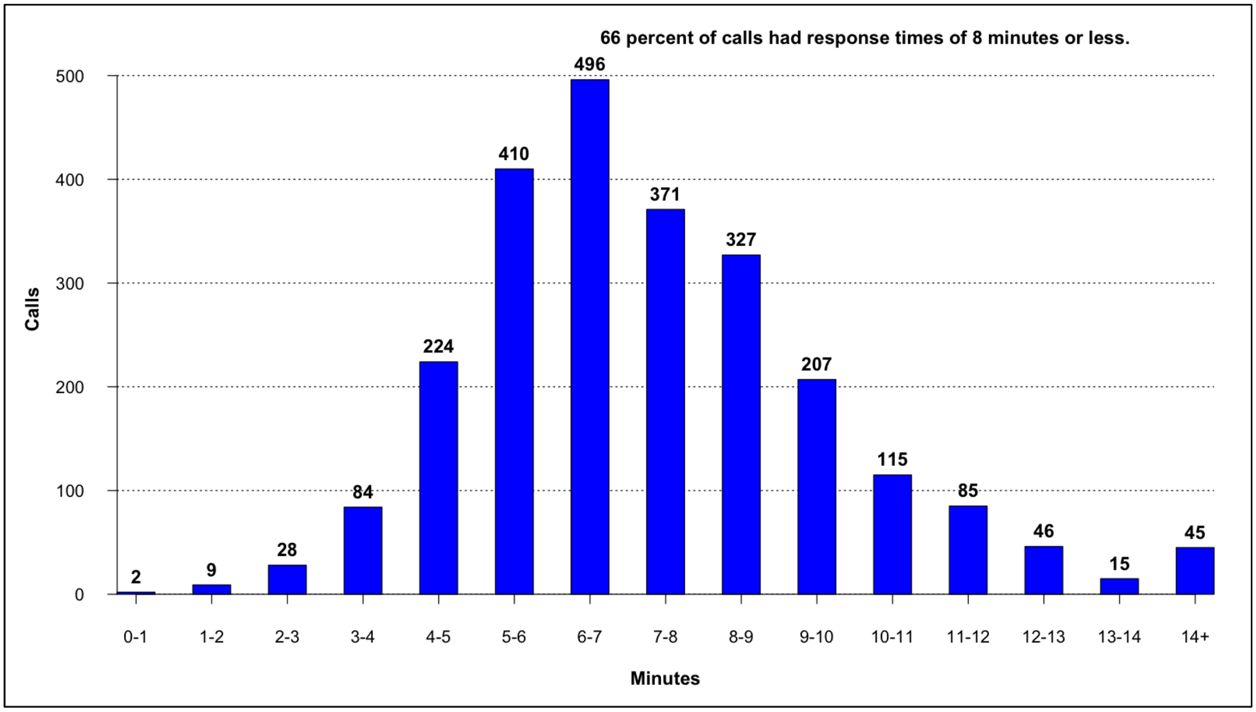


TABLE 9-14: Cumulative Distribution of Response Time – First Arriving Unit – EMS

Response Time (minute)	Frequency	Cumulative Percentage
< 1	2	0.1
1 - 2	9	0.4
2 - 3	28	1.6
3 - 4	84	5.0
4 - 5	224	14.1
5 - 6	410	30.7
6 - 7	496	50.9
7 - 8	371	65.9
8 - 9	327	79.2
9 - 10	207	87.6
10 - 11	115	92.2
11 - 12	85	95.7
12 - 13	46	97.6
13 - 14	15	98.2
14+	45	100.0

FIGURE 9-11: Cumulative Distribution of Response Time – First Arriving Unit – Fires

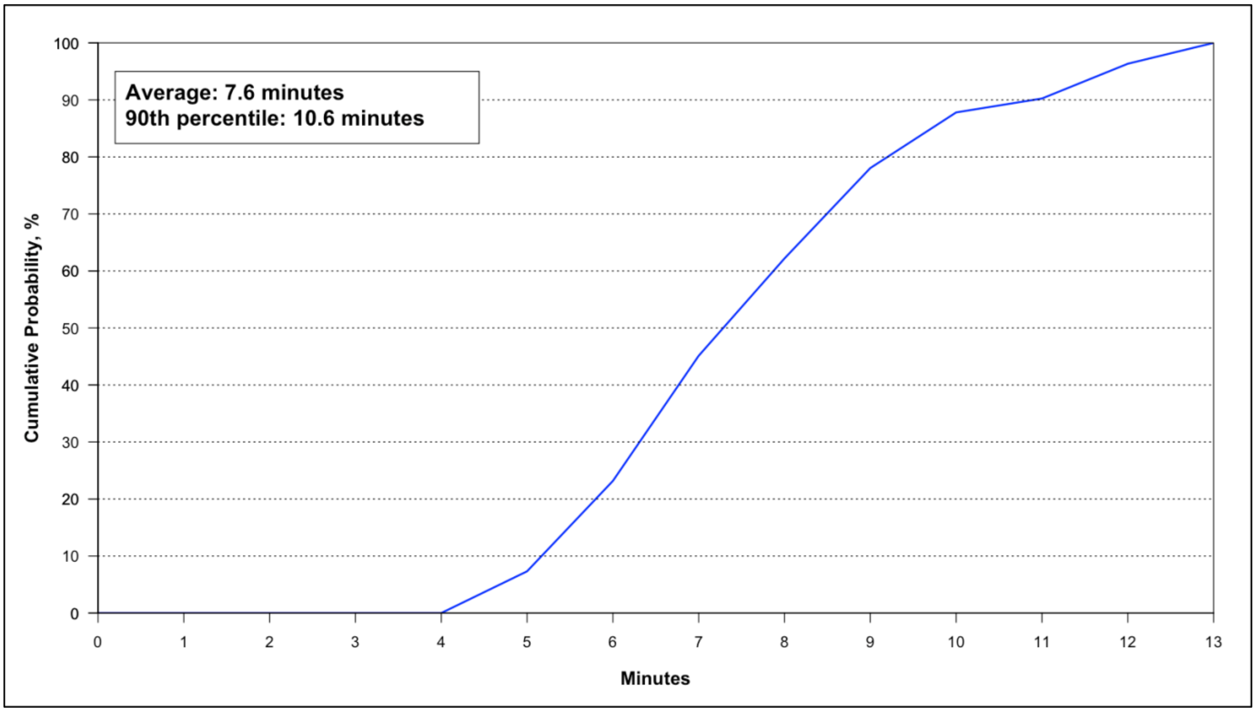


FIGURE 9-12: Frequency Distribution of Response Time – First Arriving Unit – Fires

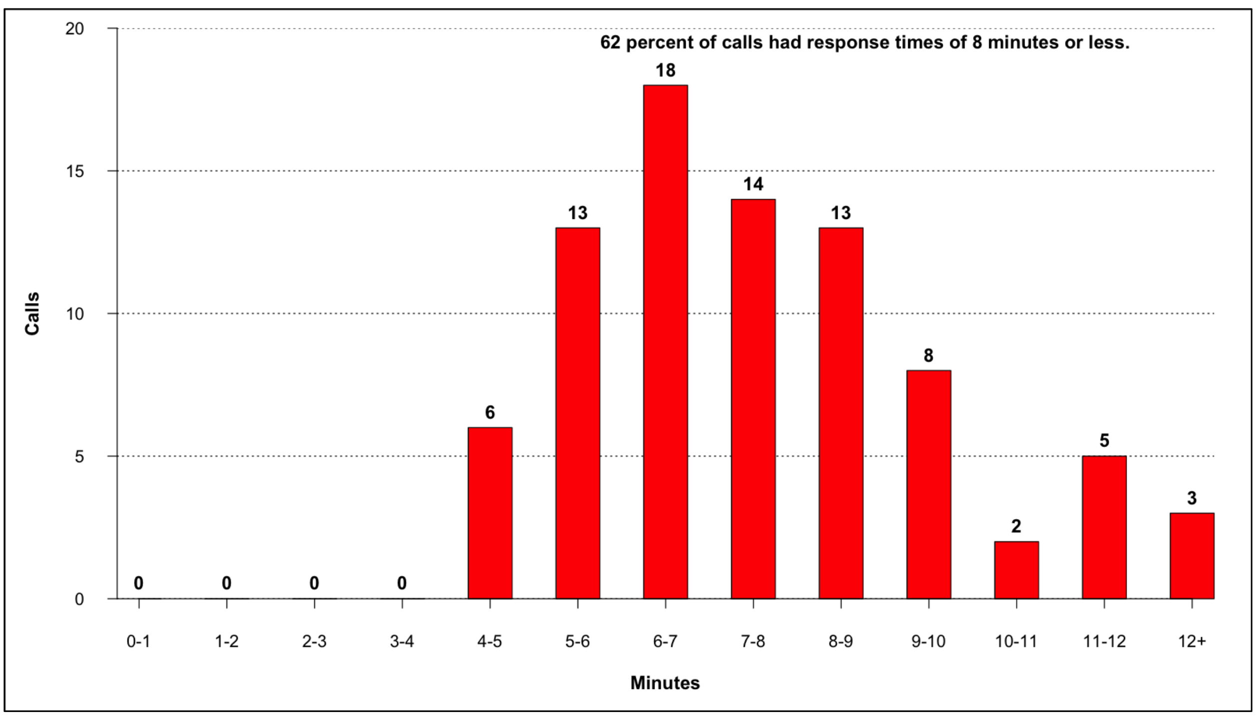


TABLE 9-15: Cumulative Distribution of Response Time – First Arriving Unit – Fires

Response Time (minute)	Frequency	Cumulative Percentage
< 1	0	0.0
1 - 2	0	0.0
2 - 3	0	0.0
3 - 4	0	0.0
4 - 5	6	7.3
5 - 6	13	23.2
6 - 7	18	45.1
7 - 8	14	62.2
8 - 9	13	78.0
9 - 10	8	87.8
10 - 11	2	90.2
11 - 12	5	96.3
12+	3	100.0

Observations:

- For 66 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 23 percent of structure and outside fire calls, the response time of the first arriving unit was less than 6 minutes and for 62 percent was less than 8 minutes.

SHARED RESPONSE WITH AMR

In addition to the EMS response provided by the Bozeman Fire Department, American Medical Response (AMR) provides EMS response and transport services under a contract with the city. BFD provides transport services with Medic 1 when all AMR units are unavailable.

A full analysis of AMR's responses in Bozeman was beyond the scope of this study; however, we looked at the calls to which both BFD and AMR responded during the study period to measure call response time from a citizen's perspective.

Response Time of First Arriving BFD or AMR Unit

BFD and AMR responded to 3,106 calls together during the study period. Canceled and mutual aid calls were excluded, leaving 2,622 calls where at least one unit from both agencies arrived on scene. The same criteria used in the response time analysis earlier in the report were then applied. This left 2,278 calls where at least one unit from both agencies arrived on scene with a response time under 30 minutes and had complete time stamps. There were 15 calls where the first arriving units from BFD and AMR recorded the same arrival time. These 15 calls are not included in the averages.

Table 9-16 shows the average response time of the first arriving unit from each agency to calls based on call type, the average time between the first unit from the first agency to arrive and the first unit from the second agency to arrive, and the number of calls.

TABLE 9-16: Average Response Time of the First Arriving BFD or AMR Unit

Call Type	Arrival Order	Average Response Time			Number of Calls
		First Arriving	Second Arriving	Difference	
EMS	BFD First	6.7	8.8	2.2	1,392
	AMR First	6.9	8.7	1.8	695
	Total	**6.7**	**8.8**	**2.0**	**2,087**
Fire	BFD First	7.2	9.6	2.3	120
	AMR First	7.3	9.0	1.7	56
	Total	**7.3**	**9.4**	**2.1**	**176**
Overall	BFD First	6.7	8.9	2.2	1,512
	AMR First	6.9	8.7	1.8	751
	Total	**6.8**	**8.8**	**2.0**	**2,263**

Observations:

- BFD arrived on scene first 67 percent of the time, with an average response time of 6.7 minutes and an average arrival of 2.2 minutes before AMR.
- AMR arrived on scene first 33 percent of the time, with an average response time of 6.9 minutes and an average arrival of 1.8 minutes before BFD.
- Overall, the average response time for a unit from either BFD or AMR was 6.8 minutes.

TABLE 9-17: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Outside Fire	Structure Fire
Fire control or extinguishment, other	8	4
Extinguishment by fire service personnel	21	9
Salvage & overhaul	6	5
Contain fire (wildland)	1	0
Confine fire (wildland)	1	0
Control fire (wildland)	2	0
Rescue, remove from harm	0	1
Ventilate	4	11
Determine if materials are non-hazardous	1	0
Operate apparatus or vehicle	2	0
Systems and services, other	0	1
Restore fire alarm system	0	3
Shut down system	0	1
Information, investigation & enforcement, other	1	1
Incident command	2	1
Provide information to public or media	1	0
Investigate	4	6
Investigate fire out on arrival	11	12
Total	**65**	**55**

Note: Totals are higher than the total number of structure and outside fire calls because some calls had more than one action taken.

Observations:

- A total of 21 outside fires were extinguished by fire service personnel, which accounted for 43 percent of outside fires.
- A total of 9 structure fires were extinguished by fire service personnel, which accounted for 24 percent of structure fires.

TABLE 9-18: Content and Property Loss – Structure and Outside Fires

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Outside fire	$54,551	18	$18,806	9
Structure fire	$67,400	13	$93,475	15
Total	**$121,951**	**31**	**$112,281**	**24**

Note: This includes only calls with recorded loss greater than 0.

Observations:

Outside Fires

- Out of 49 outside fires, 18 had recorded property loss, with a combined $54,551 in loss.
- 9 outside fires also had content loss with a combined $18,806 in loss.
- The highest total loss for an outside fire was $40,000.

Structure Fires

- Out of 37 structure fires, 13 had recorded property loss, with a combined $67,400 in loss.
- 15 structure fires also had content loss with a combined $93,475 in loss.
- The average total loss for all structure fires was $4,348.
- The average total loss for structure fires with loss was $8,938.
- The highest total loss for a structure fire was $70,000.

TABLE 9-19: Total Fire Loss Above and Below $20,000

Call Type	No Loss	Under $20,000	$20,000 plus
Outside fire	28	20	1
Structure fire	19	15	3
Total	**47**	**35**	**4**

Note: One outside fire had $1 in property loss and $1 in content loss.

Observations:

- 28 outside fires and 19 structure fires had no recorded loss.
- 1 outside fire and 3 structure fires had $20,000 or more in loss.

ATTACHMENT III

TABLE 9-20: Workload of Administrative Units

Unit ID	Unit Type	Annual Hours	Annual Runs
F1	Fire Chief	22.2	21
F2	DC Operations	27.5	27
F3	DC Prevention	7.7	6
F4	EM Captain	2.2	3
F5	Training Officer	0.6	2
F6	Other	1.5	1

Note: The EM Captain provides services to the entire county; however, only workload associated with BFD calls is included in this table.

ATTACHMENT IV

TABLE 9-21: EMS Call Type Descriptions

Call Type	CAD Call Type
Breathing difficulty	ABNORMAL BREATHING
	BREATHING PROBLEMS
	CHOKING
	DROWNING/DIVING/SCUBA ACCIDENT
Cardiac and stroke	CARDIAC - RESPIRATORY ARREST
	CHEST PAIN (NO TRAUMA)
	HEART PROBLEMS
	POSSIBLE HEART ATTACK
	STROKE
Fall and injury	ASSAULT
	ELECTROCUTION
	FALLS
	HEMORRHAGE / LACERATIONS
	STABBING
	TRAUMATIC INJURIES
Illness and other	ABDOMINAL PAIN
	ACUTE SEVERE PAIN
	ALLERGIES
	BACK PAIN (NO TRAUMA)
	CO/INHALATION/HAZMAT
	DIABETIC PROBLEMS
	EMERGENCY RESPONSE REQUESTED
	EYE PROBLEMS / INJURIES
	HEADACHE
	HEAT / COLD EXPOSURE
	PATIENT TRANSPORT
	POISONING - ACCIDENTAL
	PREGNANCY/CHILDBIRTH
	SICK PERSON
	UNKNOWN PROBLEM - EMS
MVA	VEHICLE COLLISION
Overdose and psychiatric	SUICIDE
Seizure and unconsciousness	CONVULSIONS / SEIZURES
	NOT ALERT
	UNCONSCIOUS

Note: Some CAD call types were simplified for this table; e.g., there are18 vehicle collision call types in CAD.

TABLE 9-22: Fire Call Type Descriptions

Call Type	NFIRS Code	NFIRS Type Description
False alarm	700	False alarm or false call, other
	710	Malicious, mischievous false call, other
	713	Telephone, malicious false alarm
	715	Local alarm system, malicious false alarm
	721	Bomb scare - no bomb
	730	System malfunction, other
	731	Sprinkler activation due to malfunction
	733	Smoke detector activation due to malfunction
	734	Heat detector activation due to malfunction
	735	Alarm system sounded due to malfunction
	736	CO detector activation due to malfunction
	740	Unintentional transmission of alarm, other
	741	Sprinkler activation, no fire - unintentional
	742	Extinguishing system activation
	743	Smoke detector activation, no fire - unintentional
	744	Detector activation, no fire - unintentional
	745	Alarm system activation, no fire - unintentional
	746	Carbon monoxide detector activation, no CO
Good intent	600	Good intent call, other
	631	Authorized controlled burning
	651	Smoke scare, odor of smoke
	652	Steam, vapor, fog or dust thought to be smoke
	661	EMS call, party transported by non-fire agency
	671	HazMat release investigation w/no HazMat
Hazard	210	Overpressure rupture from steam, other
	220	Overpressure rupture from air or gas, other
	221	Overpressure rupture of air or gas pipe/pipeline
	251	Excessive heat, scorch burns with no ignition
	400	Hazardous condition, other
	410	Combustible/flammable gas/liquid condition, other
	411	Gasoline or other flammable liquid spill
	412	Gas leak (natural gas or LPG)
	413	Oil or other combustible liquid spill
	421	Chemical hazard (no spill or leak)
	423	Refrigeration leak
	424	Carbon monoxide incident
	440	Electrical wiring/equipment problem, other
	442	Overheated motor

Call Type	NFIRS Code	NFIRS Type Description
Hazard	443	Breakdown of light ballast
	444	Power line down
	445	Arcing, shorted electrical equipment
	451	Biological hazard, confirmed or suspected
	460	Accident, potential accident, other
	461	Building or structure weakened or collapsed
	463	Vehicle accident, general cleanup
Outside fire	100	Fire, other
	130	Mobile property (vehicle) fire, other
	131	Passenger vehicle fire
	132	Road freight or transport vehicle fire
	137	Camper or recreational vehicle (RV) fire
	140	Natural vegetation fire, other
	141	Forest, woods or wildland fire
	142	Brush or brush-and-grass mixture fire
	143	Grass fire
	150	Outside rubbish fire, other
	151	Outside rubbish, trash or waste fire
	153	Construction or demolition landfill fire
	154	Dumpster or other outside trash receptacle fire
	160	Special outside fire, other
	161	Outside storage fire
	162	Outside equipment fire
Public service	500	Service Call, other
	510	Person in distress, other
	511	Lock-out
	520	Water problem, other
	522	Water or steam leak
	531	Smoke or odor removal
	542	Animal rescue
	550	Public service assistance, other
	551	Assist police or other governmental agency
	552	Police matter
	553	Public service
	554	Assist invalid
	555	Defective elevator, no occupants
	561	Unauthorized burning
	911	Citizen complaint

Call Type	NFIRS Code	NFIRS Type Description
Structure fire	111	Building fire
	112	Fires in structure other than in a building
	113	Cooking fire, confined to container
	114	Chimney or flue fire, confined to chimney or flue
	115	Incinerator overload or malfunction, fire confined
	116	Fuel burner/boiler malfunction, fire confined

ATTACHMENT V

TABLE 9-23: Workload by Day of Week

Day of Week	EMS	Fire	Other	Total
Sunday	6.6	2.8	1.9	10.4
Monday	6.9	3.2	2.0	11.3
Tuesday	6.4	3.5	2.2	11.6
Wednesday	6.4	3.6	2.1	11.3
Thursday	6.9	3.6	1.8	11.6
Friday	8.0	3.7	2.2	13.5
Saturday	7.9	2.5	2.0	11.5