CITY OF JOPLIN FIRE DEPARTMENT

Resource Allocation Study

Canfield Jenkins and Associates, LLC

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SCOPE

This document provides an overview and assessment of fire department operations and deployment for the City of Joplin, evaluating an all-hazards response model using existing fire stations with the anticipated construction of Station 7. Fire station locations and response methodology are assessed, and recommendations made based on efficiencies, effectiveness, industry best practices and comparison to national consensus standards. Data was compiled from the Department's records management system, city resources and from other reputable public sources. Included in this report are recommendations designed to improve fire and emergency response for the citizens of Joplin.

With intention, opportunities for improvement are identified and coupled with realistic solutions. By the nature of this work, other ancillary emergency response components were reviewed and are included, as appropriate, with the recommendations in this report. These include nearby fire departments that provide mutual and automatic aid, the various 9-1-1 centers in the Joplin region and the two ambulance services that provide emergency medical care to the citizens of Joplin. It is important to understand that recommendations made here are a direct product of the assessment of community risk, resources, technology, staffing models, and funding that are necessary to mitigate and control emergency incidents in a city as complex as Joplin.

This report is considered a living document, and should be updated as changes are made to the Department or staffing changes occur.



DEFINITIONS AND ABBREVIATIONS

ALS – Advanced Life Support
ARFF – Aircraft Rescue and Firefighting
BLS – Basic Life Support
CADS – Computer Aided Dispatch System
ERF - Effective Response Force
FDC - Fire Department Connection
GIS – Geographic Information System
IAFF – International Association of Firefighters
ICS - Incident Command System
ISO – Insurance Service Office
JFD – Joplin Fire Department
KJLN – Joplin Airport
METS – Metropolitan Emergency Transport System
MPDS – Medical Priority Dispatching System
NCAD – Newton County Ambulance District
NFIRS – National Fire Incident Reporting System
NIMS - National Incident Management System
NFPA - National Fire Protection Association
PPE - Personal Protective Equipment
PSAP – Public Safety Answering Point (e.g. a primary 9-1-1 center)
RMS – Records Management System
SCBA - Self Contained Breathing Apparatus
UHU – Unit Hour Utilization

BACKGROUND AND ASSUMPTIONS

This report is the product of extensive collaboration, research and focus on the City of Joplin and the opportunities to enhance and improve fire and emergency response provided by the Joplin Fire Department (JFD). In an attempt to gain consensus, this document has included input from a leadership team made up of members of the Department's command staff and a representative of the International Association of Firefighters (IAFF) Local 59. Recommendations developed in this report are the result of interviews, research and comparison to industry standards to identify opportunities to streamline or further enhance service delivery to the citizens who live and work in the City of Joplin.

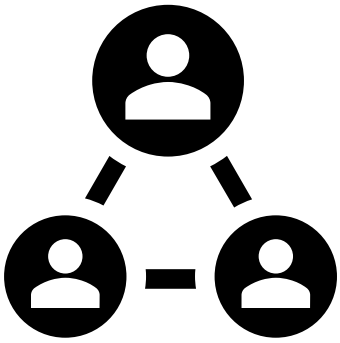
Joplin is a unique community, serving as a destination city for many smaller communities in southwest Missouri. The Joplin Metropolitan Statistical Area is recognized as Jasper and Newton Counties. The Combined Statistical Area includes portions of Oklahoma, but is not used in this analysis. It is recognized that the City of Joplin's residential population is merely a fraction of the total number of people who might be in the city limits at any given time. Fire and emergency response resources must be sufficient to address the risk calculated for the area at any particular period of time. An imbalance of risk compared to emergency response resources will produce an unmitigated opportunity for disaster. While a comprehensive risk assessment is not the purpose of this report, the probability and severity of all risks, both natural and manmade, must be considered. Furthermore, risk reduction concepts that mitigate the initiation or scale of emergencies should be integrated into development and construction projects undertaken within the City.

Throughout the development of this report, it was apparent that the leadership within the Joplin Fire Department embrace opportunities to improve and possess the skill set to facilitate change. Communication was regular, appropriate and thorough as questions were identified. Historically, Joplin has invested in an appropriate quantity of stations placed in strategic locations. This pattern of protection continues with several recent stations (constructed in the aftermath of the 2011 tornado) and the plans associated with Fire Station 7. As Joplin grows and changes, so too will the quantity and type of fire stations, and the resources inside them.



This report is the deliverable associated with a City of Joplin Request for Proposals (RFP) issued on January 22, 2021. The RFP was awarded by City Council action on March 20, 2021. Special thanks are extended to the following members of the Department who participated in interviews, data collection and organizational context throughout the development of this document. Those individuals include: Retired Fire Chief James Furgerson, Acting Fire Chief Mark Cannon, Deputy Chief Andy Nimmo, Fire Marshal Dale Brooks, Training Chief Dustin Lunow, Battalion Chief John Smith, Firefighter Adam Grimes and Airport Director Steve Stockam

1: INTRODUCTION AND ORGANIZATION



1. INTRODUCTION

Deployment of emergency response resources is paramount to a healthy, protected and thriving community. This City of Joplin provides fire protection and all-hazards emergency response service in a methodology that has served the community in disasters both big and small. Fire stations and deployment resources not only provide protection for the community, but also serve as a visual reminder of community safety. Woven into the fibers of individual neighborhoods, fire stations are unique elements of civic security.

> "Studies on adequate deployment of resources are needed to enable fire departments to design an acceptable level of resource deployment based upon community risks and service provision commitment."
>
> (Averill, et al., 2010)

This document is intended to serve as the foundation for future deployment additions and changes, taking into consideration all current and future risk information. Additional effort has been undertaken to evaluate service delivery enhancements that could add value to the citizens of Joplin immediately and in the future.

This document considers the following assumptions:

- A detailed risk assessment must be regularly and systematically conducted for the City of Joplin. Risk changes as the profile of the community's inhabitants change and economic development occurs. Elements of risk assessment include an evaluation of recognized hazards and their probability, vulnerability and magnitude.
- Economic realities of local government necessitate realistic and cost-effective strategies to improve public safety.
- Recommendations are based on industry standards, fire service best practice, input of local fire officials and recommendations derived from the data supplied by the Joplin Fire Department. Nothing in this document is intended to restrict local leaders and decisionmakers from using alternative deployment strategies, technological innovations or other variables in the provision of public safety.

1.1 CONCENSUS STANDARDS, REGULATIONS AND INDUSTRY BEST PRACTICES

While each municipality is unique in its effort to match the risk of the community it serves, the fire protection industry has standards and guidelines to help guide the development and deployment emergency services resources. The following documents were used as a guide and are referenced as necessary in the report.

1. 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 Fire Departments*
2. National Fire Protection Association (NFPA) 1221 – *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*
3. Insurance Service Office (ISO) – Fire Suppression Rating Schedule
4. Center for Public Safety Excellence (CPSE) – *Quality Improvement for Fire and Emergency Services*, 10th Edition
5. Center for Public Safety Excellence – *Community Risk Assessment and Standard of Cover*, 6th Edition

These documents are intended to serve as the foundation for evaluation of the Joplin Fire Department. Each of these documents contain elements that are vital for modern and progressive fire departments. The National

Fire Protection Association, Insurance Service Office and Center for Public Safety Excellence represent organizations that have made significant impact on the fire service. Their recommendations, guidelines and standards are vetted by industry experts and are regularly updated and modified to ensure they maintain relevancy.

1.2 DEPARTMENT ORGANIZATION - CURRENT

The Joplin Fire Department (JFD) is a career fire department providing services through six stations that are geographically distributed throughout the City. The Department is comprised of ninety-five (95) firefighters, including administrative staff. Three platoons, consisting of ninety (90) firefighters, work twenty-four (24) hours on-duty, followed by forty-eight (48) hours off-duty. Minimum staffing for each day is twenty-six (26) firefighters, allowing for three (3) firefighters to be off during normal conditions. The Department has fourteen (14) paramedics, however only eleven (11) of those paramedics are assigned to positions in the Operations Division. Firefighters staff four (4) engine companies, two (2) ladder companies and two (2) medium-duty rescue units. Minimum staffing on engine companies, with the exception of Engine 6, is four (4). Engine 6 is the only engine company minimally staffed with three (3) firefighters. Rescue units are staffed with two (2) firefighters. Ladders companies are stationed with the rescue units and considered a single "response unit within their primary service area" in accordance with JFD Standard Operating Guidelines 227.1-21. Engine and ladder companies are fire suppression capable apparatus, each possessing sufficient water, pumping capacity, tools and staffing to conduct conventional firefighting operations. Rescue units serve to supplement the suppression efforts and provide equipment and supplies for other non-fire incidents.

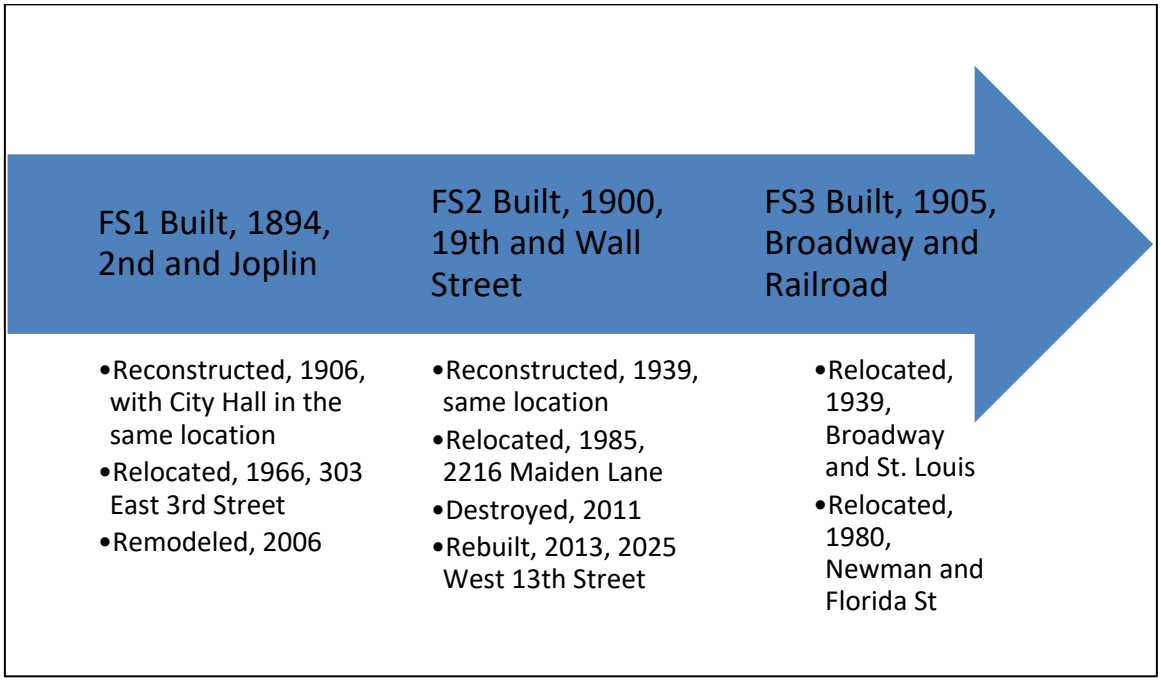
Station No.	**Address**	**Apparatus (Minimum Staffing)**
1	303 East Third Street	Ladder 1 (3) Rescue 1 (2) Battalion 1 (1)
2	2825 West 13th Street	Engine 2 (4)
3	2717 Newman Road	Engine 3 (4)
4	3402 South Hearnes Boulevard	Engine 4 (4)
5	3223 Texas Avenue	Ladder 5 (3) Rescue 4 (2)
6	5302 West 32nd Street	Engine 6 (3)

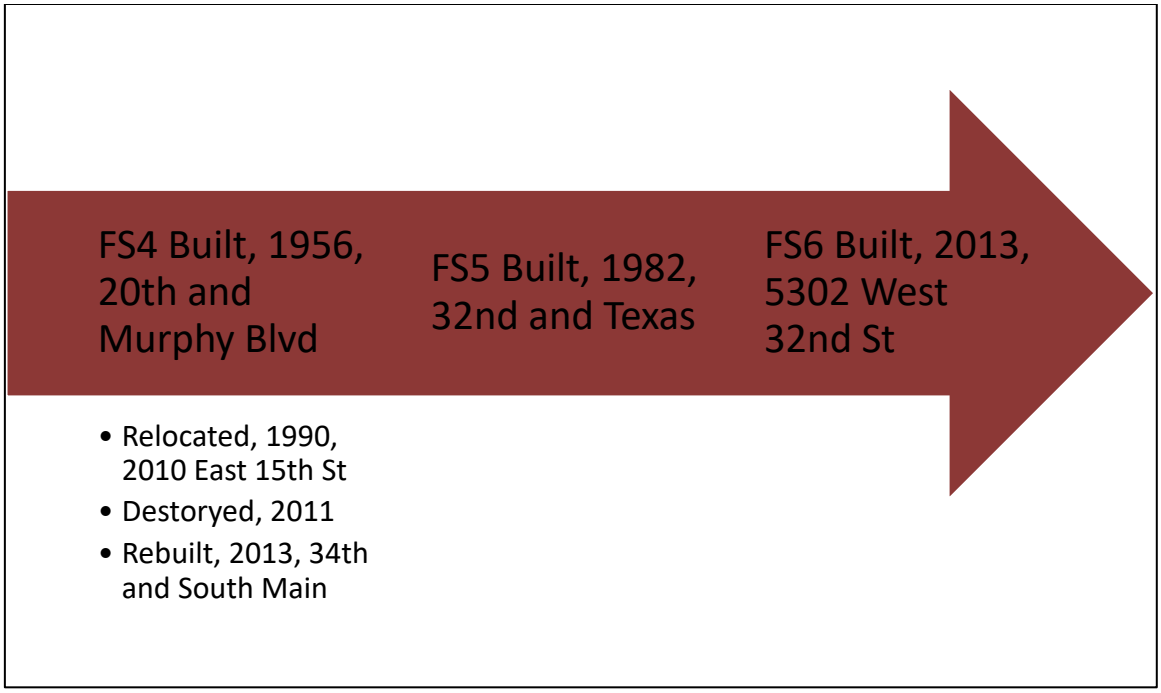
In addition to staffing on shift, the Department has a full-time Fire Apparatus Mechanic, Fire Marshal, two (2) Training Chiefs, a Deputy Chief of Operations and a Fire Chief. The City of Joplin 9-1-1 center is managed by the

Police Department and employs dispatchers to provide services to both the police and fire departments.

1.3 HISTORICAL GROWTH AND RESOURCE ADDITIONS

Following a devastating downtown conflagration in 1872, the Joplin Fire Department was established. In 1894, the Department was further improved through a transition from a volunteer force to a paid organization (Joplin Fire Department, 2011). Following this pivotal metamorphosis, the organization has steadily increased its capacity and value to the citizens of Joplin. Fire stations have been built and evolved steadily throughout the City during history of the Department. Initial stations within the City were spaced close together. With the implementation of building and fire codes, as well as the development of motorized apparatus, stations have been relocated to be further apart. Investments and changes to fire stations in the City are outlined in the following timeline.





Fire department staffing has typically increased as fire stations have been constructed. While staffing in many cities is typically a function of permanent city population, Joplin's existence as a destination city in the region creates an environment where the resident population is a fraction of the number of people working and recreating in the City.

The number of firefighters in the City has remained static since 2017. Modifications to operational staffing for the Department in the last fifteen (15) years include the addition of twenty-four (24) firefighting positions, including:

- Six (6) firefighters added in 2008
- Fifteen (15) firefighters added in 2012
- Three (3) firefighters added in 2015

Most of these human resource advancements were made with funding from a public safety sales tax passed by the City in 2007.

While some fire stations are specially-equipped, they all maintain a consistent capability and function. Each fire station in Joplin is equipped with the following at a minimum:

- Fire pumping capabilities sufficient to meet ISO requirements
- ISO compliant fire equipment, tools and supplies
- ALS medical equipment
- BLS medical trained firefighters
- A minimum staffing of four (4), with the exception of Station 6

1.4 CITY GROWTH, DEVELOPMENT AND ECONOMY

The Joplin Fire Department exists to protect the complexity of risk inherent to the City of Joplin. Joplin includes

areas of Jasper and Newton Counties in southwestern Missouri near the Oklahoma border. Joplin, as a destination city, is dynamic and presents a wide spectrum of risk. The City was founded in 1873 and underwent explosive growth associated with the discovery of minerals nearby. This explosive growth peaked in the 1940s and 1950s, and the growth since then has been incremental in each census measurement. Historically, the City is an amalgamation of several small towns. The modern-day layout of the City of Joplin is configured to present several distinct nodes of commerce and living. The current job market shows that the three most predominant jobs in the Joplin area are manufacturing, health care and retail trade (Emsi, 2021)

The economy of Joplin is robust with a population of just over 50,000 residents and an unemployment rate of 4.0%. However, the total labor force has steadily declined over the past decade (Bureau of Labor Statistics, 2021). Joplin is the anchor city for the Joplin-Miami, MO-OK Combined Statistical Area used by the US Census Bureau. This statistical area includes the counties of Newton, Jasper and Ottawa (OK) and a total population of approximately 181,466 (US Census Bureau). An analysis of the demographic data for the region shows a population growth of approximately 7.3% over the ten-year period, but a growth in populations age 65 and older by over 37% (Proximity One, 2018). This growth in an aging population segment is important to note as the fire department continues to provide emergency medical care with area ambulance agencies.

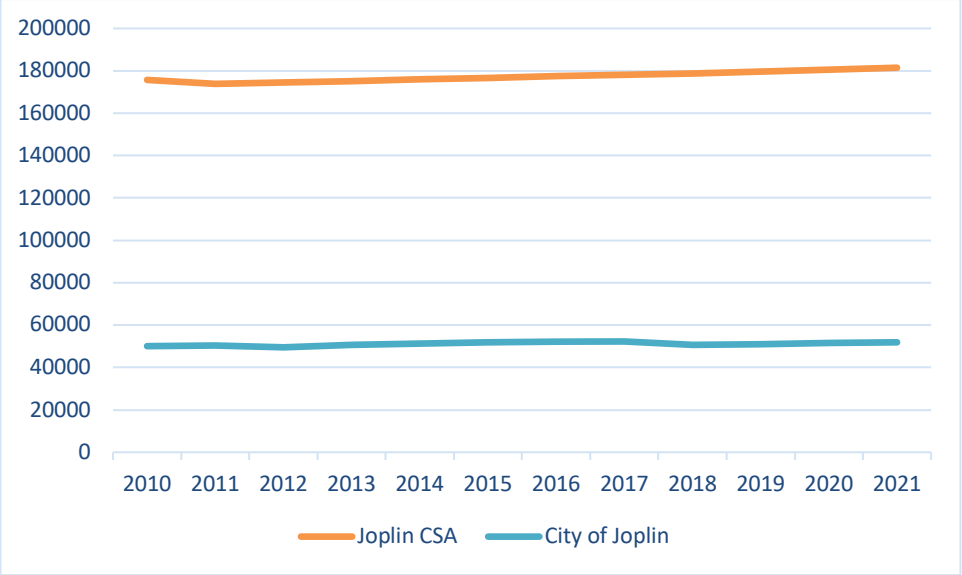


Figure 1 – Population for Joplin and the Combined Statistical Area (2010-2021)

1.5 EMERGENCY MEDICAL SERVICE DELIVERY

The fire department plays an essential role in the delivery of pre-hospital emergency medical care to the City. The fire department does not provide transportation of patients to the hospital. All Department fire companies are equipped with Advanced Life Support (ALS) equipment and ambulance service is provided by the Metro Emergency Transport System (METS) and the Newton County Ambulance District (NCAD). METS provides ambulance response throughout the City, while NCAD only responds to calls in Newton County (South of 32nd Street) that are also inside the city limits. Because overlap exists between the response areas of these two services, this area of Newton County in the city limits of Joplin is often referred to as the "grey zone" by firefighters. Both services simultaneously respond to emergencies in this area.

METS is a not-for-profit corporation that has existed in its capacity since 1982. METS operates from two stations inside the City, located at 625 South Virginia Avenue and 3220 Ferguson Road (METS Ambulance, 2021).

METS provide emergency and non-emergency ambulance transportation services to Joplin and Webb City. The standard staffing arrangement for METS is two ambulances staffed at both Joplin stations, with additional resources available at the Webb City Station. NCAD was formed in 1975 and is headquartered to the south of Joplin in Neosho. NCAD operates from one station in Joplin located at 42nd Street and South Main with two ambulances. NCAD has additional stations spread throughout Newton County.

2: CITY RISK ASSESSMENT



2. CITY RISK ASSESSMENT

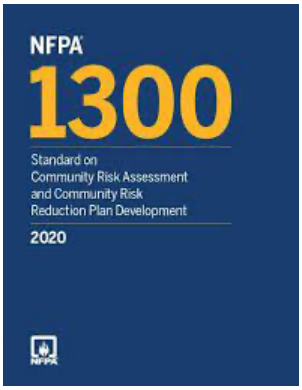


Figure 2: NFPA 1300

The risk associated with a community must be evaluated before any aspect of an emergency response deployment can be reviewed. Fundamentally, the goal of the fire department should be to match the risk of the community with a balance of appropriate resources (personnel, stations, apparatus). The community risk not only impacts the number of operational personnel required to staff emergency response apparatus, but also the number of administrative, training, support employees and resources.

The evaluation of risk for the purposes of this document involves a basic community risk assessment. It focuses on the three basic elements of risk: probability, consequence and vulnerability. The basic combination of probability and consequence define the base level of risk, while vulnerability serves as a force multiplier that impacts both high-risk populations and occupancies.

A continuous process of risk assessment is an important and fundamental tenant of operation for the Joplin Fire Department going forward. It is this comprehensive evaluation of risk that will signal the need for additional resources, relocation of assets or other changes in operational procedure in order to protect those who live, work or travel to Joplin. The National Fire Protection Association Standard NFPA 1300: *Standard on Community Risk Assessment and Community Reduction Plan Development*, should be utilized for ongoing risk assessment.

The underlying objective of risk assessment and deployment analysis is to build resiliency within Joplin. Portions of that equation include emergency response times, fire station deployments, staffing, and equipment necessary to respond to and manage emergency situations. The figure to the right illustrates how the elements of consequence, probability and vulnerability synergistically interact to determine the severity of risk.

The remainder of this chapter provides general information on risk assessment inputs that must be considered when reviewing emergency response service.

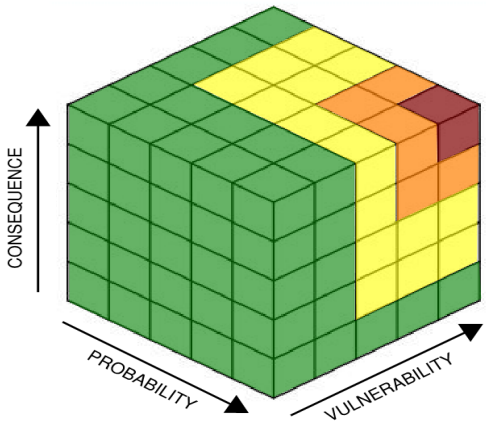


Figure 3: Three-Dimensional Risk Matrix

2.1 HAZARD IDENTIFICATION

It is recognized that Joplin has typical hazards for an urbanized location. Due in large part to the 2011 tornado, Joplin has a rare balance of both significant new construction and an older building stock. Hazards are both human-made and natural, and they create the stage for economic, life and property loss for the City and its residents. A hazard analysis was performed as a part of this report. The top hazards that present a risk to the City are shown in the following table.

Hazard Type	*Impact*	*Considerations*
Tornadoes	Depleted resources, unstable communications, simultaneous emergencies, limited mutual aid, large life and property loss	Mass casualty event, structural collapse presence, structure fires will occur from hazardous gas leaks, large-scale destruction
Severe Weather (Non-Tornadic)	Moderate impact to critical infrastructure, depletion of resources, limited property damage	Structure fires likely to occur from lightning strikes and damage to trees and electrical distribution systems likely to impact elements of the community
Ice Storm	Depleted resources, delayed response, extreme working conditions	Electrical system impact likely, along with the potential for transportation mobility issues
Flooding	Depleted resources, Limited access to the City due to road viability, life safety issues to residents	Impact to response and likely delays, drowning potential
Structural Fires	The first alarm utilizes two-thirds of the JFD resources and simultaneous fires cannot be handled without mutual aid	Life, property and economic loss to the City and its citizens
Hazardous Materials Leaks and Releases	Life safety hazard to potential large segments of the population, difficult cleanup and containment strategies	Wide array of potential with transportation and rail routes

2.2 RISK ASSESSMENT STRATEGY

Risk assessment must first establish the overarching priorities for the community served so that the determined response strategy can be evaluated accordingly. In general, those priorities include:

- Safety to life, including that of citizens and emergency responders
- Conservation of property
- Protection of essential community assets

Evaluation of risk includes a review of the City's 32,363 buildings, of which 24,843 are housing units (Jasper-Newton Bi-County Natural Hazard Mitigation Plan, 2021). Additional information on comprehensive hazard evaluation and risk can be found in the Jasper-Newton Bi-County Natural Hazard Mitigation Plan.

2.3 ELEMENTS OF RISK

Evaluating risk provides insight to the need for fire and emergency response resources. The Department must continue to evaluate risk and ensure that resources are adequate for meeting the known and realistic risk types in the community. Key elements of risk include:

- Probability of an event: The counties of Jasper and Newton have experienced just under thirty (30) disaster declarations each since 1953 (Federal Emergency Management Agency, 2021). Of these disasters, they include numerous severe storms and tornadoes, flooding and ice events. Thirty-seven percent of the disaster declarations have occurred in the past ten (10) years for both counties. The months of January to July present the highest likelihood of federal disaster declarations from a historical nature. Smaller disasters, such as large fires, occur much more frequently. Although these incidents are smaller in scale, their high probability of occurrence makes them equally as concerning.

- Consequence of an event: Consequence of an event can be difficult to measure since any death, injury or significant loss of property can be disruptive to a community. Small events on the spectrum of disaster, such as structure fires, can be equally as devasting as tornadoes if the fire breaks out in a concentrated and densely populated area, such as downtown Joplin. Severity can also be measured by economic impact to the community. The largest employers in the Joplin area, according to the City's 2019 Comprehensive Annual Financial Report, include the Freeman Health System, Wal-Mart, Mercy Hospital, Joplin School District, Tri-State Motor and Empire Electric. Severe disruption and potential job loss to these entities would be extremely harmful and disruptive to the community's overall wellbeing in the short- and long-term.

- Vulnerability: While probability and severity of an event are important elements of risk, impact to vulnerable populations and community elements can be a force multiplier. When vulnerable populations are impacted, recovery is prolonged and the community often has to provide additional resources for recovery and support. Population profiles generally identify "at-risk" populations based on chronological age, language spoken, health condition and other considerations. In many cities, the most at-risk populations generally include those over sixty-five (65) years of age, those with chronic health conditions, people with access needs, and those living at or below the level of poverty. The most evident vulnerable population in Joplin is the homeless.

2.4 COMMUNITY BASELINES

The baseline of a city's annual emergency response is a principal part of understanding risk since it speaks directly to the probability of occurrence. Types of emergencies handled by the JFD between the years of 2017 and 2020 are shown in the figure below.

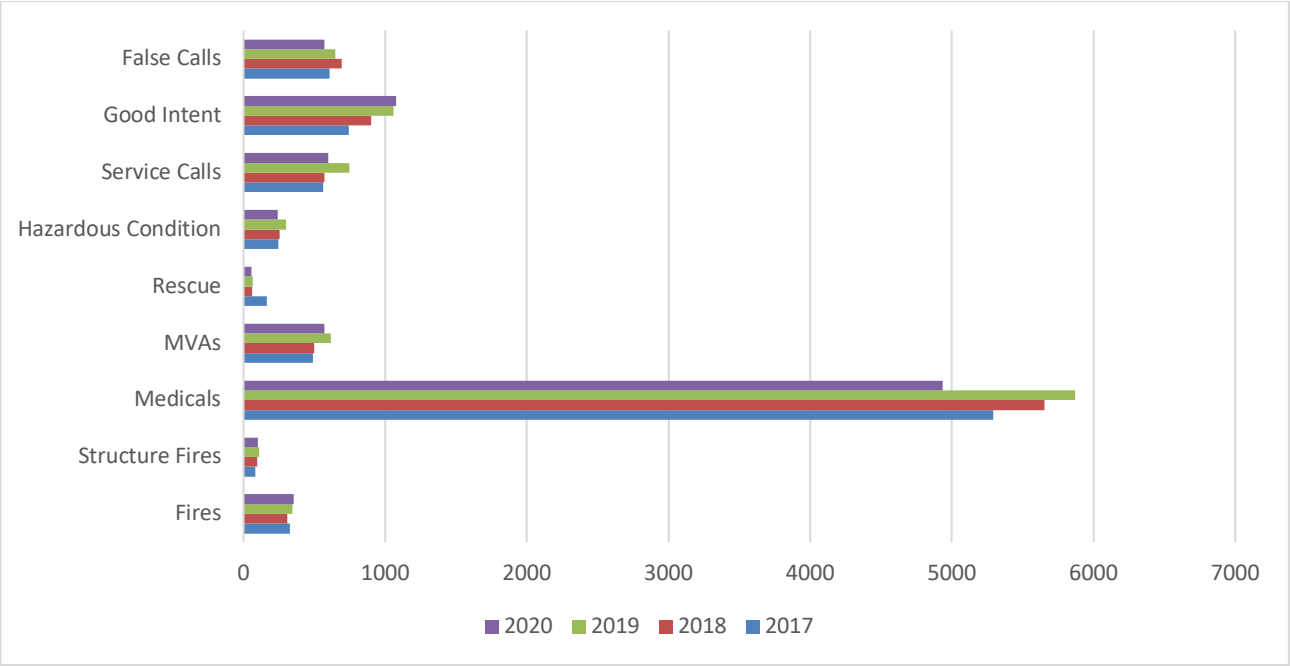


Figure 4: Incident Types for the Joplin Fire Department (2017-2020)

The most frequent category of emergencies encountered by the JFD are medical calls. These emergencies include a significant number of chief complaint types which range from chest pains and seizures, to cardiac arrests and breathing problems. Good intent calls are the second most common incident type. Good intent calls include units being dispatched and cancelled while responding, smoke scares and authorized controlled burns. All call types, except for rescues, grew in frequency between 2017 and 2019. Data from 2020, which was significantly impacted by the early COVID-19 pandemic closures and restrictions, showed a 13% reduction in overall call volume. The reduction in call volume was most evident in the category of emergency medical calls. As an oddity, fire-related calls did increase by 2% in 2020. Motor vehicle accidents shrunk in call volume by 7.5% in 2020, likely as a result of the reduction in vehicular mobility caused by more people working at home and not commuting.

The JFD responded to an average of twenty-four (24) emergencies per day from 2017 to 2020. A structure fire was fought by the Department approximately every four (4) days. According to the data supplied, 37% of all structure fires are related to the homeless population of the City. On average, each structure fire causes $12,181 dollars of property loss. The JFD responded to an average of fifteen (15) medical emergencies and over one (1) motor vehicle accidents.

While each fire station is an important response asset, analysis of their response metrics is important for understanding the areas of the City that have the highest probability of emergencies. Using the time period of 2017 to 2020, the following table shows the number of emergency responses by station, total number of

responses for the four-year period and percentage of total responses for the entire Department.

	2017	2018	2019	2020	4-Year Total	Percentage of Call Volume
Station 1	2777	2959	3297	2595	11628	34%
Station 2	1003	1133	1122	928	4186	12%
Station 3	1407	1453	1656	1204	5720	17%
Station 4	1485	1475	1496	1338	5794	17%
Station 5	1362	1481	1603	965	5411	16%
Station 6	121	139	186	180	626	2%
Station 7 (Est.)	166	214	162	151	693	2%

Figure 5: Call Volume by Joplin Fire Station (2017-2020)

2.5 IDENTIFICATION OF TARGET HAZARDS

Each community will have differing hazards that need to be included in the risk determination. It is recognized that large segments of developed areas have common hazards, do not require granular examination. These includes areas such as individual residences, residential subdivisions, multi-family housing, office buildings, commercial developments, retail zones and health care campuses. In general, the hazards associated with these facilities are sufficiently understood.

Target hazards are those buildings where the impact from an emergency could produce significant consequences. Target hazards could be identified based on a number of reasons, including but not limited to:

- High-challenge emergency conditions – Includes locations such as industrial facilities, high-rise buildings, airports, and utility sites.
- Large loss-potential conditions – Includes locations with large numbers of people, such as stadiums, schools or housing for the aged.
- Community impact conditions – Includes locations that could affect the community's health and safety through impact to services or functions, including water treatment facilities, power distribution utilities, roadway systems and water transport facilities.

2.5.1 Joplin Regional Airport

Fire and rescue response at the Joplin Regional Airport incorporates multiple hazards that must be considered. Airports present a life safety risk that is complicated by the hazards that come with aviation-related emergencies. Airports also have the need for structural fire protection and response to the various hazards connected with industry on the property.

The Joplin Regional Airport has two (2) runways, each measuring 6,500 feet in length. The airport itself encompasses 970 acres and has 128 aircraft based on the property (Federal Aviation Administration, 2021). Regional passenger jets are operated by United Express Airlines and provide daily nonstop passenger service to Chicago, Denver and Houston. Approximately sixty-six (66) takeoffs and landings occur each day according to data provided to the Federal Aviation Administration.

As the airport continues to grow and evolve, special attention should be paid to industrialized airport operations which could include cargo handling facilities, fuel and lubricant storage tanks, and other airport activities. These operations can change the risk profile of the airport and impact the resources needed by the Joplin Fire Department.

3: BASELINES AND HISTORICAL PERFORMANCE



3. PERFORMANCE BASELINES AND HISTORICAL DATA

> "In general, firehouses should be distributed throughout the city so that each firehouse has a primary service area extending within a radius of one-half mile. This spacing should vary in relation to population densities, building intensities and types of construction, the pattern of trafficways, and with the relative degree of fire-hazard." *(American Society of Planning Officials, 1957)*

The City of Joplin has provided conventional fire protection and emergency response services using common methodology and practices. Pioneering features of Joplin's fire protection and emergency response strategy include the systematic construction of fire stations throughout the geography of the City and the addition of special services (technical rescue, hazardous materials, emergency medical response) to meet the needs of the community as growth occurred.

This chapter establishes the current baseline response performance for the Department. Understanding current response performance and incident information is necessary in order to evaluate recommendations considered later in the report.

3.1 COMMUNICATIONS AND ALARM HANDLING PROCESS

Often overlooked in the evaluation of fire departments is the alarm handling and dispatch process. The governing standard for fire department alarm handling and dispatching processes is NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*. ISO also maintains requirements for dispatching processes and circuits that impact the overall rating of the JFD. The alarm handling process involves the ability of a Public Safety Answering Point (PSAP) to receive emergency calls for service, determine the location and type of emergency and alert the closest and most appropriate resources for response. PSAPs include the three 9-1-1 centers that service the City of Joplin.

- **City of Joplin 9-1-1 Center**: dispatches Joplin Police and Fire Departments, Duquesne Police, and Missouri Southern State University Campus Police (after hours)
- **Jasper County 9-1-1 Center:** dispatches Jasper County Sheriff's Office, METS and rural fire departments
- **Newton County 9-1-1 Center:** dispatches Newton County Sheriff's Office, NCAD, Webb City Police, Webb City Fire, Carl Junction Fire, Carl Junction Police, Mercy Ambulance and rural fire and departments

The City of Joplin 9-1-1 center is staffed with three (3) dispatchers at all times who divide responsibilities and are cross-trained across the fire, EMS and law enforcement disciplines. In total the Joplin PSAP has nineteen (19) certified dispatchers. The PSAPs have the ability to transmit and receive calls for service utilizing the computer aided dispatch system (CADS), making the transfer of emergencies effective between the centers. Because the majority of emergencies are medical in nature, the ability to summon the response of an ambulance is imperative. All Joplin dispatchers are trained in Emergency Medical Dispatching (EMD) utilizing the Medical Priority Dispatching System (MPDS). The performance goals for PSAPs should be as follows (National Fire Protection Association, 2019):

- Alarm Answering Time – 15 seconds for 95% of calls, 40 seconds for 99%
- Alarm Processing Time – 64 seconds for 90% of calls, 106 seconds for 95% of calls

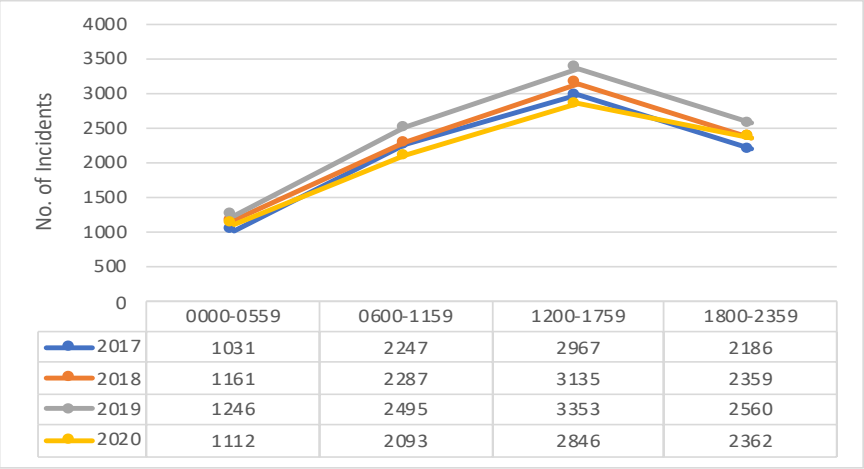
3.2 INCIDENT TYPES AND BASELINE OUTPUTS

JFD reflects industry best practices by responding to numerous hazards that impact the community. From fires of all varieties, to technical rescues and emergency medical calls, the Department has a tradition of serving the community in a variety of ways. Information on incident types is stored in the Firehouse Software Records Management System (RMS). The RMS provides this information to a national database of incident information called the National Fire Incident Report System (NFIRS). This data was extracted for this study to understand the type and frequency of incidents to which the Department responded. This report used data from 2017-2020, with a special emphasis placed on the 2019 dataset. The rational for this was that the four-year range of data would be sufficient to illustrate trends and opportunities for deployment decisions. The 2019 dataset was the most recent "normal" response dataset that excludes impact from the COVID-19 pandemic.

3.2.1 Incident Types and Community Impact

The Department responds to over 8,000 emergency incidents each year, with 2019 seeing 9,654 calls. The vast majority of these responses (67%) are emergency medical in nature. On average, 15 emergency medical responses occur each day, excluding motor vehicle-related incidents. When excluding the events and impact of the pandemic in 2020, trends of all incident type categories trended upward, with 2018 and 2019 showing a 7.7% and 8.0% increase in total incidents, respectively. It is anticipated that as the pandemic recovery continues, the Department will continue to see similar increases in incident frequency. The incident types with the highest rate of growth are Good Intent incidents and Service Calls at 43% and 34%, respectively.

3.2.2 Incident Time Periods and Days of the Week



	0000-0559	0600-1159	1200-1759	1800-2359
2017	1031	2247	2967	2186
2018	1161	2287	3135	2359
2019	1246	2495	3353	2560
2020	1112	2093	2846	2362

Figure 6: Incident Time Periods (2017-2020)

Incidents are not evenly distributed throughout the day or week. Consistently, Joplin's identification as a destination city is shown by the prevalence of incidents (35%) occurring between the hours of 12:00 and 6:00pm. The second busiest time of day for emergency incidents is nearly tied at the 6:00am to 12:00pm and 6:00pm to 12:00am slots.

While variance is noted by time of day, the day of the week has a less dramatic impact on the frequency of emergency responses. In 2020 and 2019, the day of the week with the fewest number of incidents was Sunday. However, the standard deviation for the dataset was a mere 0.70%, with little change in distribution each day. No clear pattern was established in the analysis regarding months of the year regarding call volume.

3.3 UNIT UTILIZATION AND SYSTEM EXHAUSTION

The commitment of individual response units is critical to understanding the stress of the response system and the potential for exhaustion of emergency response units. System exhaustion are time periods in which emergency response resources are unavailable for response. For the purposes of this report, the calculation of unit hour utilization (UHU) is measured by using the following formula:

$$UHU = \frac{Quantity\ of\ Respones\ \times\ Average\ Incident\ Duration}{Total\ Availability}$$

The value provided reflects the percentage of the time that resources are committed to incidents. While a common threshold for the UHU value in the fire service is 25 percent or less, it is important to note that there is no standard for this measurement. In accordance with guidance from the Center for Public Safety Excellence and in order to meet performance requirements set forth in 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,* emergency resources must be available at least 90 percent of the time (Fitch and Associates). For the purposes of this report, any value greater than 10 percent is considered problematic.

3.3.1 Fire and Emergency Response Resources

Each shift, the Department provides staffing for four (4) engine companies, two (2) ladder companies, two (2) medium-duty rescue units and a Battalion Chief. These resources represent the primary resources used for fire suppression response. Specific information about the total time a unit was committed to an incident was not available from the RMS dataset. Therefore, for the purposes of UHU calculation, it was assumed that the average duration of an emergency incident (measured from time of dispatch to time the until was available) would be 40 minutes.

The following table shows the UHU for the fire and emergency response resources for the Department based on 2019 data:

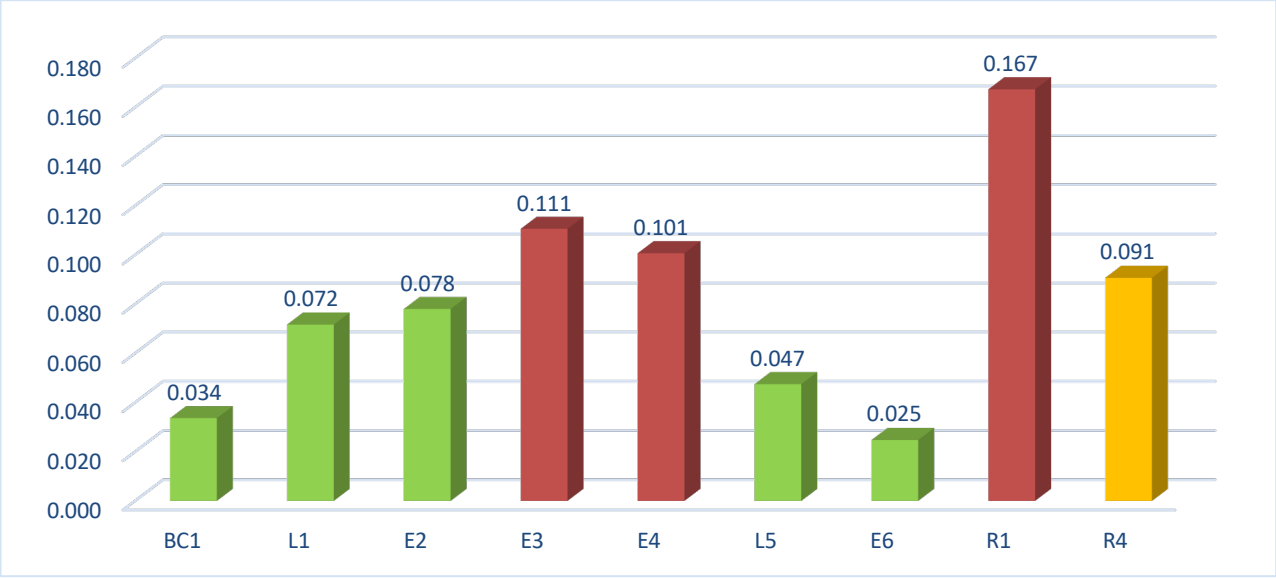


Figure 7: 2019 Unit Hour Utilization by Fire Response Unit

Based on the 2019 UHU data, and taking into consideration the likelihood for continued incident increases in the years to come, three units are immediately identified as exceeding a 10-percent commitment threshold. Those units are Rescue 1, Engine 3 and Engine 4. While not over 10-percent by 2019 measurements, Rescue 4 is close to the threshold as well and should be considered "at risk" for over utilization.

3.3.2 Emergency Medical Resources

The same JFD resources that are used for fire suppression duties are also used for emergency medical response. All emergency medical responses are tiered with either METS or NCAD ambulances for patient transport. An analysis of ambulance performance was not conducted as part of this study. However, anecdotal information on ambulance utilization and EMS resource exhaustion was obtained from the Department during the interview process.

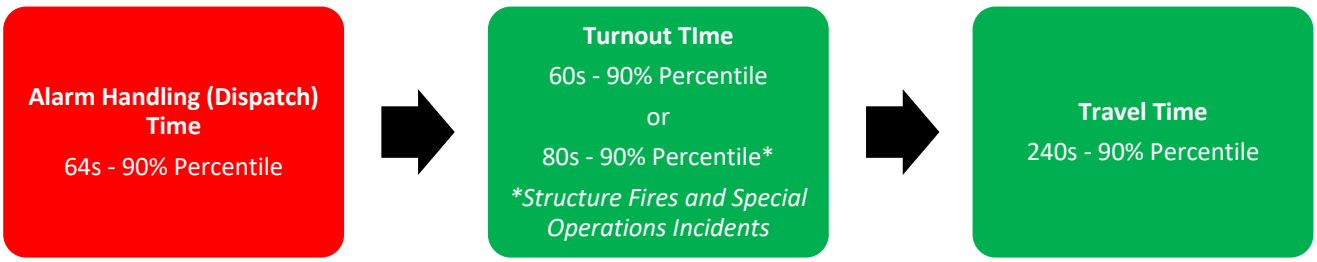


Figure 8: METS Ambulance

No official standard exists for the quantity of ambulances necessary to protect a community, however a recent survey of seventy fire department-based ambulances in the United States found that each ambulance protected an average of 21,057 citizens (Shekhar, 2020). Given that ratio, the quantity of ambulances providing services to the City appears to be sufficient. The Department encounters situations of delayed response due to stress in the emergency medical system. This is likely a side effect associated with services providing non-emergency transfers from the various medical campuses. Exhaustion and reliability of ambulances impacts the resources of the fire department and should be monitored.

3.4 FRACTILE RESPONSE TIME PERFORMANCE

The Department collects a significant amount of data and demonstrates effort in ensuring response performance is evaluated. The Department does not have a proven analytical software to conduct analysis of performance, and instead must use a series of reports and complicated Microsoft Excel spreadsheets. Performance is primarily measured as an average time, instead of at the 90th percentile of the various datasets. Because NFPA 1710 measures performance using the 90th percentile, it is necessary to extract data and determine the Department's current response time performance. Using 2019 incident data, the performance of the Department was calculated for two of the three response time intervals. The response time intervals calculated (in green) were only those for which the Department is directly responsible. The graphic below shows the elements of total response time and those measured by this analysis.



The dataset was divided into major operational call groups: emergency medical, fires, hazardous materials, motor vehicle accidents and technical rescue. The response time performance goal, which includes both turnout time and travel time, in accordance with NFPA 1710 and the Center for Public Safety Excellence would be five minutes or five minutes and 20 seconds depending on whether the incident was a structure fire or special operations (technical rescue or hazardous materials) incident.

Figure 9 shows performance for each call group and station response area at the 90th percentile. For example,

emergency medical calls occurring in Station 1's response area show that from time of dispatch, an emergency response unit arrived with 7 minutes and 42 seconds, 90 percent of the time. It is also important to note that while Station 7 is presented in this table, responses into that area were occurring from other stations since Station 7 itself it not built. Call times with infrequent responses (e.g., technical rescue) are subject to interference from a small dataset and therefore their response times may be spurious in nature.

STATION NO.	EMS	FIRE	HAZMAT	MVA	TECHNICAL RESCUE
STATION # 1	0:07:42	0:08:33	0:09:17	0:07:55	0:14:09
STATION # 2	0:07:34	0:07:51	None	0:06:57	None
STATION # 3	0:08:14	0:07:48	0:11:13	0:07:39	None
STATION # 4	0:08:17	0:09:19	0:08:29	0:10:50	0:13:23
STATION # 5	0:08:25	0:07:57	0:12:46	0:08:00	0:08:17
STATION # 6	0:09:28	None	None	None	None
STATION # 7	0:11:12	0:12:11	None	0:11:26	None

Figure 9: Fractile Response Time (Dispatch to Arrival) Performance by Station (2019)

Response times exceed the performance goals establish by industry standard for the time interval in question. Further analysis of the dataset indicates that travel time was reasonably compliant, but the turnout time interval regularly exceeds 60 or 80 seconds. Explanations for this can include responses made in a non-emergency mode or other sources of time error. It is also likely the turnout time baseline performance by the JFD can simply be improved.

3.5 MUTUAL AND AUTOMATIC AID

"It is imperative that joint coordination continue and become emphasized to ensure adequate resource coordination among fire departments in the Joplin region."

Joplin encounters approximately 100 incidents each year that involve mutual or automatic aid. Typically, aid is given by the JFD more than it is provided, however that trend is not consistent and varies by department.

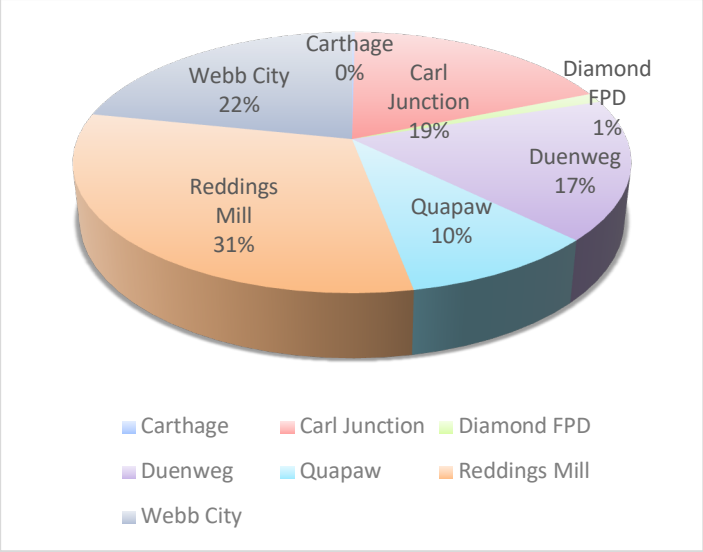


Figure 10: Incidents Involving Aid (Given or Received) 2017-2020

The Department has regular mutual or automatic aid involvement with the departments of Reddings Mill, Webb City, Carl Junction and Duenweg. All of these fire departments have fulltime firefighters on staff, and they represent an important pierce of the overall emergency response arrangement, since their reliability and capability can provide an important supplemental response. Aid from these departments on incidents of significant consequence, namely structure fires, is standard practice in certain geographic areas of

the community. The training and equipment provided by these departments varies greatly and was not evaluated as part of this report. It is imperative that joint coordination continue and become emphasized to ensure adequate mutual aid resource coordination for the JFD.

4: CURRENT DEPLOYMENT ASSESSMENT



4. CURRENT DEPLOYMENT ASSESSMENT

4.1 ADMINISTRATION AND SUPPORT

> "Fire departments require extensive administrative support to function properly."

While the majority of work and scope of this report is directed at emergency response units, it is important to note that all fire departments require extensive administrative support to function properly. Training, prevention efforts, hazard mitigation, personnel management and emergency preparedness are just a few of the administrative objectives that are typically completed by administrative members of a fire department. No official standard exists to guide the ratio of administrative firefighters to firefighters in field assignments, but recommendations can be generated through examination of similar comparison cities and assessment of workload.

4.1.1 Comparison Cities

The unique attributes of Joplin made identification of comparison cities challenging. Joplin is remote from other population centers and serves as a hub of commerce and employment for the surrounding region. When identifying comparison cities, the following guidelines were utilized. The cities should:

- exist remote from other population centers,
- represent an employment hub with an identified increase in daytime population,
- have a population greater than 35,000 people but a population less than 90,000 people as identified by the last US Census Bureau estimate,
- utilize a full-time fire department, without supplemental volunteers, and perform EMS response without transport ambulances,
- have a poverty rate similar to Joplin,
- be located within Missouri or an adjoining state.

Comparison Cities	Population	Daytime Pop Est.	Median Income	Poverty Rate	Size
Joplin, MO	50,386	70,742	45,449	18.2%	35.6 mi^2
Bartlesville, OK	36,144	39,686	54,778	13.5%	22.8 mi^2
Fayetteville, AR	87,590	102,655	43,690	22.9%	53.9 mi^2
Hutchinson, KS	40,383	41,473	46,927	14.4%	22.7 mi^2
Jefferson City, MO	42,708	68,845	52,253	12.9%	36.0 mi^2
Cape Girardeau, MO	39,566	52,583	45,733	23.0%	24.3 mi^2
Stillwater, OK	50,299	56,486	34,309	35.2%	29.5 mi^2
St. Joseph City, MO	74,875	86,181	48,197	18.7%	44.0 mi^2

Figure 11: Joplin Comparison Cities (US Census Bureau) (Bureau of Labor Statistics, 2021)

As can be derived from Figure 11, all of the comparison cities meet the requirements set forth in the study and have fire departments with significant similarities to Joplin. In the comparison city list, Joplin represents the third largest city by population (both Census population and daytime population estimates) and the fourth largest by land area.

The fire departments for each of the cities were contacted to determine their size and response makeup. The results are shown below.

Comparison Cities	No. Stations	No. Firefighters	ISO Class	Training Staff	Fire Marshall Staff
Joplin, MO	6	96	2	2	1
Bartlesville, OK	4	67	2	1	1
Fayetteville, AR	7	122	1	2	5
Hutchinson, KS	6	91	1	3	2
Jefferson City, MO	5	75	2	2	1
Cape Girardeau, MO	4	65	4	1	2
Stillwater, OK	4	74	2	1	2
St. Joseph City, MO	11	130	3	2	4

Figure 12: Comparison Cities Fire Department Information (2021)

The general size of the Joplin Fire Department is consistent with the size of population it protects when compared to its neighbors. Joplin has 5.61 square miles for each fire station, which is similar to the comparison cities who averaged 5.71 square miles per fire station. Joplin has 525 citizens per firefighter and the comparison group averaged 586 citizens per firefighter, ranking Joplin's staffing slightly better than the majority in the survey. While many attributes of Joplin were similar to those of the comparison cities, some elements were worthy of noting:

- Fire Marshal staffing for the Department was in a three-way tie for the lowest of the group. In Jefferson City, Missouri the Fire Marshal is officially supplemented with six firefighters who work overtime to compensate for the staffing arrangement.
- Joplin was the only department identified as not having a fulltime clerical or administrative support position.

The volume of administrative work that has to be accomplished by the Department dictates prioritization of solutions that aid administrative and management functionality, especially in support of the Fire Marshal's Office.

4.2 FIELD OPERATIONS STAFFING AND EFFECTIVE RESPONSE FORCE

Fire station staffing is designed to provide 24 hour-per-day, 365 day-per-year emergency response coverage. Joplin has successfully adopted a three-platoon system for a number of decades. It is essential that each platoon will be identical in makeup and consist of the same number of firefighters and officers. Special consideration must be given to balanced distribution of specially-trained firefighters who can provide the skills and experience to handle special operations incidents. The

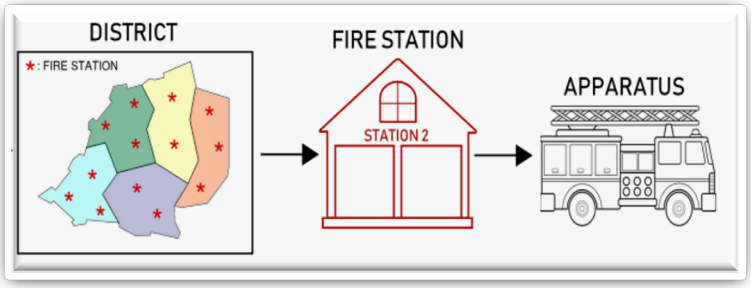


Figure 13: Fire Department Deployment Elements

types of responses commonly associated with this description are technical rescue, hazardous materials and aircraft rescue and firefighting. Staffing and deployment in the Field Operations Division is complex and critical since it involves a risk assessment of the City, coupled with the construction of fire stations and staffing of apparatus.

The evaluation of staffing in fire stations and on fire companies is established in NFPA 1710. This document ensures a minimum number of firefighters are assigned to each emergency response apparatus, and that a sufficient number of firefighters are assembled at the emergency incident scene to facilitate all the tasks that must be accomplished. This team of firefighters is called an effective response force, or ERF. In general, all fire apparatus shall be staffed with a minimum of four (4), including an officer, driver/operator and two (2) firefighters. Apparatus can be operated with fewer than four (4) firefighters if they operate in tandem with another fire apparatus and the sum of firefighters is equal to, or greater than, four (4) (National Fire Protection Association, 2020).

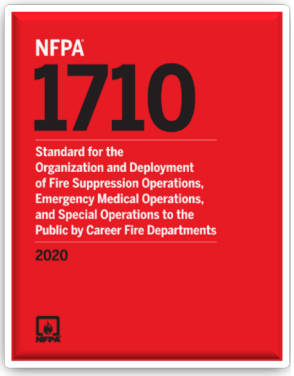


Figure 14: NFPA 1710 Cover

Apparatus must be capable of operating independently at small incidents and as part of a larger team at incidents of greater significance. The staffing of these apparatus relates to their ability to intervene at both emergency medical, fire and other incidents.

Firefighting and response to recognized hazards requires a sufficient initial response with an adequate number of firefighters to initiate control measures, coupled with the assembly of an ERF to bring the entire incident under control within a reasonable timeframe. The ERF is different based on the incident type. The ERF is defined by the predominant risk in the NFPA 1710 standard.

For the City of Joplin, a minimum of 15 firefighters should be assembled at every structure fire, with higher risk structures such as high-rise buildings and strip malls receiving additional staffing (see NFPA 1710 Section 5.2.4 for additional information). This staffing does not have to originate solely from within the Department, but can be assembled using automatic aid resources. The typical structure fire assignment in the City of Joplin does not meet the ERF set forth in the standard staffing on the *initial* alarm. The *initial* alarm for structure fires in Joplin will deploy an ERF of 13 or 14 firefighters, depending on the companies assigned. An additional fire company is sent in supplemental to the initial alarm when the incident is determined to be a “working fire”. This additional fire company sent upon declaration of a “working fire” meets the necessary ERF of the standard.

Joplin’s staffing of four (4) firefighters on engine companies, with the exception of Engine 6 is an industry best practice. However, the staffing of three (3) firefighters on Engine 6 and three (3) firefighters on both ladder companies warrants discussion and the evaluation of alternatives. Ladders are currently stationed with a two (2)-person medium-duty rescue company and operate, accordingly to policy, as a single unit. However, by practice these two (2) units frequently operate independent of one another.

A ladder is currently being constructed for the Department by Pierce Manufacturing. That apparatus is anticipated to be assigned to Ladder 6, replacing the current fire company. It is not clear how the Department established the need for the third ladder company and identified this particular station for the placement of such an apparatus.

Joplin lacks consistent staffing relating to its deployment of special operations functions (technical rescue and hazardous materials), as well as ALS emergency medical care. While trained members are distributed among

the ranks and shifts within the Department, a staffing and deployment strategy has not been implemented to ensure they consistently staff apparatus in a predictable fashion.

4.2.1 Comparison Cities

The staffing arrangement for the Department, when compared to the comparison cities, showed that Joplin had superior fire company staffing practices. No other recommendations or findings regarding the comparison cities are noted for this particular section.

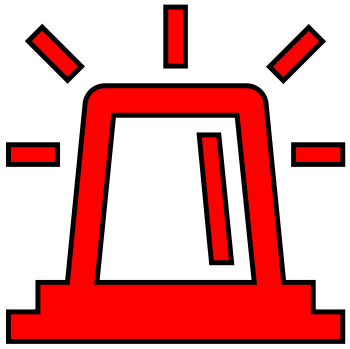
4.2.2 Response Plans and Call Types

Response plans, as implemented in the City's CADS, are described in Department's Standard Operating Guideline 226.10-21. This document appears to be regularly updated and is consistent with industry practices regarding the various call types listed. No task analysis was identified associated with the document. This effort should be considered to ensure initial response and ERF are sufficient for the emergency summoning dispatch.

4.2.3 Joplin Regional Airport

The Joplin Regional Airport (KJLN) is a regional commercial airport located in the City of Joplin. The airport is required by Federal Aviation Administration (FAA) Standard Part 139 to have Aircraft Rescue and Firefighting (ARFF) capability onsite for commercial air traffic. The airport is rated an "Index A" according to FAA regulations. Currently, this capability is provided by airport maintenance employees, who are also certified as ARFF firefighters, and a specialized ARFF fire engine that is located onsite. The Department supplements alerts at the airport with a response of structural fire apparatus and rescue units. The ARFF airport maintenance employees are not certified structural firefighters and do not leave the cab of the airport fire engine during emergency responses.

5: FIRE STATION LOCATION EVALUATION



5. FIRE STATION LOCATION EVALUATION

Fire stations should be designed and constructed with their final intent in mind. This promotes the most effective and efficient use of resources, while providing emergency response. Future fire station design and location should be carefully evaluated from the beginning of development to ensure the best selection of land for the site and facilitation of acceptable response. Considerations for advantageous fire station location include proximity to target hazards, nearby population, access to transportation corridors and the location's interaction with other station response boundaries.

> "Fire stations should be designed and constructed from the onset with their final intent in mind."

In this section, each station is evaluated based on its modeled performance using ESRI Geographical Information Systems and actual performance for emergency medical and fire incidents. Included in the evaluation are logistic and layout considerations for each facility. Fire station locations are evaluated based on both their distribution inside the City and their ability to provide resources for the assembly of an ERF.

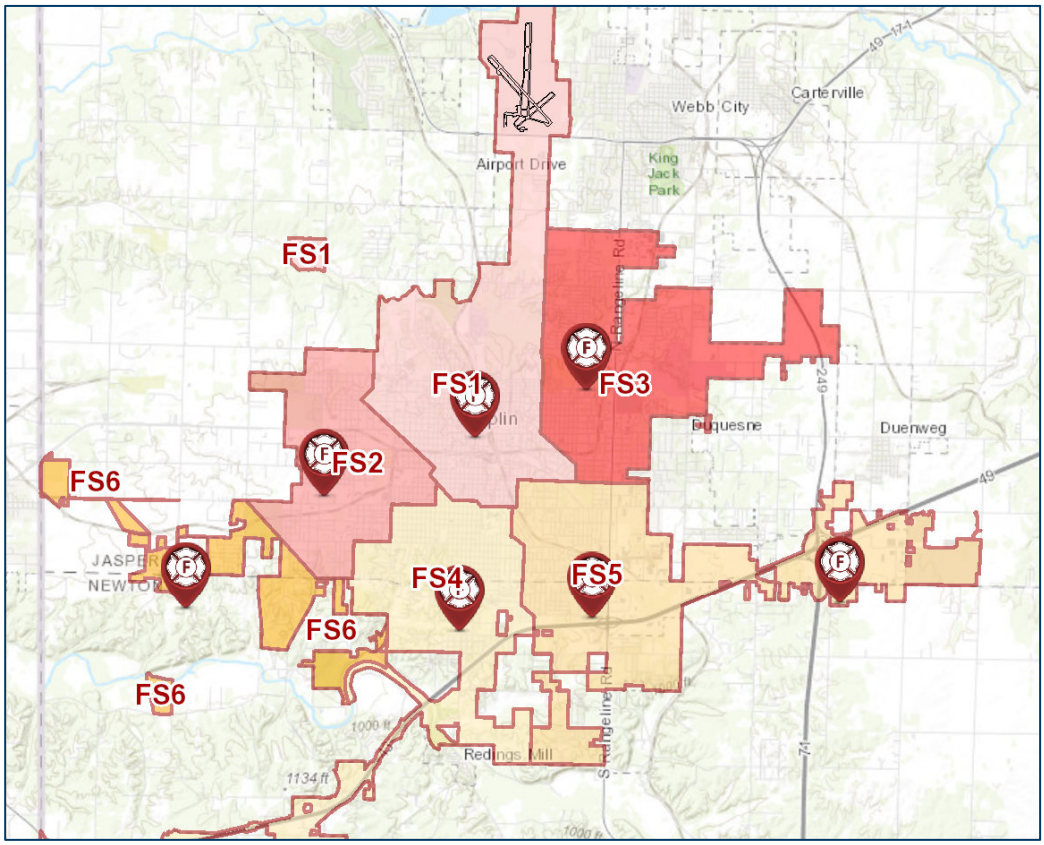


Figure 15: Fire Station Locations in the City of Joplin

The effects of the May 2011 tornado were significant to the Department, causing the reconstruction of two (2) fire stations that were destroyed by the storm. While these new stations present a significant improvement in modern living conditions and amenities, they did impact the response framework for the City.

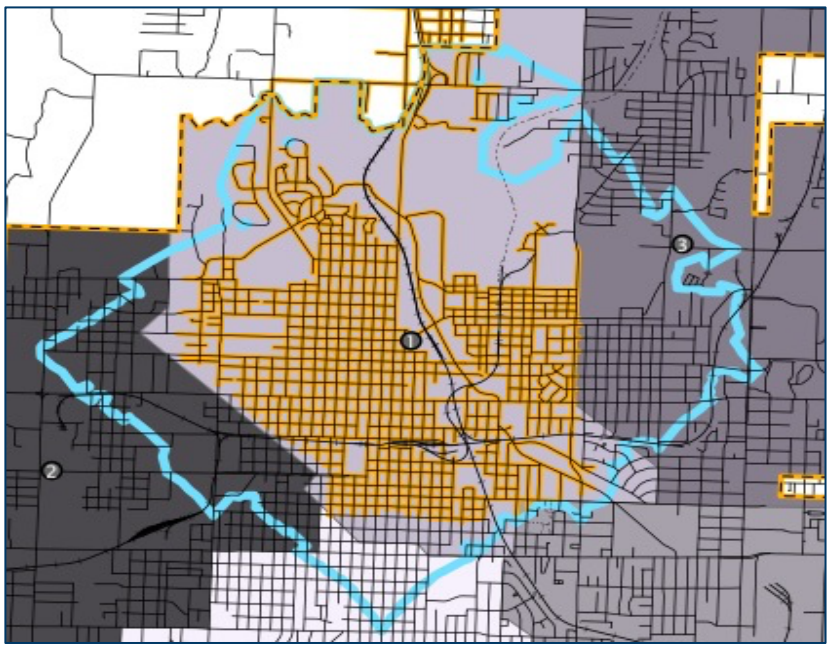
5.1 STATION 1

Station 1 is the oldest fire station in the City and the busiest by call volume. It is home to Ladder 1, Rescue 1 and Battalion 1, as well as other support apparatus. It was originally built in 1966 and remodeled in 2006. It has four apparatus bays, is the headquarters fire station and houses the offices for the Fire Marshal, Deputy Chief, and Fire Chief.

90th Percentile Performance	EMS Incidents 7:42	Fire Incidents 8:33	Motor Vehicle Incidents 7:55
2017 Responses	2,777	**2017 Structure Fires**	20
2018 Responses	2,959	**2018 Structure Fires**	30
2019 Responses	3,297	**2019 Structure Fires**	32
2020 Responses	2,595	**2020 Structure Fires**	32

Figure 16: Fire Station 1 Metrics (2017-2020)

Station 1 is a critical station for the City because of its centralized location. According to GIS data provided, the station is closest to 4,616 addresses in the City. These addresses constitute 21% of the total addresses in the City of Joplin. The four-minute travel time polygon from this station covers 99%, or 4,567 of those address points, leaving only 49 outside the modeled performance characteristic. Portions of Station 1's four-minute polygon extend into small portions of the response area for Stations 2, 3 and 4. The mean modeled travel time from the station is 2.14 minutes.



Station 1 – Quick Facts

Address: 303 East 3rd Street

Year Built: 1966

Staffed Units: Ladder 1, Rescue 1, Battalion 1

Addresses Protected: 4,616

Figure 17: Fire Station 1 Four-minute Response Polygon (ESRI GIS Modeled 2021)

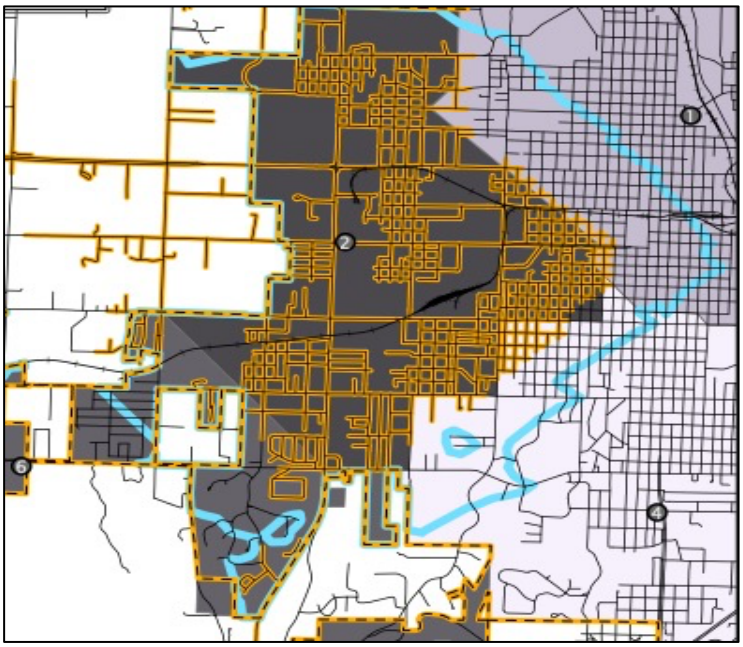
5.2 STATION 2

Station 2 is one of the newest fire stations and was built and relocated after the devastating 2011 tornado. The call volume handled by this station makes it the fourth busiest in the City. It is home to a single engine company, Engine 2, and has two apparatus bays. It was built in 2013.

90th Percentile Performance	EMS Incidents	Fire Incidents	Motor Vehicle Incidents
	7:34	7:51	6:57
2017 Responses	1,003	**2017 Structure Fires**	8
2018 Responses	1,133	**2018 Structure Fires**	9
2019 Responses	1,122	**2019 Structure Fires**	13
2020 Responses	928	**2020 Structure Fires**	12

Figure 18: Fire Station 2 Metrics (2017-2020)

Station 2 provides important coverage for the northwest quadrant of the City. Its location allows for important secondary coverage to Station 6 and Station 1 through road connectivity in the City. According to GIS data provided, the station is closest to 3,856 addresses in the City. This constitutes 18% of the total addresses in the City of Joplin. The four-minute travel time polygon from this station covers 100% of those address points. Portions of Station 2's four-minute polygon extend into small portions of the response area for Stations 1, 4 and 6. The mean modeled travel time from the station is 2.19 minutes.



Station 2 – Quick Facts

Address: 2025 West 13th Street

Year Built: 2013

Staffed Units: Engine 2

Addresses Protected: 3,856

Figure 19: Fire Station 2 Four-minute Response Polygon (ESRI GIS Modeled 2021)

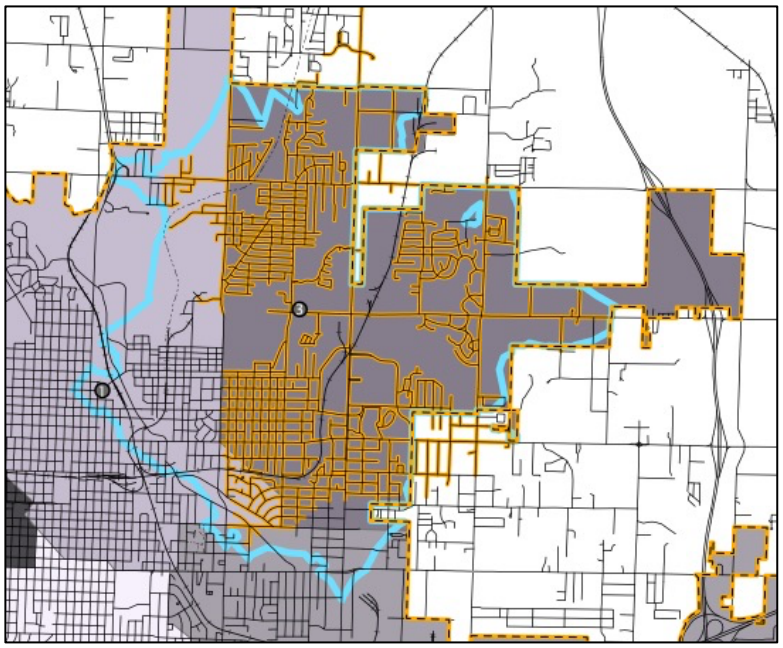
5.3 STATION 3

Station 3 is an older fire station and protects the largest number of addresses of all JFD stations. It protects a large area of the northwest side of the City. Its number of emergency responses make it the third busiest fire station in the City. It was built with two apparatus bays in 1980 and is home to Engine 3. Its design and function are antiquated.

90th Percentile Performance	EMS Incidents	Fire Incidents	Motor Vehicle Incidents
	8:14	7:48	7:39
2017 Responses	1,407	**2017 Structure Fires**	13
2018 Responses	1,453	**2018 Structure Fires**	7
2019 Responses	1,656	**2019 Structure Fires**	17
2020 Responses	1,204	**2020 Structure Fires**	4

Figure 20: Fire Station 3 Metrics (2017-2020)

Station 3 is the most northwestern station in the City and serves a variety of purposes. Station 3 has minimal intrusion into Station 5's area and limited overlap into Station 1's response area. This overlap into Station 1's area is an important attribute of this station, since Station 1 has a significant call volume. According to GIS data provided, the station is closest to 4,725 addresses in the City. This constitutes 22% of the total addresses in the City of Joplin. The four-minute travel time polygon from this station covers 96%, or 4,542 address points, leaving only 183 outside the modeled performance characteristic. The mean modeled travel time from the station is 2.56 minutes.



Station 3 – Quick Facts

Address: 2717 Newman Road

Year Built: 1980

Staffed Units: Engine 3

Addresses Protected: 4,725

Figure 21: Fire Station 3 Four-minute Response Polygon (ESRI GIS Modeled 2021)

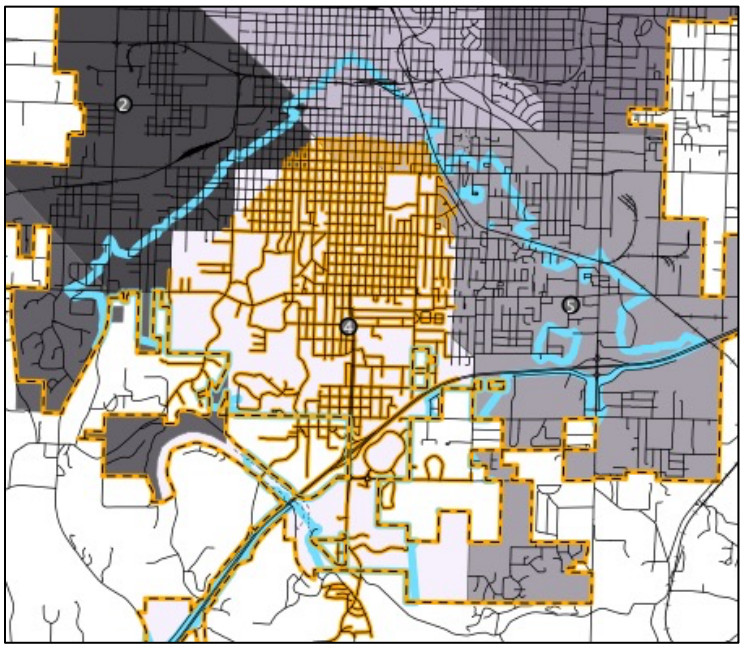
5.4 STATION 4

Station 4 is one of the newest fire stations in the City, having been reconstructed and relocated after the 2011 tornado. This station protects the second largest number of addresses of all JFD stations. This station is positioned in the south-central section of the City and provides important primary and back-up coverage for the City. This is the second busiest station in the City by call volume. It is home to Engine 4 and a water tender and has two apparatus bays.

90th Percentile Performance	EMS Incidents 8:17	Fire Incidents 9:19	Motor Vehicle Incidents 10:50
2017 Responses	1,485	**2017 Structure Fires**	8
2018 Responses	1,475	**2018 Structure Fires**	10
2019 Responses	1,496	**2019 Structure Fires**	8
2020 Responses	1,338	**2020 Structure Fires**	15

Figure 22: Fire Station 4 Metrics (2017-2020)

Station 4 was previously located in a more central location in the City. It remains an important station for the Department, providing essential first-due coverage to the second-largest quantity of address points and second-due coverage to Station 1, 5, and 6's area. According to GIS data provided, the station is closest to 4,688 addresses in the City. This constitutes 21% of the total addresses in the City of Joplin. The four-minute travel time polygon from this station covers 98%, or 4,616 of those address points, leaving only 72 outside the modeled performance characteristic. Portions of Station 4's four-minute polygon extend into significant portions of the response area for Station 5. The mean modeled travel time from the station is 2.08 minutes.



Station 4 – Quick Facts

Address: 3402 South Main Street

Year Built: 2013

Staffed Units: Engine 4

Addresses Protected: 4,688

Figure 23: Fire Station 4 Four-minute Response Polygon (ESRI GIS Modeled 2021)

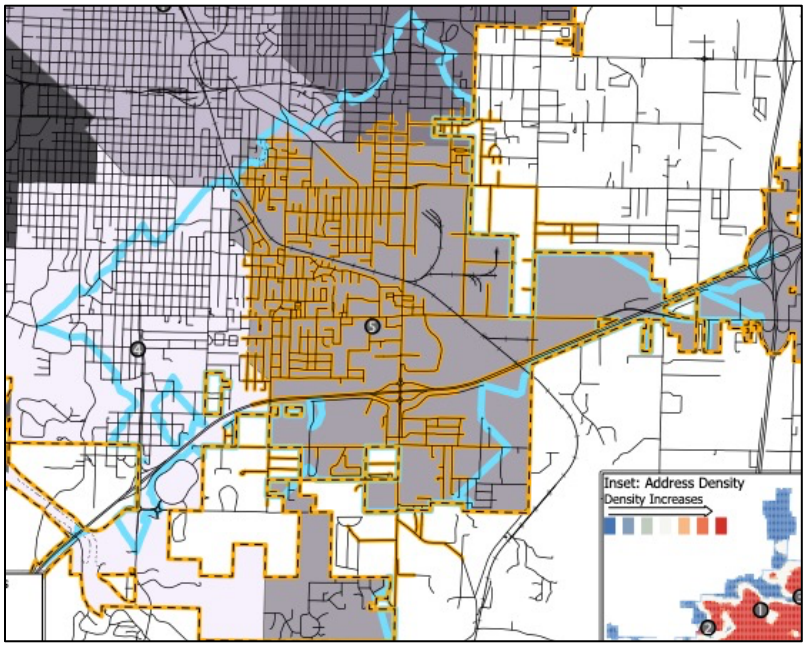
5.5 STATION 5

Station 5 was built in 1982 and is one of the older stations in the JFD inventory. It is one of the few stations that exists in its original location. This station is currently positioned the furthest east in the City. When Station 7 opens, this distinction will change. This station provides quarters to Ladder 5 and Rescue 4. By call volume, this station is the fourth busiest.

90th Percentile Performance	EMS Incidents 8:25	Fire Incidents 7:57	Motor Vehicle Incidents 8:00
2017 Responses	1,362	**2017 Structure Fires**	8
2018 Responses	1,481	**2018 Structure Fires**	7
2019 Responses	1,603	**2019 Structure Fires**	8
2020 Responses	956	**2020 Structure Fires**	3

Figure 24: Fire Station 5 Metrics (2017-2020)

Station 5 has four-minute coverage that overlaps into Station 4's area, and also protects the area for future Station 7. According to GIS data provided, the station is closest to 3,353 addresses in the City. This constitutes 15% of the total addresses in the City of Joplin. The four-minute travel time polygon from this station covers 95%, or 3,191 address points, leaving only 162 outside the modeled performance characteristic. The mean modeled travel time from the station is 2.53 minutes.



Station 5 – Quick Facts

Address: 3223 Texas Avenue

Year Built: 1982

Staffed Units: Ladder 5, Rescue 4

Addresses Protected: 3,353

Figure 25: Fire Station 5 Four-minute Response Polygon (ESRI GIS Modeled 2021)

5.6 STATION 6

Station 6 was built in 2013 and represents the newest and most modern fire station in the JFD. It was built in an area of the community that continues to see development and growth. This station protects the western edge of the City and possesses significant mutual aid capability to nearby departments. This station provides quarters to Engine 6 and the hazardous materials trailer. This station is the slowest in the City by call volume.

90th Percentile Performance	EMS Incidents	Fire Incidents	Motor Vehicle Incidents
	9:28	N/A	N/A
2017 Responses	121	**2017 Structure Fires**	1
2018 Responses	139	**2018 Structure Fires**	1
2019 Responses	186	**2019 Structure Fires**	1
2020 Responses	180	**2020 Structure Fires**	2

Figure 26: Fire Station 6 Metrics (2017-2020)

Station 6 does not protect a large quantity of address points or critical target hazards for the City, but represents an investment in the future safety of the western corridor of the City. According to GIS data provided, the station is closest to 479 addresses in the City. This represents just 2% of the total address points in the City. 99% of the addresses protected, or 473, are covered within the four-minute travel time polygon. Very little of Station 6's four-minute polygon extends into other station areas. The mean modeled travel time from the station is 2.21 minutes.

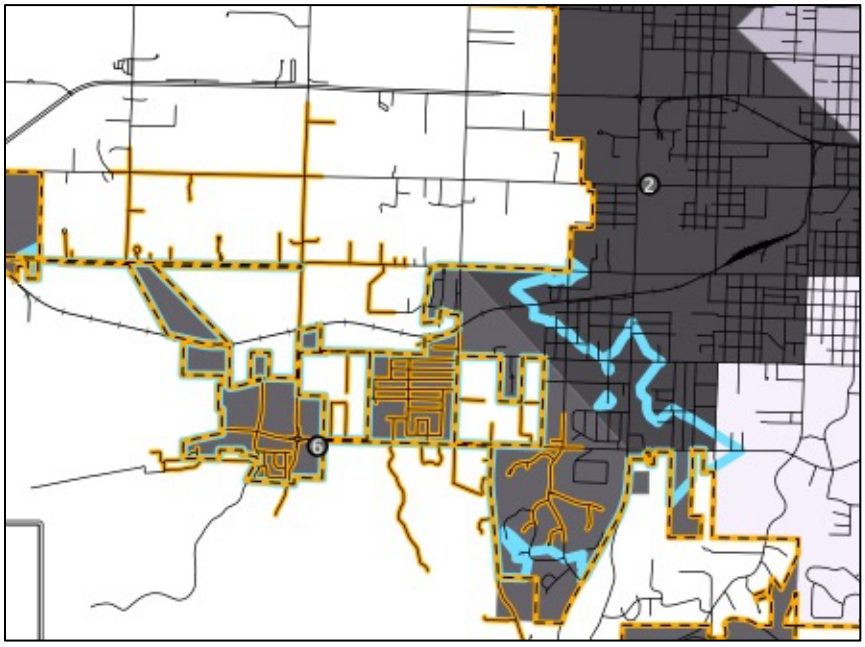


Figure 27: Fire Station 6 Four-minute Response Polygon (ESRI GIS Modeled 2021)

Station 6 – Quick Facts

Address: 5302 West 32nd Street

Year Built: 2013

Staffed Units: Engine 6

Addresses Protected: 479

5.7 STATION 7

Station 7 is not currently constructed, but is in the planning and design phase. The Department has collected information on responses in this station's area and it is reviewed as part of this report. It is anticipated to be built in an area of the community that is home to significant industry and near Interstate 49 and 44. It is anticipated for this station to house a single engine company.

90th Percentile Performance (Modeled)	EMS Incidents 11:12	Fire Incidents 12:11	Motor Vehicle Incidents 11:26
2017 Responses	166	**2017 Structure Fires**	0
2018 Responses	214	**2018 Structure Fires**	2
2019 Responses	162	**2019 Structure Fires**	2
2020 Responses	151	**2020 Structure Fires**	1

Figure 28: Fire Station 7 Metrics (2017-2020)

Station 7 is anticipated to protect a small quantity of address points (114), which only constitutes 1% of the City. It should be noted that many of these addresses are commercial or industrial in nature. This station, like Station 6, demonstrates a significant investment by the City in protecting this growing node of the community. The modeled travel time polygon will likely encroach into Station 5's response area. The mean modeled travel time for the station is 2.63 minutes.

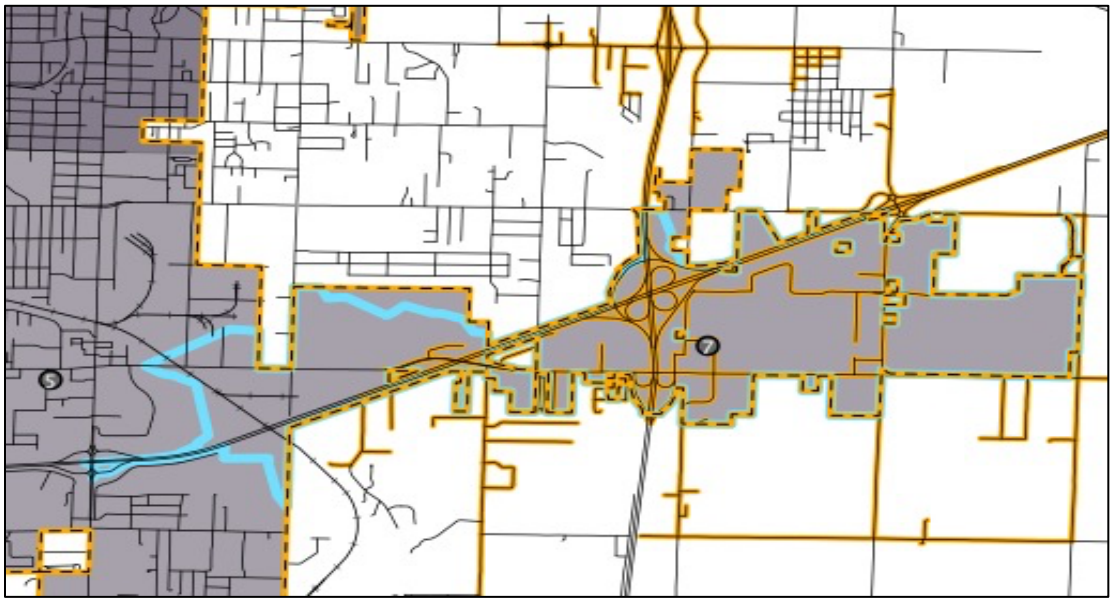


Figure 29: Fire Station 7 Four-minute Response Polygon (ESRI GIS Modeled 2021)

5.8 CURRENT STATION PERFORMANCE

Evaluating individual fire station performance is only one piece of the overall deployment assessment. All stations, operating as a system, must be reviewed for interaction and coverage to understand gaps that may exist in the City. Current fire station locations, inclusive of proposed Station 7, provide modeled four-minute response coverage to 21,325 address points representing 98% of the City. The largest number of addresses outside the four-minute response time are in Station 3 and Station 5's areas. The overall performance of the stations is shown in the figure below.

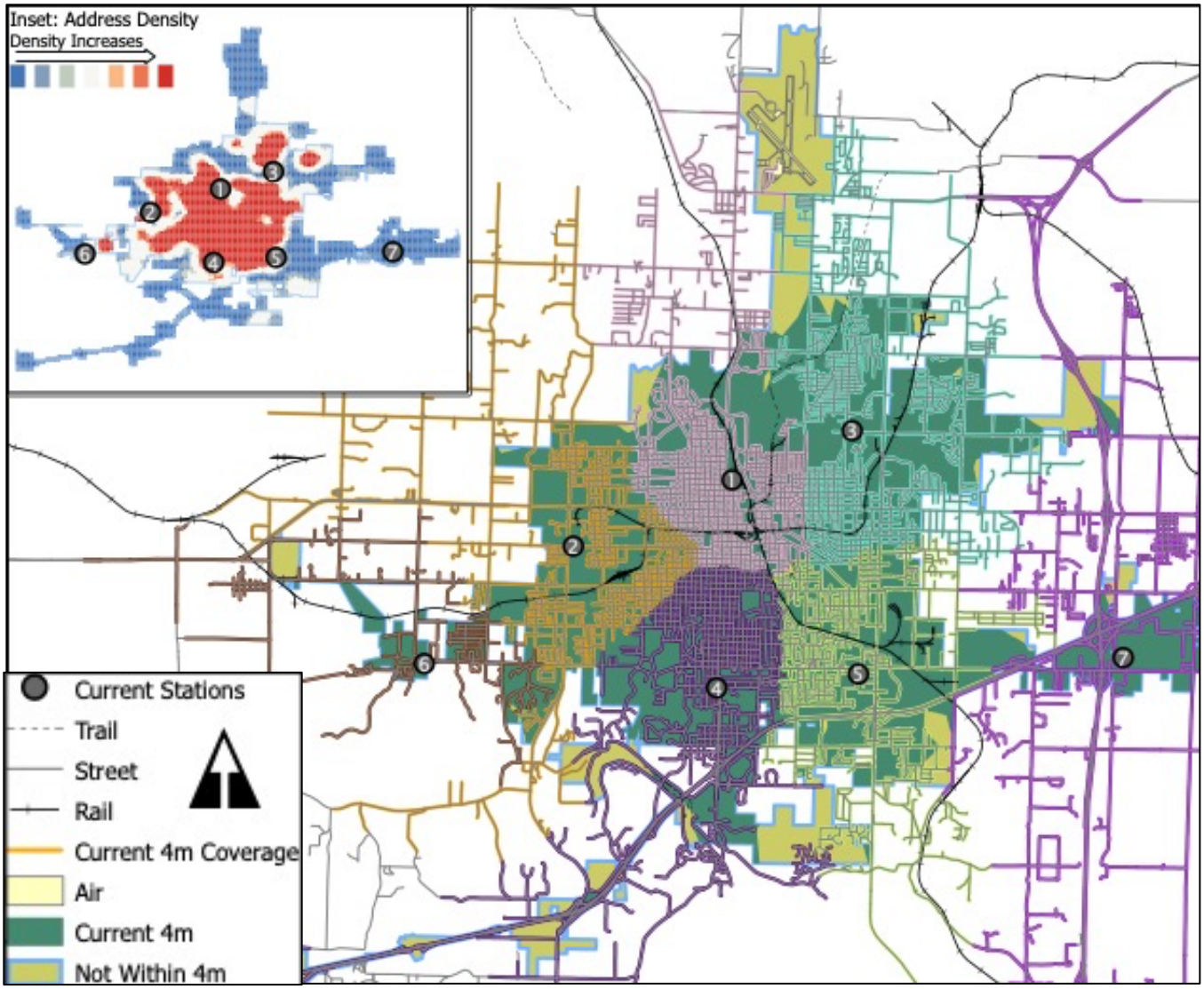


Figure 30: JFD Stations Four-minute Response Polygon and Overall City Coverage (ESRI GIS Modeled 2021)

When considering risk, population and other variables, the current distribution of fire stations is adequate, but can be improved.

Concentration of resources is critically important for fire department service delivery since high-risk types of emergencies require the response of multiple stations to properly mitigate the incident. Emergencies like structure fires, hazardous materials leaks, technical rescues and mass casualty incidents often require the

response of four or more fire stations in order to accumulate sufficient personnel to safely and effectively respond. The figure below shows the overlapping concentration of fire station response polygons within an eight-minute travel time. The eight-minute travel time is derived from NFPA 1710 as the benchmark travel time for the firefighting team, or ERF, to arrive at a structure fire.

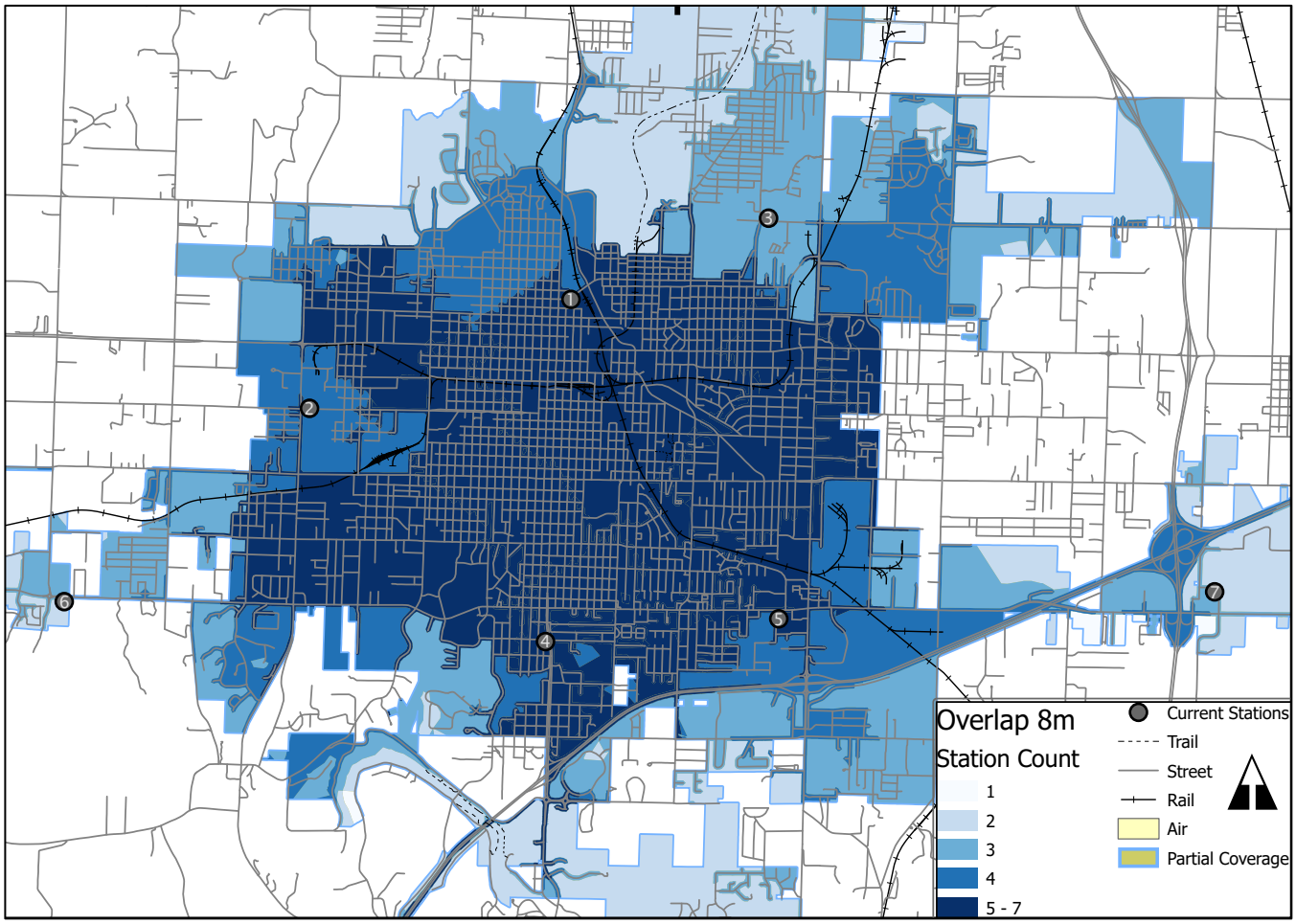


Figure 31: JFD Stations Eight-minute Response Concentration Measurement Overall City Assessment (ESRI GIS Modeled 2021)

In order to achieve the desired number of 15 firefighters at the scene of a structure fire, at least four fire stations will need to respond. Assuming that all fire stations are available and in quarters, the majority of the City, especially the center core, has the modeled capability to arrive within the designated time frame. This graphic does include Station 7 and does not reflect the current six fire stations.

7: RECOMMENDATIONS



6. RECOMMENDATIONS AND DECISION PACKAGES

The City of Joplin operates a fire department that is rich with tradition, capability and possess a spirit of service to the community. This report recommends realistic and time-sensitive recommendations to help improve protection of people and property. The recommendations are presented by functional category.

6.1 STAFFING AND PERSONNEL

The most important resource for the JFD are its firefighters. As such, it is necessary to provide a sufficient quantity of them in a short window of time to ensure they can quickly and safely control dangerous situations.

Recommendation 1 - Four-person staffing should be adopted as minimum staffing for fire suppression companies (engines and ladders) regardless of station.

Recommendation 2 - A task analysis should be completed by the Department to ensure sufficient personnel are dispatched on the initial alarm to all incident types.

Recommendation 3 - A minimum of four fire companies, including at least one ladder company, should be dispatched on the initial alarm for all structural fires to ensure adequate assembly of an effective response force.

Recommendation 4 - An Assistant Fire Marshal should be hired to supplement staffing in the Fire Marshal's Office. This position would help provide important risk reduction solutions to the JFD and City.



6.2 FIRE STATION LOCATIONS AND LOGISTICS

The location of fire stations is critical to the success of the fire and emergency response system. Properly located and designed fire stations for the City of Joplin translates into property and lives saved.

Recommendation 5 - The City should consider a future fire station location in the immediate central corridor of the City to address identified performance gaps in that area and improved concentration of resources.

Recommendation 6 - Station 3 should be relocated to position itself for improved east-west and north-south accessibility and improve layout and capacity for future expansion. This relocation should be done under consideration with the opening of Station 7, potential relocation of Station 5 or a fire station in the central corridor of the City to enhance overall system performance.



Recommendation 7 - Station 5 should be relocated to position itself for improved balance of coverage after the opening of Station 7. Special consideration should be given to overall system performance regarding the location of Station 4 and any potential relocation involving Station 3 or a fire station in the central corridor of the City.

Recommendation 8 - Future fire stations should be constructed with no fewer than three apparatus bays to accommodate mission expansion in the future.

6.3 APPARATUS AND DEPLOYMENT

Fire and emergency response must provide a careful balance of reliability, technology and function. The City of Joplin has invested significantly into its fleet, training and capability and should continue that tradition in the future.

Recommendation 9 – The Department should consider a standalone technical rescue and hazardous materials response unit for improved reliability and function for these low-frequency, high-risk calls.

Recommendation 10 – The Department should enhance training and capacity for technical rescue and hazardous materials response.

Recommendation 11 – Automatic aid departments should receive quarterly training and drills with nearby Joplin fire companies to ensure readiness and familiarization with protocols and procedures.

Recommendation 12 – To reduce risk to firefighters and citizens, the City should abate inhabitable structures posing unnecessary risk to firefighters and the public.

6.4 EMERGENCY MEDICAL SERVICES

The provision of emergency medical care is provided in the City of Joplin through a tiered system involving the JFD and two ambulance agencies. These types of emergencies are the most frequent type of response provided by the JFD.

Recommendation 13 – The City of JFD should develop a formal operational agreement or memorandum of understanding between all parties involved with emergency medical response, including the City of Joplin, Joplin Fire Department, Metropolitan Emergency Transport System, and Newton County Ambulance District. This document should establish minimum expectations of all stakeholders, a response algorithm, and response time standards or benchmarks. Elements for consideration for inclusion into the document should include the dual ambulance dispatch into areas of Newton County in the City of Joplin, and the use of Automatic Vehicle Location (AVL) to dispatch the closest ambulance to emergencies to provide efficient and effective response.

Recommendation 14 – Enhanced paramedic-level service delivery should be incrementally implemented in the JFD by establishing Engine 3 as a permanent paramedic fire company in the next 18 months. The Department should expand its paramedic-level service delivery to Engine 2 by 2024.

Recommendation 15 – By 2025, the Department should have the goal of placing a JFD paramedic on the scene of all Delta and Echo-level emergency medical calls 75% of the time.

6.5 ALARM HANDLING AND DISPATCH OPERATIONS

Crucial to emergency response is the rapid and authentic transmission of emergencies. The current 9-1-1 system in Joplin is sufficient but creates an opportunity for improved coordination and collaboration.

Recommendation 16 – 9-1-1 Services should be evaluated for consolidation or colocation to improve interoperability and function between the various 9-1-1 centers serving the City.

6.6 AIRCRAFT RESCUE AND FIREFIGHTING OPERATIONS AT JOPLIN REGIONAL AIRPORT

The City's regional airport is an important community asset that provides daily nonstop service to three major metropolitan areas. The protection of the passengers that enplane at this facility is important to community function and viability.

Recommendation 17 – The City should consider the transition of Aircraft Rescue and Firefighting (ARFF) responsibility to the fire department as a strategic initiative. This long-term shift in responsibility would involve hiring the necessary number of firefighters to provide Federal Aviation Administration (FAA) Part 139 services to the City's airport.

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