



Killeen Fire Department

Killeen, Texas

July 2021

Fire Department MASTER PLAN

ESCI Emergency Services
Consulting International

Providing Expertise & Guidance that Enhances Community Safety

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Jim Kubinski

Fire Chief

Jose Segarra

Mayor

James Chism

Assistant Chief/Fire Marshal

Kent Cagle

City Manager

James Chambers

Deputy Chief-EMS

Jonathan Locke

Executive Director-Finance

Keith Foxx

Deputy Chief-Support Services

Tony McIlwain

*Executive Director-Planning &
Development Services*

Joel Secrist

Deputy Chief-Fire Operations

Danielle Singh

Executive Director-Public Works

Randy Pearson

Training Captain

Leslie Hinkle

*Executive Director-Community
Development*

Beatrice Payne

Office Administrator

Aubrey Huckaby

Director of Operations

Marc Clifford

*President-Killeen Professional Firefighters
Association
IAFF Local 2505*

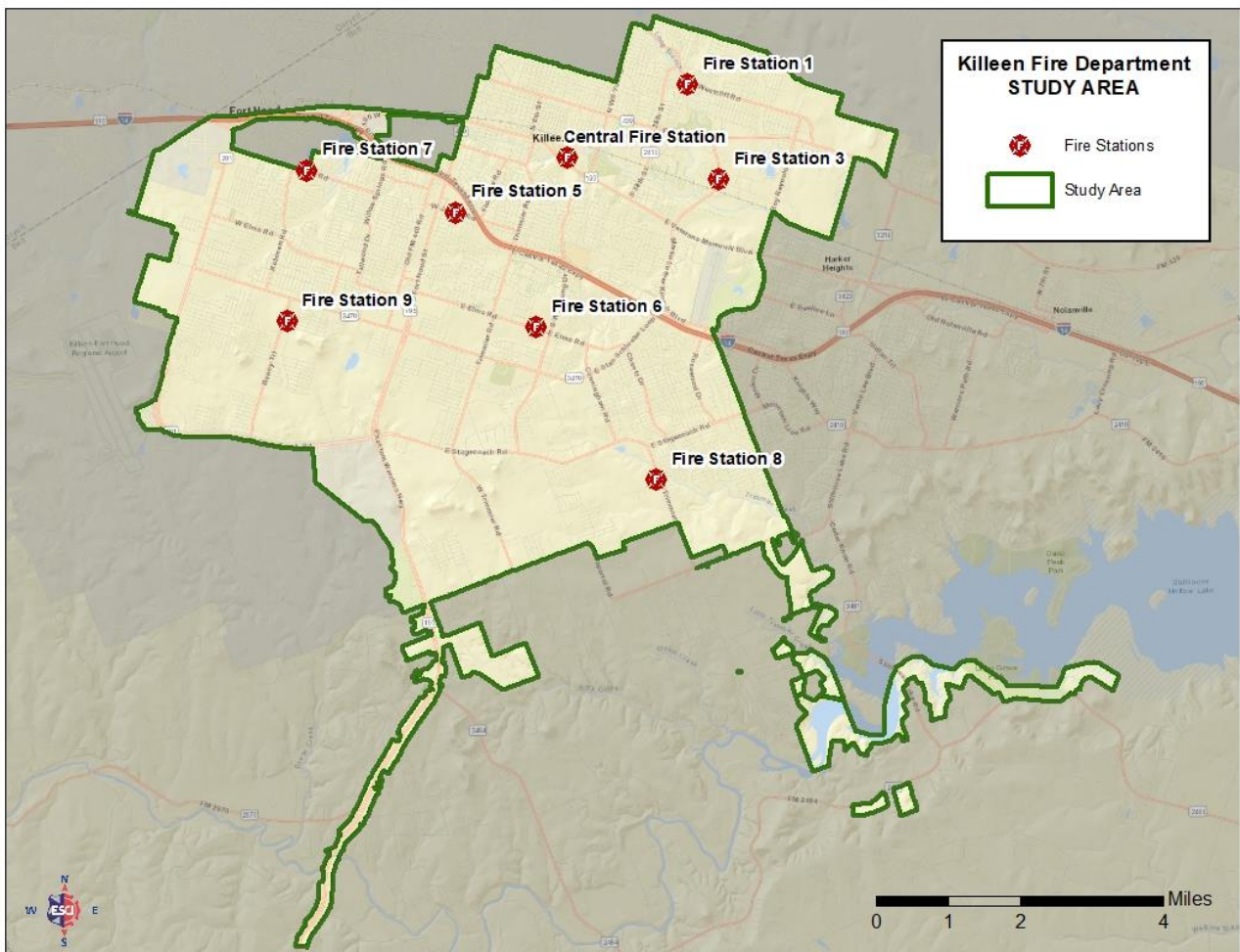
Bell County 911 Communications Center

...and the rest of the employees of the Killeen Fire Department and the City of Killeen who selflessly serve their citizens and visitors with compassion and professionalism.

INTRODUCTION

In November 2020, the City of Killeen, Texas, Fire-Rescue Department retained Emergency Services Consulting International (ESCI) to conduct a Long-Range Master Plan. The primary motivations for this study are related to past and continued population growth and development, and a desire to identify key strategies to keep the Department healthy and ready to provide vital emergency services. The following figure is an illustration of the primary study area for this project.

Figure 1: Killeen Study Area Map



Note, that besides serving the City, KFD also provides fire and EMS response to portions of southern Bell County, including the community of Ding Dong. The study area identified around Stillhouse Hollow Lake is served primarily by Harker Heights Fire Department.

COMMUNITY & ORGANIZATIONAL OVERVIEW

The following section provides a general overview of the City of Killeen and the Killeen Fire Department (KFD).

The City of Killeen

Killeen is an incorporated city located approximately 70 miles north of Austin and is considered part of the Killeen-Temple Metropolitan Statistical Area (MSA). The City lies entirely within Bell County. According to the U.S. Census Bureau, Killeen is approximately 54 square miles in size. The United States' largest military installation, Fort Hood, is located immediately adjacent to the City on its northern border. This military installation, home to the Army's Third Armored Corps, covers 340-square miles, and has an estimated active-duty military population of over 36,000 active-duty personnel and approximately 9,500 civilians and contractors.¹ The City is also home to Central Texas College and Texas A&M University-Central Texas.

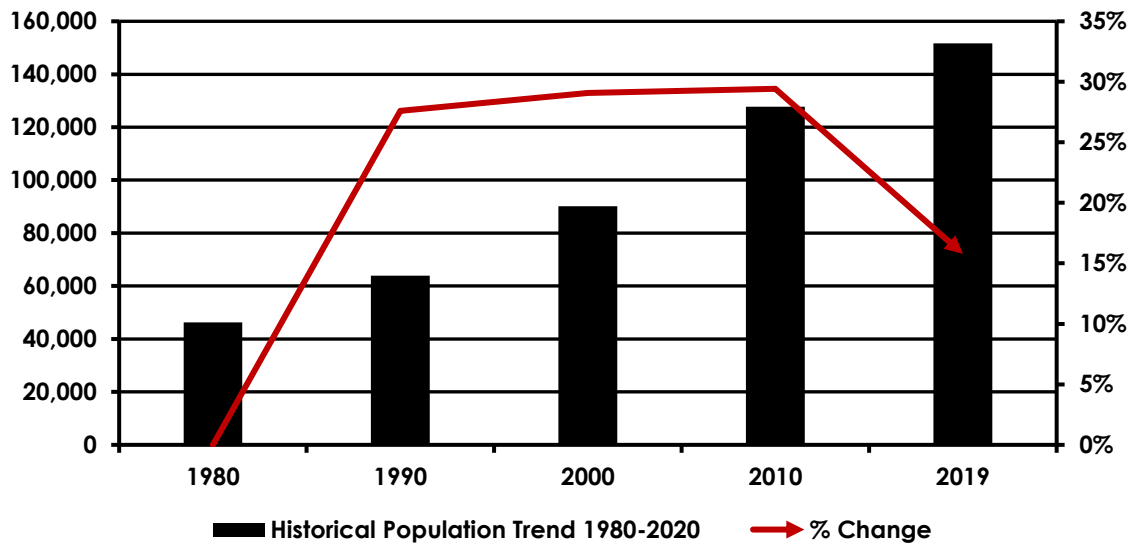
According to the Greater Killeen Chamber of Commerce, Killeen was founded in 1882 with the construction of a railway through the area. The town was named after Frank P. Killeen, a railway executive. The City became a major shipping point for agricultural products, the largest of which was cotton.² In 1942, the U.S. Army constructed Camp Hood, which operated as a tank destroyer training installation.

The City adopted a City Charter in 1949, which established a Council-Manager form of government. The City is divided into four voting districts, who elect a Mayor and seven Council Members. Four Council Members represent a single voting district, and the Mayor and three Council Members are at-large positions. Each Council Member serves a two-year term, and cannot serve more than three consecutive terms.

Like many cities in Texas, Killeen has experienced significant population growth in the past three decades. According to U.S. Census Bureau, the City's population was estimated at 63,936 persons in 1990, which has grown to an estimated 2019 population of 151,666. The following figure illustrates Killeen's population growth over the four decades, as estimated by the Texas Demographics Center.

¹ <https://installations.militaryonesource.mil>

² <https://local.townsquarepublications.com/texas/killeen/01cha/topic.html>

Figure 2: Killeen Population History, 1980–2019³

As shown in the preceding figure, the City experienced steady and significant growth over the past 40 years, especially between 1990 and 2010. Much of this growth can be attributed to the influences and growth of Fort Hood, and the associated impacts on the local economy and business environment. Killeen's major employers include Fort Hood (37,004 employees), the Killeen Independent School District (6,000 employees), the U.S. Government Civilian Personnel Office (5,373), Teleperformance (1,700), and the City of Killeen (1,173 employees).

³ U.S. Census Bureau and Erik Steiner, Spatial History Project, Center for Spatial and Textual Analysis, Stanford University.

Killeen Demographics

The following figures summarize various demographic characteristics of Killeen's population as provided by U.S. Census estimates.

Figure 3: Sex

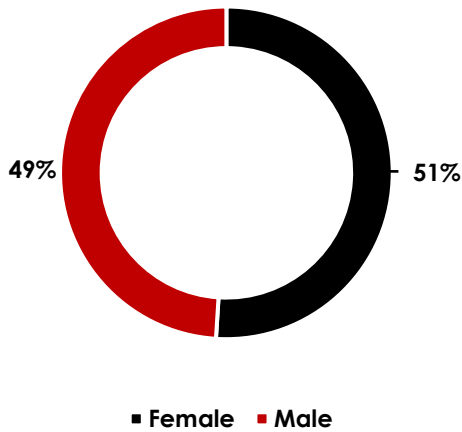


Figure 4: Race

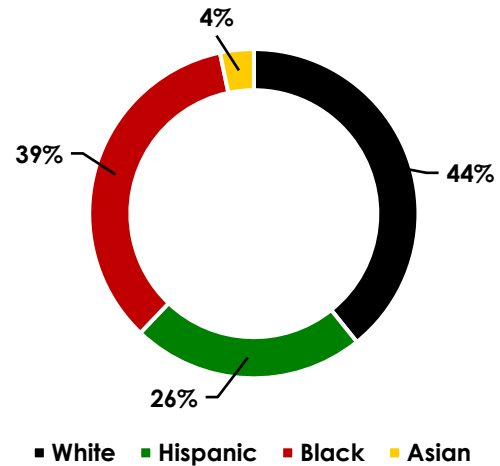


Figure 5: Age

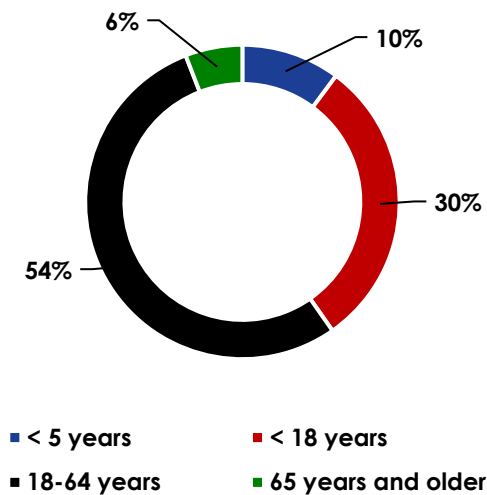
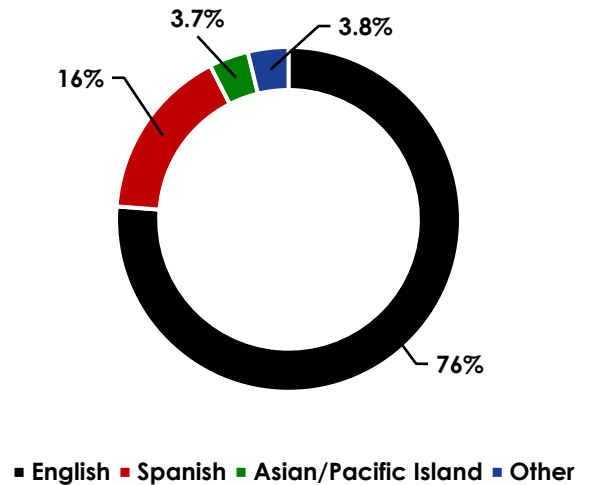


Figure 6: Primary Language



Demographics Discussion

According to the U.S. Census Bureau, in July 2019, approximately 12% of the population under the age of 65 years had some type of disability, and 12.5% of the total population did not have medical insurance.

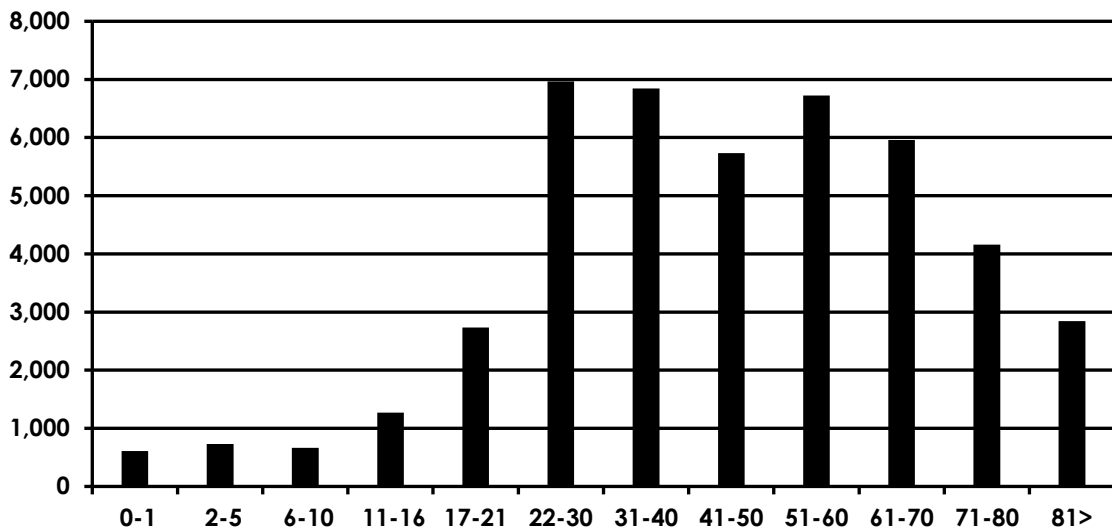
The previously described demographic traits of a community coupled with population density characteristics can affect overall community risk, the specific nature of the risk, and subsequent demand for emergency services.

An October 2019 NFPA research report, *Home Structure Fires*, cited a study by Gilbert and Butry that determined population “frailty,” defined by age- and gender-adjusted natural cause mortality rates, can identify populations vulnerable to fire death but not those vulnerable to non-fatal injuries. The NFPA report revealed that more than half (54%) of the fatal home fire victims were 55 and over, and one-third (34%) were at least 65 years old. One of every five fatal home fire victims was between 55 and 64 years of age. More than two-thirds (69%) of the people who were non-fatally injured were between 35 and 64 years of age. In urban cities, several factors have been identified that place certain groups of people at higher risk of being injured or killed in a fire. Fifty-six percent were male, as were 54% of those non-fatally injured.

These segments of the population are also more likely to use fire department services, especially EMS, than other population groups. EMS incidents in Killeen represent approximately 68% of the overall service demand in the city. Additional detail about these special risk groups, and their impact on emergency services, follows.

Age: The elderly may have difficulty escaping from fire due to physical limitations and diminished sensory perception (primarily hearing and vision). Quality of life issues, chronic illness, and the proliferation of assisted living/nursing home facilities also increase emergency medical service demand. The very young also represent a vulnerable population, as they do not have the ability to appropriately and quickly recognize and react when faced with an immediately dangerous situation.

ESCI evaluated 2018–2020 EMS patient records to identify the ages of evaluated patients. The following figure summarizes the number of patients per age range.

Figure 7: EMS Patient Ages (2018–2020)

As shown in the preceding figure, the greatest number of patients fall into the 22–40 age range. This demographic appears to coincide with the relatively young overall population in Killeen, which is primarily influenced by the large military presence at Fort Hood.

Lack of Health Insurance: People with no health insurance may be more prone to chronic illnesses or undiagnosed medical conditions simply because they cannot afford to seek medical treatment. Twelve and one-half percent (12.5%) of Killeen's overall population does not have health insurance.

Disabilities: People under 65 years of age with some form of disability comprise just over 12% of the City's population and may be incapable of quickly recognizing an emergency and reacting appropriately.

Language Barrier: Segments of the population may have cultural differences or language barriers that inhibit their ability to call for help when needed, or effectively communicate their needs and concerns. According to the NFPA, "Language barriers, cultural differences, and inexperience with unfamiliar home technologies are factors that mark the challenges of helping newcomers live safely from the threat of fire in the home."⁴ The percentage of the City's population that cannot speak English is unknown. Over 9% of the City's population is foreign-born; and almost 24% of the population speak a language other than English at home.

⁴ Serving immigrant and refugee populations, National Fire Protection Association, 2017.

Low Income: Those with low incomes tend to use fire and EMS services more often than those with higher incomes. Approximately 14% of the City's population lives below the poverty level. The U.S. Census Bureau's 2020 poverty threshold is defined as \$12,760 for an individual, and \$26,500 for a family of four. The low-income category is often combined with other factors such as education or work status. The median household income in Killeen is relatively low at \$50,418 (in 2019 dollars).

City Government

As noted earlier, Killeen is a Home Rule City with a Council-Manager form of government. The City Council consists of a seven-member elected board that serves two-year staggered terms. Elections are held annually. Appointed City Manager and Assistant City Manager positions oversee the various City departments. The Fire Department is overseen by the City Manager, and the Police Department is overseen by the City Manager.

The Killeen Fire Department

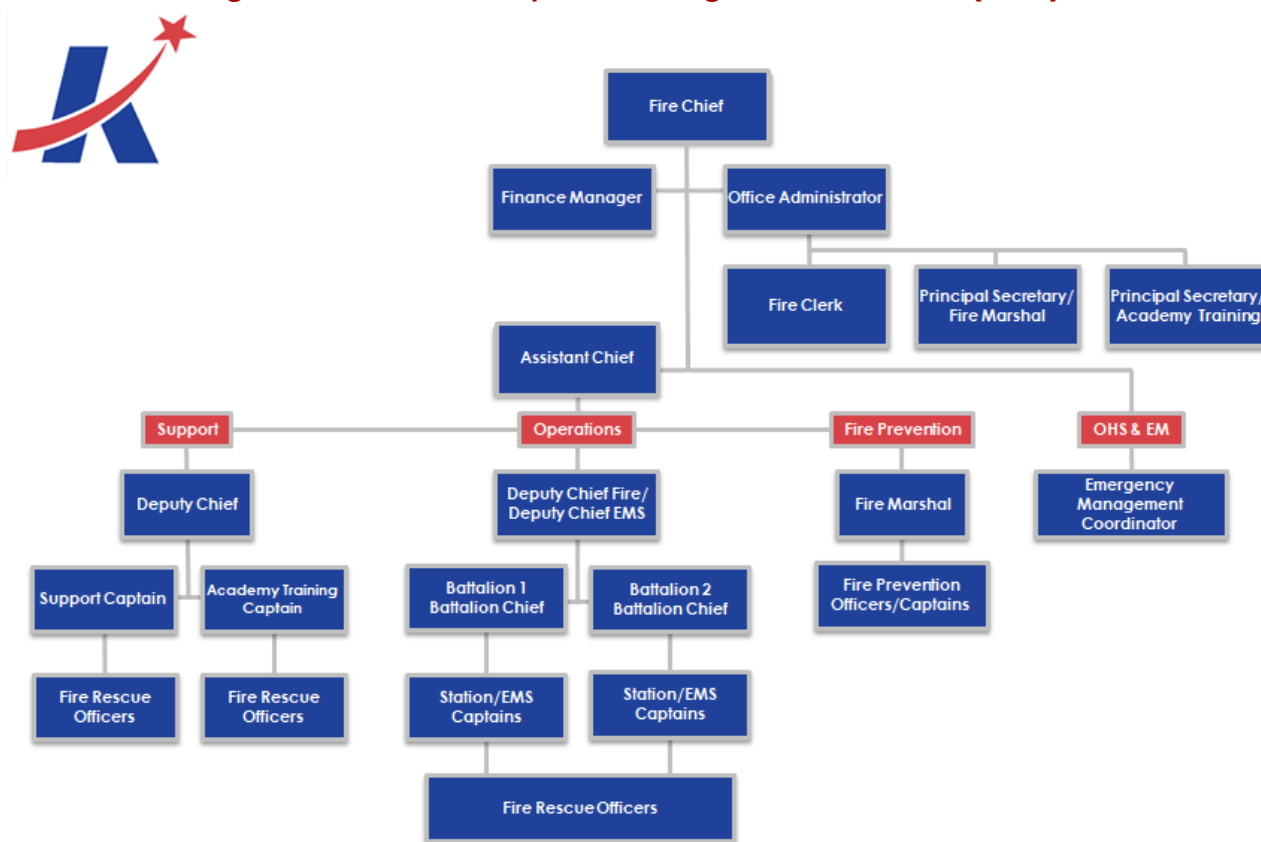
Organizational Structure

The KFD Fire Chief oversees all fire department operations and the City's emergency management functions. A new Fire Chief was hired from outside the Department in February 2021.

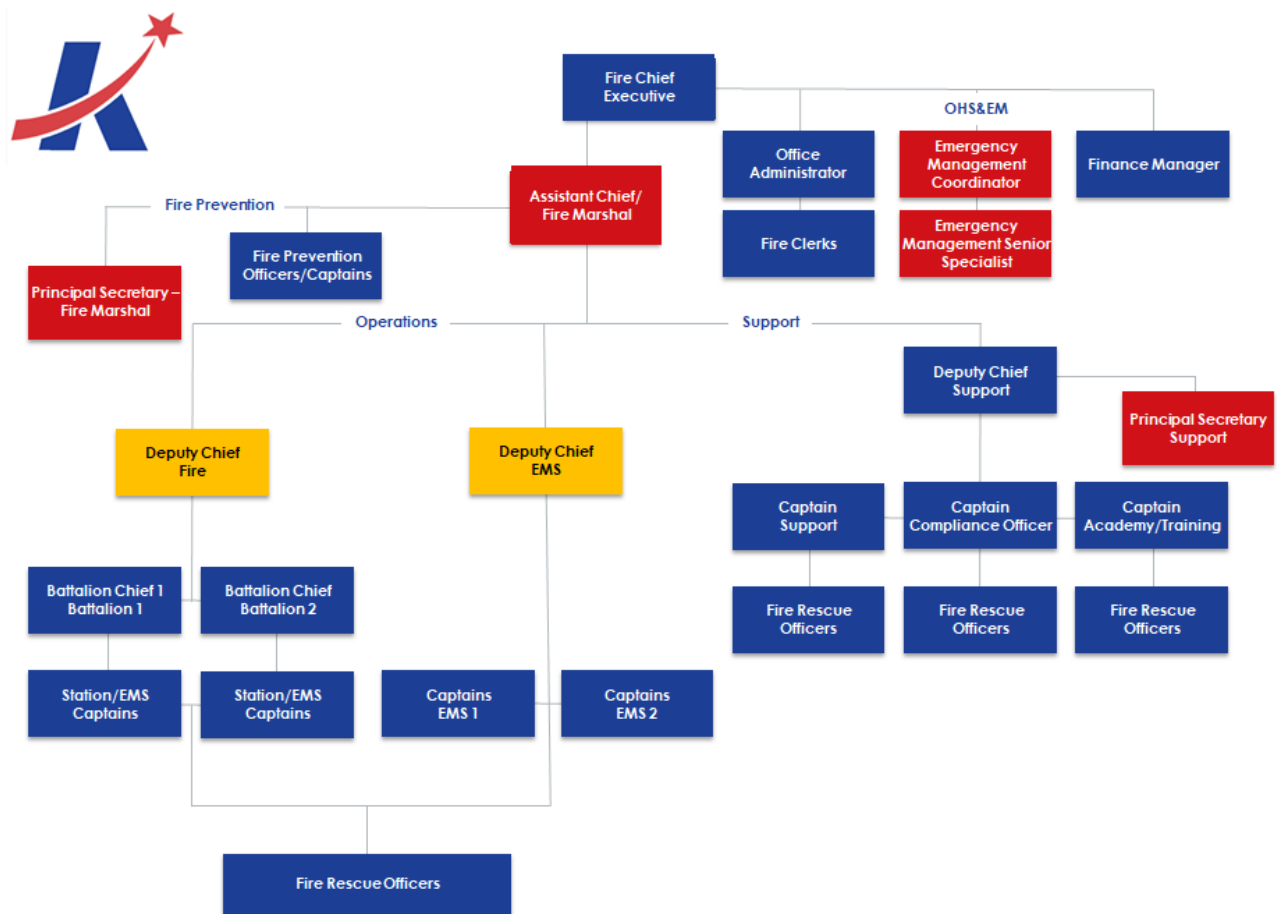
In 2015, KFD was assigned and maintains a *Public Protection Classification* (PPC®) score of 1 by the *Insurance Services Office* (ISO). This is the highest rating awarded by the ISO, and at the time, the KFD was only one of approximately 100 fire departments across the United States that had achieved a Class 1 rating.

The KFD is part of the Texas Interagency Fire Mutual Aid System, and works closely with the Texas A&M Engineering Extension Service.

The Department's previous organizational structure consisted of four primary divisions: Operations, Support, Fire Prevention, and Emergency Management. The Fire Chief reports to the City Manager. The following figure illustrates the past organizational structure of the Killeen Fire Department.

Figure 8: Killeen Fire Department Organizational Chart (2020)

During the study period, the Department's administration was reorganized. The following figure illustrates this interim administrative configuration.

Figure 9: KFD Interim Administrative Structure

Operations & Deployment

The KFD deploys its operations personnel and apparatus from eight fire stations, organized into two battalions. The Department provides traditional fire protection along with medical first response (MFR) and ground ambulance transport at the Advanced Life Support (ALS) level. In addition, KFD provides:

- Confined Space Rescue
- Hazardous Materials Response

Life-safety activities delivered by the Department include:

- Limited Fire Inspections
- Code Enforcement
- Plan Reviews
- Fire and Arson Investigations
- Limited Public Education and Prevention Programs

Fire Suppression

The minimum daily staffing is 48 personnel deployed across eight fire stations in two battalions, as shown in the following figure.

Figure 10: KFD Station Staffing

Station	Unit (Minimum Staffing)
1	Engine 1 (3), Medic 1 (2)
2 (Central)	Ladder 2 (3), Rescue 2 (2), Medic 2 (2), Battalion 1 (1), EMS Command 208 (1)
3	Engine 3 (3), Medic 3 (2)
5	Engine 5 (3), Medic 5 (2)
6	Engine 6 (3), Medic 6 (2)
7	Engine 7 (3), Medic 7 (2)
8	Engine 8 (3), Medic 8 (2), Battalion 2 (1)
9	Ladder 9 (3), Rescue 9 (2), Medic 9 (2), Unit 206 (1)

Wildland Firefighting

The geography, climate, and light natural fuels present in and around Killeen make it susceptible to wildfires, especially in the wildland-urban interface areas around the City's periphery. The KFD routinely responds to wildfires, especially in the summer and fall. The Department has six Type 6 brush units called "Boosters," that are cross-staffed as needed for wildfire response.

EMS

Each station has EMT-Paramedics who staff an ALS-equipped ambulance to respond to medical incidents in their first-due territory and transport for definitive care as appropriate. All operations personnel are minimally trained and certified at the EMT-Basic level, but are required by the City's municipal code to achieve paramedic level certification. At the time of this study, the Department had 141 Fire-Rescue Officer/Paramedics and 29 Fire-Rescue Officer/EMTs.

Hazardous Materials Response

The Department provides hazardous materials response with a 58-person technician trained hazardous materials team. All technicians are also TCFP certified Hazardous Materials Safety Officers. The Department's HAZMAT specialized apparatus consists of a HAZMAT truck and trailer, which responds out of Station 8. Almost all operations assigned personnel are trained to at least the HAZMAT Operations level, and nine are certified HAZMAT Incident Commanders. The Technicians are trained and equipped to conduct surveillance, containment, and control of uncontrolled chemical releases in Level A and B protective ensembles. The team trained quarterly prior to the 2020 COVID-19 pandemic. Additional mutual aid HAZMAT response resources are available through Fort Hood and Temple Fire Departments.

Technical Rescue

The Department provides a wide range of technical rescue responses, including surface water rescue, confined space, trench rescue, and high angle rope rescue. Two heavy rescue units (Rescue 2 and Rescue 9) are staffed 24/7, with a minimum of one Technician trained Fire-Rescue Officer on each unit. Twenty technicians are assigned on each shift, along with one Team Leader and two alternate Team Leaders.

Components of the Emergency Services System

Emergency Medical Services

KFD staffs eight medic units—24 hours a day, seven days a week, providing ALS ground ambulance transport throughout the City. KFD charges a fee for ambulance transport, and uses an outside billing agency to bill patients. A more extensive review of EMS activities is documented later in this report.

Medical Facilities

Several emergency medical facilities are in or in relative proximity to Killeen, as shown in the following figure.

Figure 11: Medical Facilities

Medical Facility/Location	Trauma Center Designation
AdventHealth Central Texas, Killeen	4
Baylor Scott & White, Temple	1
Baylor Scott & White McLane Children's Medical Center, Temple	2
Carl Darnell Army Medical Center, Fort Hood	3
Central Texas Veterans Health Care System, Temple	N/A

ESCI noted that the closest Level 1 and Level 2 Trauma Centers are in Temple, which is approximately 30 miles away.

Emergency Communications

All fire, EMS, and law enforcement agencies located within Bell County are dispatched by the Bell County Communications Center (BCCC), which is a department within the County government. The Center is the primary 911 Public Safety Answering Point (PSAP), and according to the Center's website, it is the first consolidated dispatch center in the nation to provide dispatch services for 60 police, fire, and EMS agencies in the County. The Center and communications system is funded by a combination of County contributions, contributions from four member cities and the County, and available state funds granted through the Central Texas Council of Governments (CTCOG). The Center's operating budget is overseen by an Executive Board comprised of the four-member city mayors (Belton, Harker Heights, Killeen, and Temple) and the County Judge. This board meets quarterly, and monthly during budget season.

A Regulatory Board of Operations oversees the administration and operations of the Center. This board is comprised of the fire and police chiefs from each of the four-member cities and the Bell County Sheriff. The Center's Director reports directly to the County Judge. The Center's 2021 operating budget is \$9,284,767 (excluding 911 PSAP expenses that are paid by the Central Texas Council of Governments (CTCOG)).

The BCCC employs 106 full and part-time personnel, 70 of whom are combined Call-Takers/Dispatchers who are assigned to three shifts (7 a.m.–3 p.m., 3 p.m.–11 p.m., 11 p.m.–7 a.m.). Each shift has an average of 17 Call-Takers/Dispatchers who are typically assigned to the following primary positions:

- 11 Dispatchers: 1-Temple PD/College, 1-Killeen PD/Colleges, 3-Law Enforcement radio talk groups (1/2/3), 3-Fire/EMS, 1-Fire/EMS ("overflow")
- 2–3 Relief Dispatchers/Supervisors
- 2–4 Call-Takers
- 2 Non-emergency law enforcement records check Dispatchers

Dispatchers must obtain and maintain a Texas Commission on Law Enforcement Public Telecommunicator license, and complete 20 hours of continuing education every two years. Dispatchers must also be certified in the Priority Dispatch® ProQA™ Emergency Medical Dispatch protocol system.

The Dispatchers use the Priority Dispatch® ProQA™ Emergency Medical Dispatch protocol system to appropriately interrogate and prioritize emergency medical incidents and provide consistent pre-arrival instructions to the 911 caller. This system has been in place for approximately 10 years.

The ProQA™ system and the Center's CAD are configured and programmed to “cross-walk” the EMD card number, determinate and sub-determinate codes into a plain-English chief complaint and response priority designator (Priority 1, 2, 3, 4) that is sent to the response unit(s) MDCs. The priority codes for each chief complaint were determined by the County EMS Medical Director. However, each fire agency defines its response modes and assigned resources for each type of EMS incident/chief complaint.

Participating agencies use a Harris P25 compliant 800 MHz trunked radio system that has repeater transmitter sites located in strategic locations throughout the county. The BCCC relays incident information and mapping data through a CAD interface to apparatus with mobile data computers (MDCs) and automatic vehicle locator (AVL) devices. However, the system is not configured to send the closest unit regardless of jurisdiction. A radio frequency propagation study to identify radio coverage throughout the county was underway at the time of this report.

Emergency Management (EM)

The City has an Office of Homeland Security and Emergency Management (OHSEM), which is a Division within the Fire Department, and is managed by an Emergency Management Coordinator (EMC) who reports to the Fire Chief. The Division is responsible for mitigating, planning, coordinating, and recovering from large-scale natural, technological, and human-caused hazards in the community. Additional details on EM activities are included later in this report.

Mutual Aid Organizations

KFD has automatic aid and mutual aid agreements with the following agencies:

- Belton Fire Department (Mutual Aid)
- Central Bell County Fire & Rescue (Mutual Aid)
- Copperas Cove Fire Department (Mutual Aid)
- Fort Hood Fire Department (Automatic & Mutual Aid)
- Harker Heights Fire Department (Automatic & Mutual Aid)
- Temple Fire Department (Mutual Aid)
- Southwest Bell County Fire Department (Automatic & Mutual Aid)

MANAGEMENT COMPONENTS

Effectively managing a fire department is a complex task, often impacted by financial constraints, political pressures, and demanding community expectations. Today's fire department must address these complexities by ensuring an efficient and flexible organizational structure, adequacy of response, maintenance of competencies and a qualified workforce, and financial sustainability.

A well-organized and efficiently administered organization has appropriate documentation, policies, procedures, and clearly understands, acknowledges, and addresses internal and external issues affecting the agency. Processes must also be established to address the flow of information and communications within KFD as well as with the citizens it serves.

In the following section, ESCI analyzed KFD's current efforts in managing the organization.

Foundational Management Tenants

To be effective, the management of a fire department needs to be grounded in the acceptance and adoption of solid mission, vision, and values statements. The Department has a relatively contemporary Business Plan (2018–2019), with formally adopted Mission, Vision, and Values statements, along with goals and objectives that are consistent with the City's General Plan. The Department's overall Mission statement is:

***To save lives and property through fire protection,
emergency medical services, and rescue services.***

In addition, each division within the Department also has its own Mission Statement, with specific Mission Elements and Critical Tasks. The Fire Chief indicated that he intends to develop a more robust and inclusive strategic planning process and plan.

Since it has been five years since this strategic plan was created, efforts should be taken to conduct an inclusive strategic planning process that includes participation from all levels within the organization, which should result in organizational improvements in policies and procedures, internal and external communications practices, operational deployment, recordkeeping, and sustainable financial practices, just to name a few. Also, given the fact that a new Fire Chief has been hired from outside the organization, establishing a new strategic plan provides an opportunity for the Chief to collaborate with internal stakeholders in helping shape the Department's future vision, goals, and objectives.

For mission statements, visions and values, and strategic planning to be effective, they must be part of a “living” process, consciously evolving as the Department grows and changes.

Management Documents & Processes

For any organization, documentation of activities is not only required to meet the organizational mission, it also is a legal requirement in many aspects of department operations. Detailed and consistent documentation also provides a mechanism for measuring performance. Policy and procedure development and maintenance is critical to ensuring a stable, effective, and cohesive organization. It also provides a formal method for memorializing organizational decisions and processes.

KFD last updated its Standard Operating Guidelines (SOGs) in March 2020, which were distributed via email. Employees receive training on the SOGs, and they are routinely referenced in training evolutions.

Internal Assessment of Critical Issues & Future Challenges

As previously noted, the current Fire Chief was new to the organization as of February 2021, which was during the study period. However, he was able to identify the following critical issues and challenges currently facing the organization.

- The Department needs a contemporary strategic plan, with defined strategic initiatives, goals, and objectives, with the goal of using this process to help achieve Department Accreditation.
- Inadequate/old station, support, and training facilities.
- Anticipated significant development and population growth in certain areas of the city.
- Increased call volume, especially for ambulances.
- Lengthy response times in certain station response zones.

Internal & External Communications

In today’s “hyper speed” world of communication, the public expects strategic, frequent, responsive, and caring communication from government agencies. Likewise, employees expect the same when disseminating internal messages. Without it, public and employee confidence in the organization can be severely damaged, and informal communication channels may be created to spread false and misleading information throughout the community and organization.

The City maintains a website that includes pages for each City department, and also electronically distributes a weekly newsletter, the *Killeen Scene*. The KFD's home page primarily focuses on fire code inspection fee information, and includes a few links to previous fire department annual activity summaries, and contact information for the Office Administrator and Fire Marshal. There are additional Department pages related to Emergency Management, Training Academy, and fire station locations. However, the only way to access these pages from the Fire Department home page is to click on the site map link and scroll down to the fire department list.

The City also uses a third-party mass communication application called CodeRed™, which can provide geo-targeted emergency public safety alerts and instructions to its citizens.

Regarding social media engagement, the Department contributes Department-specific information, news, and public safety education topics for inclusion on the City's Facebook® account. This account is regularly updated with safety information, Department activities, and incident information. The site had over 28,000 followers at the time of this study. The Department does not maintain Twitter® or Instagram® accounts.

Internal City communications of Department activities include the use of the City's intranet, written memos, and annual publishing of Department incident statistics and activities. The Fire Chief annually reported department activities through the budget process and a published and presented annual report to the City Council.

Communications Discussion

While the City's overall website has a professional appearance, the KFD should work with the City to improve the content and functionality of the Department's web pages, starting with the home page. This page, and related pages, should include robust and easily accessed information related to, but not limited to the following examples:

- The Department's Mission, Vision, and Values statements
- Current strategic plan documents
- All hazards life safety information and downloadable brochures
- Links to other public safety agencies
- Description of the various KFD Divisions
- Photographs of Department activities, incidents, and personnel
- Fire Code regulations, permitting fee information, and how to apply for permits
- Seasonal life safety tips
- Public health and safety information
- Recent incident information

While many emergency response agencies are now using Facebook® to interact with the public, additional tools like Twitter® and Instagram® can be useful as well. The Killeen Police Department has an active Twitter® account, with over 1,500 followers. Twitter® is now being used by emergency response agencies around the country to provide real-time information during evolving emergency events and to gather the public's observations, opinions, and information. These tools are now engrained in the fabric of our society, and KFD should explore expanding its social media presence on these additional platforms.

Record Keeping, Document Control & Facility Security

Diligent documentation and analysis of fire department activities are critical in making sound management decisions and maintaining public transparency. KFD uses the following records management systems (RMS) to document various Department activities:

- Crew scheduling and tracking: Active911®
- Fire incident reporting: Currently, Zoll Fire RMS®. Will soon migrate to ESO®
- EMS Incident reporting: ESO®
- Inspections & Permits: Zoll Fire RMS®

Training is logged via hard copy forms and submitted to a secretary, who enters the information on an Excel spreadsheet.

Most hard copy personnel documents are secured in cabinets via lock and key in a locked room, and electronic records are password-protected and back up via cloud-based servers and external hard drives. However, during the site visit, personnel reported that some personnel records with confidential information were being stored in an unlocked filing cabinet in a Support Services building closet.

Mandated records related to the maintenance and testing of fire equipment are created and stored by various third-party contractors who conduct the testing. Apparatus maintenance records are logged and archived by the City.

KFD stations are secured via standard locks, except for the EOC, which is secured by a digital keypad. Computers are secured via individual log-in codes.

During the site visit, anecdotal information was shared indicating that the Support Services building has experienced frequent break-ins, resulting in the theft of numerous and expensive pieces of fire equipment, and some acts of vandalism. Other stations have experienced vehicle prowls and vandalism of parked personal vehicles in station parking lots. There are no security cameras or secure perimeter fencing around any of the fire facilities.

Record Keeping & Document Security Discussion

With the exception of training documentation and reported lack of document security in one facility, the methods used by the City and KFD to document activities appear to be similar to other contemporary fire departments studied by ESCI. In particular, the use of off-site cloud-based storage provides a level of resilience in the event of a catastrophic local incident that damages or destroys the Department's information technology infrastructure.

Consideration should be given to using the existing RMS systems for logging and tracking department training. This would allow easy access for staff and line personnel to track and monitor their training, and ensure mandated training is completed within required timeframes.

Department Planning Processes

Contemporary fire service organizations spend considerable time and effort analyzing data to evaluate their effectiveness and efficiency in delivering high-quality emergency services. There are two main areas of fire department planning: emergency preparedness and response planning, and administrative/organizational planning.

Emergency Preparedness & Response Planning

The Mayor is the City's designated Emergency Manager, and the KFD Emergency Management Coordinator is responsible for emergency/disaster mitigation, preparedness, and response planning for the City. The Department's Fire Chief and Emergency Management Coordinator were actively involved in the development of the Central Texas Council of Governments Regional Hazard Mitigation Action Plan (HMAP). The draft plan was created in 2018 and is currently under State review for formal approval.

The Department has not performed a Standards of Cover/Community Risk Assessment (SOC/CRA) study. However, this study includes a partial community risk assessment and many of the components of an SOC that can be leveraged in future planning efforts.

The Department-specific emergency response plan includes dividing up the City into specific response districts with pre-determined apparatus response assignments based on incident type.

The Department has interlocal agreements with adjacent fire departments to provide automatic and mutual aid resources and is also part of the State's Intrastate Mutual Aid System.

Administrative Planning

Administrative planning is also extremely important and is often overshadowed by emergency response planning efforts. However, the KFD has taken an initial proactive approach in administrative planning through this study effort. Administrative planning can take many different forms, including, but not limited to:

- Master Planning
- Strategic Planning
- Succession Planning
- Community Development Planning
- Capital Equipment/Facilities/Apparatus Planning

According to KFD, they created a strategic plan in 2016, complete with a mission statement, vision statement, or values statements. Goals and objectives were also established. A collaborative strategic planning process that results in the formulation and adoption of realistic goals is critical to ensuring everyone in the organization and the community understands why KFD exists, the level of services provided, vision for the department over the next three to five years, and the goals and objectives to get there.

The Department has a Capital Facilities Plan and Capital Apparatus Replacement Plan. Both are reviewed and updated annually, with specific projects identified and submitted to the City for review and approval. This process is explained in detail in the Capital Facilities section of the study.

FINANCIAL ANALYSIS

This section provides background information on the historical and current financial condition of the KFD. Understanding of fire service financial resources and costs begins with an overview of the various revenues and expenditures which support the fire department and its operations across all programs. This includes a multi-year historical review of revenues and expenses followed by a status quo financial forecast from FY 22 through FY 26 utilizing historical trend data and key assumptions about future trajectory to the extent known. This analysis relies on extensive financial documentation provided by the department, including the actual and adopted budget documents from FY 16–21 and Killeen's comprehensive annual financial reports (CAFRs) and budget documents through FY 21.

Fund Accounting

Local governments use an accounting system organized around a series of discrete funds to ensure appropriate accountability and segregation of revenues and expenses related to specific activities. The Governmental Accounting Services Board (GASB), an independent organization that develops and adopts standards of government accounting and reporting, defines a fund as "...a fiscal and accounting entity with a self-balancing set of accounts recording cash and other financial resources, together with all related liabilities and residual equities or balances, and changes therein, which are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions or limitations."⁵ In other words, a fund exists to capture all revenue, expense, and fund balance activity related to a specific function or set of activities.

There are three categories of funds: Governmental Funds, accounting for most governmental functions such as fire, rescue, and EMS services; Proprietary or Enterprise Funds, accounting for business-type activities (Drainage Utility, Solid Waste, Water/Wastewater, and Airport), Debt Service and various Internal Services that can be billed out to other departments on a cost reimbursement basis such as the Fleet Management, Risk Management and Information Technology; and Fiduciary Funds, accounting for assets held by the government as an agent of which the City has only one; the Employee Benefits Trust Fund. Fire department primary and supporting functions are typically found in Governmental funds, which is the case with the KFD.

⁵ GASB Codification Section 1300; www.gasb.org.

Expenditures supporting fire department activities may, and often are, found in several different major and minor funds which may relate to how revenue is generated.^{6,7} Funds may be wholly dedicated to a specific department, or they may comprise several different departments and functions, such as the City's General, Capital Projects, Debt Service, and various Internal Service Funds. The following analysis compiles data from all pertinent funds to the extent that they contribute to and support the overall mission and various operations of the KFD except for the City Debt Service Fund. Some percentage of the City's annual debt service is attributable to fire department capital expenses funded through various debt instruments but is not shown in the following analysis.

The **General Fund** or GF is the City's largest and most diverse governmental fund accounting for the bulk of the KFD's revenue and expense, including general County government operations and both internal and external services such as fire/rescue and EMS. The primary GF revenue sources are sales tax, ad valorem or property tax, and franchise fees.⁸

The **Capital Improvement Projects Fund** is a governmental fund used to account for resources restricted, committed, or assigned to acquisition, renovation and/or construction of major capital facilities such as fire stations and other capital assets such as apparatus. Expenditures are often financed by long-term debt repaid from recurring GF operating revenues, primarily ad valorem revenues which comprise almost 90% of the revenue stream in the FY 21 adopted budget.⁹ The City has a formalized five-year Capital Improvement Program (CIP) and commits funding each year during the annual budget process to various projects approved during the CIP review process. KFD-related capital expenditures are budgeted in the appropriate General and Capital Projects Funds expenditure budgets depending upon the specific expenditure type and funding source.

⁶ Major governmental funds are those shown separately within the City of Killeen CAFR such as the General, Capital Improvements Project and Debt Service Funds.

⁷ Non-major governmental funds are those not considered separately in the City of Killeen CAFR but rather are shown in aggregate such as the Fire Department Donation Fund.

⁸ City of Killeen FY 2021 Adopted Annual Budget, p. 32.

⁹ City of Killeen FY 2021 Adopted Annual Budget, p. 329.

Special Revenue Funds are governmental funds used to account for revenues legally restricted or otherwise restricted by policy for specified purposes and the name typically indicates the restricted purpose. There is only one Special Revenue Fund associated with the KFD, the Fire Department Donations Fund (Fund 246). Although this fund is included in the analysis below, it is very minor, only showing activity of less than \$3,000 in FY 17 and FY 21 adopted.

The City uses a current financial resources measurement focus and a modified accrual basis for budgeting and accounting in Governmental Funds. The City fiscal year runs from October 1 through September 30 of the following year. The City Council makes final revisions to all City budgets and adopts them by resolution no later than September 20 each year.¹⁰

Since the KFD operates as a General Fund department but expenditures are made from multiple budgets and funds as discussed above, the following analysis presents combined fire-related revenue and expense as a composite intended to illustrate to the reader total department-specific revenue and total expense in one table. However, it should be noted that debt service on capital projects financed through various debt instruments is accounted for in the General Fund in aggregate along with other City projects. Specific debt for various fire department projects has not been included in the following analysis.

Further, while several internal service charges are included as expenditures in the KFD budget analysis below, other internal services such as Human Resources, Legal, Budget/Finance, and City Administration costs are not directly allocated to the expenditure budget. A proportionate share of these costs (5-10% of the operating budget is typically seen as a reasonable estimate for support service costs) would be included in a true full cost analysis of the Department.

¹⁰ City of Killeen Comprehensive Annual Financial Report for the Fiscal Year Ended September 30, 2020, p. 54.

As of FY 19, the KFD provided its budget information as various programs, including Administration (010-7001), Operations (010-7070), Support (010-7071), Fire Prevention (010-7072), and Emergency Management/Homeland Security (010-7075). Although the Emergency Management/Homeland Security is a function supporting all City departments, it is housed within the fire department and is included in the following analysis. Further, and as mentioned above, fire department capital expenditures are found with the various fire department programs found in the GF as well as CIP Funds 347 and 349 and the Internal Service Fund Fleet Service (601).

Historical Revenue and Expense

Revenue

The following figure shows actual fire and EMS-related revenues for the General and Donations Funds which are divided into recurring and non-recurring revenues. Recurring revenues are those such as fees for service (ambulance charges) and permit fees, and other income streams that are reasonably predictable in many cases and expected to continue on a year-to-year basis. Non-recurring revenues, on the other hand, are more sporadic in nature and difficult to predict, such as grant (state and federal aid) funds, donations and sales of surplus property and equipment and insurance, and other reimbursements as well as various miscellaneous sources. Bond or loan proceeds, when applicable, are also considered non-recurring revenue sources but are not considered here since they provide undifferentiated funding for multiple Department projects.

Figure 12: KFD Revenues (FY 16–FY 20 Actual; FY 21 Adopted)

Revenue	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Adopted
Ambulance Fees	3,200,100	2,632,557	2,741,923	3,109,628	3,388,481	3,400,000
Other Service Fees	220,465	187,562	175,149	203,368	235,875	185,100
Recurring Revenue	3,420,564	2,820,119	2,917,072	3,312,996	3,624,356	3,585,100
Federal Grants/Aid	815,325	2,812,976	1,556,300	48,268	5,030,143	38,959
State Grants/Aid	136,466	5,009	39,193	167,568	75,891	-
Other Grants	-	-	-	21,637	281,223	-
Miscellaneous	852	6,029	937	954	960	910
Non-Recurring Rev	952,644	2,824,014	1,596,430	238,427	5,388,216	39,869
TOTAL REVENUE:	\$4,373,208	\$5,644,133	\$4,513,502	\$3,551,423	\$9,012,572	\$3,624,969

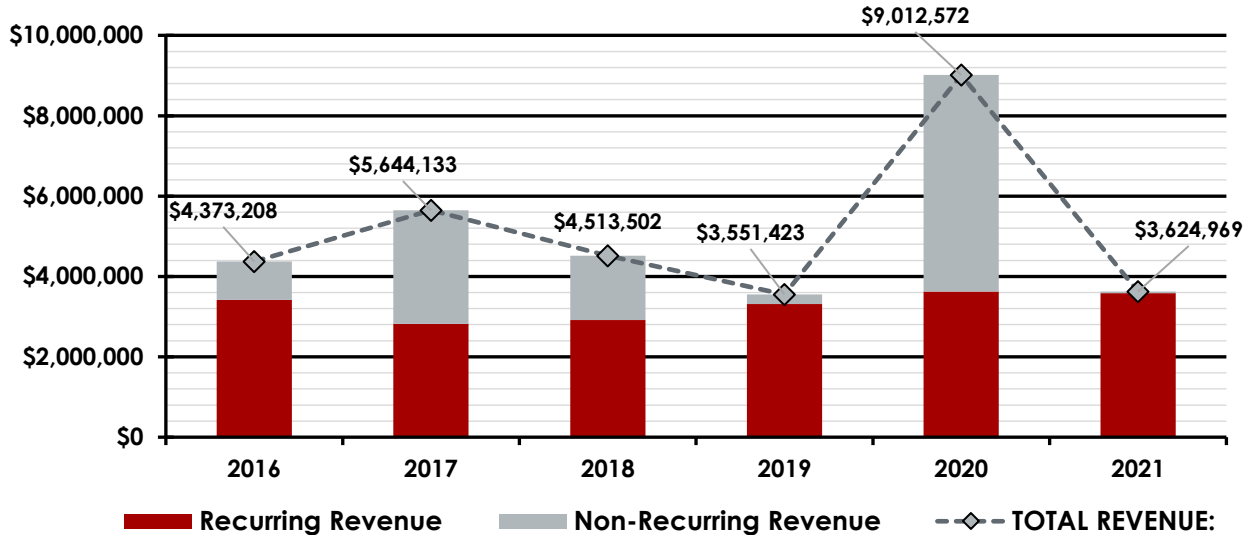
Fire department-specific recurring revenues supporting the department dropped significantly (\$600,000 or 17.6%) between FY 16 and FY 17, after which they steadily increased at 8.5% annually to \$3.6 million by FY 20, driven primarily by ambulance billing revenues. Recurring revenue comes from several sources outlined in the following:

- **Ambulance Fees**—Ambulance transport billing revenue, which includes contractual revenue for transports within unincorporated Bell County, dropped almost \$570,000 or 17.8% between FY 16 and FY 17, after which it steadily increased at approximately 8.5% per year to \$3.39 million by FY 20.
- **Other Service Fees**—Driven primarily by training academy charges, which comprise an average of almost 81% of the total, have fluctuated around an average of approximately \$200,000 annually. Fire prevention charges increased from \$20,570 in FY 16 to \$34,133 in FY 20, an increase of 66% over the period.

Non-recurring revenues supporting the department, as expected, have varied considerably from a high of \$2.82 million in FY 17 to a low of just under \$240,000 in FY 19. Non-recurring revenues are driven primarily by various federal grants. Non-recurring revenue sources are outlined as follows:

- **Federal Grants/Aid**—has varied considerably over the period from a low of \$48,268 in FY 19 to a high of just over \$5 million in FY 20. Federal grant funding has been a diverse mix, from FEMA SAFER Act funding totaling \$4.44 million from FY 16-18 to FEMA COVID19 relief funding of \$5 million in FY 20. The KFD received a FEMA Assistance to Firefighters Grant (AFG) of \$572,231 in FY 17 and has received various other federal grants and reimbursements from DHS.
- **State Grants/Aid**—have varied considerably over the period, with the largest source being TEEX-Task Force funding which has varied from a low of \$1,826 in FY 17 to a high of \$167,568 in FY 19.
- **Other Grants**—have been relatively infrequent but have been as high as \$210,864 in FY 20.
- **Miscellaneous**—minor, and except for a spike of \$6,029 in FY 17, this source has generally fluctuated, averaging \$925.

The following figure compares recurring to non-recurring and total revenue for the department and clearly shows the variability due to fluctuating grant funding.

Figure 13: Recurring vs. Non-Recurring Revenues (FY 16–FY 20 Actual; FY 21 Adopted)

Expense

The following figure shows actual fire department expenditures (KFD-related operating and capital expenses in the General Fund are included along with KFD expenses in both the CIP and Fire Department Donated Funds in the totals that follow). Expenses for the period FY 16–20 actual and FY 21 adopted are divided into recurring and non-recurring expenses. Recurring expenses are those such as employee wages and benefits and various functional operating costs that are reasonably predictable and expected to continue from year-to-year.

In the case of some larger fire departments, fleets are so large that replacement can be well planned and cycled such that departments can spend a predictable, uniform amount each year on apparatus and equipment replacement. Typically, they consider this a recurring cost and can budget such with an offsetting recurring revenue. The KFD follows industry standards with a long-range apparatus replacement plan based upon various factors such as age, mileage, use, and condition, as well as annual repair versus replacement cost for various apparatus classes. However, the KFD apparatus replacement plan is not funded as part of the City CIP.

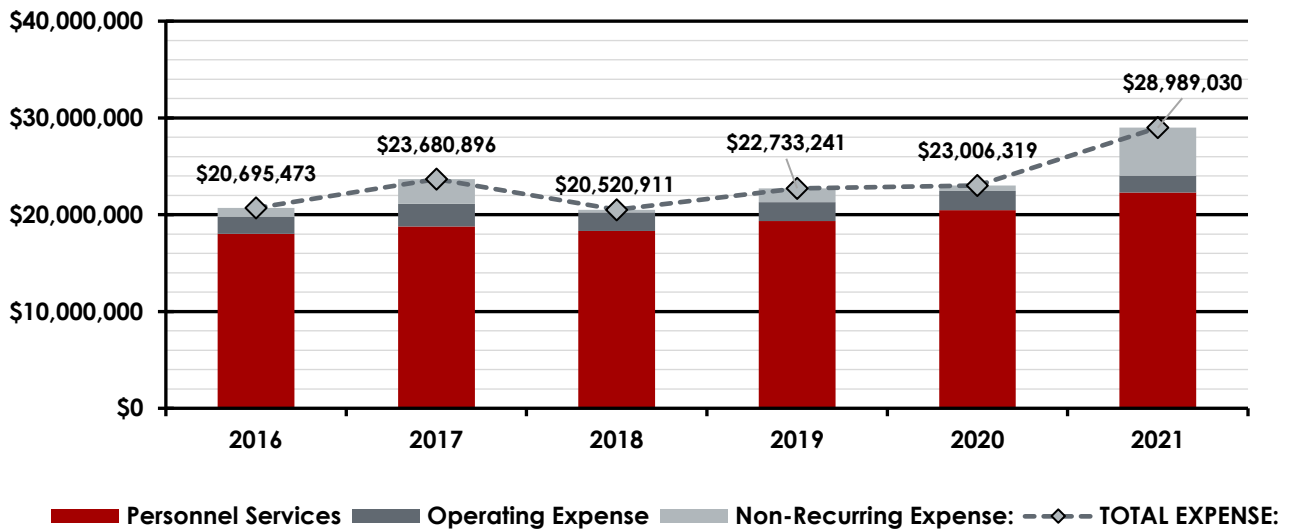
Non-recurring expenses, on the other hand, are more sporadic in nature and may be difficult to predict, such as land acquisition, facility construction, and major facility renovation, and large-scale equipment or apparatus purchases. In this analysis, all capital expenditures are shown as non-recurring expenses. Fire department-related expenses may be found directly in the Department's General Fund expenditure budget and the Fire Department Donated Fund budget, or indirectly in the Debt Service Fund budget (not shown here) and the City Capital Improvement Project Fund budget. The City maintains and utilizes a rolling five-year Capital Improvement Plan (CIP). Each year the initial year's projects approved for the various submitting departments are funded using various sources in the City's CIP budget. Those fire department-related projects are shown in the following analysis.

Figure 14: KFD Expenses (FY 16–FY 20 Actual; FY 21 Adopted)

Expense	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Adopted
Personnel Services	18,015,480	18,781,746	18,310,315	19,363,992	20,484,294	22,291,497
Salaries & Wages	14,042,998	14,560,517	14,176,601	15,022,850	15,840,470	16,911,521
<i>Regular</i>	<i>13,400,515</i>	<i>14,349,278</i>	<i>13,664,893</i>	<i>14,575,263</i>	<i>15,364,205</i>	<i>16,586,521</i>
<i>Overtime</i>	<i>642,483</i>	<i>211,239</i>	<i>511,708</i>	<i>447,587</i>	<i>476,264</i>	<i>325,000</i>
Benefits	3,972,482	4,221,229	4,133,714	4,341,142	4,643,825	5,379,976
Operating Expense	1,775,275	2,354,644	1,943,251	1,927,176	1,961,641	1,766,290
Supplies	874,061	1,122,831	888,718	794,782	870,437	866,893
Repair & Maint	469,082	443,351	566,427	484,848	434,392	356,526
Support Services	281,993	324,684	269,215	290,146	289,108	274,913
Minor Capital	44,316	276,730	95,938	210,240	227,166	136,448
Professional Services	105,822	136,160	122,953	146,016	138,190	126,700
Designated Expenses	0	50,888	0	1,144	2,349	4,810
Recurring Expense:	19,790,754	21,136,390	20,253,566	21,291,168	22,445,935	24,057,787
Buildings	0	0	178,038	9,400	0	0
Equip & Machinery	904,718	2,544,506	89,307	1,395,411	560,383	4,931,243
Furniture & Fixtures	0	0	0	11,924	0	0
Comp Equip/Software	0	0	0	25,338	0	0
Non-Recurring Expense:	904,718	2,544,506	267,345	1,442,073	560,383	4,931,243
TOTAL EXPENSE:	\$20,695,473	\$23,680,896	\$20,520,911	\$22,733,241	\$23,006,319	\$28,989,030

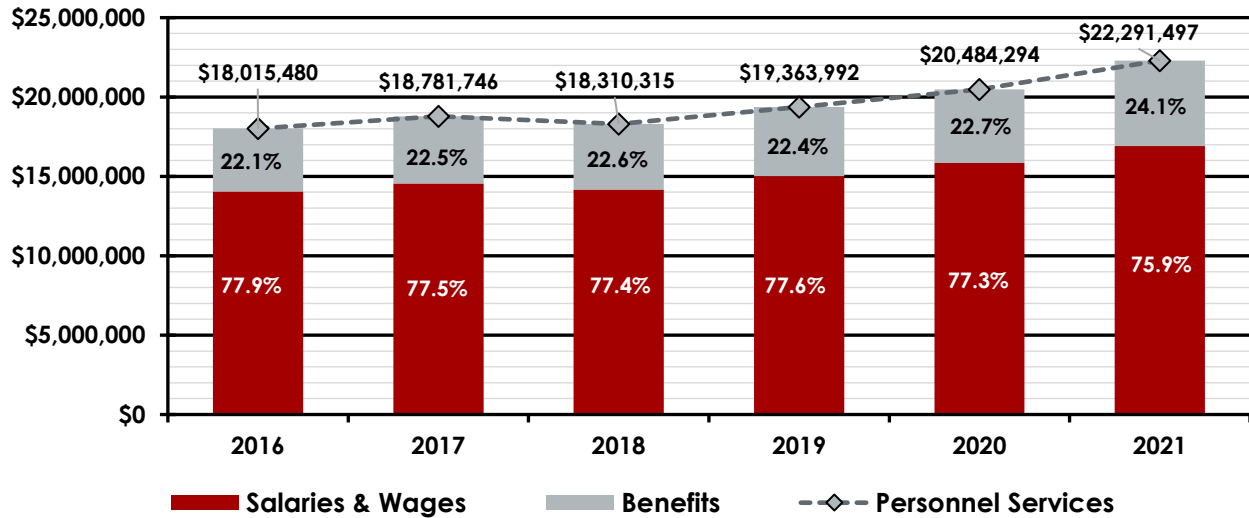
The following figure compares recurring, non-recurring, and total department expense (less any department-related debt service and central service costs) from FY 16 through FY 20, actual and FY 21, as adopted. Total expenses have increased from \$20.7 million in FY 16 to \$23 million in FY 20, with fluctuation over the period driven by variability in non-recurring expenses, which have varied from a low of \$267,000 in FY 18 to a high \$2.54 million in FY 17. Non-recurring costs are dominated by the acquisition of various apparatus over the period.

Figure 15: Recurring vs. Non-Recurring Expenses (FY 16–20 Actual; FY 21 Adopted)

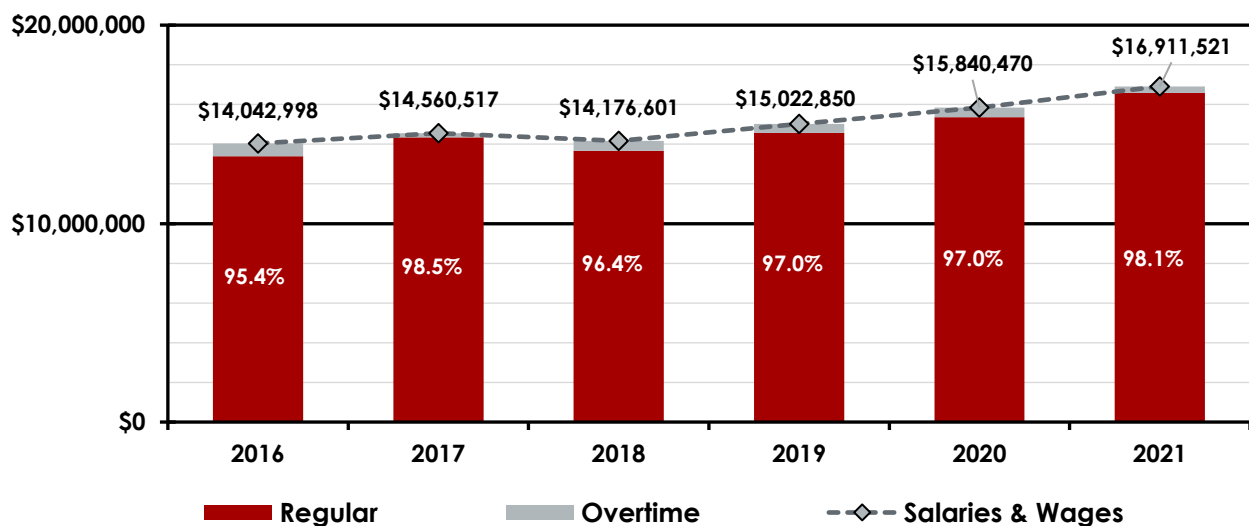


Recurring expenses, again excluding the fire department portion of City debt service, for the Department have increased over the period, rising at an average annual rate of 3.2% between FY 16 and FY 20 driven by personnel services costs which have increased at almost 3.3% annually while operating costs have remained relatively flat, fluctuating around an average of just under \$2 million annually through FY 20. The major categories are described as follows:

Personnel Services—as shown in the following figure, total costs have increased from \$18 million in FY 16 to \$20.5 million by FY 20 for an increase of 13.7% over the period, which represents an average annual increase of approximately 3.3%. This increase, except for deletion and addition in several positions resulting in a net zero change in FTE according to department records, primarily represents increases in wages and benefits. Benefits have averaged 22.4% of total compensation, while salaries and wages have averaged 77.6% from FY 16–20.

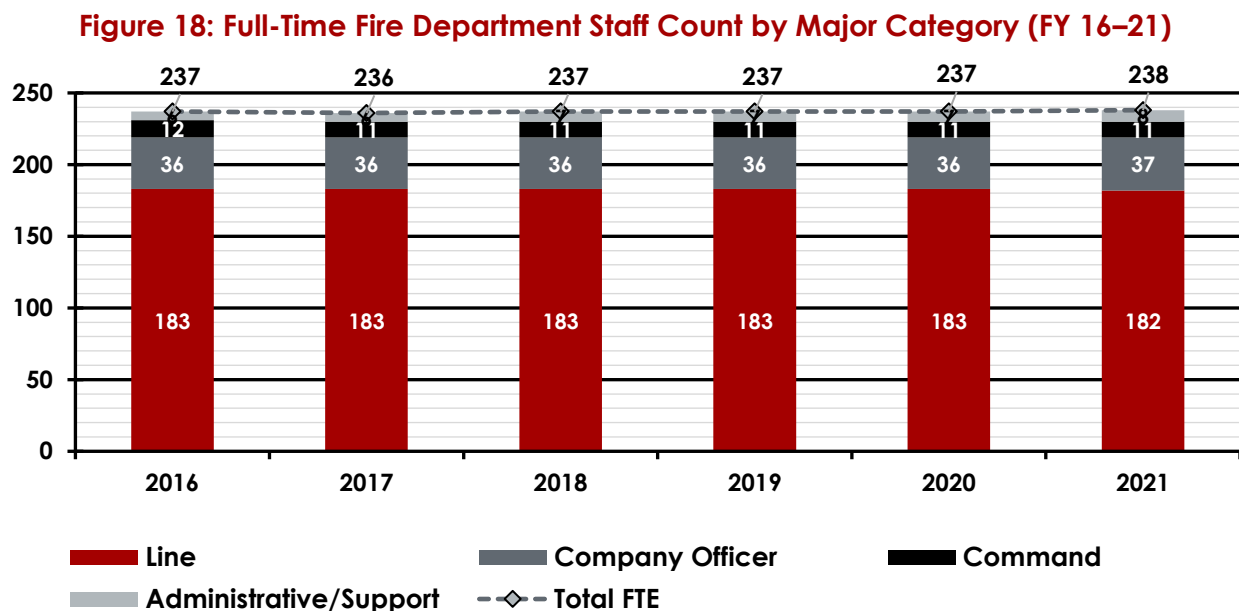
Figure 16: Personnel Services Expense (FY 16–20 Actual; FY 21 Adopted)

Overtime costs (sick/vacation and other operational coverage) as a percentage of total salaries/wages, and shown in the following figure, averaged 3.2%, while the salaries/wages line increased from \$14.04 million to \$15.84 million or an average of approximately 3.1% per year. This rate of increase is driven almost exclusively by regular wage and benefits increases authorized by the City Council as part of the annual budget process.

Figure 17: Salary/Wage Components (FY 16–20 Actual; FY 21 Adopted)

For the purposes of this discussion, all non-uniformed clerical, inspector, logistical, and emergency management type positions are grouped together as administrative/support positions, while uniformed positions assigned to administrative roles are considered operational since they are certified and capable of acting in operational roles. Line positions are those providing traditional fire/rescue and EMS services. Line positions are Fire Rescue Officers, whether certified as paramedics or EMTs, Company Officers are Captains while Command staff positions are uniformed officer positions above the Company Officer.

The following figure shows budgeted, full-time staff count (FTE) by major category, which has remained unchanged from 237 FTE in FY 16 to 237 FTE in FY 20, a net zero staffing increase over the historical period. There have, however, been some very minor changes within categories.



Using FY 20 salary and benefits amounts for the various positions that have been added and/or deleted between FY 16 and FY 20, the following figure shows the approximate net total impact ("New Position Adjustment") that the addition or deletion of these positions has on the FY 20 adjusted budget.

The total FY 20 adjustment due to staffing changes in salaries/wages for these positions is approximately \$1.68 million (a reduction of \$14,045 in regular wages, a reduction of \$449 in overtime based on average overtime of 3.2% of regular wages), while benefits are \$5,816 less. Therefore, adding the net negative cost of the added/deleted positions from FY 20 adjusted personnel services line items leaves \$15.35 million and \$4.64 million, respectively, as revised totals for wage and benefits increases. Therefore, the average annual increase in regular wages and benefits between FY 16 and FY 20 is approximately 3.46% and 3.95%, respectively.

**Figure 19: Net Impact Positions Added/Deleted on FY 20
Adjusted Personnel Services Budget**

Expense	2016 Actual	2020 Actual	New Position Adjustment	2020 Revised	Average Annual Increase
Personnel Services	18,015,480	20,484,294	-20,310	20,463,984	
Salaries & Wages	14,042,998	15,840,470	-14,494	15,825,975	
Regular	13,400,515	15,364,205	-14,045	15,350,160	3.46%
Overtime	642,483	476,264	-449	475,815	
Benefits	3,972,482	4,643,825	-5,816	4,638,009	3.95%

Operating Expenses—as shown in the following figure, operating costs, although fluctuating somewhat, have remained relatively static, averaging just under \$2 million annually between FY 16 and FY 20. Operating expenses increased significantly in FY 17 due mainly to spikes in Supplies (Uniforms/PPE, medical and chemical supplies, fuel) and Minor Capital (radios).

Figure 20: Operating Expense by Major Category (FY 16–20 Actual; FY 21 Adopted)

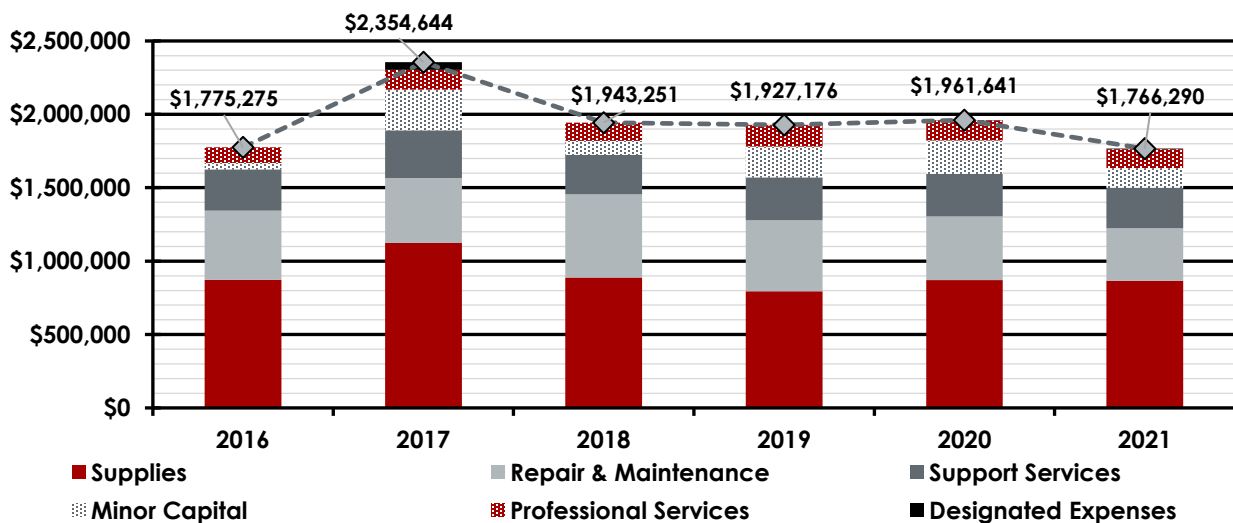
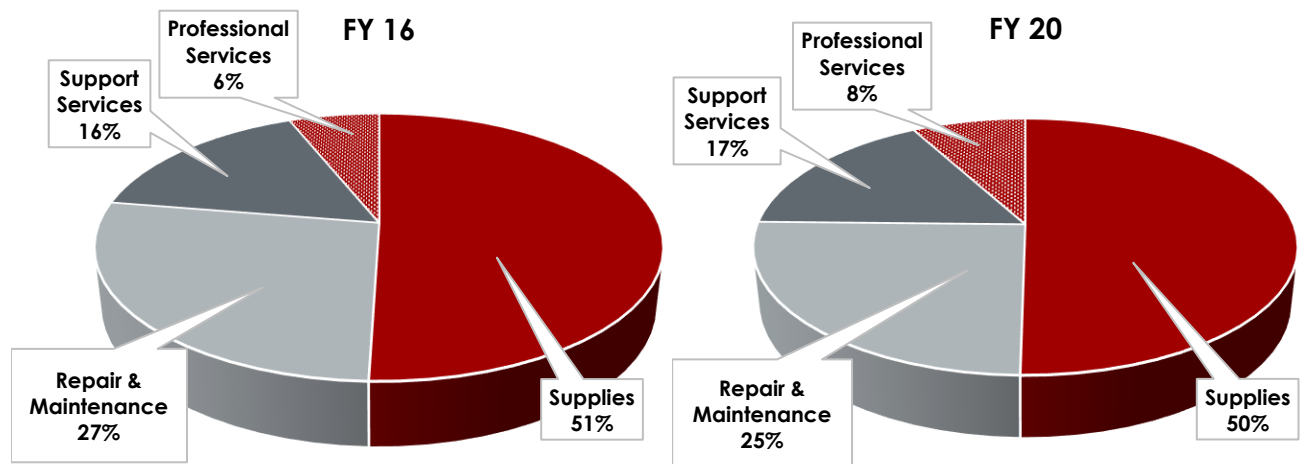
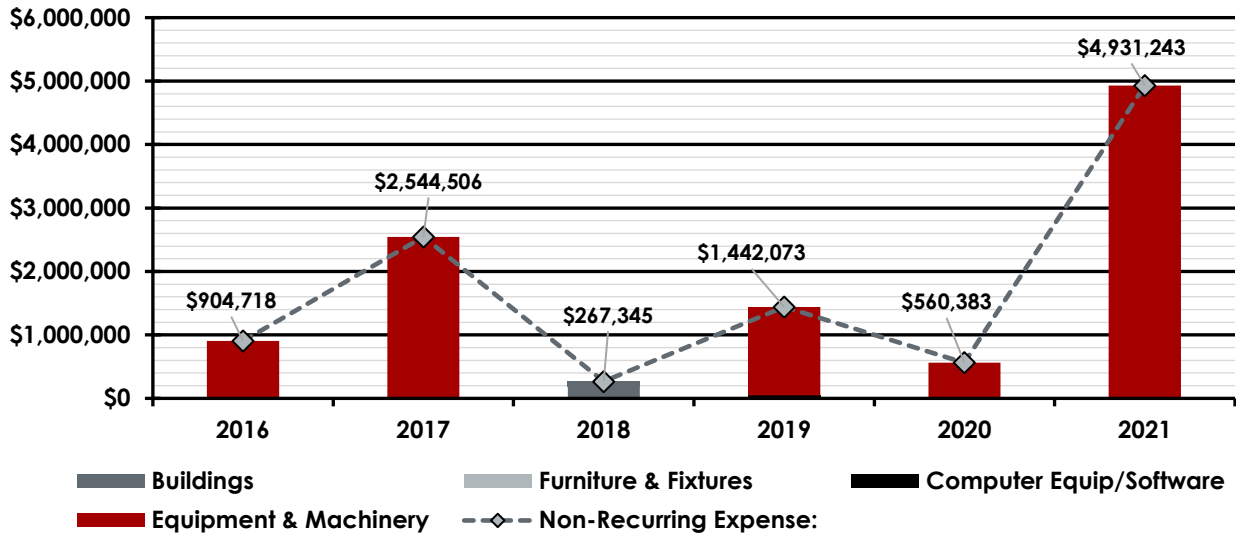


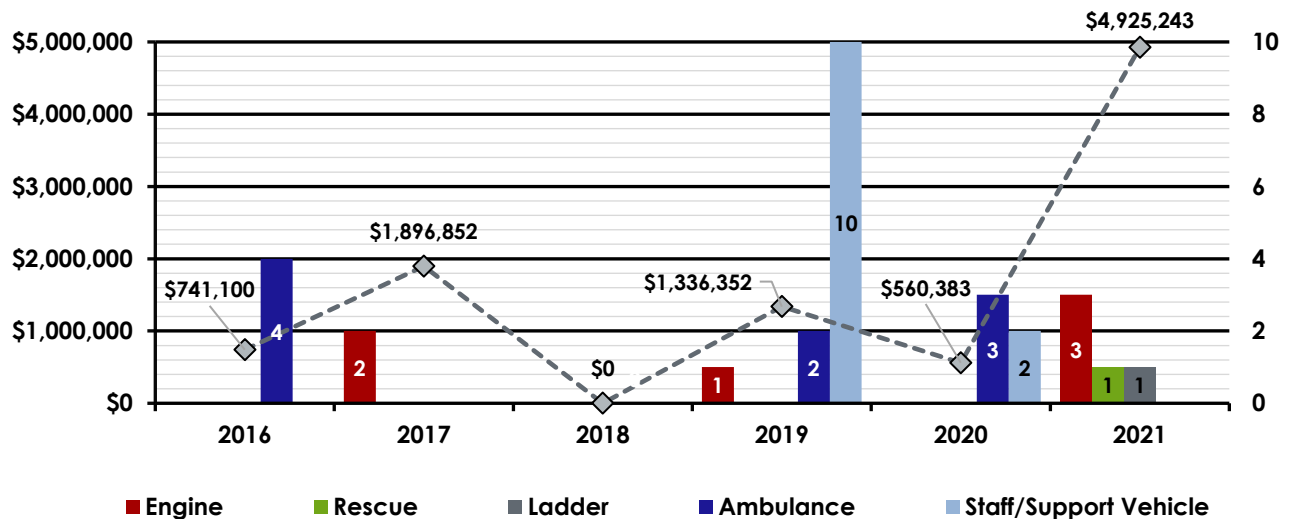
Figure 21: Comparison of Major Operating Costs FY 16 to FY 20

When Minor Capital and Designated Expenses are excluded, the proportionate costs for each of the other major categories have remained relatively fixed from FY 16 through FY 20, as seen in the preceding figure.

Non-recurring expenses have been dominated by apparatus acquisition and have varied from a low of \$267,000 in FY 18 to a high of \$2.54 million in FY 17. The following figure shows capital expenditures by category with the dominance and variable impact of apparatus acquisition on the overall budgets clearly seen. Vehicle/apparatus replacement and other major capital costs are generally accomplished within the City CIP budget but have been included in the analysis here to provide a fuller picture of KFD costs. As mentioned above, debt service costs related to fire department CIP projects are not shown in the analysis but should also be considered. The Department has a strong long-range capital apparatus replacement plan which is in line with industry standard; however, this plan is not routinely funded in the City CIP.

Figure 22: Capital Expenses by Category (FY 16-20 Actual; FY 21 Adopted)

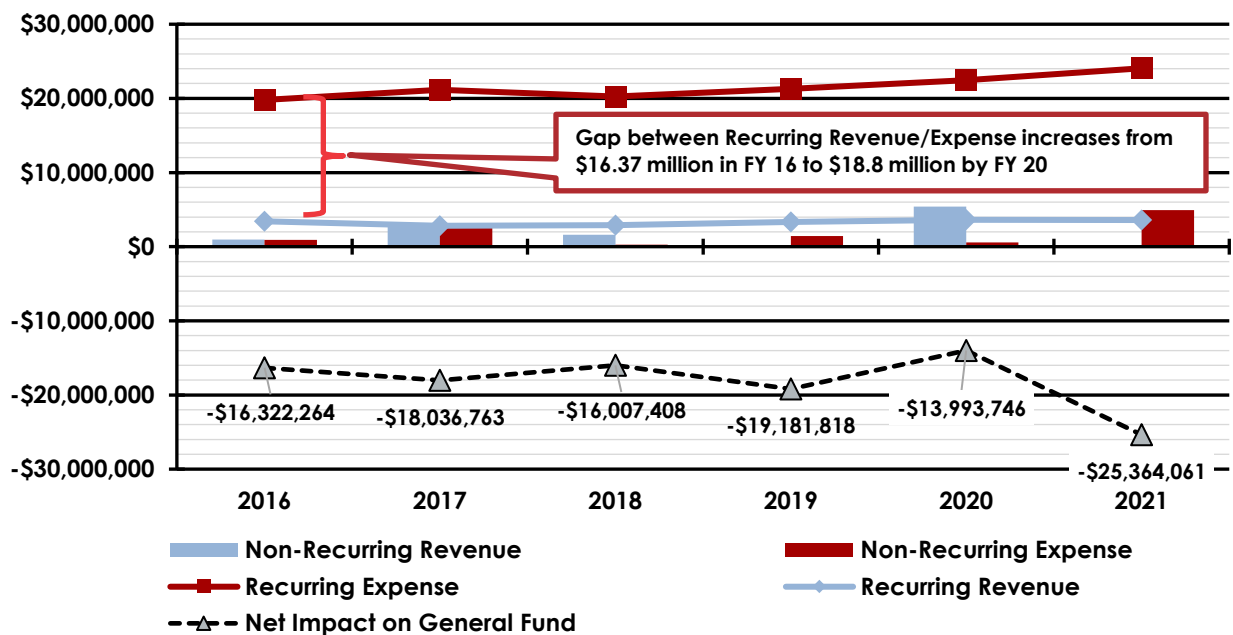
The following figure shows CIP apparatus volume and cost by year and the total impact on non-recurring costs. The total trend is virtually the same as the preceding figure and shows how apparatus acquisition has, historically, dominated non-recurring expense totals for the Department. The bars represent the total cost for each apparatus class, and the number in the bar represents how many of each apparatus type were purchased each year. The staff/support vehicle purchase in FY 19 was an equal purchase of cars and SUV vehicles. The vehicle costs shown in FY 21 are the full costs prior to any pre-payment discount, as shown in the FY 20 bid document. The ambulances represent both new purchases and vehicle re-chassis projects.

Figure 23: Fire Department CIP Apparatus Expenditures (FY 16–20 Actual; FY 21 Adopted)

Net Impact on City General Fund

As mentioned, the fire department revenue and expenditure budgets are housed primarily within the City's General and CIP Funds but have a significant impact on the General Fund, particularly when CIP expenditures are considered. And, although fire department-related debt service is not shown here since it is part of overall City debt, the impact is even greater. The following figure shows total program-specific revenues (from all sources) and expenses from FY 16 actual through FY 21 adopted and the net impact on the General Fund.

Figure 24: Net Fire Department Impact on General Fund (FY 16–20 Actual; FY 21 Adopted)



Recurring expenditures have risen from \$19.79 million in FY 16 to \$22.45 million by FY 20, while department-specific recurring revenues have only risen from \$3.42 million to \$3.62 million. The recurring funding gap has risen from \$16.37 million in FY 16 to \$18.8 million in FY 20 and is \$20.47 million in the FY 21 adopted budget. This gap has grown at an annual rate of almost 3.6% between FY 16 and FY 20, driven largely by personnel costs. When the large fluctuation of one-time CIP expenditures and grant revenues are considered, the demand on general revenues has fluctuated around an average of \$16.7 million in FY 16–FY 20, before jumping to \$25.36 million in the FY 21 adopted budget with the large apparatus acquisition planned. The City will need to monitor this trend and balance this increasing demand on GF revenues against other programs in the General Fund, particularly as it considers improvements in fire and EMS service levels.

Status Quo Projection

ESCI evaluated the historical information provided by staff to prepare a status quo revenue and expenditure forecast for the KFD. The forecast relies on trends previously developed through the historical review period along with forecast information available from the City when available, to understand potential anomalies due to personnel changes, apparatus acquisitions, and other major events. Certain assumptions were made about various revenue and expenditure components and are outlined below. It should be noted that the model uses a straight-line annual increase for each of the five years in the projection for most items unless otherwise noted. Year-to-year fluctuation in each revenue and expenditure component is much more likely, but historical trends suggest that most changes are generally linear over an extended time frame. However, beyond five years, the use of an average annual increase based upon historical trending is highly speculative and should be monitored closely. The status quo projection assumes no change to service level and can be compared against the differential cost of various service level enhancements presented later.

Revenue Assumptions

The revenue assumptions used in the KFD forecast are described in the next figure.

Figure 25: KFD Revenue Forecast Assumptions (FY 22–26)

Revenue Source	Assumptions
Ambulance Fees	Include contractual revenue from unincorporated Bell County and dropped almost \$570,000 or 17.8% between FY 16 and FY 17 then steadily increased at approximately 8.5% per year to FY 20. Expected to increase with rising call volume but payor mix may be an issue. Forecast uses adopted FY 21 amount and more conservative annual increase of 4% through FY 26.
Other Service Fees	Have historically fluctuated around an average of approximately \$205,000. Forecast assumes FY 22 revenue of \$205,000 which increases at 1% per year through FY 26.
Federal Grants	KFD has historically been quite successful in securing federal grant funding, including DHS AFG and SAFER Act grants. The department has averaged just over \$2 million annually in federal funding from FY 16 through FY 20. The forecast assumes the KFD will continue to be successful in seeking grants but at a more conservative rate of \$250,000 per year on average through FY 26.

Revenue Source	Assumptions
State Grants	Have been quite variable historically but have averaged near \$85,000 annually. The forecast assumes that it is much more likely that the KFD will continue to receive state funding at some level but assumes a more conservative amount of \$50,000 per year.
Other Grants	KFD received two other grants of significance in FY 20, totaling just over \$280,000. The forecast assumes no additional other grants during the forecast period.
Miscellaneous Income	Very minor source of revenue and the forecast assumes no additional revenue in this category.

The following figure is the status quo revenue forecast for the KFD for the period FY 21 as adopted through FY 26 based upon the stated assumptions.

Figure 26: KFD Revenue Forecast (FY 22–FY 26)

Revenue	2021 Adopted	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
Ambulance Fees	3,400,000	3,536,000	3,677,440	3,824,538	3,977,519	4,136,620
Other Service Fees	185,100	205,000	207,050	209,121	211,212	213,324
Recurring Revenue	3,585,100	3,741,000	3,884,490	4,033,658	4,188,731	4,349,944
Federal Grants/Aid	38,959	250,000	250,000	250,000	250,000	250,000
State Grants/Aid	-	50,000	50,000	50,000	50,000	50,000
Other Grants	-	-	-	-	-	-
Miscellaneous	910	-	-	-	-	-
Non-Recurring Rev	39,869	300,000	300,000	300,000	300,000	300,000
TOTAL REVENUE:	\$3,624,969	\$4,041,000	\$4,184,490	\$4,333,658	\$4,488,731	\$4,649,944

Expense Assumptions

The expense assumptions used in the KFD forecast are described in the following figure. The capital expenses represent an estimate based upon past CIP spending. Major expenditure categories are discussed, but for each category, the average annual rates of increase forecast and starting points may differ by program and fund as observed in the historical analysis. Individual program/fund rates of increase will impact the department totals in each category.

Figure 27: KFD Expenditure Forecast Assumptions (FY 22–26)

Expense Source	Assumptions
Personnel Services	<p>The department has not historically added staff but has increased total compensation to recruit and retain well-trained professional firefighters. The average annual rate of increase in PS costs has been 3.3%. After adjusting for several additions and deletions, which resulted in a slight reduction in the adjusted FY 20 compensation costs, the average annual wage and benefit increases between FY 16 and FY 20 were 3.46% and 3.95%, respectively. The forecast uses the FY 21 adopted wages and benefits figures as a starting point for the projection and uses historical increases for each from FY 22–26. Overtime is anticipated to grow proportionately with regular wages and is maintained at the historical average of 3.3% of regular wages for the period FY 22–26.</p>
Operating Expenses	<p>In all major categories have historically fluctuated slightly around an average with minor exceptions. The U.S. Department of Labor, reports an average Southern Region consumer price index of approximately 1.3% for the eight-year period 2012–2020.¹¹ Although significantly lower following the COVID-19 pandemic, ESCI believes this rate will return during the forecast period. The forecast assumes that each category will increase at the annual projected inflation rate of 1.3% using the FY 21 figures as a basis for the projection.</p>
Buildings	<p>Historical expenditures have been sporadic but average \$37,500 per year between FY 16 and FY 20. The forecast assumes an average annual expenditure of \$35,000 starting in FY 22 and rising at the rate of inflation for commercial construction (4.5%) in more detail under the Decision Unit Cost Projection portion of the study. It is more likely that facility projects will continue to be sporadic and higher in one-time cost.</p>

¹¹<https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category.htm>.

Expense Source	Assumptions
Equipment & Machinery	Although fluctuating throughout the historical period, expenditures for equipment and machinery, new and replacement, have averaged approximately \$1.1 million annually. ESCI's experience with fire equipment manufacturing pricing suggests an annual inflation factor of 4%. The forecast uses an average for the historical period of \$1.1 million starting in FY 21 as the basis for the forecast and increases it by 4% annually.
Furniture & Fixtures	Historical expenditures have been sporadic but average \$2,385 per year between FY 16 and FY 20. The forecast assumes an average annual expenditure of \$2,500 starting in FY 22 and rising at the rate of inflation (1.3%).
Computer Equipment/ Software	Historical expenditures have been sporadic but average \$5,068 per year between FY 16 and FY 20. The forecast assumes an average annual expenditure of \$5,000 starting in FY 22 and rising at the rate of inflation (1.3%).

The following figure is the status quo recurring expenditure forecast for the KFD for FY 21 as adopted and projected through FY 26.

Figure 28: KFD Expenditure Forecast (FY 22–FY 26)

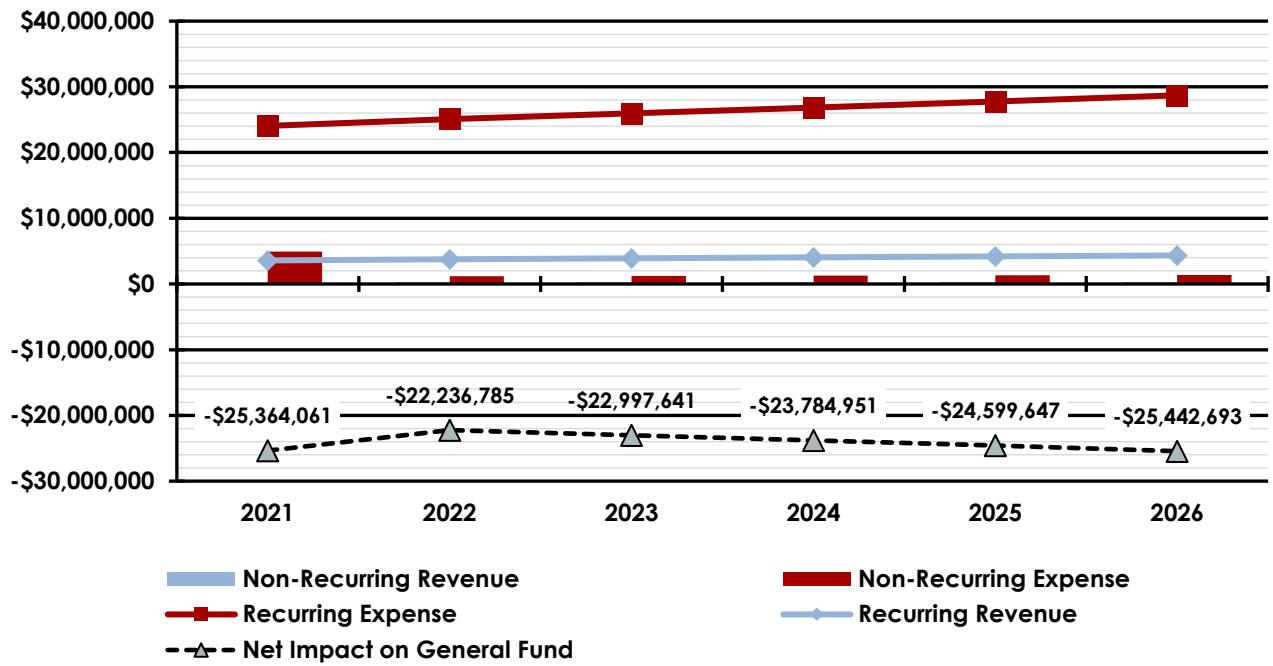
Expense	2021 Adopted	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
Personnel Services	22,291,497	23,302,033	24,135,686	24,999,267	25,893,852	26,820,560
Salaries & Wages	16,911,521	17,709,548	18,322,298	18,956,250	19,612,136	20,290,716
Regular	16,586,521	17,160,415	17,754,165	18,368,459	19,004,008	19,661,546
Overtime	325,000	549,133	568,133	587,791	608,128	629,169
Benefits	5,379,976	5,592,485	5,813,388	6,043,017	6,281,716	6,529,844
Operating Expense	1,766,290	1,789,252	1,812,512	1,836,075	1,859,944	1,884,123
Supplies	866,893	878,163	889,579	901,143	912,858	924,725
Repair & Maint	356,526	361,161	365,856	370,612	375,430	380,311
Support Services	274,913	278,487	282,107	285,775	289,490	293,253
Minor Capital	136,448	138,222	140,019	141,839	143,683	145,551
Prof Services	126,700	128,347	130,016	131,706	133,418	135,152
Designated Exp	4,810	4,873	4,936	5,000	5,065	5,131
Recurring Expense:	24,057,787	25,091,285	25,948,199	26,835,342	27,753,796	28,704,683
Buildings	0	35,000	36,575	38,221	39,941	41,738
Equip & Machinery	4,931,243	1,144,000	1,189,760	1,237,350	1,286,844	1,338,318
Furniture & Fixtures	0	2,500	2,533	2,565	2,599	2,633
Comp Equip/Soft	0	5,000	5,065	5,131	5,198	5,265
Non-Recurring Exp:	4,931,243	1,186,500	1,233,933	1,283,268	1,334,582	1,387,954
TOTAL EXPENSE:	\$28,989,030	\$26,277,785	\$27,182,131	\$28,118,609	\$29,088,377	\$30,092,637

Status Quo Forecast

The following figure shows total forecast recurring revenues (blue line), total forecast recurring expenses (red line), forecast non-recurring revenue and expense (blue and red bars, respectively), and the net impact on the City General Fund (dotted grey line) for the forecast period FY 22–26. The forecast assumes no major changes in service level or operational configuration but does assume that the department will continue to increase total compensation as it has historically to attract and retain quality professionals.

Fire department-specific revenues, primarily ambulance billing revenue, will continue to be minor relative to total expenses, and increases will continue to be driven primarily by personnel costs. It is anticipated that the expenditure forecast could be used to gauge funding needs and used to assess the impacts of adding various decision units to enhance services, as discussed elsewhere in the study.

Figure 29: Projected KFD Status Quo Net Impact on General Fund (FY 22–26 Forecast)



STAFFING & PERSONNEL MANAGEMENT

Managing personnel to achieve maximum efficiency, professionalism, and personal satisfaction is an art as much as a science. Consistency, fairness, safety, and opportunities for personal and professional growth are key values for the healthy management of an organization. Additionally, a contemporary fire department must have enough administrative resources to adequately provide operational and logistical support, public life safety education and code enforcement services, training services, and overall administrative services in support of department operations.

Several national organizations recommend standards to address staffing issues. The *Occupational Health & Safety Administration (OSHA) Respiratory Protection Standard*, and the *National Fire Protection Association (NFPA) Standard 1710* are frequently cited as authoritative documents.^{12,13} In addition, the *Center for Public Safety Excellence (CPSE)* publishes benchmarks for the number of personnel recommended on an emergency scene for various levels of risk (known as "Effective Response Force").

Civil Service Commission

Human Resources personnel practices related to the staffing management of the Fire and Police Departments are overseen by the City's Fire and Police Civil Service Commission. The Commission, comprised of three members, is responsible for adopting and publishing rules related to the hiring, promotion, discipline, and discharge of employees. Further, the Commission has the authority and obligation to investigate allegations of misconduct, unfair application of Civil Service Rules, or other matters that fall under the purview of the Commission.

Administrative & Support Staffing

In this section of the staffing analysis, the ratio of KFD administrative and support positions to total organizational staffing is compared to industry best practices. Analyzing the ratio of administrative and operations supervisor and support positions can identify gaps and/or redundancies within the organization.

The following figure outlines KFD's administrative and support staff positions.

¹² Respiratory Protection Standard 29 CFR 1910.134; Occupational Health & Safety Administration.

¹³ NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, to the Public by Career Fire Departments; National Fire Protection Association.

Figure 30: KFD Administrative & Support Staff

Administrative Staff Positions	No. of Staff
Fire Chief	1
Assistant Chief	1
Deputy Fire Chief	3
Administrative Captain	3
Emergency Management Coordinator	1
Emergency Management Senior Specialist	1
Fire Inspector/Investigator	2
Fire Inspector/Public Educator/Investigator	1
Fire Inspector/Plan Reviewer/Investigator	1
Administrative Support Fire Rescue Officers	4
Training Academy Fire Rescue Officers	3
Executive Assistant	1
Administrative Assistant	4
Finance Manager	1
Total FTE:	27
Administrative Personnel to Total Department Staff Ratio:	11%

Administrative Staff Discussion

The level of administration and support staffing reflects 11% of the total workforce. This ratio of administrative to operations personnel should be viewed as light given the overall size of the organization and the current and anticipated growth in the City. ESCI noted that at the time of this study, a newly created Emergency Management Senior Coordinator position was in the process of being filled.

ESCI recognizes that other City departments provide many necessary administrative and support functions and services (such as information technology, finance, and legal).

Emergency Response Staffing

Safe and effective emergency operations require the rapid deployment of a sufficient number of well-trained personnel and equipment. These resources must be strategically located to quickly respond while also ensuring they can also back up other response units which may be out of service on another emergency. This concept will be discussed in depth in the Service Delivery Analysis section of this study. The following figure lists the Department's career emergency response staffing.

Figure 31: KFD Career Emergency Response Staffing

Operations Staff Positions	No. of Staff
Battalion Chief	6
Captain	30
Fire Rescue Officer/Paramedic	141
Fire Rescue Officer/EMT	29
Probationary Fire Rescue Officers	5
Total Operations Personnel:	207
Operational Officers to Fire Rescue Officers Ratio:	17.4%

ESCI noted that unlike many other similar-sized fire departments studied by ESCI, there are no formal Apparatus Operator or Driver Engineer positions. Fast and effective operation of complex fire pumps and aerial ladder apparatus on a dynamic emergency scene requires unique problem-solving knowledge and skills. However, this unique skill set is not formally acknowledged or compensated within the Department.

KFD Operations Scheduling

KFD Operations personnel are assigned to three separate shifts, and work a rotating 24-hours on, 48-hours off schedule. The shift starts at 0700 hours each day for line operations personnel, and 0630 for Battalion Chiefs. The average work hours in the 19-day FLSA work period is 144 hours, and all hours worked over 144 hours in that work period are paid at time and one-half. The total average annual hours worked is 2,756 hours in the normal work schedule. A regular three-shift rotation work schedule would normally result in a 56-hour work week, with an average annual work hours total of 2,912 hours. However, KFD Operations personnel receive an additional 24-hour shift off—known as a “Kelly Day”—every 57 days to reduce their overall annual work time.

Employees can trade shifts. Shift trade requests must be submitted to the Battalion Chief no later than 48 hours before the scheduled shift(s) to be traded. A maximum number of consecutive hours worked limit is not identified in the Trade Time Policy (Policy 9), or the Work Period and Overtime Policy (Policy 7).

Leave Scheduling

Administrative assigned uniformed personnel working a 40-hour schedule with less than ten years seniority accrue 4.62 hours of vacation per pay period up to a maximum of 240 hours. Administrative assigned uniformed personnel with 10 years or more seniority accrue 6.15 hours of vacation per pay period up to a maximum of 320 hours.

Operations personnel working the 24-hour shift schedule with less than ten years seniority accrue 6.92 hours of vacation per pay period up to a maximum of 360 hours. Personnel with 10 years or more seniority earn 9.23 hours vacation per pay period up to a maximum of 480 hours.

Operations Scheduling Discussion

The 24-hour shift, followed by at least 24 hours off duty, remains the predominant schedule for fire departments in the Western United States.

The EMS community has also been concerned for some time about the negative physical and mental effects of lengthy EMS shifts and the implications on safety. An *Interim Safety Advisory Committee* of the *National EMS Advisory Council* addressed the issue of fatigue in EMS workers in a report published in 2012.¹⁴ The review of the existing research literature and government work-hour regulations noted a profound lack of research specific to the EMS environment. It noted much more research—specific to the EMS environment—is needed to quantify and validate the issue of fatigue among EMS providers, along with identifying strategies to address the issue within the EMS environment. However, they clearly expressed their expert opinion that poor sleep and fatigue threaten the safety of EMS workers and their patients.

The importance of adequate rest between work shifts cannot be overstated. The Department requires all personnel to maintain a Class B Commercial endorsement on their driver's license, even though the operation of fire apparatus is exempt from Federal Motor Carrier Safety Administration (FMCSA) rules governing drivers of heavy commercial vehicles. However, the underlying reasons for these regulations certainly apply to fire departments. FMCSA has very restrictive rules in place to address potential driver fatigue. ESCI highlights these specific requirements because Fire Rescue Officers, Fire Rescue Officer/Paramedics, and EMS workers routinely drive emergency vehicles in all types of weather conditions—often for extended periods (long-distance interfacility transfers, for example). The following figure is a summary of the rules for truck drivers. This is presented to provide context on the level of the federal government's concern on driver fatigue.¹⁵

¹⁴ Safety Committee INTERIM Advisory (May 30, 2012). Fatigue in emergency medical services. The National EMS Advisory Council.

¹⁵ 349 Code of Federal Register 395.1-5.

Figure 32: Commercial Driver Rules for Work Hours

Property Carrying Drivers	Passenger Carrying Drivers
11-Hour Driving Limit May drive a maximum of 11 hours after 10 consecutive hours off-duty.	10-Hour Driving Limit May drive a maximum of 10 hours after 8 consecutive hours off-duty.
14-Hour Limit May not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off-duty. Off-duty time does not extend the 14-hour period.	15-Hour Limit May not drive after having been on duty for 15 hours, following 8 consecutive hours off-duty. Off-duty time is not included in the 15-hour period.
Rest Breaks May drive only if 8 hours or less have passed since the end of the driver's last off-duty or sleeper-berth period of at least 30 minutes.	60/70-Hour Limit May not drive after 60/70 hours on duty in 7/8 consecutive days.

As noted in the preceding figure, the focus is not only on the length of the work periods, but also *the length of the off duty/rest periods*. Also, the safety and productivity implications of allowing shift trades that could extend well beyond a 24-hour shift must also be considered.

Staff Relief Analysis

In evaluating the level and availability of KFD Operations staff, ESCI analyzed and compared the minimum number of employees required to be on-shift, the total number of operations employees in the organization, and the average amount of leave used by these employees to determine how many personnel the Department theoretically needs to meet the minimum number of total staff required daily. This is commonly referred to as a "Staffing Relief Factor (SRF)." In the following figure, ESCI used employee data provided by KFD to identify the theoretical minimum total number of employees required to staff operations 24 hours daily.

Figure 33: Elements Used to Calculate KFD Staffing Relief Factor (2018–2020)

Shift Schedule	Annual Hours	Average Workweek	Average Sick Leave	Average Vacation Leave	Average Other Leaves ¹
24-hours on, 48-hours off	2,756	53	115	186	159

¹ Includes FMLA, Funeral, Holiday, Military Leaves

ESCI calculated the theoretical number of KFD employees required to meet the various average types of leave used by employees from 2018–2020 and compared the results to the current (as of 2/1/21) number of Operations FTE employees. Note: 2018 vacation use data was not available for analysis.

The SRF calculation compared the average available scheduled weekly work hours per employee, subtracted the average leave usage based on the past historical leave use data, and calculated the SRF. ESCI then multiplied the number of personnel needed to cover a single position at 24-hours per day with the relief factor to determine the total number of employees *theoretically* required to meet daily minimum staffing without having to inordinately hire back personnel on overtime to cover vacant shifts. The calculated staffing relief factor is 1.28.

This factor was multiplied by the number of personnel needed to cover one position 24 hours daily. The following figure compares the theoretical number of positions needed to meet minimum daily FTE staffing (48 positions) with the current number of employees assigned to the Operations work schedule.

Figure 34: Calculated Operational Staff Shortage/Overage

Shift Coverage Required	Calculated Total Personnel Required	Current No. Employees	Staff Shortage/Overage
Vacation, Sick, Holiday, FMLA, Military, etc.	193	198	+3

KFD Staffing Discussion

ESCI calculated that the Department theoretically has 3 Fire Rescue Officers above what was required over the past three years to cover scheduled and unscheduled leaves. However, it must be noted that leave usage is not uniformly spread throughout any given year, or across years, resulting in peaks and valleys in the use of overtime to cover vacancies, including long-term vacancies related to family and medical leaves.

The Department's Standard Operating Guideline Policy 2: Authorized Staffing sets the minimum number of personnel assigned to each apparatus. ESCI understands this policy was put into place in approximately 2017 due to an unanticipated significant City budget deficit. It also allows "drawdown" of up to 4 personnel on certain Rescue and Ladder companies when vacancies occur to avoid overtime usage, as noted in the following figure.

Figure 35: Minimum Staffing Drawdown Priority List

Station Company	Normal Staffing	Drawdown Number	Company Personnel Remaining
Ladder 2	4	1	3
Rescue 2	3	1	2
Rescue 9	3	1	2
Ladder 9	4	1	3

Deployment of fire apparatus and crews are modified as required when these drawdowns occur. For example, Rescue 2 and Rescue 9 are dispatched on Priority 1 EMS responses along with a MICU for incidents in their respective response territories. However, when Rescue unit staffing is reduced to two personnel, the respective ladder companies are dispatched instead.

If minimum staffing levels were set at 52 per shift, 13 additional employees would theoretically be required to meet this minimum staffing level.

The cost of adding employees to ensure adequate staffing versus simply paying current employees overtime to provide relief coverage must be carefully balanced due to the additional cost of employee benefits, which can be up to 40% or more of employee salaries. This additional cost is not factored into overtime expenses, therefore making overtime expenditure a more cost-effective approach. However, if the total number of available employees is significantly diminished, requiring a substantially higher use of overtime or volunteer backfill to meet minimum daily staffing levels, it may result in employee "burnout," and inability to meet minimum daily staffing requirements.

Staff Salaries & Benefits

ESCI evaluated the salaries, benefits, and compensation for the various employee classifications. The primary purpose of this analysis was to assist in forecasting future expenditure impacts related to recommended future administrative and operations staff changes. The following figures summarize the 2018–2020 average salaries for each FTE position.

Figure 36: Administrative Uniformed & Civilian FTE Salaries

Administrative Staff Positions	Average Salary
Fire Chief	\$149,500
Assistant Chief	\$115,488
Deputy Chief	\$104,753
Administrative Captain	\$80,801
Fire Inspector	\$88,936
Administrative Support Fire Rescue Officer	\$71,812
Training Academy Fire Rescue Officer	\$71,812
Executive Assistant	\$40,275
Principal Secretaries	\$40,140
Finance Manager	\$40,140

The following figure summarizes the uniformed Operations staff salaries.

Figure 37: Operations FTE Salaries

Operations Staff Positions	Average Salary
Battalion Chief	\$95,510
Captain	\$87,735
Fire Rescue Officer/Paramedic	\$62,422
Fire Rescue Officer/EMT	\$50,210

The City offers a wide range of benefits to full-time employees and family members that begin on the first of the month after their first 30 days of employment. The following figure summarizes these benefits.

Figure 38: KFD Benefits

Benefits	
Medical Insurance	Dental Insurance
Vision Insurance	Wellness Program
Health Savings Account	Flexible Spending Account
Accidental Injury Insurance	Critical Illness Insurance
Life Insurance	Short and Long-Term Disability Insurance
457 Deferred Retirement Account	Employee Assistance Program

KFD uniformed personnel and the City contribute to the Killeen Firefighters Retirement Pension Fund. This program is governed by a Board of Trustees comprised of the Mayor, Executive Director of Finance, Fire Chief, citizen representatives, and appointed firefighters. The City contributes 13% to 15% monthly to the Fund, and the employees contribute 11%.

Personnel Management

Effective and efficient management of personnel is critical to the success of any organization. This section of the study examines the administrative components related to managing KFD staff.

Policies, Rules and Regulations, and Guidelines

When a new KFD employee is hired, they undergo a two-part orientation process. The first part of orientation involves meeting with HR to fill out the necessary paperwork involved with enrolling in the various benefit packages, enrolling in the City's intranet system, and reviewing various overarching city personnel policies (Sexual harassment, drug policy, etc.). The second orientation session occurs at the end of the employee's first month of employment, and involves presentations by various City departments about their services and roles in City government.

In addition to receiving a hard copy of City policies, employees have online access to the policies through the City's intranet. These policies were last updated in April 2019. City policy updates are distributed via email, and employees must provide a hard copy acknowledgment of having received the policy.

New Hire Process

Fire Rescue Officer (FRO) candidates must meet the following pre-requisites to take the FRO Civil Service examinations:

- Must be at least 18 years of age, and not reach their 36th birthday at the time of hire
- High school diploma or equivalent
- Reside no further than 45 minutes away from the City's Extraterritorial Jurisdiction
- Valid Texas driver license with ability to obtain Class B endorsement with 15 days of hire or completion of the Fire/EMT Academy

Hiring preference may be given to candidates who have TCFP Structural Firefighter certification or EMT certification up to the paramedic level.

Candidates must pass a written examination with at least a 70% score and pass a physical agility test. The physical agility test was created and validated by an outside vendor, FitForce Inc®. This validation process and revised physical agility test was the result of a review by the Texas Workforce Commission concerned about adverse hiring practices.

The physical agility test is comprised of four components and related minimum standards, irrespective of age and sex:

- **Vertical Jump Test:** Jump as high as possible from a standing position. (15.5 inches)
- **Agility Run:** Spring and dodge around traffic cones for 180 feet. (18.4 seconds)
- **1 Minute Sit Up Test:** Perform as many bent leg sit-ups as possible within one minute. (30)
- **300 Meter Run:** 300-meter sprint. (64.5 seconds)

The score on the written test establishes the ranking on the eligibility register. When each opening occurs, the candidate at the top of the list is interviewed by a panel that includes the Fire Chief, Deputy Chiefs, and the Training Captain. Upon conditional hire, the candidate is subject to a full medical examination, psychological examination, and background check. Previously, the Department administered almost all components of the testing process, including reference and criminal background checks. However, at the time of this study, the process was modified, with the Human Resources Department participating in the interview process, and also facilitating the psychological testing and background checks.

Performance Evaluations

KFD employees receive annual performance evaluations that are administered based on their hire date. However, salary step increases are not tied to these evaluations. A new software performance evaluation system, emPerform® will be implemented by October 2021.

Discussions with Department officers revealed situations where it appears that evaluation scoring may have been inconsistently applied by various officers, leading to situations where an employee received higher scores from one officer and lower scores from another, even though their performance was satisfactory. ESCI learned that officers have not received training on how to use the performance evaluation process to fairly and accurately document job performance. ESCI recommends that supervisors receive training on not only using the new performance management software system, but also how to fairly and equitably judge and document employee performance.

Promotion Process

Promotions below the rank of Fire Chief and Assistant Chief are based only on written scores from a Civil Service written test. Many of the fire departments studied by ESCI utilize an Assessment Center format as a key component of a promotional testing process. Depending on the rank being tested, an Assessment Center typically includes the impartial observation of a candidate's performance in various scenarios, which may include how they handle one or more tactical exercises such as mitigating a fire or hazmat incident, a personnel or discipline issue, presenting a topic to a group, or managing paperwork. Some departments administer a written test as well.

Including an Assessment Center component in promotional testing can be a very effective method of identifying future competent leaders in the organization, as it places candidates in realistic situations they may encounter as an officer, and evaluates their performance in ways that cannot be assessed through the administration of a written test alone, especially as it relates to interpersonal communication skills and handling stressful situations.

According to the 2015 *International Task Force on Assessment Center Guidelines*, a valid assessment process should include the following components:

- A contemporary job analysis to identify job relevant behaviors.
- Identification and classification of behaviors to be measured.
- Multiple assessment center components.
- Linkages between behavioral constructs and Assessment Center components.
- Simulation exercises.
- Multiple trained assessors.
- Individual assessor reports on each candidate.
- Data integration and assimilation between the assessors.
- Standardization throughout the Assessment Center process.

As noted above, the development and administration of a valid Assessment Center process is a complicated process that must be approached pragmatically. However, if properly applied it can be extremely effective in identifying and selecting excellent officers. It can also help avoid allegations of unfair testing practices that have plagued other fire departments in the past. For example, in 2019, the Jacksonville Fire Department and the firefighter's union settled a lawsuit alleging discrimination in questions in its written tests for \$4.9 million.^{16,17}

Representation, Compensation & Retention

The KFD uniformed employees belong to the Killeen Professional Firefighters Association-Local 2505, which is affiliated with the International Association of Firefighters (IAFF). The Association does not have a direct role in negotiating working conditions, pay or benefits, or deal with disciplinary matters. The employees and the City are not subject to binding arbitration.

KFD's ability to attract, hire, and retain employees has a direct impact on its ability to effectively and efficiently provide the desired services. Agencies should provide periodic reviews of current compensation structures, market competitiveness, and City compensation philosophies. These internal and external comparisons of equitable positions and workloads ensure the agency can attract and maintain a productive and experienced workforce. This should be an important consideration for the City, as ESCI understands that KFD has experienced approximately 10% annual turnover over the past three years, with the majority of those leaving the Department doing so to work for larger departments that offered higher salary and benefits packages.

However, ESCI cautions that higher salary and benefits packages may not be the only reasons KFD employees are leaving City employment. Often, other factors influence employees to seek other employment. A 2008 Gallup® poll identified key reasons that motivates employees to potentially seek employment elsewhere:

- Lack of career advancement/promotional opportunities
- Pay/Benefits
- Management/General work environment
- Lack of fit for the job

¹⁶ Jacksonville to pay \$4.9M to settle firefighter discrimination lawsuit, News4Jax, September 6, 2019.

¹⁷ Jacksonville could face federal lawsuit over discrimination in firefighter promotional tests, The Florida Times-Union, April 19, 2012.

In distilling down and interpreting the survey results, Gallup® opined on what workplace elements are needed to keep employees:

According to Gallup's research, 9 of the 12 workplace elements consistently predict turnover across business units, regardless of an organization's size. These elements are: having clear expectations, having the materials and equipment to do the job right, having the opportunity to do what you do best every day, the belief that someone at work cares, the belief that someone encourages your development, a sense that your opinions count, the mission or purpose of the company making you feel that your job is important, a belief that your coworkers are committed to quality, and having opportunities to learn and grow at work. If these needs are met, as shown by higher scores on these employee engagement items, turnover is likely to be low. If not, keeping people may be the hardest part of a manager's job.

Selecting, hiring, equipping, and training new firefighters is time consuming and expensive. Fire service organizations, including KFD, spend considerable time and resources in trying to ensure new employees are successful, and enjoy long-term careers. However, as previously noted, employees leave for various reasons.

The length of time necessary to select, hire, and train employees is another significant factor that needs to be recognized. It takes time to perform all of the necessary steps, processes, and deliver the required education to ensure an employee is prepared and trained to safely deploy in an operations assignment. Depending on the number of current operations employees available at any given time, the Department may have to backfill the vacancy with a current employee working on overtime until the new employee completes their training and can fill the vacancy. This can take months, and result in significant expense beyond the typical expenses of hiring, equipping, and training the new employee.

A research paper written as part of the curriculum of the Naval Post Graduate School examined the cultural impacts related to generational differences in today's employees. The paper, published in December 2017, titled *Millennials in the Fire Service: The Effectiveness of Fire Service Recruiting, Testing, and Retention*, used a scientific survey to identify reasons why fire departments across the country are not able to attract suitable candidates, or keep employees.

The paper's author, Bullhead City, Arizona, Assistant Fire Chief Scott Neal, reached the following conclusions:

...the fire service—within the defined scope of the survey—is not attracting the number and quality of applicants that it did 20 years ago. Second, the generational traits of millennials do not fully align with the traditional business model of the modern fire service. Parents direct their children toward the college education many of them did not get themselves. This is a competing interest with trade-based professions like the fire service. The five forces of influence that shaped millennials during their childhood are rendering recruitment methods ineffective in maintaining a stable workforce. Finally, the fire service testing process does not necessarily identify the most-desired traits in a candidate. The traditional written exam, physical agility test, and oral board schematic have remained unchanged for decades. Using a systematic evaluation process—like that found in continuous quality improvement—is an important step in making fundamental changes to fire service testing.

These impediments may be a factor in recruiting qualified KFD candidates and retaining them in the long-term. While it is outside the scope of this study to delve deeper into this issue, given the Department's recent experience, attention should be given to performing an introspective analysis of the current hiring requirements, practices, training methods (and methodologies), organizational support, and employee motivational factors.

The preceding information is not intended to imply that current or previous fire department leadership is to blame for the high turnover rate. Rather, it is intended to alert the organization to the fact that rather complex and unrecognized organizational factors may be present that are affecting employee retention. Given the relatively high turnover rate, and the cost of hiring new employees, conducting an introspective analysis of this turnover, including overall City employee turnover, should be a high priority for KFD and the City.

Disciplinary Process

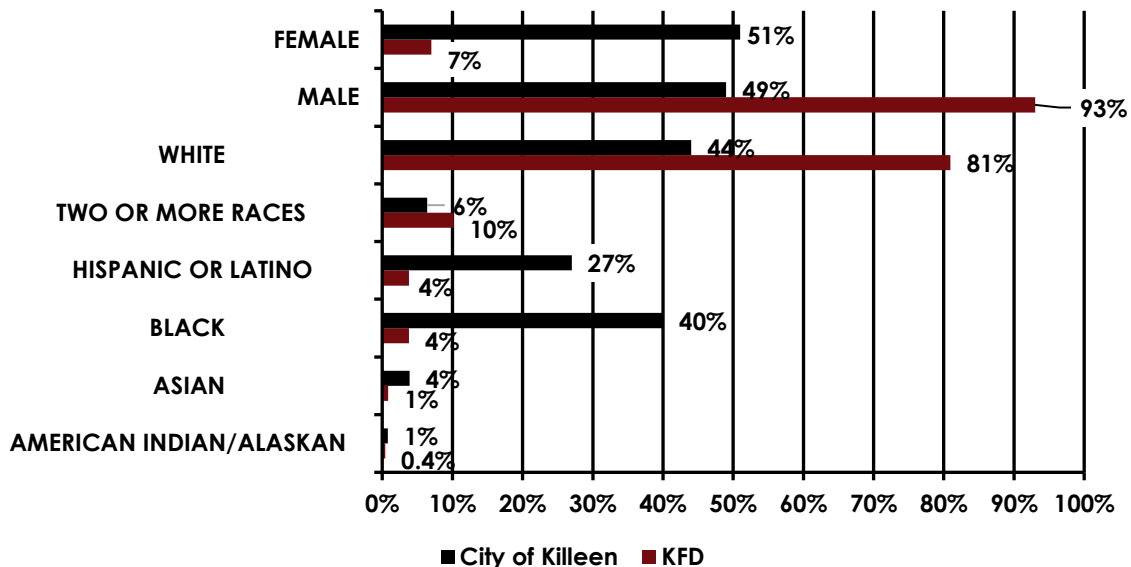
Under the existing organizational configuration, personnel-related decisions are made at different levels. The Fire Chief and Assistant Chief can hire, discharge, and promote.

Discipline can be issued at several levels of the organization based on the severity of the infraction. The discipline policy is outlined in the progressive discipline process in the SOPs and City policies. Personnel-related decisions can, and often do, subject an organization to potentially extensive liability exposure. Risk can result from a hiring mistake, improperly processed disciplinary process, wrongful termination claims, and more. Access to legal counsel can reduce this liability. Employees are afforded an appeal process for suspensions and dismissals only as defined in the City's discipline policy.

Diversity

ESCI evaluated the sex and race composition of the KFD, and compared it to the overall race composition of the city, as estimated (2019 estimate) by the U.S. Census Bureau. The following figure illustrates this comparison.

Figure 39: KFD Diversity Comparison



The preceding figure reveals a marked difference in diversity between the city's population and KFD employees. The fire service has historically had difficulty in attracting females and minorities to apply for firefighter positions. In highlighting this issue, one author offered the following perspective:

It's no secret that fire departments in many cities don't much resemble the communities they serve. In areas that have a high concentration of poverty, many fire departments are comprised primarily of members who live outside of the jurisdictions they serve and don't have a vested interest in the municipalities where they work. And as the number of fires has declined over recent decades, so has many fire department's community involvement. In most large cities, many residents no have interactions with members of the fire service only when they dial 911, typically for a medical emergency.¹⁸

¹⁸ Samuel Johnson Jr., *Governing Magazine*, November 29, 2016.

The author also noted that focused efforts to conduct community outreach that targets minority populations can be successful in attracting them to apply for firefighter positions. Outreach techniques such as hosting open houses at fire stations located in minority neighborhoods, and also performing targeted recruitment drives, including helping interested citizens apply for the positions.

KFD's Fire Academy program and partnership with the College and the Killeen Independent School District (KISD) and KISD Career School may allow access to resources that can be leveraged to increase minority groups' interest in a fire service career. The Department should work with the City's Human Resources Department and the local colleges to explore ways to increase interest and applications from minority groups, including targeted community outreach.

CAPITAL ASSETS & CAPITAL IMPROVEMENT PLANS

ESCI evaluated the KFD capital facilities and apparatus. The Department completed survey tables to describe the various facilities and apparatus and were asked to subjectively grade their current condition. Understanding that both are extremely expensive to build and maintain, it is important to evaluate and benchmark their condition to assist in future planning and replacement efforts. The following section is an assessment of KFD's capital facilities and apparatus as noted by the Department and ESCI during the site visit.

Fire Stations & Other Facilities

Fire stations play an integral role in the delivery of emergency services for several reasons. A station's location will dictate, to a large degree, response times to emergencies. A poorly located station can mean the difference between confining a fire to a single room and losing the structure. Fire stations also need to be designed to adequately house equipment and apparatus, as well as meet the needs of the organization and its personnel. It is important to research needs based on service demand, response times, types of emergencies, and projected population growth prior to making a station placement commitment.

Consideration should be given to a fire station's ability to support the Department's mission as it exists currently and into the future. The activities that take place within a fire station should be closely examined to ensure the structure is adequate in both size and function:

- The housing and cleaning of apparatus and equipment, including decontamination and disposal of biohazards
- Residential living space and sleeping quarters for on-duty personnel (all genders)
- Kitchen facilities, appliances, and storage
- Bathrooms and showers (all genders)
- Administrative and management offices; computer stations and office facilities for personnel
- Training, classroom, and library areas
- Firefighter fitness area
- Public meeting space

In gathering information from the Killeen Fire Department, ESCI asked the department to rate the condition of its eight fire stations, training facilities, and support facility, using the criteria listed in the following figure.

Figure 40: Criteria Utilized to Determine Fire Station Condition

Excellent	Like new condition. No visible structural defects. The facility is clean and well maintained. Interior layout is conducive to function with no unnecessary impediments to the apparatus bays or offices. No significant defect history. Building design and construction match the building's purposes. Age is typically less than 10 years.
Good	The exterior has a good appearance with minor or no defects. Clean lines, good work flow design, and only minor wear of the building interior. Roof and apparatus apron are in good working order, absent any significant full-thickness cracks or crumbling of apron surface or visible roof patches or leaks. Building design and construction match the building's purposes. Age is typically less than 20 years.
Fair	The building appears to be structurally sound with a weathered appearance and minor to moderate non-structural defects. The interior condition shows normal wear and tear, but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building's purposes well. Showing increasing age-related maintenance, but with no critical defects. Age is typically 30 years or more.
Poor	The building appears to be cosmetically weathered and worn with potentially structural defects, although not imminently dangerous or unsafe. Large, multiple full-thickness cracks and crumbling of concrete on apron may exist. The roof has evidence of leaking and/or multiple repairs. The interior is poorly maintained or showing signs of advanced deterioration with moderate to significant non-structural defects. Problematic age-related maintenance and/or major defects are evident. May not be well suited to its intended purpose. Age is typically greater than 40 years.

ESCI virtually toured each of the Killeen fire stations and, combined with the information provided, produced the observations listed in the following figures.

Figure 41: KFD Fire Station #1

Address/Physical Location:	3800 Westcliff Road, Killeen, Texas
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General Description: Three bay station that houses an engine company, medic unit, and a cross-staffed brush unit (Booster). It also includes a community meeting room.

Structure

Construction Type	Type 2
Date of Construction	2009
Seismic Protection	None
Auxiliary Power	Propane generator
General Condition	Good
Number of Apparatus Bays	3 Drive-through
Special Considerations	ADA compliant
Square Footage	11,400

Facilities Available

Separate Rooms/Dormitory/Other	4 Bedrooms	7 Beds
Maximum Station Staffing Capability	7	
Exercise/Workout Facilities	Yes	
Kitchen Facilities	Yes	
Individual Lockers/Storage Assigned	Yes	
Shower Facilities	Yes	
Training/Meeting Rooms	Yes	
Washer/Dryer	Yes	

Safety & Security

Sprinklers	Yes
Smoke Detection	Yes
Decon/Biohazard Disposal	Yes
Security	Electronic lock and keyed locks
Apparatus Exhaust System	Yes

Figure 42: KFD #2 Central Fire Station**Address/Physical Location:** 201 S. 28th Street, Killeen, Texas

General Description: Five bay station that houses a ladder company, rescue unit, medic unit, Battalion Chief, and an EMS command unit. It also houses most of the Administrative personnel, with the exception of the Fire Prevention and Emergency Management Divisions.

Structure

Construction Type	Type 2			
Date of Construction	1975			
Seismic Protection	None			
Auxiliary Power	Yes, but powers very limited equipment			
General Condition	Fair			
Number of Apparatus Bays	2	Drive-through	3	Back-in
Special Considerations	Partially ADA compliant			
Square Footage	15,000 (estimated)			

Facilities Available

Separate Rooms/Dormitory/Other	4	Bedrooms	16	Beds	13	Dorm beds
Maximum Station Staffing Capability	16					
Exercise/Workout Facilities	In apparatus bay					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Meeting/Conference room only					
Washer/Dryer	Yes					

Safety & Security

Sprinklers	No
Smoke Detection	Yes
Decon/Biohazard Disposal	Yes
Security	Electronic locks
Apparatus Exhaust System	No

Figure 43: KFD Fire Station #3


Address/Physical Location:		700 N. Twin Creek Drive, Killeen, Texas			
		General Description: Three bay station that houses an engine company, medic unit, and a cross-staffed brush unit (Booster).			
Structure					
Construction Type		Type 3			
Date of Construction		1988			
Seismic Protection		None			
Auxiliary Power		Portable generator			
General Condition		Good			
Number of Apparatus Bays		3	Back in bays		
Special Considerations		None			
Square Footage		4,394			
Facilities Available					
Separate Rooms/Dormitory/Other		1	Dormitory	9	Beds
Maximum Station Staffing		8			
Exercise/Workout Facilities		In apparatus bay			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Yes			
Shower Facilities		Yes			
Training/Meeting Rooms		No			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		No			
Smoke Detection		Yes			
Decon/Biohazard Disposal		No			
Security		Electronic locks			
Apparatus Exhaust System		None			

Figure 44: KFD Fire Station #5


Address/Physical Location:		905 W. Jasper Drive, Killeen, Texas			
		General Description: Three bay station that houses an engine company, medic unit, and a cross-staffed brush unit (Booster).			
Structure					
Construction Type		Type 3			
Date of Construction		1968			
Seismic Protection		No			
Auxiliary Power		Portable generator			
General Condition		Fair, dated			
Number of Apparatus Bays		3	Back in bays		
Special Considerations		None			
Square Footage		5,418			
Facilities Available					
Separate Rooms/Dormitory/Other		1	Dormitory	7	Beds
Maximum Station Staffing		6			
Exercise/Workout Facilities		Limited			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Yes			
Shower Facilities		Yes			
Training/Meeting Rooms		No			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		No			
Smoke Detection		Yes			
Decon/Biohazard Disposal		No			
Security		Electronic locks			
Apparatus Exhaust System		No			

Figure 45: KFD Fire Station #6


Address/Physical Location:		2001 E. Elms Road, Killeen, Texas			
		General Description: Two bay station that houses an engine company and a medic unit.			
Structure					
Construction Type		Type 3			
Date of Construction		1996			
Seismic Protection		Unknown			
Auxiliary Power		Portable generator			
General Condition		Good			
Number of Apparatus Bays		1	Drive through		1 Back in
Special Considerations		None			
Square Footage		4,273			
Facilities Available					
Separate Rooms/Dormitory/Other		1	Dormitory	10	Beds
Maximum Station Staffing		6			
Exercise/Workout Facilities		In apparatus bay			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Yes			
Shower Facilities		Yes			
Training/Meeting Rooms		No			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		No			
Smoke Detection		No			
Decon/Biohazard Disposal		No			
Security		No			
Apparatus Exhaust System		No			

Figure 46: KFD Fire Station #7


Address/Physical Location:		3701 Watercrest Road, Killeen, Texas			
		General Description: Two bay station that houses an engine company, medic unit, and a cross-staffed brush unit (Booster).			
Structure					
Construction Type		Type 3			
Date of Construction		1999			
Seismic Protection		None			
Auxiliary Power		Portable Generator			
General Condition		Fair			
Number of Apparatus Bays		2	Drive through		
Special Considerations		Yes			
Square Footage		4,256			
Facilities Available					
Separate Rooms/Dormitory/Other		2	Bedrooms	8	Beds
Maximum Station Staffing		8			
Exercise/Workout Facilities		No			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Limited-Inadequate			
Shower Facilities		Yes			
Training/Meeting Rooms		No			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		No			
Smoke Detection		Limited to common areas only			
Decon/Biohazard Disposal		No			
Security		Electronic locks			
Apparatus Exhaust System		No			

Figure 47: KFD Fire Station #8


Address/Physical Location:		7252 E. Trimmier Road, Killeen, Texas			
		General Description: Four bay station that houses an engine company, medic unit, cross-staffed hazardous materials unit, Battalion Chief, and cross-staffed brush unit (Booster). Also houses a reserve engine.			
Structure					
Construction Type		Type 2			
Date of Construction		2008			
Seismic Protection		None			
Auxiliary Power		Propane generator			
General Condition		Good			
Number of Apparatus Bays		4	Drive through		
Special Considerations		ADA compliant			
Square Footage		5,280			
Facilities Available					
Separate Rooms/Dormitory/Other		6	Bedrooms	11	Beds
Maximum Station Staffing		11			
Exercise/Workout Facilities		Yes			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Yes			
Shower Facilities		Yes			
Training/Meeting Rooms		Yes			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		Yes			
Smoke Detection		Yes			
Decon/Biohazard Disposal		Yes			
Security		Key pad, and key locks			
Apparatus Exhaust System		Yes			

Figure 48: KFD Fire Station #9


Address/Physical Location:		5400 Bunny Trail, Killeen, Texas			
		General Description: Four bay station that houses a ladder company, rescue unit, medic unit, EMS Command unit, cross-staffed brush unit (Booster), and Rescue Boat 9.			
Structure					
Construction Type		Type 5			
Date of Construction		2017			
Seismic Protection		None			
Auxiliary Power		Generator			
General Condition		Excellent			
Number of Apparatus Bays		4	Drive through		
Special Considerations		ADA compliant			
Square Footage		11,956			
Facilities Available					
Separate Rooms/Dormitory/Other		5	Bedrooms	10	Beds
Maximum Station Staffing		10			
Exercise/Workout Facilities		Yes			
Kitchen Facilities		Yes			
Individual Lockers/Storage Assigned		Yes			
Shower Facilities		Yes			
Training/Meeting Rooms		No			
Washer/Dryer		Yes			
Safety & Security					
Sprinklers		Yes			
Smoke Detection		Yes			
Decon/Biohazard Disposal		Yes			
Security		Electronic locks			
Apparatus Exhaust System		Yes			

Figure 49: KFD Fire Training Facility


Address/Physical Location:	910 Conder Street, Killeen, Texas	
		General Description: Small brick building with a classroom, bathroom, office, and kitchen. Three-story drill tower, with various class B burn props on site. Houses one reserve engine and a training engine.
Structure		
Construction Type		Type 2
Date of Construction		Unknown
Seismic Protection		None
Auxiliary Power		None
General Condition		Fair
Number of Apparatus Bays	2	Back in bays
Special Considerations		None
Square Footage		3,124 + 300 sq. ft. 3 story training tower
Facilities Available		
Separate Rooms/Dormitory/Other		N/A
Maximum Station Staffing		N/A
Exercise/Workout Facilities		No
Kitchen Facilities		Yes
Individual Lockers/Storage Assigned		No
Shower Facilities		Yes
Training/Meeting Rooms		Yes
Washer/Dryer		No
Safety & Security		
Sprinklers		No
Smoke Detection		Yes
Decon/Biohazard Disposal		No
Security		Key locks
Apparatus Exhaust System		No

Figure 50: KFD Fire Academy Training Building**Address/Physical Location:**207 South 28th Street, Killeen, Texas

General Description: Fire Academy classroom training facility. No fire station programmatic/response capability or living quarters.

Structure

Construction Type	Type 2
Date of Construction	2002
Seismic Protection	None
Auxiliary Power	None
General Condition	Good
Number of Apparatus Bays	0
Special Considerations	ADA compliant
Square Footage	6,555


Facilities Available

Separate Rooms/Dormitory/Other	N/A
Maximum Station Staffing	N/A
Exercise/Workout Facilities	No
Kitchen Facilities	Yes
Individual Lockers/Storage Assigned	No
Shower Facilities	Yes
Training/Meeting Rooms	2 classrooms can be configured into 1 large room. Also has a computer lab.
Washer/Dryer	No

Safety & Security

Sprinklers	No
Smoke Detection	Yes
Decon/Biohazard Disposal	No
Security	Key locks
Apparatus Exhaust System	N/A

Figure 51: KFD Support Building

Address/Physical Location:	114 W. Avenue D, Killeen, Texas
	General Description: Decommissioned Fire Station that is being used as a storage and equipment/apparatus repair facility. Vehicle repairs are done in a small bay behind the station. The station is in significant disrepair and may be structurally compromised.
Structure	
Construction Type	Type 2
Date of Construction	1952
Seismic Protection	None
Auxiliary Power	None
General Condition	Very poor
Number of Apparatus Bays	0
Special Considerations	None
Square Footage	6,000
Facilities Available	
Separate Rooms/Dormitory/Other	N/A
Maximum Station Staffing	N/A
Exercise/Workout Facilities	No
Kitchen Facilities	Yes
Individual Lockers/Storage Assigned	No
Shower Facilities	Yes
Training/Meeting Rooms	No
Washer/Dryer	No
Safety & Security	
Sprinklers	No
Smoke Detection	Yes
Decon/Biohazard Disposal	No
Security	Key locks
Apparatus Exhaust System	No

Capital Improvement Plans

The City's Community Development Department manages the maintenance and improvements at each City-owned building. The City has a 2021–2025 Capital Improvement Program that identifies new capital projects, capital improvement projects, capital equipment projects, and capital maintenance projects.

The Department annually submits capital maintenance and improvement requests to the City as part of the budget process. Most recently, the City funded a remodel of the Central Station dormitory, approved extending an apparatus bay at Station 5 by six feet, painted the offices and replaced flooring at the Central Station, authorized a remodel design and construction of a new Emergency Operations Center at the Killeen Arts and Activities Center, and funded upgrades to the City's outdoor warning siren system.

The City uses a structured, objective grading system to prioritize the submitted capital requests from each department. City departments complete an Excel spreadsheet template that automatically assigns points depending on answers submitted to yes and no questions related to the following programmatic categories and maximum available points for each:

- Public Health & Safety (20 points)
- Available Funding (20 points)
- Service & Operational Impacts (15 points)
- Regulatory Compliance (15 points)
- Strategic Alignment with City Initiatives (10 points)
- Quality of Life (10 points)
- Economic Development & Growth (5 points)
- Project Timing & Coordination (5 points)

Maximum available points: 100

The KFD's most recent capital facilities improvement requests and points awarded are summarized in the following figure.

Figure 52: FY 2020–2021 Capital Facilities Requests

Station Improvement	Estimated Cost	Points Awarded
Central Station Staff office remodel and addition of an exercise room.	\$975,000	67
Station 3 remodel of bathrooms, dormitory, and office space.	\$500,000	60
Station 5 remodel to update interior and reconfigure vacant office space.	\$500,000	65
Station 6 remodel to update interior and add more apparatus bay space.	\$750,000	60
Support Building expansion with additional land acquisition.	\$500,000	62
Acquire land and build a replacement Station 5.	\$4,700,000	62
Acquire land and recommission Station 4 in proximity to the Skylark Airport	\$4,100,000	62
Total Cost/Average Score %	\$12,025,000	62.6%

Capital Facilities Discussion

The average age of the KFD fire stations is 26 years, with Station 9 being the newest at four years, and Station 5 is the oldest at 53 years. Station 2 is the next oldest at 46 years of age.

The Support Services building is the oldest building used by the Department. According to the Community Development Executive Director and the KFD Support Services Deputy Chief, the building envelope is compromised, including significant cracks in load-bearing walls, and requires significant maintenance upkeep and expense. Additionally, the facility is too small to efficiently accommodate the various KFD support and maintenance programs. ESCI toured this building and found it to be in extremely poor condition, with significant structural issues that warranted a separate report to the Fire Chief to recommend that the building be immediately assessed for structural stability and ability to be safely occupied. Additional significant workplace safety and housekeeping issues were also identified in the separate report.

Due to the previously identified issues with the building, the Support Services Division has been canvassing potential locations and vacant structures that could adequately support their various programs and maintenance functions, and also store the reserve fire and EMS apparatus. For example, the Department identified a vacant site owned by the Killeen Independent School District, which consists of a large, paved parking lot and a vacant 50-foot by 300-foot (15,000 square feet) office and storage building immediately north of Station 3. Another identified privately owned site for sale is located approximately three-quarters of a mile east of Station 3. This 15-acre site contains six structures, including a 47,000 square foot warehouse with offices, and is located in an industrial (M-1) zone.

During the site visit, ESCI performed a cursory tour of each department facility, and noted the following general conditions found at two or more stations.

- Housekeeping and general storage and organization were lacking at the older stations. This is likely due to their small size and lack of sufficient storage space.
- Point capture vehicle exhaust systems are not installed in all stations. Those that have the exhaust systems were not being used at the time of ESCI's station tours, and were observed in some cases to be tied to walls or the hose tied in a knot to keep them out of the way.
- Exercise and gymnasium equipment is in the apparatus bays at some stations, which should be considered an incompatible use in proximity to apparatus exhaust and other contaminants.
- Turnout gear is stored unprotected on the apparatus floors. In some cases, the turnout gear emitted a smoke smell, indicating that they have not been sufficiently washed/decontaminated.
- Oxygen filling stations do not have armored fragmentation containment vessels for filling.
- Reserve fire and EMS apparatus are stored outside due to lack of apparatus bay space.
- Flammable liquids are not stored in fire-resistant flammable liquids cabinets.
- Lack of eyewash stations in industrial working areas.

In evaluating KFD's most recent capital facilities improvement requests, including recommissioning a station near the airport and replacing Station 5, ESCI offers the following important considerations in choosing an appropriate station site, and the necessary programmatic design features common in contemporary fire stations.

Site Location Considerations

The necessary steps and considerations in siting a new or relocated fire station include, but are not limited to:

- Assessing potential sites for optimal response coverage. Sites located on corners offer the benefit of reduced cost for most stations.
- Assessing available utility services to the site; water (for domestic use as well as fire protection systems), natural gas, power (3-phase is preferred), and communications (including dispatch requirements for either line-of-sight, hardwire, or optical/digital cable).
- Access roadway characteristics to ensure safe ingress and egress (terrain, line of sight, roadway speed, intersection control(s), and roadway alignment).
- Site topography and characteristics. Steep site locations may require expensive retaining walls, and require extensive ground preparation to accommodate a station. Conversely, a flat site may present stormwater ponding issues. An apparatus bay slightly elevated above the roadway is preferred.
- Neighborhood or location “fit” is often a consideration, particularly if the station is to be placed in an area with existing residential or commercial development and adjacent structures.

Station Programmatic Considerations

Additional considerations relative to overall station programmatic needs that can enhance operational efficiency and effectiveness include:

- Station placement on a site that enables safe vehicle ingress/egress, good traffic site lines, and adequate turning radiuses.
- Adequate and flexible apparatus bay space and storage that allows for sufficient space around stored equipment and apparatus.
- Layout of living quarters and working areas that facilitate fast and efficient access to response apparatus.
- Design that promotes positive crew interactions, reduces stressors, and promotes overall well-being. This includes adequate separation of offices and work areas from dayroom/kitchen/bunk spaces, and the creation of a homelike setting.
- Gender-neutral living and sleeping spaces that facilitate privacy and individually controlled environmental conditions (HVAC, speaker volume, lighting).
- Sufficient/robust data transmission infrastructure that meets agency alerting and data transmission needs, delivery of training, and also allows for adequate access for personal use by assigned personnel.
- Appropriately sized emergency generator; with sufficient outlets and connections to key station equipment and functions.
- Allocation of facility design and construction budget in alignment with functionality goals and project priorities.

Apparatus & Vehicles

This section of the report describes the frontline and reserve fleet inventories of KFD, which includes emergency response apparatus, medic units (ambulances), command/staff vehicles, and support units. The following figure lists the inventory of the frontline fleet.

Figure 53: Killeen Fire Department Frontline Apparatus Fleet Inventory

Designation	Type	Year	Manufacturer	Condition	Status
Engine/Pumpers					
Engine 1	Pumper	2001	E One	Fair	Frontline
Engine 3	Pumper	2018	Pierce	Excellent	Frontline
Engine 5	Pumper	2012	Crimson/Spartan	Fair	Frontline
Engine 6	Pumper	2016	Crimson/Spartan	Good	Frontline
Engine 7	Pumper	2012	Crimson/Spartan	Fair	Frontline
Engine 8	Pumper	2011	Crimson/Spartan	Fair	Frontline
Unit 200	Pumper	1996	E One	Poor	Reserve
Unit 202	Pumper	1996	E One	Poor	Reserve
Unit 206	Pumper	1996	E One	Poor	Reserve
Unit 207	Pumper	2001	E One	Fair	Reserve
Unit 220	Pumper	1996	E One	Poor	Reserve
Aerials/Ladders					
Ladder 2	Aerial	2004	Pierce	Fair	Frontline
Ladder 9	Aerial	2009	Crimson/Spartan	Fair	Frontline
Medic Units					
Medic 1	Ambulance	2020	Ford	Excellent	Frontline
Medic 2	Ambulance	2015	Dodge	Fair	Frontline
Medic 3	Ambulance	2019	Dodge	Excellent	Frontline
Medic 5	Ambulance	2013	Dodge	Fair	Frontline
Medic 6	Ambulance	2013	Dodge	Fair	Frontline
Medic 7	Ambulance	2020	Ford	Excellent	Frontline
Medic 8	Ambulance	2019	Dodge	Excellent	Frontline
Medic 9	Ambulance	2015	Dodge	Fair	Frontline
Unit 2270	Ambulance	2009	Dodge	Poor	Reserve
Unit 2274	Ambulance	2009	Dodge	Poor	Reserve
Unit 2279	Ambulance	2012	Dodge	Fair	Reserve
Unit 2280	Ambulance	2012	Dodge	Fair	Reserve
Unit 2281	Ambulance	2012	Dodge	Fair	Reserve
Unit 2282	Ambulance	2013	Dodge	Fair	Reserve
Unit 2287	Ambulance	2015	Ford	Fair	Reserve
New Unit 2287	Ambulance	2020	Ford	Good	N/A
New Unit 2296	Ambulance	2018	Ford	Excellent	N/A

Figure 54: Killeen Fire Department Special Apparatus

Designation	Type	Year	Manufacturer	Condition	Status
Specialty Apparatus					
Booster 1	Brush	2012	Ford	Good	Frontline
Booster 3	Brush	1999	Ford	Fair	Frontline
Booster 5	Brush	2008	Dodge	Fair	Frontline
Booster 7	Brush	2005	Ford	Fair	Frontline
Booster 8	Brush	2008	Dodge	Good	Frontline
Booster 9	Brush	2012	Ford	Good	Frontline
Haz Mat 8	Haz Mat Truck	1989	International	Fair	Frontline
Haz Mat 8	Trailer	2005	Haulmark	Good	Frontline
Unit 276	Spare Haz Mat Truck	1999	International	Fair	Reserve
Rescue 2	Rescue Unit	2008	Crimson/Spartan	Fair	Frontline
Rescue 9	Rescue Unit	2017	Crimson/Spartan	Good	Frontline
Boat 9	Boat Trailer	2018	McClain	Excellent	Frontline
Boat 9	Boat	2018	Zodiac	Excellent	Frontline
Boat 2	Boat Trailer	2016	Pacific Boat	Excellent	Frontline
Boat 2	Boat	2017	Inmar	Excellent	Frontline
Boat Trailer	Boat Trailer	2009	Sportsman	Fair	Spare
ATV	ATV	2010	Polaris	Fair	Reserve
Unit 280	Bus	1992	International	Fair	Frontline
Unit 2260	Cargo Trailer	2005	N/A	Good	Frontline
Unit 2261	Utility Trailer	2009	N/A	Good	Frontline
Unit 2262	Utility Trailer	2010	Bragg	Good	Frontline
Unit 2263	Training Pump Trailer	2011	N/A	Good	Frontline

Figure 55: Killeen Fire Department Command/Staff Vehicles

Designation	Type	Year	Manufacturer	Condition	Status
Command/Staff Vehicles					
Battalion 1	Command	2018	Ford	Excellent	Frontline
Battalion 2	Command	2013	Chevrolet	Good	Frontline
EMS 206	EMS Staff	2019	Ford	Excellent	Frontline
EMS 208	EMS Staff	2018	Ford	Excellent	Frontline
Chief 200	Staff	2019	Ford	Excellent	Frontline
Chief 201	Staff	2018	Ford	Excellent	Frontline
Chief 202	Staff	2009	Chevrolet	Good	Frontline
Chief 203	Staff	2018	Ford	Excellent	Frontline
FM 204	Staff	2019	Ford	Excellent	Reserve
Chief 205	Staff	2020	Ford	Excellent	Frontline
Training 207	Staff	2005	Chevrolet	Good	Frontline
Investigator 209	Staff	2019	Ford	Excellent	Frontline
Investigator 210	Staff	2019	Ford	Excellent	Frontline
Investigator 211	Staff	2019	Ford	Excellent	Frontline
Investigator 212	Staff	2019	Ford	Excellent	Frontline
Support 213	Staff	2004	Ford	Good	Spare
Support 214	Staff	2008	Ford	Good	Reserve
216-220	Staff	2011	Ford	Excellent	Frontline
230-231	Staff	2008	Ford	Fair	Frontline
232-233	Staff	2008	Ford	Fair	Frontline
EMC-194	Staff	2008	Ford	Fair	Frontline
Special Ops 282	Staff	2006	Chevrolet	Good	Frontline

Apparatus Maintenance & Replacement Planning

No piece of mechanical equipment or vehicle can be expected to last indefinitely. As apparatus age, repairs tend to become more frequent and more complex. Parts may become more difficult to obtain, and downtime for repair and maintenance increases. Given that fire protection, EMS, and other emergencies prove so critical to a community, downtime is one of the most frequently identified reasons for apparatus replacement.

Because of the expense of fire apparatus, most communities develop replacement plans, and establish a life cycle for apparatus that results in an anticipated replacement date for each vehicle. The apparatus is then periodically evaluated for age, reliability, and maintenance/repair downtime and costs to determine the actual replacement date.

Future Apparatus Serviceability & Replacement

Fleet Maintenance

Most of KFD's apparatus repairs are performed and documented by the City's Fleet Services Division, along with other local fire apparatus and heavy vehicle dealerships and repair shops. However, due to the limited number of Fleet Services Mechanics, routine maintenance, such as oil changes and lubrication, and some minor repairs of staff vehicle and ambulances, are performed by KFD Support Services assigned personnel at the Support Services building. However, the vehicle maintenance bay is too small to accommodate fire apparatus, nor does the facility have a vehicle hoist. ESCI noted that no KFD or Fleet Services mechanics are trained and certified to the NFPA 1071: *Standard for Emergency Vehicle Technician Professional Qualifications*.

Apparatus service lives can be readily predicted based on factors including vehicle type, call volume, age, and maintenance considerations.

National Fire Protection Association *1901: Standard for Automotive Fire Apparatus* recommends that fire apparatus 15 years of age or older be placed into reserve status, and apparatus 25 years or older should be replaced.¹⁹ This is a general guideline, and the standard recommends using the following objective criteria in evaluating fire apparatus lifespan:

- Vehicle road mileage.
- Engine operating hours.
- The quality of the preventative maintenance program.
- The quality of the driver-training program.
- Whether the fire apparatus was used within its design parameters.
- Whether the fire apparatus was manufactured on a custom or commercial chassis.
- The quality of workmanship by the original manufacturer.
- The quality of the components used in the manufacturing process.
- The availability of replacement parts.

¹⁹ NFPA 1901: Standard for Automotive Fire Apparatus; Section D.3.

KFD's current replacement schedule replaces engines and aerial apparatus every ten years and ambulances every seven years, which is well under the NFPA recommended replacement schedule. The brush units are used less frequently, so their life span is much longer, up to 15 years or more, depending on the severity of use when deployed.

The following figure is one example of criteria that can be utilized for determining apparatus replacement based on a points system. The method examines age, apparatus mileage or hours, service, condition, and general reliability.

Figure 56: Criteria & Method for Determining Apparatus Replacement

Evaluation Components		Points Assignment Criteria	
Age:		One point for every year of chronological age, based on in-service date.	
Miles/Hours:		One point for each 10,000 miles or 1,000 hours	
Service:		1, 3, or 5 points are assigned based on service-type received (e.g., a pumper would be given a 5 since it is classified as severe duty service).	
Condition:		This category takes into consideration body condition, rust interior condition, accident history, anticipated repairs, etc. The better the condition, the lower the assignment of points.	
Reliability:		Points are assigned as 1, 3, or 5, depending on the frequency a vehicle is in for repair (e.g., a 5 would be assigned to a vehicle in the shop two or more times per month on average; while a 1 would be assigned to a vehicle in the shop an average of once every three months or less.	
Point Ranges		Condition Rating	Condition Description
Under 18 points		Condition I	Excellent
18–22 points		Condition II	Good
23–27 points		Condition III	Consider Replacement
28 points or higher		Condition IV	Immediate Replacement

As an example, ESCI took the current information for Reserve Engine (Unit 200) and applied the above criteria. The following figure summarizes the evaluation.

Figure 57: Reserve Engine (Unit 200) Replacement Grading Example

Evaluation Components	Points
Age: 25	25
Miles/Hours: 194,831	19.4
Service: Heavy Duty	5
Condition: Fair	3
Reliability: Fair	3
Points Total:	55.4 (Immediate Replacement)

ESCI noted that four out of the five reserve engines are the same age and same manufacturer and were rated in poor condition by the Department.

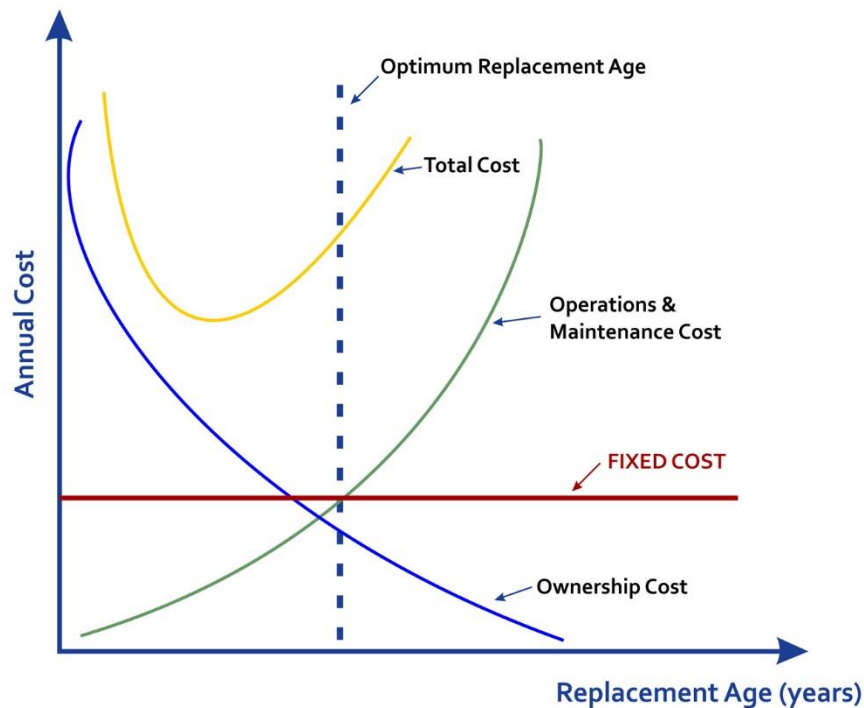
Economic Theory of Apparatus Replacement

A conceptual model utilized by some fire departments is the *Economic Theory of Vehicle Replacement*. The theory states that, as a vehicle ages, the cost of capital diminishes and its operating cost increases. The combination of these two costs produces a total cost curve. The model suggests the optimal time to replace any piece of apparatus is when the operating cost begins to exceed the capital costs. This optimal time may not be a fixed point, but rather a range of time.

Shortening the replacement cycle to this window allows an apparatus to be replaced at optimal savings to the fire department. If an agency does not routinely replace equipment in a timely manner, the overall reduction in replacement spending can result in a quick increase in maintenance and repair expenditures. Fire officials, who assume that deferring replacement purchases is a good tactic for balancing the budget, need to understand two possible outcomes that may occur because of that decision:

- Costs are transferred from the capital budget to the operating budget.
- Such deferral may increase overall fleet costs.

The following figure is a graphic representation of the *Economic Theory of Vehicle Replacement*.

Figure 58: Economic Theory of Vehicle Replacement

Regardless of its net effect on current apparatus costs, the deferral of replacement purchases unquestionably increases future replacement spending needs and may impact operational capabilities and safe and efficient use of the apparatus. KFD's current replacement schedule appears to be a prudent approach that ensures apparatus remain reliable and cost-efficient until they are replaced.

With that said, KFD has ordered one new aerial apparatus, a new rescue unit, and three new engines, which are due to be delivered between November 2021 and January 2022, per the following replacement schedule.

Figure 59: KFD Fire and MEDIC UNIT Apparatus Replacement Plan, 2021–2022

New Unit Assignment	Unit Moved to Reserve Status
Engine 1	Unit 209-Replaces Unit 200
Engine 5	Unit 215
Engine 8	Unit 208-Replaces Unit 220
Ladder 2	Unit 246
Rescue 2	Unit 250
Medic Unit 2270 (Remount)	N/A
Medic Unit 2274 (Remount)	N/A
Replacement Medic Unit	Unit 2281 totaled in collision

Engines 200 and 220 will be decommissioned as engines, but may be retained and maintained as Highway Blocking vehicles for motor vehicle collisions on the PGBT and State highways. ESCI believes that the planned replacement of these vehicles is warranted, given their overall age and mileage.

ESCI also noted the Department's plan to replace its entire fleet of Booster (Brush) units over a span of six years, starting in 2024. While these units currently have relatively low mileage, they operate in the extremely harsh environments often encountered in wildfires. In addition, the Department is now routinely sending these units as part of intrastate and interstate mutual aid deployments around the country, which contributes to the significant apparatus wear and tear.

SERVICE DELIVERY & PERFORMANCE

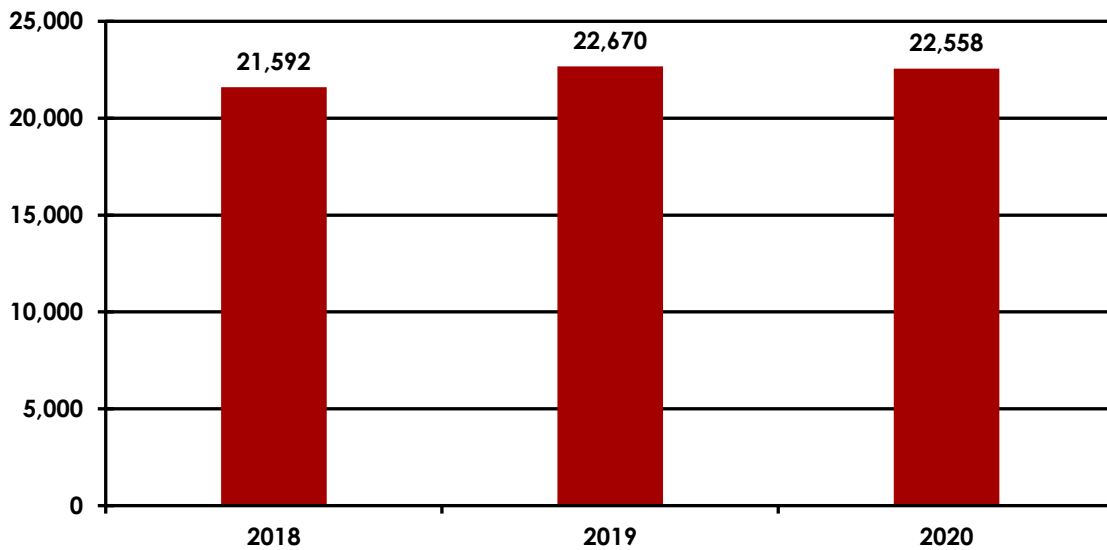
In this section, ESCI reviews KFD's current service delivery and performance for the Killeen Fire Department (KFD) from multiple perspectives, including service demand, resource distribution, resource concentration, resource reliability, and response performance. To provide the highest level of service to the citizens and visitors of the Department, the sum of all these components must be effective and efficient. This is achieved through efficient notifications of incidents and rapid responses from strategically located facilities with appropriate typed apparatus staffed with an adequate number of properly training personnel.

Service Demand Analysis

The service demand analysis reviews current and historical service demand by incident type and temporal variation. GIS software geographically displays service demand. Data for the service delivery and performance analysis was provided from the Department's FireRMS® Record Management System (RMS), and the Bell County 911 Communications Center Computer Aided Dispatch (CAD) system. The RMS data provided was from January 1, 2018, to December 31, 2020. As noted in the applicable figures, effects from SARS-CoV-2 (COVID-19) pandemic on 2020 datasets could cause issues with the overall analysis and must be accounted for.

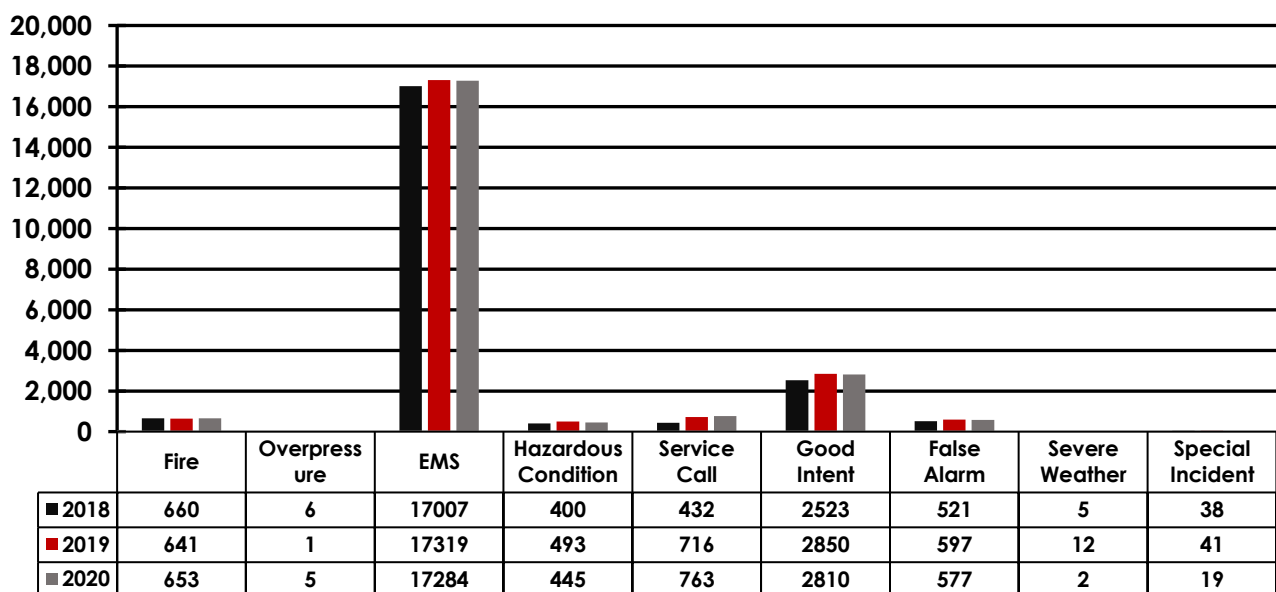
For the response time performance analysis, single incident records had to be extracted from duplicate incident data. This was completed by pulling the best performance in each time category and then removing duplicates. The dataset that was best suited for each analysis was utilized. When analyzing the data, some incidents had separate incident numbers for various types of response units responding to the same incident. For example, ambulances were assigned their own incident number. In these cases, the duplicate incident numbers were converted to a single incident record. A recommendation will be included in this report to correct this issue moving forward and allow for ease of data analysis by the Department.

The next figure displays historical service demand for the KFD for the previous three calendar years.

Figure 60: Killeen Service Demand (2018–2020)

Overall, service demand increased by 4.47% in the years displayed in the preceding figure. While 2020 showed a decrease in demand from 2019, it should be noted that the global outbreak of COVID-19 caused similar downward incident trends for other fire/EMS organizations studied by ESCI in 2020–2021.

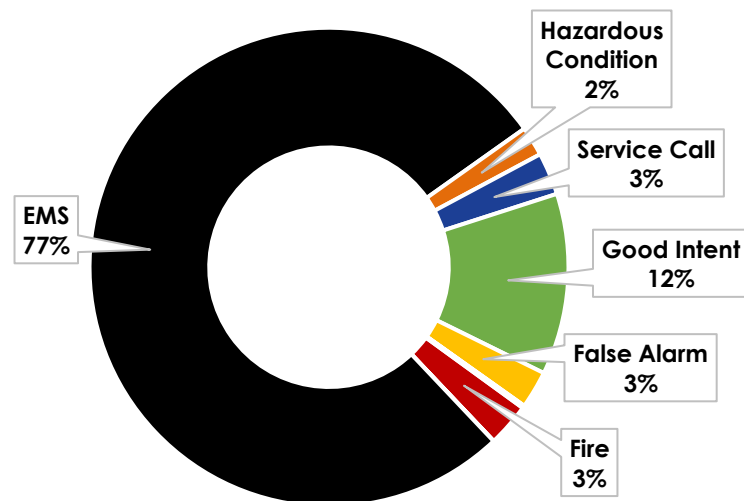
The next figure displays the KFD's overall service demand for the previous three calendar years and a breakdown by the National Fire Incident Reporting System (NFIRS) incident category, including the total number of annual calls.

Figure 61: KFD Service Demand NFIRS Incident Type (2018–2020)

In the preceding figure, incidents coded as “Fires” include all types of fires such as structure, wildland, vehicle, etc. “False Alarms” include manual and automatic fire alarms in which no fire problem was identified. While most NFIRS incident categories showed modest fluctuations in the three-year period, the most notable increase was noted in the Service Calls category. While the total Service Calls are rather low in comparison to total service demand, an increase of 76.62% should be examined further by the KFD administration. EMS incidents within the KFD only increase by 1.63% during this period. While this is a marginal increase, it likely reflects the impact of the COVID-19 pandemic, as EMS responses declined in 2020, similar to other fire/EMS providers studied by ESCI during this time period.

The next figure illustrates the percentages of incident types as a percentage of the total service demand for the KFD.

Figure 62: KFD Service-Demand by NFIRS Incident-Type Percentages (2018–2020)



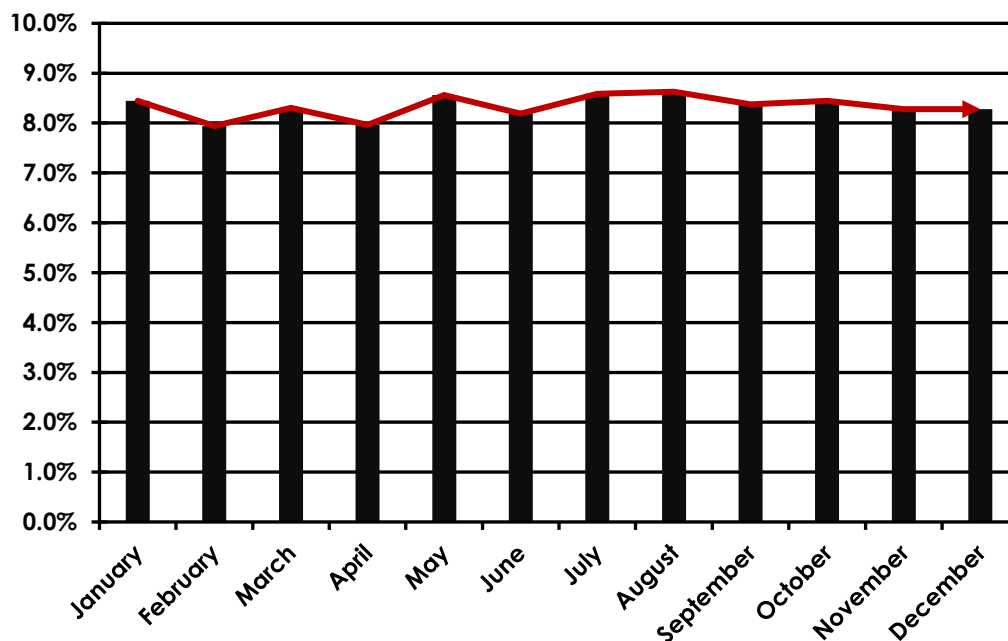
Over the three-year period, the incident type percentages vary from a low of 2% for incidents coded as Hazardous Condition, to a high 77% for EMS. Clearly, the NFIRS data indicates that EMS incidents comprise the highest percentage of service demand during this time, which is not uncommon based on ESCI's experience in studying fire departments that provide pre-hospital EMS care.

Temporal Variation

In ESCI's experience, service demand fluctuates in cyclical patterns. A temporal variation analysis is helpful in order to determine if there are specific trends during various time measurements where staffing can be modified to efficiently meet the varied service demand. In order to determine if these patterns exist, the following figures are presented and each is discussed.

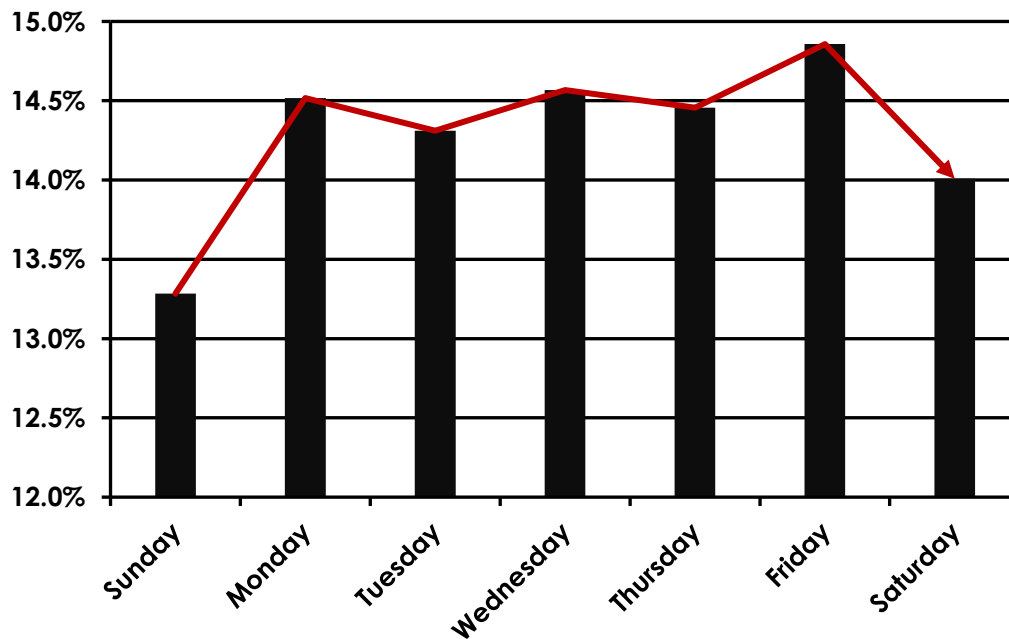
The following figure illustrates service demand by month during the preceding three-year period based on provided data.

Figure 63: KFD Service Demand by Month (2018–2020)



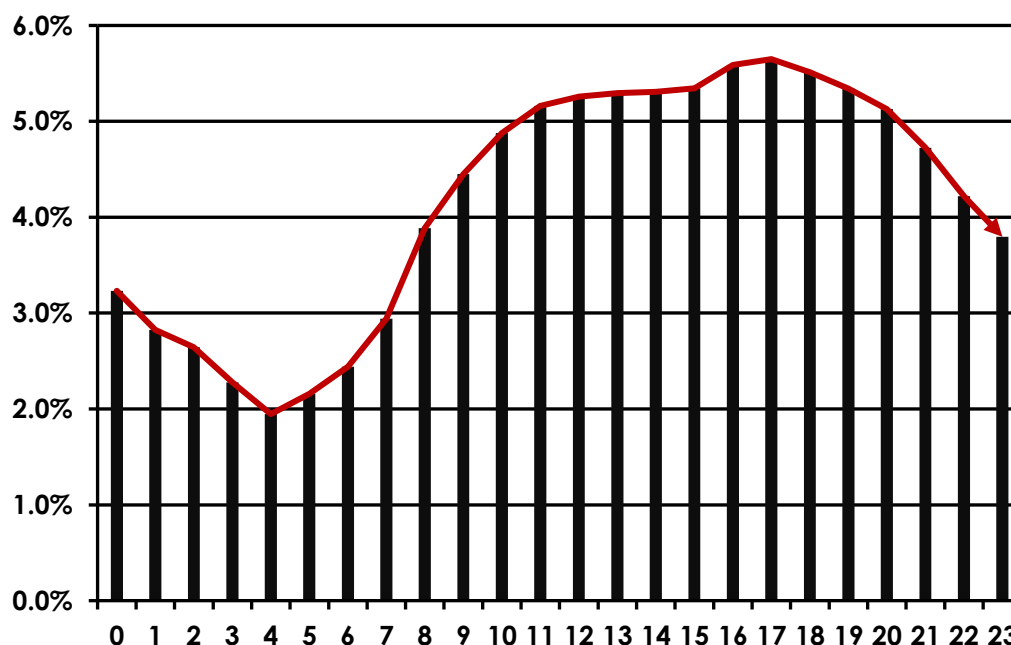
Service demand remained extremely consistent throughout the year with the range between the busiest month and the slowest month at only 0.7%. The busiest month for the KFD was August, which accounted for 8.6% (5,803 incidents) of the service demand. February was the slowest month accounting for 7.9% (5,341 incidents) of the total service demand.

The next figure continues the temporal analysis with an examination of service demand by day of the week.

Figure 64: KFD Service Demand by Day of the Week (2018–2020)

The most noticeable variation occurs during the weekends when service demand decreased. This is typical of most fire departments studied by ESCI, as more activity occurs during the work week, such as an increase in transient population tied to the retail/commercial labor force depending on the area studied. While weekends did exhibit the lowest percentage of service demand in the KFD's service area, overall demand remained relatively consistent throughout the week. During the study period, the difference between the busiest day and the slowest day was only 1.6%. Sundays accounted for 13.3% (8,934 incidents) of service demand making it the slowest day of the week. With 14.9% (9,992 incidents) of service demand, Fridays were the busiest days for the KFD.

The final temporal analysis of service demand examines demand summarized by hour of the day.

Figure 65: KFD Service Demand by Hour of the Day (2018–2020)

Similar to the day of the week, analysis of service demand by the specific time of day also typically reflects the activities of the general population, with service demand increasing during daytime hours and decreasing during nighttime hours, as illustrated in the preceding figure. Incident activity is at its highest between 8:00 a.m. and 8:00 p.m. During this 12-hour period, 61.7% of KFD's overall calls for service occurred, which would be expected. The highest incident activity was 5:00 p.m., with 5.6% (3,799 incidents) of the total activity per day. The slowest hour was 4:00 a.m. which accounted for 1.9% (1,309 incidents) during the study period.

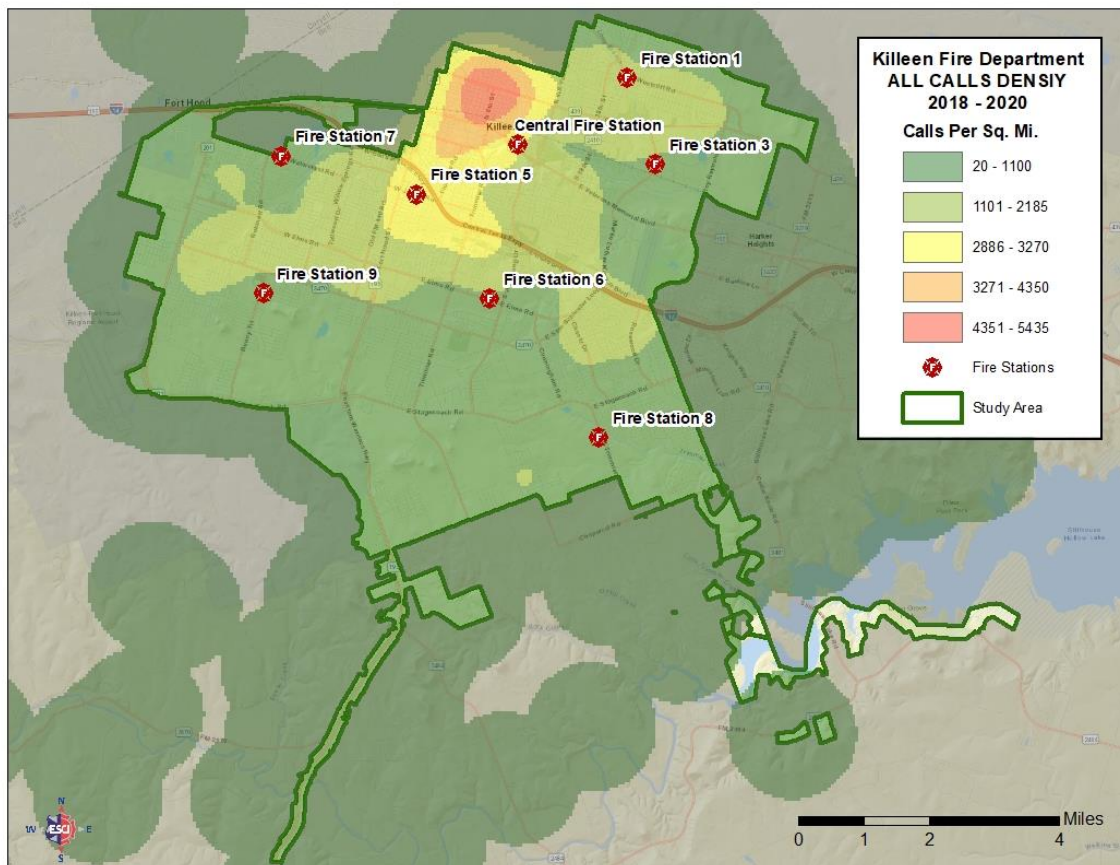
Note that while demand is lower in the early morning hours, nationwide, residential fatal fires occur most frequently late at night or in the early morning. According to the U.S. Fire Administration, from 2014 to 2016, the occurrence of residential fatal fires were highest between 0100 to 0200 hours and 0400 to 0500 hours. The 8-hour peak period (11 p.m. to 7 a.m.) accounted for 48% of residential fatal fires.²⁰

²⁰ Fatal Fires in Residential Buildings (2014–2016), Topical Fire report Series Volume 19, Issue 1/June 2018, U.S. Department of Homeland Security, U.S. Fire Administration, National Fire Data Center.

Geographical Service Demand Analysis

In addition to the temporal analysis of service demand, ESCI examined the geographic distribution of service demand in the KFD service area. Utilizing KFD's CAD data, ESCI used GIS software to plot and analyze historical incident locations for fire and EMS incidents. In the following figures, ESCI illustrates an incident density analysis to determine "Hot Spots," or areas experiencing the highest level of service demand. The next figure illustrates the mathematical density of all incidents on a per square mile basis.

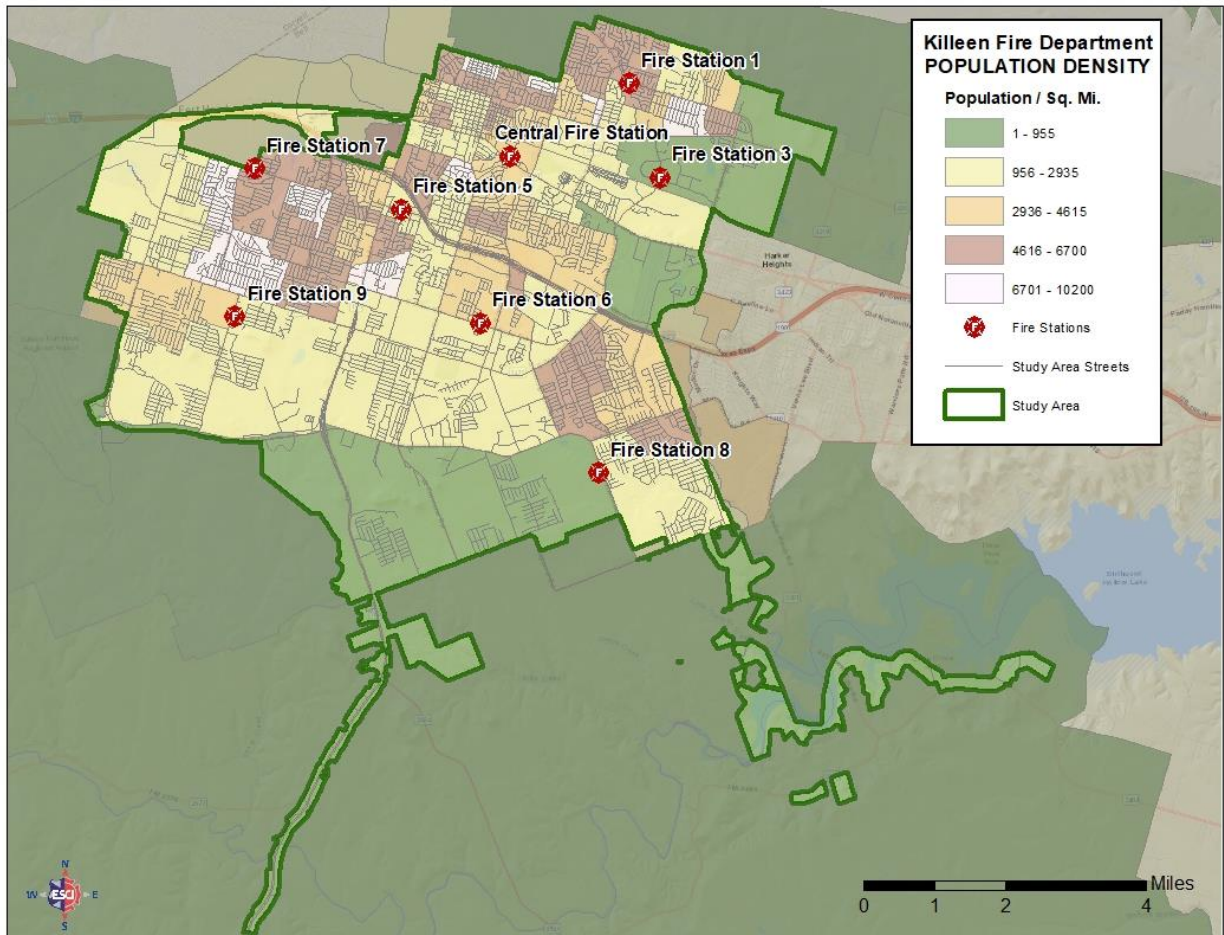
Figure 66: Incident Density (Hot Spot Analysis), 2018–2020



The densest concentration of service demand within the service area was generally located in the northern central region proximate to the Central Fire Station and Station 5. Not surprisingly, the service demand was the highest around both East Veterans Memorial Boulevard/US Business Highway 190 and Interstate 14/US Highway 190. While the areas colored in green indicate a lower call per square mile, it should not be assumed that these areas experience no service demand. The south central region is of particular interest due to the current and planned growth.

As can be expected, areas of high incident density are typically linked to areas of higher population and activity. The next figure illustrates the population density of the KFD service area.

Figure 67: Killeen Population Density

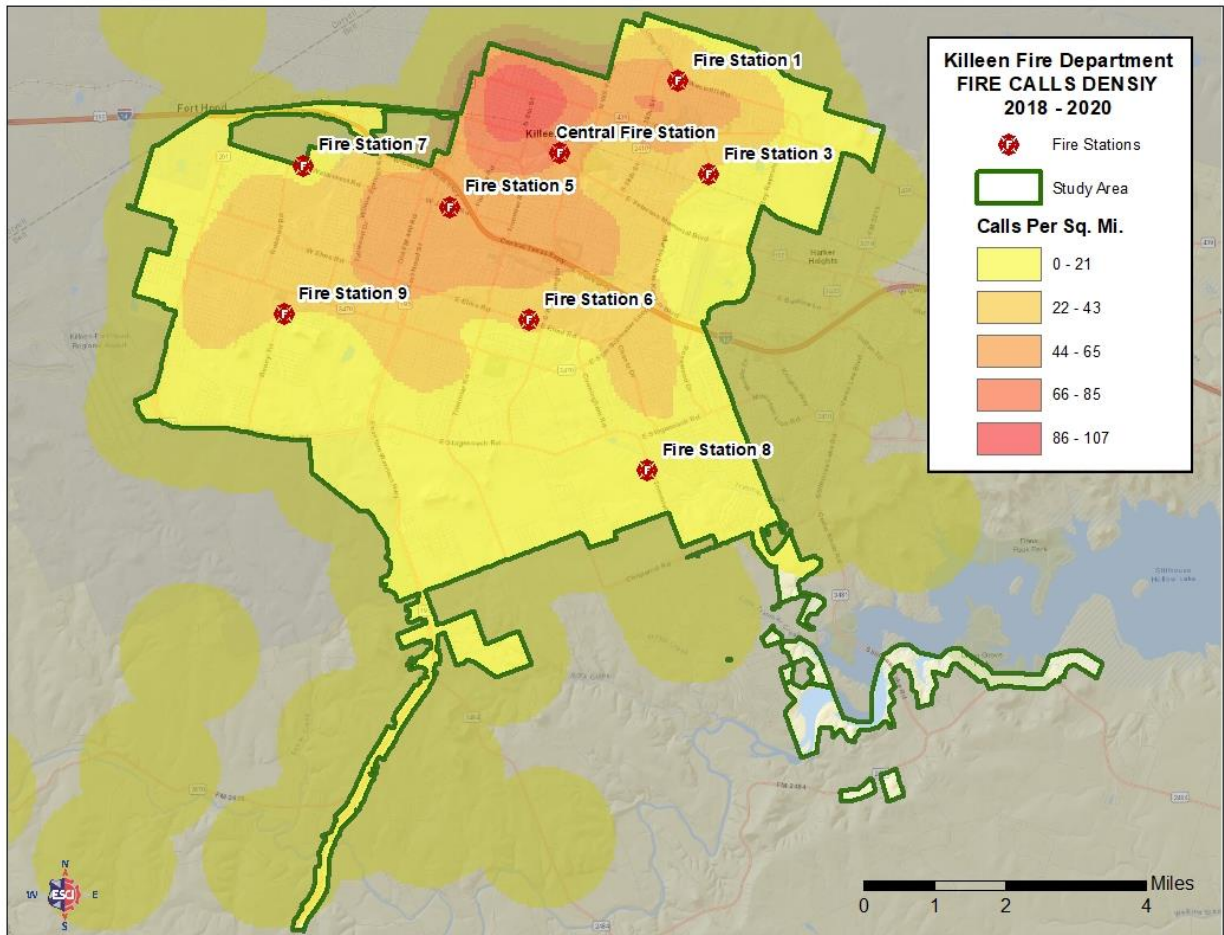


The KFD's fire stations are generally located within or adjacent to areas of higher population density. As previously mentioned, higher population counts typically result in increased service demand. When compared to the previous incident density figure, this holds true for the KFD's service area.

Fire-Related Incidents

The next figure illustrates incidents categorized as fires in the NFIRS data summarized as incidents per square mile.

Figure 68: Fire Incident Density (Hot Spot Analysis), 2018–2020

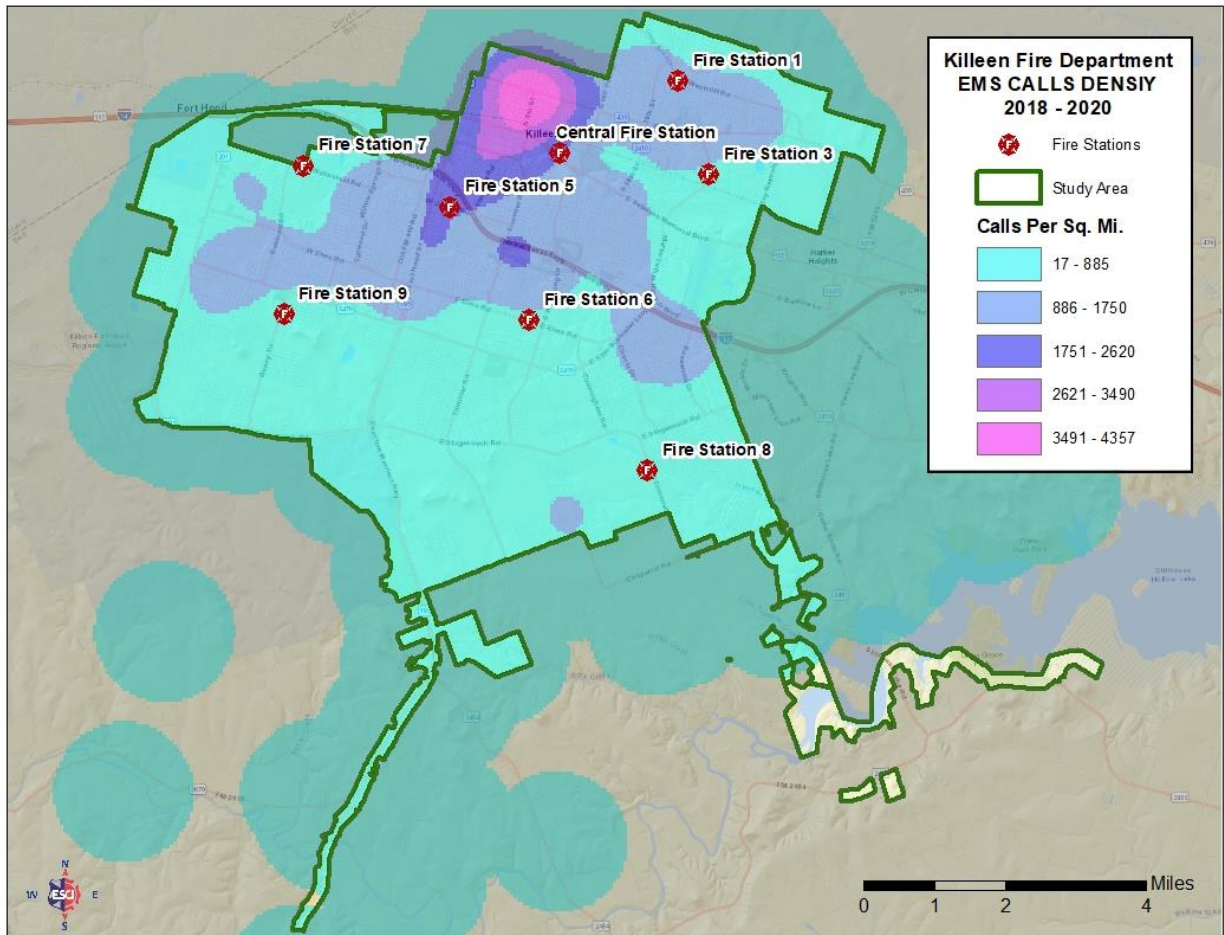


Fire-only incidents are distributed within the KFD's service area in a similar pattern to the overall incidents figure with no noticeable variances. While a majority of fire incidents are concentrated in the northern central region, it is important to maintain an initial and effective fire response capability for the entire service area.

Emergency Medical Incidents

The next figure illustrates the distribution of EMS incidents summarized as incidents per square mile.

Figure 69: EMS Incident Density (Hot Spot Analysis), 2018–2020



As previously discussed, EMS incidents are the primary driver of service demand in KFD's service area. EMS incidents follow a similar pattern to the overall incidents and fire incidents only figures. However, there are two noticeable variances when analyzing the EMS incidents. One area of increased density appears east of Trimmier Road and south of Interstate 14/US Highway 190 in the general location of a business development that houses a Walmart Supercenter. A second area of increased density appears in the south-central region just north of Chaparral Road in the general location of the Killeen Police Department.

Resource Distribution

Next, ESCI analyzed the distribution and deployment of response facilities, apparatus, and personnel throughout the KFD service area. ESCI relies on two national performance standards to provide a benchmark for performance: The Insurance Services Office (ISO) criteria and the National Fire Protection Association (NFPA) standards. These are important standards for comparison purposes because, while ISO focuses on fire suppression capabilities for insurance purposes, NFPA standards establish a foundation for overall system benchmarking for fire suppression, EMS, rescue, and other activities fire departments may be required to perform. The distribution of resources is examined by geographical location and by travel time over the existing road network. In addition, water system (hydrant) distribution and coverage are evaluated.

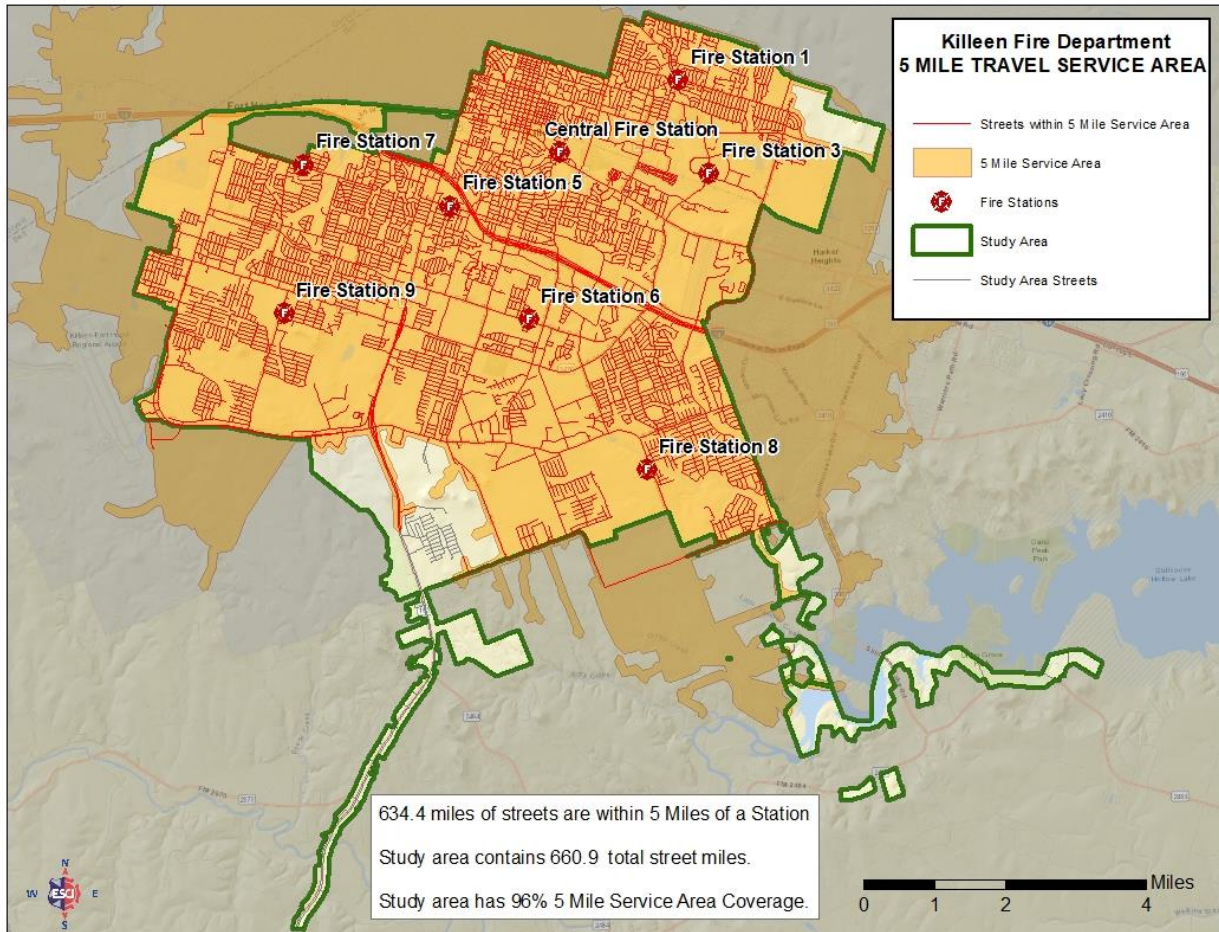
ISO Distribution

ISO™, a subsidiary of Verisk Analytics®, is a national insurance industry organization that evaluates fire protection for communities across the country. ISO assesses all areas of fire protection as broken down into four major categories, including emergency communications, fire department, water supply, and community risk reduction. Following an on-site evaluation, or virtual visit in the COVID-19 era, a Public Protection Classification (PPC™) number is assigned to the community ranging from 1 (best protection) to 10 (no protection). The PPC score is developed using the Fire Suppression Rating Schedule (FSRS), which outlines sub-categories of each of the four major categories, and details the specific requirements for each area of evaluation.

A community's ISO rating is an important factor when considering fire station and apparatus distribution and deployment due to its potential effect on the rates for residential and commercial fire insurance. The ability of a fire department to arrive on the scene of an incident equipped with personnel, equipment, and water sufficient to effectively suppress a fire is a critical factor during an ISO evaluation. To determine whether or not a structure is eligible to receive a PPC rating better than 10, a measure of five road miles from a fire station is generally used. Typically, areas outside of five road miles may be subject to a split ISO rating if the fire department can demonstrate sufficient fire flow is available. In addition, to receive maximum credit for station and apparatus distribution, ISO evaluates the percentage of the community (contiguously built upon area) that is within specific distances of both engine/pumper companies (1.5 miles) and aerial/ladder/truck companies (2.5 miles).

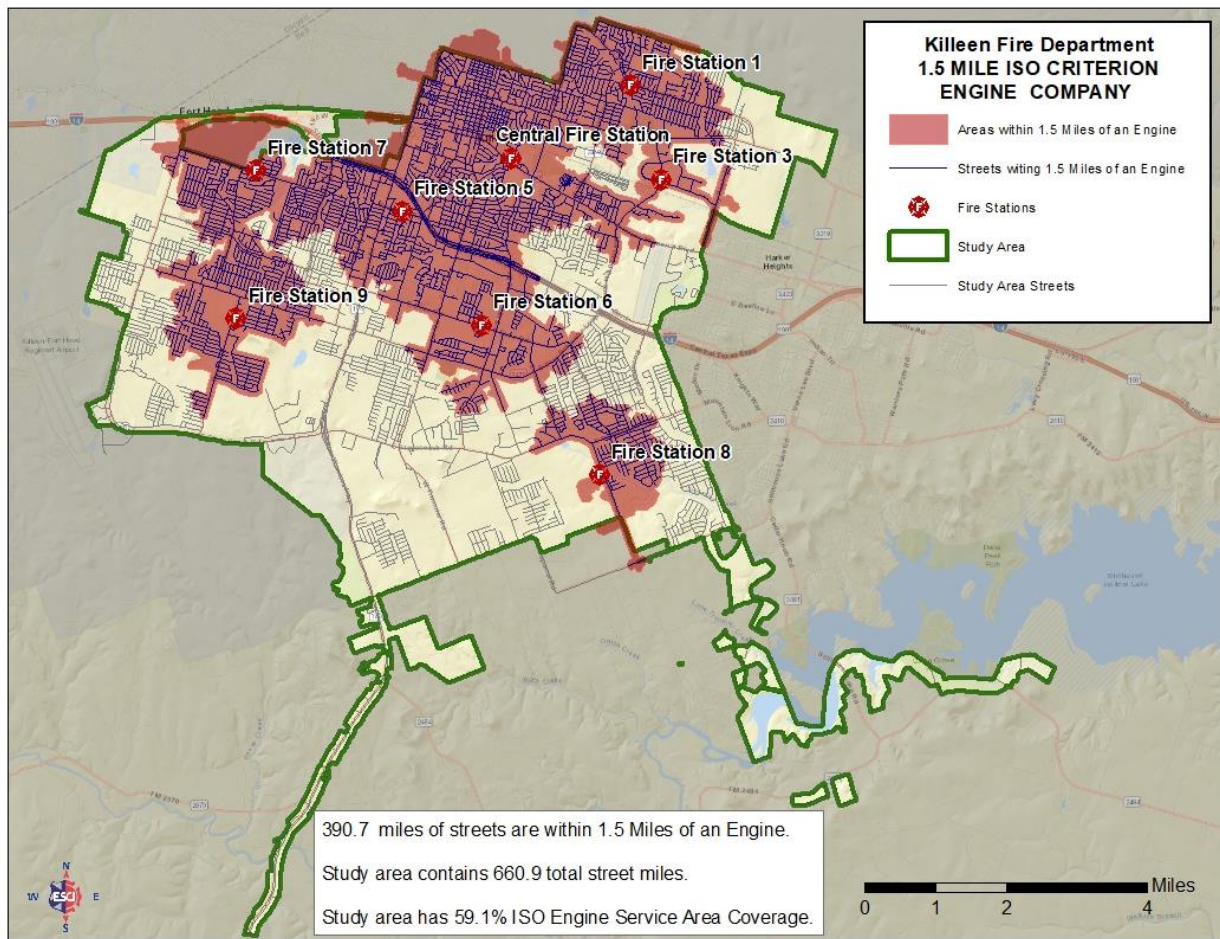
The next figure illustrates fire station distribution for the KFD service area and the roadways within the ISO required 5 miles of travel distance.

Figure 70: KFD Station Distribution, ISO 5-Mile Travel Distance Criteria



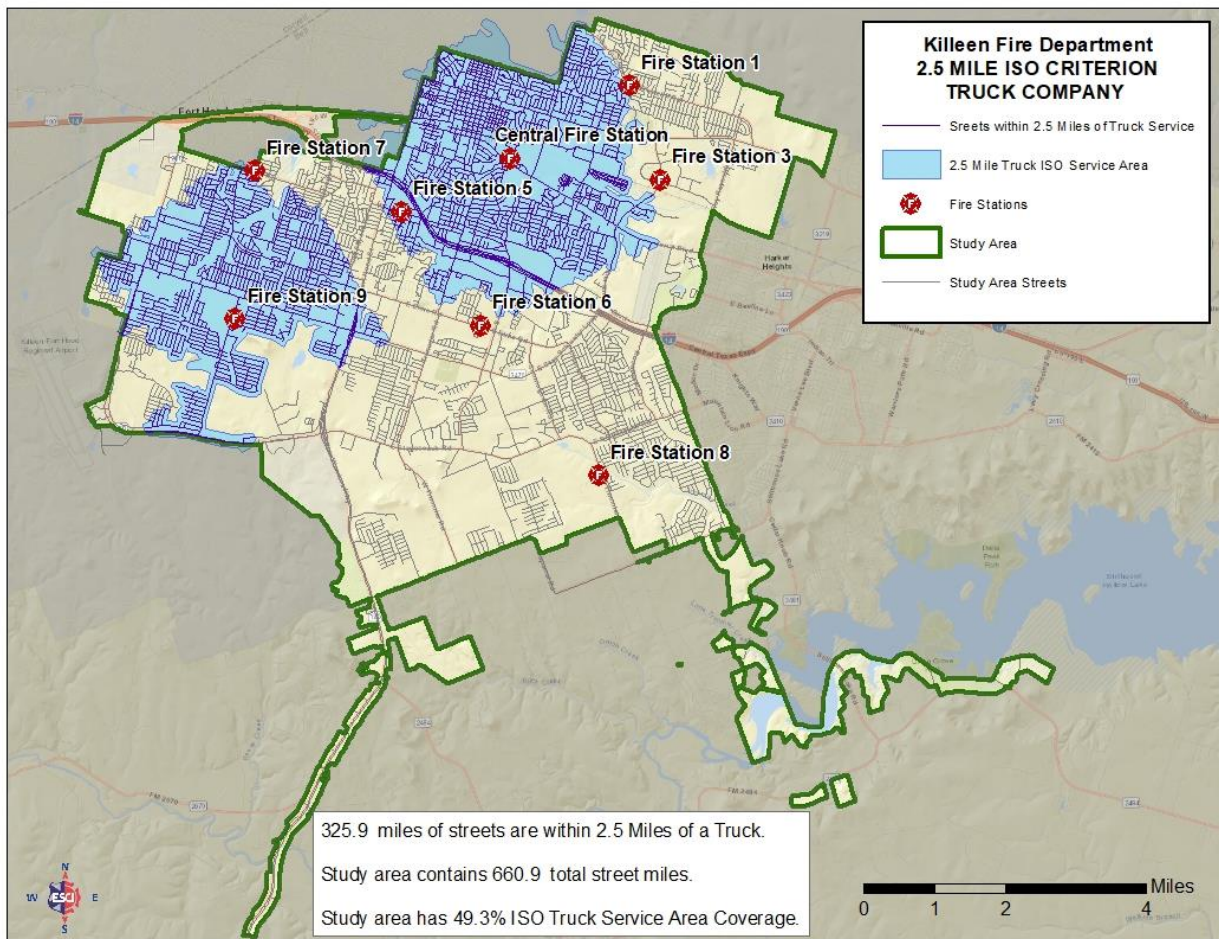
As would be expected, the areas centrally located around the eight KFD fire stations meet the 5-mile ISO coverage requirement. In total, 634.4 miles of the 660.9 miles of roadways with the service area fall within the 5-mile coverage requirement equaling 96.5% of total coverage.

The next figure illustrates engine company distribution for the KFD service area and the roadways within the ISO required 1.5 miles of travel distance.

Figure 71: KFD Station Distribution, ISO 1.5-Mile Engine Company Criteria

The KFD operates engines or engine capable units from all eight fire stations. As measured from the facility in which they are housed, KFD engine companies are deployed such that 59.1% of the road network in the service area are within the ISO 1.5 miles of travel distance (390.7 miles). This leaves 40.9% of the road network outside of the ISO required 1.5 miles of travel distance (270.2 miles).

The next figure illustrates truck company distribution for the KFD service area and the roadways within the ISO required 2.5 miles of travel distance.

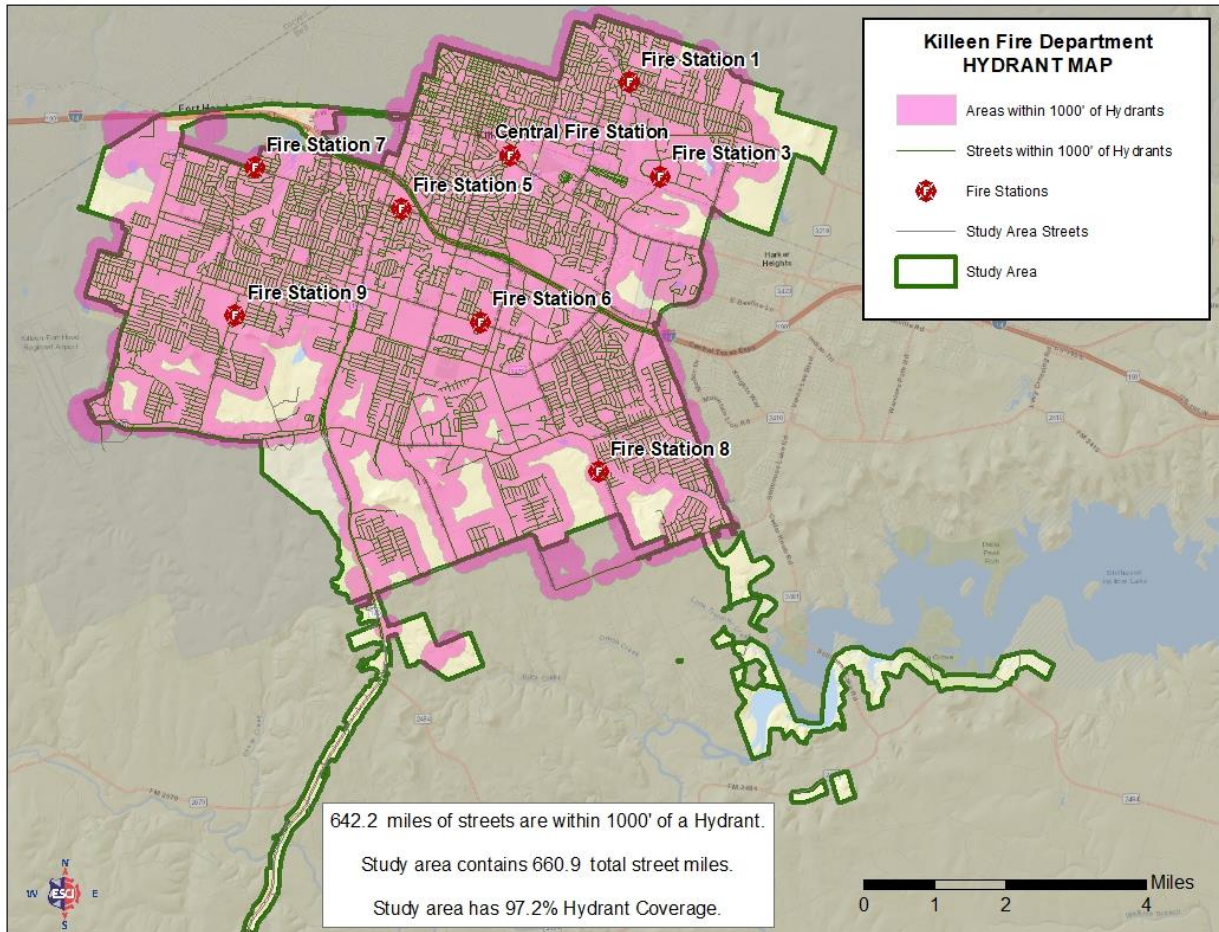
Figure 72: KFD Station Distribution, ISO 2.5-Mile Truck Company Criteria

The KFD operates two truck companies that respond out of the Central Fire Station and Fire Station 9. This limited deployment does leave gaps as overall, less than fifty percent (49.3%) of the road network in the district are within the ISO 2.5 miles of travel distance (325.9 miles). This leaves 50.7% of the road network outside the ISO required 2.5 miles of travel distance (335 miles).

ISO also evaluates a community's availability of a sufficient water supply, critical for extinguishing fires, and the location of fire hydrants throughout the service area. Based on ISO scoring, structures located beyond a 1,000-foot radius of a fire hydrant could be subject to a Class 10 rating. Exceptions are made when a fire department can show adequate water is available to provide the needed volume of water for fire suppression activities for a specific period of time. This could be provided by items such as a dry hydrant storage tank of 30,000 gallons or more, or a suitable water tanker shuttle operation.

The next figure illustrates fire hydrant distribution within the KFD service area and the roadways within the ISO criteria 1,000-foot radius.

Figure 73: Killeen Hydrant Distribution, ISO Criteria

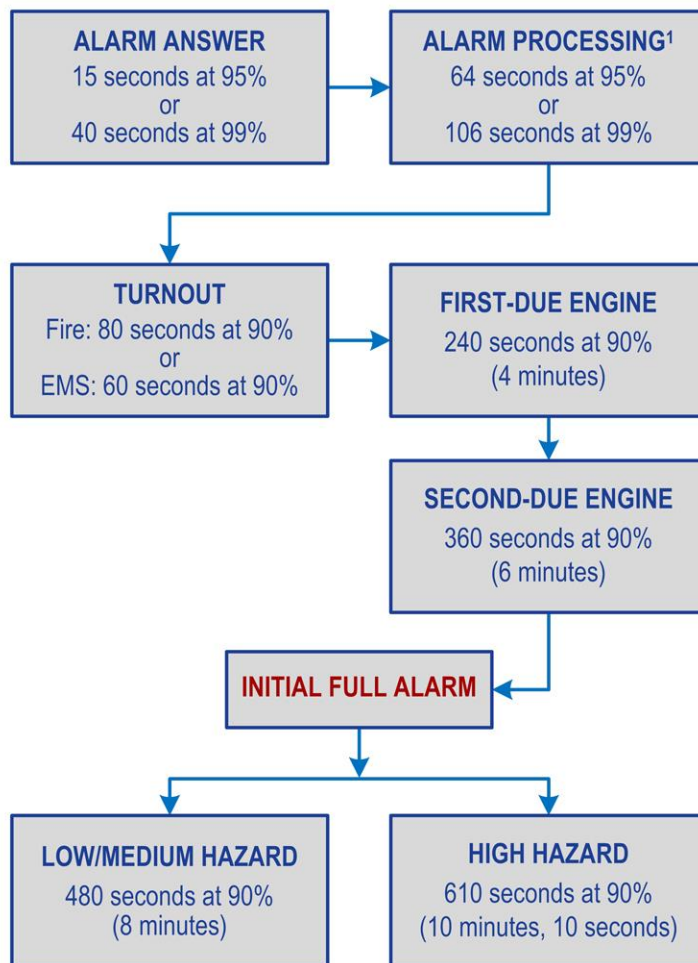


The availability of fire hydrants within the City of Killeen is abundant. A high percentage (97.2%) of roads in Killeen falls within the 1,000-foot radius of a fire hydrant as required by ISO (642.2 miles). This leaves only 2.8% of the roads outside of the 1,000-foot radius (18.7 miles). While this is impressive, other factors are considered when providing a final ISO water supply score, including flow rates and capacities, inspections, flow testing, and record-keeping.

NFPA 1710

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*, provides travel time goals for fire, EMS, and special operations emergency responses.²¹ The next figure illustrates this standard while also including alarm processing (call processing) and turnout time.

Figure 74: NFPA 1710 Standards

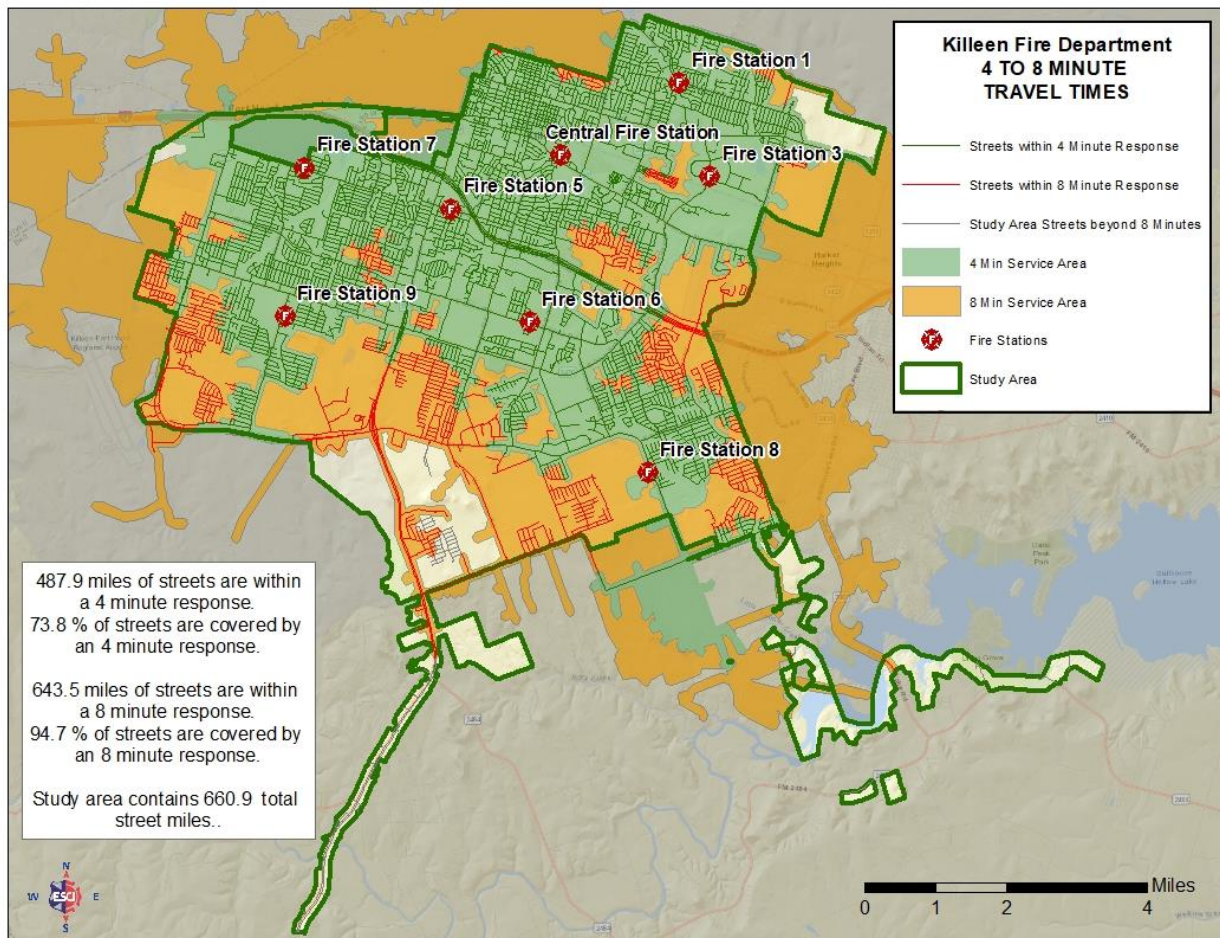


¹From NFPA 1710, which references NFPA 1221 (2019), which states high-priority incidents should be at 60 seconds or less at 90%.

²¹ 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* (National Fire Protection Association 2010).

As illustrated in the preceding figure, NFPA 1710 specifies that fire departments deploy resources such that 90% of emergency service demand can be reached in four minutes travel time or less. Additionally, the standard recommends that the full first alarm assignment (called the effective response force) should arrive in eight minutes of travel or less at a low to medium hazard fire suppression incident (measured at the 90th percentile). The next figure illustrates this standard from the eight KFD fire stations. The figure is based upon theoretical travel times using historical traffic data for traffic patterns at 8 a.m. on Monday mornings.

Figure 75: 4 and 8-Minute Travel Time, NFPA 1710 Criteria



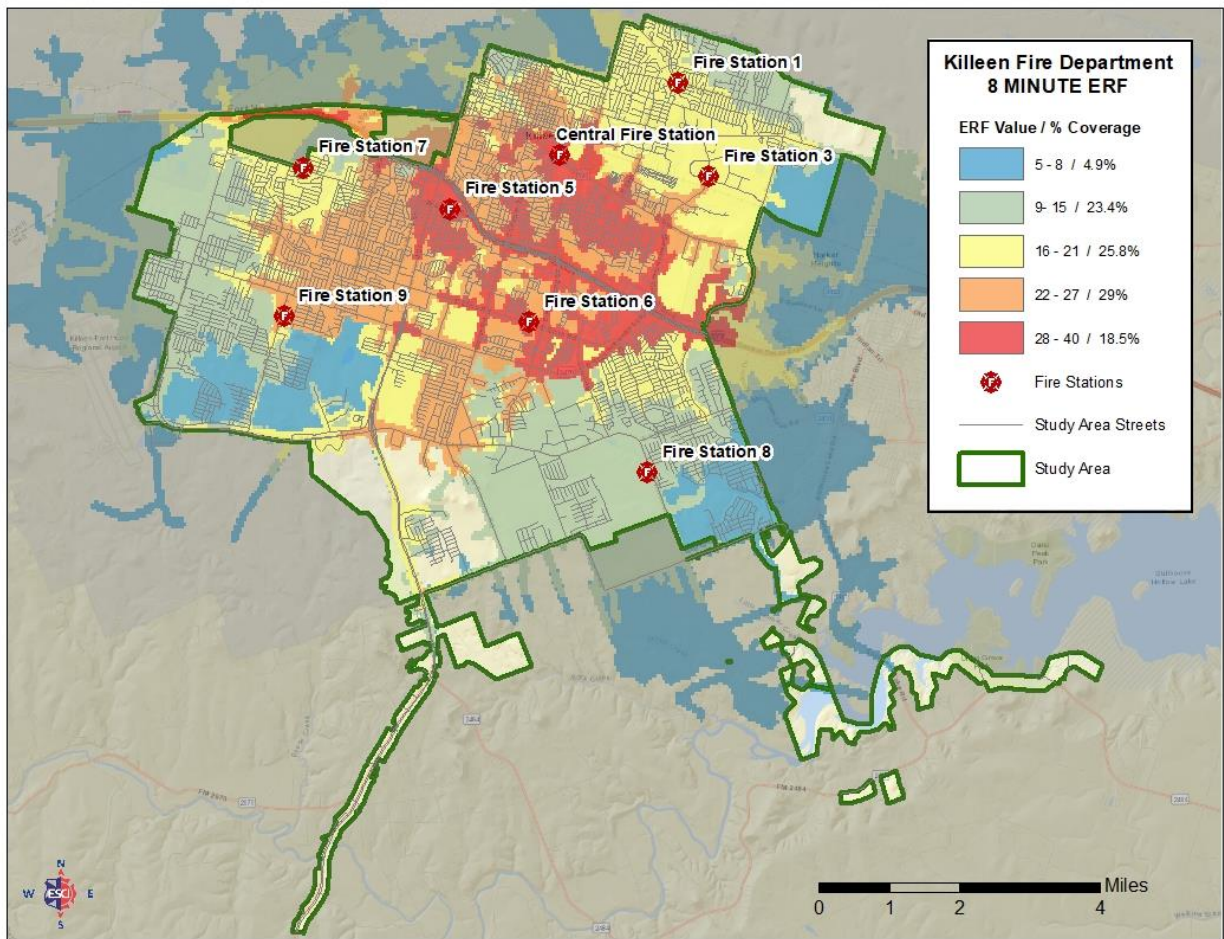
The quality and connectivity of the street network, traffic, geography, and barriers can all affect potential travel time performance. The 4-minute travel time criterion is accomplished in 73.8% of the geographic locations within the KFD service area (487.6 miles). It should be noted that these locations do include the areas of increased incident density when compared to previous figures. However, the south-central region is of particular interest and concern due to the current and planned growth. The 8-minute travel time criterion for the full alarm assignment on low to medium hazard incidents is accomplished through much of the KFD service area resulting in 94.7% coverage (643.5 miles).

It should be noted that the NFPA 1710 response time criteria is not mandated or codified. However, it is an industry best practice and should be viewed as a desirable goal. Also, note that the travel time model does not measure actual travel time performance. The preceding models only demonstrate theoretical travel times on the existing road network and assume apparatus are responding from their assigned stations.

Resource Concentration

Accepted firefighting procedures call for the arrival of the entire initial assignment or Effective Response Force (ERF), which is the sufficient number of apparatus and personnel to effectively mitigate an incident based on its level of risk within a reasonable amount of time. NFPA 1710 stipulates that this "reasonable amount of time" equals eight minutes of travel time. Specifically, the 1710 standard states that the full first alarm assignment for a low to moderate risk structure fire (single story residential structure) should arrive within eight minutes from the time of beginning a response.

The next figure examines the KFD's ERF that theoretically can be assembled in eight minutes or less from the current fire station locations.

Figure 76: Effective Response Force (ERF) 8-Minute Travel

As illustrated in the preceding figure, the central region of Killeen has the greatest ERF concentration of firefighters as currently deployed by the Department. This concentration diminishes significantly in the outer regions of the service area, which is typical in many similar-sized cities studied by ESCI. As will be described in later narratives and charts, critical task staffing is required to mitigate specific incidents requiring a response from numerous fire stations. Typically, geography, road network, and travel distances between stations can negatively affect the time required to assemble an effective response force for incidents that exceed the capabilities of a single engine company.

The fire service assesses the relative risk of properties and occurrences based on several factors. Properties with high fire risk often require greater numbers of personnel and apparatus to effectively mitigate the fire emergency; properties with lower risk may require fewer people, apparatus, and equipment. Staffing and deployment decisions should be made with consideration of the level of risk involved. The *Commission for Public Safety Excellence*® (CPSE) uses the following levels of risk categories:

- **Low risk**—Areas and properties used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- **Moderate risk**—Areas and properties used for medium density single-family residences, small commercial and offices uses, low-intensity retail sales and equivalently sized business activities.
- **High or Maximum risk**—Higher density businesses and structures, mixed use areas, high density residential, industrial, warehousing, and large mercantile structures.

The following figure shows one example of critical task resource requirements and recommended number of personnel for fires which was adapted from the *Community Risk Assessment and Standard of Cover*, by the CPSE. This is for illustration purposes only and does not necessarily reflect the critical tasks or number of personnel recommended for structure fires.

Figure 77: Example of Critical Task Staffing Analysis based on Risk

	Structure Maximum Risk	Structure High Risk	Structure Moderate Risk	Non- Structure Low Risk
Attack Line	4	4	2	2
Back-up Line		2	2	(2)
Support for Hose Lines/Water Supply		3	2#	
Ventilation	4	2	2	
Search and Rescue	4	2	2	
Forcible Entry/Support		2	2	
Standby/Rapid Intervention Team	4	2	2	
Driver/Pump Operator	1	1	1	1
2nd Apparatus/Ladder Operator		1		
Command	2	1	1	1#
Communications/Safety	1	1	1	
Accountability		1		
Salvage				
Rehabilitation	2			
Building Fire Pump Monitor	(1)			
Attack line—Floor Above the Fire	2			
Evacuation Management Teams	4			
Elevator Operations Manager	1			
Lobby Operations	1			
Transport Equipment to Staging	2			
EMS Crews	4			
Division/Group Supervisors	4			
Total	40–41	22	16–17	3–6

(1) indicates tasks may not be required at all incidents. # indicates task may be completed concurrently with others.

This methodology may be used to determine the number and type of resources required for any incident type. Four scenarios of commonly encountered emergencies are a non-structural fire, hazardous materials incident, a traffic collision with trapped victim, and a medical emergency.

The next figures illustrate an example for each.

Figure 78: Sample Non-Structure Fire Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Total	4

Figure 79: Sample Emergency Medical Incident Critical Tasking

Task	Personnel
Command	1
Patient Care	2
Total	3

Figure 80: Sample Motor Vehicle Collision with Entrapment Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Extrication	3
Patient Care	2
Total	9

Figure 81: Sample Hazardous Materials Incident Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Back-Up Line	2
Support Personnel	7
Total	13

In summary, critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents to control the situation, stop loss, and to perform necessary tasks required for a medical emergency.

The preceding figures are provided as an example for these types of incidents, although ESCI recommends the KFD conduct its own field validation exercises with their crews, including automatic aid resources, to verify the critical tasking analysis provided. After field validation is complete, the Department may find that the critical tasking can be adjusted appropriately upward or downward for each incident type.

The previously mentioned minimum staffing criteria can be used as a planning tool in setting specific service level objectives for each of the incident types.

Resource Reliability

The workload of emergency response units can be a factor in rapid response time performance. If a response unit is unavailable for any reason, then a unit from a more distant station (or mutual/automatic aid department) must respond. This can obviously increase the overall response time. Although fire stations and units may be distributed in a manner to provide quick response, as discussed earlier, that theoretical level of performance can only be achieved if the response unit is available in its primary response territory. ESCI evaluates unit workload using two metrics: Incident Concurrency and Unit Hour Utilization (UHU).

Incident Concurrency

Concurrent incidents—and the amount of time individual units are committed to an incident—can affect a jurisdiction's ability to muster enough resources to respond in a timely manner to additional emergencies. The next figure summarizes the frequency in which the KFD handled multiple incidents occurring at the same time within its service area for the three-year study period.

Figure 82: Call Concurrency (2018–2020)

Number of Incidents	Concurrency Percentage
Single Incident	2.0%
2	12.5%
3	21.7%
4	23.2%
5	17.9%
6	11.4%
7	6.1%
8	2.9%
9	1.3%
10 or more	1.1%

During the preceding three-year period, a non-concurrent incident happened only 2.0% of the time, while two simultaneous incidents occurred 12.5% of the time, and three or more incidents occurred concurrently 85.6% of the time, which indicates an overall high incident workload for the Department, especially for the medic units.

Unit Hour Utilization

Unit hour utilization (UHU) describes the amount of time that a unit is not available for response because it is already committed to another incident. The larger the number, the greater its utilization and the less available it is for assignment to subsequent calls for service. UHU rates are expressed as a percentage of the total hours in a year.

In May 2016, Henrico County (VA) Division of Fire published an article after studying its department's EMS workload. As a result of the study, Henrico County (VA) Division of Fire developed a general commitment factor scale for its department.

The next figure illustrates a summary of these findings as it relates to commitment factors.

Figure 83: Commitment Factors as Developed by Henrico County (VA) Division of Fire, 2016²²

Factor	Indication	Description
0.16–0.24	Ideal Commitment Range	Personnel can maintain training requirements and physical fitness and can consistently achieve response time benchmarks. Units are available to the community more than 75% of the day.
0.25	System Stress	Community availability and unit sustainability are not questioned. First-due units are responding to their assigned community 75% of the time, and response benchmarks are rarely missed.
0.26–0.29	Evaluation Range	The community served will experience delayed incident responses. Just under 30% of the day, first-due ambulances are unavailable; thus, neighboring responders will likely exceed goals.
0.30	Line in the Sand	Not Sustainable: Commitment Threshold—community has less than a 70% chance of timely emergency service, and immediate relief is vital. Personnel assigned to units at or exceeding 0.30 may show signs of fatigue and burnout and may be at increased risk of errors. Required training and physical fitness sessions are not consistently completed.

The next figure displays the total time the KFD's apparatus were committed to an incident in 2018–2020, according to the records provided. While all units were analyzed, only those with a UHU of greater than 1% are included in the figure.

²² How Busy Is Busy?; Retrieved from <https://www.fireengineering.com/articles/print/volume-169/issue-5/departments/fireems/how-busy-is-busy.html>

Figure 84: Unit Hour Utilization (2018–2020)

Unit	# of Calls	Total Hours	Avg. Time Committed	UHU
T 2	1,422	471:40:39	0:27:37	1.79%
ENG 9	1,712	480:13:33	0:17:50	1.83%
ENG 6	2,331	727:43:10	0:18:59	2.77%
RES 9	2,457	827:27:53	0:26:30	3.15%
ENG 8	2,365	878:52:26	0:22:33	3.34%
ENG 1	2,930	900:32:21	0:18:34	3.42%
ENG 7	2,728	925:44:42	0:20:41	3.52%
ENG 3	2,746	968:56:09	0:21:19	3.68%
L 6	3,017	982:03:33	0:20:54	3.73%
RES 2	6,270	1654:08:49	0:18:24	6.29%
ENG 5	5,969	1895:08:33	0:19:13	7.20%
MED 7	6,287	5238:57:40	0:51:20	19.92%
MED 8	5,525	5454:21:42	1:00:23	20.74%
MED 3	6,256	5709:54:30	0:56:31	21.71%
MED 9	6,411	6155:52:45	0:58:34	23.40%
MED 1	6,695	6185:43:46	0:56:45	23.52%
MED 6	8,837	7732:57:47	0:53:51	29.40%
MED 5	9,170	8137:59:00	0:54:28	30.94%
MED 2	10,292	9459:30:49	0:56:15	35.96%

The KFD's average time in which apparatus were committed to an incident over the proceeding three-year period was 0:35:50. This placed the KFD's apparatus at an average UHU of 12.96%. As shown in red in the preceding figure, MED units 2, 5, and 6 had UHUs near or over 30%. Given the significant workload on Medic 2, an additional medic unit (Medic 22) will be added as a full-time medic unit in 2022. Medic 2's current response zone will be shared with Medic 22. A GIS analysis of historical incidents during the three-year study period shows that out of 11,308 incidents, 6,868 (61%) occurred within the new Medic 22 response zone.

ESCI has found that UHU rates in the range of 25 to 30% can negatively affect response performance and possibly lead to personnel burnout issues. UHU rates higher than 30% tend to cause system failures in other areas, such as response time performance and fire effective response force (ERF) delivery degradation. When UHUs approach and exceed 30%, this implies that units are available only 70% of the time in their first due areas. It should also be noted that this analysis only looks at incident activity and does not measure the amount of time dedicated to training, public education and events, station duties, or additional duties as assigned.

Response Performance

In the following response performance analysis, ESCI used KFD's January 2018 through December 2020 incident data. Mutual aid incidents outside the study area, data outliers, and invalid data were removed from the data set whenever possible. Response performance is measured from when the 911 call is received in the dispatch center until the fire/EMS unit(s) arrives on the scene.

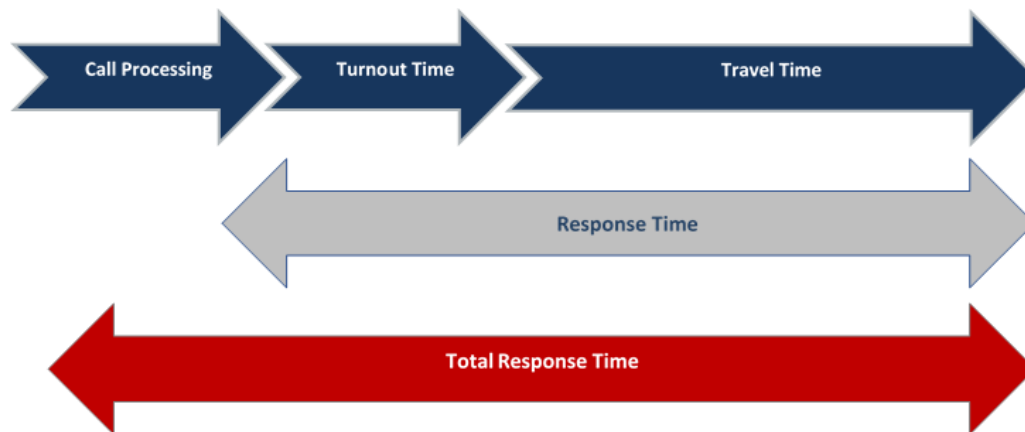
In analyzing response performance, 90th percentile measurements of response time performance of the KFD were generated. The use of percentile calculations for response performance follows industry best practices and is considered a more accurate measure of performance than "average" calculations. Commonly, the "average" measure is used as a descriptive statistic also called the mean of a data set. ESCI does not use averages in response performance analysis since it may not accurately reflect the performance for the entire data set and can be skewed by data outliers. One particularly good or bad value could skew the average for the entire set. Percentile measurements are a better measure of performance since they show that most of the data set has achieved a particular level of performance.

Fire service best practice documents such as the Center for Public Safety Excellence (CPSE) *Community Risk Assessment: Standards of Cover*, the *NFPA 1710 Standard for Career Fire Departments*, and *Special Operations to the Public by Career Fire Departments* recommend measuring emergency response time performance at the 90th percentile; meaning 90 percent of emergency responses occur in the stated value or less.^{23,24} In basic terms, the 90th percentile means that ten percent of the values are greater than the value stated, and all other data is at or below this level. This can then be compared to the desired performance objective to determine the degree of success in achieving the goal.

Industry best practices recommend measuring response performance from the time the emergency call is received at the dispatch center to the arrival of the first fire department apparatus. Tracking the individual components of the total response time allows for identifying deficiencies and areas for improvement.

While progressing through the performance analysis, it is important to understand that each of the components of response performance is not cumulative. Each is analyzed as an individual component and the point at which the fractile percentile is calculated exists in a set of data unto itself, as shown in the following figure.

Figure 85: NFPA 1710 Response Time Measurements



²³ Center for Public Safety Excellence (CPSE) *Community Risk Assessment: Standards of Cover*.

²⁴ *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* (National Fire Protection Association 2016).

The response time continuum—the time between when the caller dials 911 and when assistance arrives—is comprised of several components. The following are the individual components analyzed in this section.

- **Call Processing Time:** The amount of time between when a dispatcher answers the 911 call and resources are dispatched.
- **Turnout Time:** The time interval between when units are notified of the incident and when the apparatus are responding.
- **Travel Time:** The amount of time the responding unit takes to travel to an incident.
- **Response Time:** A combination of turnout time and travel time. This is the most commonly utilized measure of fire department response performance.
- **Total Response Time:** The time interval from the receipt of the alarm at the dispatch center to when the first emergency response unit arrives at an incident.

Total response time is the amount of time a resident or business waits for resources to arrive at the scene of an emergency, beginning when they first call 911. This process begins for the KFD once the appropriate unit is dispatched by the communications center. The NFPA standard for call processing is derived from *NFPA 1221 Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*. Similarly, NFPA 1710 provides response time measurements for career fire departments and is considered an industry best practice. These standards are illustrated in the next figure.

Figure 86: NFPA 1710 Standard for Fire/EMS Response

Response Interval	NFPA Standard
Alarm Processing (NFPA 1221)	60 seconds or less at 90% for High Acuity Calls
Turnout Time	60 seconds or less at 90% for EMS 80 seconds or less at 90% for Fire and Special Operations
Travel Time	240 Seconds or less at 90% for the first arriving unit

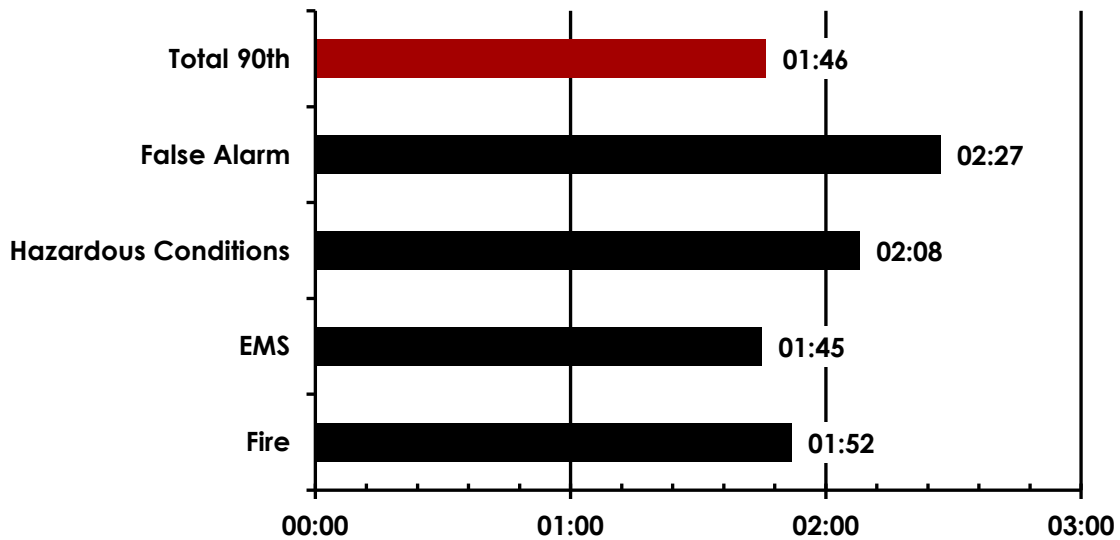
The KFD has not established any additional internal response performance goals.

While ISO™ does not specify these specific numbers under their “Fire Department” section of FSRS PPC® review, they do describe the expectation under “deployment analysis.” Specifically, ISO™ states that “the timing is in accordance with the general criteria in NFPA 1710.”

Call Processing Time

The call processing component includes the time at which dispatch receives the call to when the resources are dispatched. The following figure illustrates call processing performance for the KFD's response area at the 90th percentile.

Figure 87: Call Processing Time Performance (2018–2020)



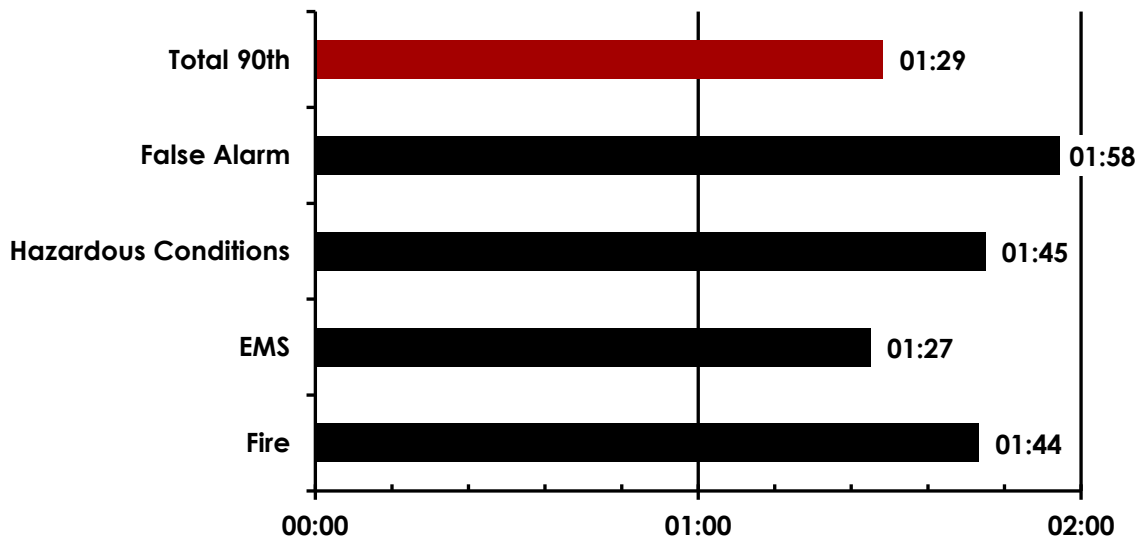
At the 90th percentile for all noted categories, Bell County's call processing performance of 01:46 exceeded the NFPA 1221 recommendation of 60 seconds or less for high acuity calls. Incidents coded as False Alarms resulted in the slowest call processing time at 02:27. Bell County also has an internal call processing goal of less than 90 seconds for Priority 1 incidents which was also exceeded in actual performance.

Turnout Time Performance

The turnout time component begins when emergency personnel are notified to respond by the dispatch center and ends when an apparatus begins to respond. Turnout time is an important piece of total response performance and can be influenced by factors such as station design, apparatus staffing and the performance of the assigned personnel. Because of this, turnout time is one area of the overall response time that field personnel have some ability to control.

The next figure illustrates the KFD's 90th percentile turnout time performance for the first apparatus on-scene at an emergency incident.

Figure 88: Turnout Time Performance (2018–2020)

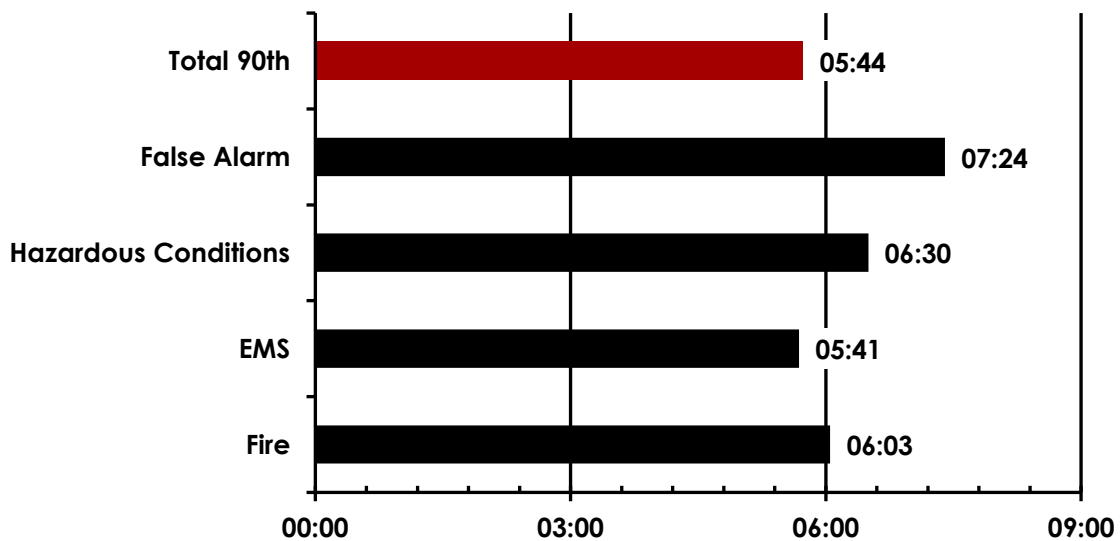


At the 90th percentile for all noted categories, the KFD's turnout time performance of 01:29 exceeded the NFPA 1710 recommendations of 60 seconds for EMS calls and 80 seconds for fire and special operations calls. The turnout time component, while rather impressive compared to other similar fire departments studied by ESCI, warrants further evaluation by the KFD, as ESCI has found in previous studies that documented turnout times may not accurately reflect a fire department's actual performance.

Travel Time Performance

Travel time is the time from when an apparatus starts traveling to an incident until it arrives on the scene. Travel time is one component of total response time that is rarely controllable by fire department personnel. The existing road network, traffic congestion, weather, geographic barriers, and the size of the service area are all key influences in travel time performance. The next figure illustrates travel time performance throughout the KFD's service area at the 90th percentile.

Figure 89: Travel Time Performance (2018–2020)



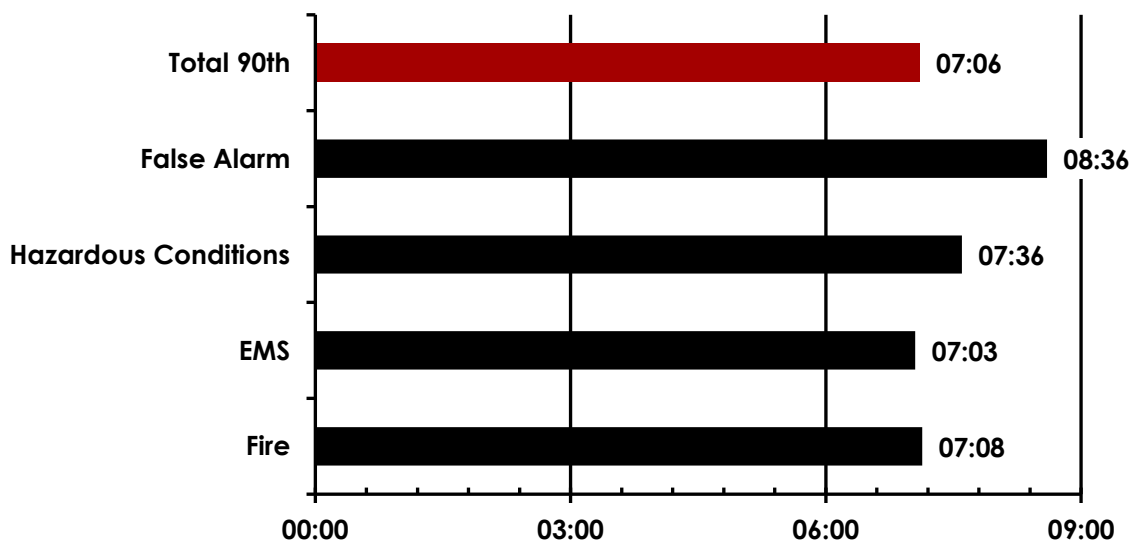
At the 90th percentile for all noted categories, the KFD's travel time performance of 05:44 exceeded the NFPA 1710 recommendations of 04:00 for the first arriving unit. The longest travel time of 07:24 for incidents coded as False Alarms could be due to the identification of these types of incidents as lower priority, and therefore, the response would be nonemergency.

Response Time Performance

As previously discussed, the most commonly utilized measure of fire department response is a combination of turnout time and travel time, referred to as response time or response performance. This is the time from when fire personnel are notified of an incident by dispatch to when the first apparatus arrives on the scene. While not specifically addressed by NFPA 1710, response time is a combination of turnout and travel time standards.

The next figure illustrates emergency response time performance for the KFD's service area at the 90th percentile.

Figure 90: Response Time Performance (2018–2020)



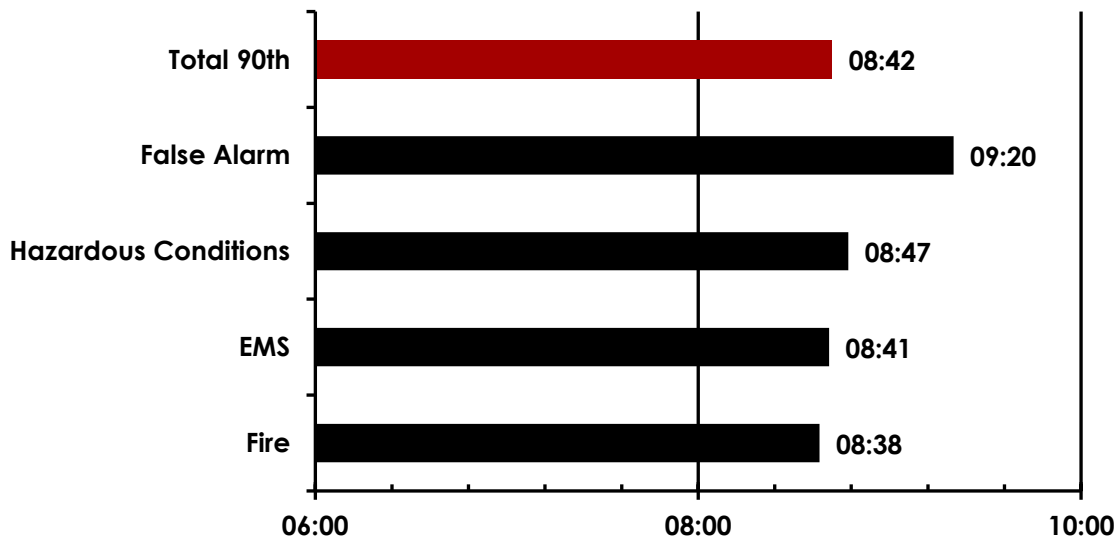
At the 90th percentile for all noted categories, the KFD's response time performance of 07:06 exceeded the NFPA 1710 recommendations of 05:00 for EMS calls and 5:20 for fire and special operations calls. It should be noted that incidents coded as EMS resulted in the fastest response times which represents the highest service demand.

Total Response Time Performance

As previously discussed, total response time is the amount of time a resident or business waits for resources to arrive at the scene of an emergency, beginning when they first call 911. This is the time interval from the receipt of the alarm at the dispatch center to when the first emergency response unit is initiating action or intervening to control the incident. Similar to response time, NFPA 1710 does not specifically address total response time but recommendations are a combination of NFPA 1221 and 1710 standards.

The next figure illustrates total response time performance throughout the KFD's service area at the 90th percentile.

Figure 91: Total Response Time Performance (2018–2020)



As would be expected due to the call processing, turnout time, and travel time performance, the KFD exceeds the NFPA 1221 and 1710 recommendations in all noted categories at the 90th percentile with a total response time performance of 08:42. Total response time is provided for informational purposes and should be utilized to continuously monitor performance trends in an effort to seek opportunities for improvements.

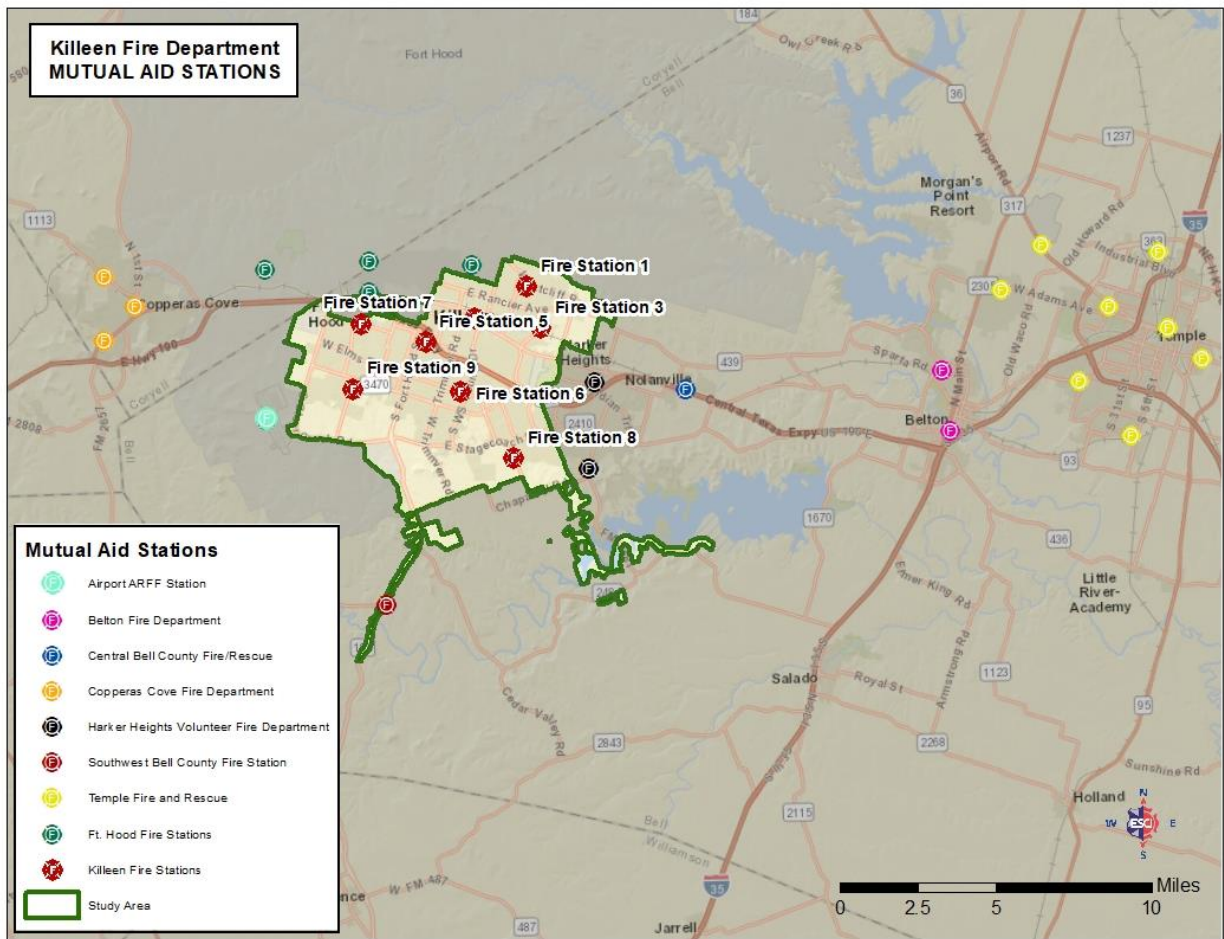
Mutual and Automatic Aid Systems

Very few, if any, organizations possess all of the resources needed to mitigate all possible types of incidents. Additionally, when mutually beneficial agreements are possible, good governance suggests that these opportunities should be seized to provide higher service levels, particularly when they occur at little or no cost.

Two types of agreements are currently in place within the KFD, mutual and automatic aid. In mutual aid agreements, two or more organizations agree that, when requested, they will supply the other agency with the resources requested if available. For emergency services, this typically occurs through the request of the responding apparatus or on-scene personnel. Automatic aid occurs, as the name implies, automatically. When an emergency call is received by the dispatch center, all available resources are examined based on the appropriate unit type and their proximity to the call. Typically then, the closest unit is dispatched, regardless of the jurisdiction in which the incident occurred.

The KFD currently has mutual aid agreements with the Belton Fire Department, Central Bell County Fire & Rescue, the Copperas Cove Fire Department, and the Temple Fire Department. In addition, the KFD has both a mutual aid and automatic aid agreement with the Fort Hood Fire Department, the Harker Heights Fire Department, and the Southwest Bell County Volunteer Fire Department.

The next figure illustrates the location of the KFD's mutual and automatic aid partners.

Figure 92: Mutual/Automatic Aid Fire Departments

The next figure displays the KFD mutual and automatic aid responses summarized by year for 2018 through 2020.

Figure 93: KFD Mutual/Automatic Aid Summary (2018–2020)

Type	2018	2019	2020
Mutual Aid Given	28	28	19
Mutual Aid Received	20	17	25
Automatic Aid Given	31	42	29
Automatic Aid Received	41	83	48
Net (Aid Given - Received)	2	30	25

During the period illustrated in the preceding figure, the KFD provided aid to neighboring jurisdictions 177 times while receiving aid 234 times. This shows a net benefit to the city of 57 incident responses through mutual and automatic aid agreements.

EMERGENCY MEDICAL SERVICES

KFD provides Medical First Response (MFR), Basic Life Support (BLS), and Advanced Life Support (ALS) care and ambulance transport in the City and portions of the unincorporated areas of Bell County. All KFD firefighters are required to obtain and maintain their paramedic certification as a condition of employment.

In this section of the report, ESCI evaluated the Department's EMS system delivery model, medical oversight, and related issues, and made recommendations where appropriate at the end of this report.

EMS Administration

The EMS Division is overseen by an EMS Deputy Chief (EMSDC). Six EMS Captains administratively report to the EMSDC, and operationally report to their duty Battalion Chiefs. Two EMS Captains are assigned to each shift to provide EMS supervision to each battalion.

Medical Direction & Oversight

The Texas Department of State Health Services EMT-Trauma Systems Division oversees the provision of EMS throughout the State. On a regional level, KFD participates in the Central Texas Regional Advisory Council. This non-profit organization is comprised of local hospitals, EMS agencies, fire departments, County and City Offices of Emergency Management, and other healthcare providers in the Central Texas six-county region (Bell, Coryell, Hamilton, Lampasas, Milam, and Mills counties).

The Council's primary mission is to provide the following trauma system support services:²⁵

- Assist member organizations in achieving the highest level of emergency healthcare they are capable of providing, which will result in a decrease in morbidity and mortality and ultimately improve the ill or injured patient's outcome.
- Encourage activities designed to promote cooperation between member organizations and provide a forum to resolve conflicts regarding injured patient care.

Provide and facilitate educational programs for the public to increase awareness regarding an inclusive trauma system with a heavy emphasis on prevention activities.

²⁵ Central Texas Regional Advisory Council website, <https://centraltexasrac.org/about/>.

KFD pre-hospital physician oversight is the responsibility of Dr. Christopher Colvin, who serves as KFD's EMS Medical Director. As a Board-Certified Emergency Medicine Physician he works for US Acute Care Solutions®, which provides emergency room physician services to medical facilities across the United States. He currently serves as the emergency department Medical Director at Seton Medical Center Harker Heights, and also serves as Southwest Bell County Volunteer Fire Department's Medical Director.

Dr. Colvin provides the following contracted physician services to KFD in exchange for a \$40,000 annual payment:

- Ride-along observations once a month.
- Once a month interaction at run review continuing education sessions.
- Participation in quarterly Quality Improvement Committee meetings.
- Development and review of Paramedic Protocols.
- Representing the Department as needed at regional and state EMS meetings and functions.

EMS Deployment

Each of KFD's fire stations has an assigned medic unit and designated response territory. Two paramedics are assigned to each medic unit. An EMS Captain is assigned to each battalion and provides logistical, operational, and EMS quality assurance support on a 24/7 basis.

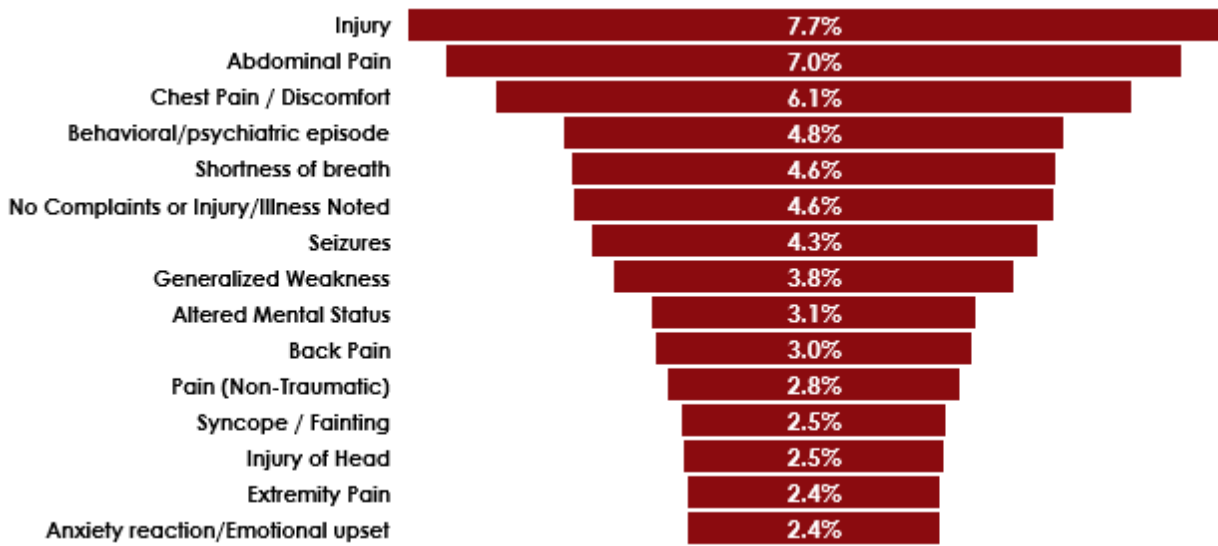
EMS Documentation

Patient care reports (PCRs) are electronically recorded using the ESO Solutions® RMS. This system is separate from the system used to document fire and other non-EMS-related incidents. The system is NEMIS and HIPAA compliant and is integrated into the Bell County Communications Center 911 CAD system.

Patient care refusals are also documented in the system, using a separate form embedded in the RMS.

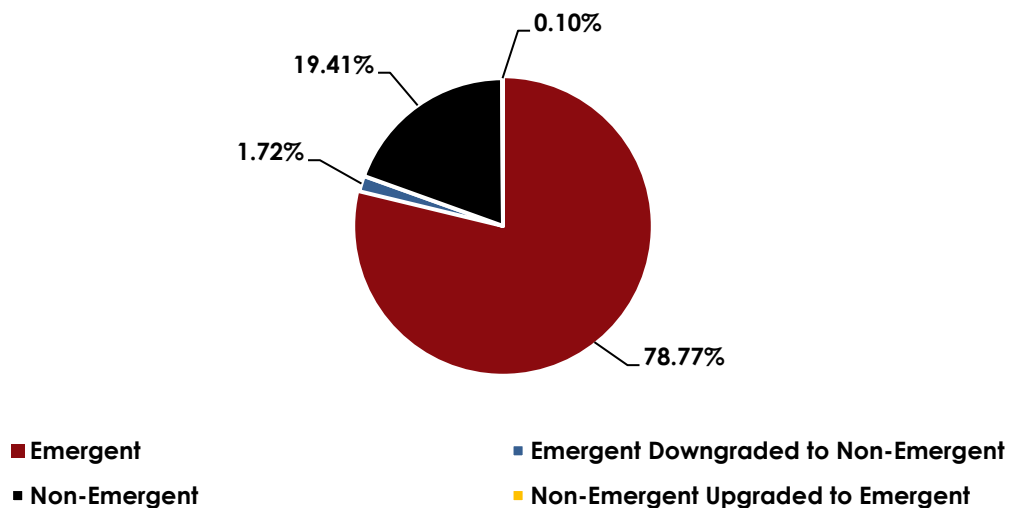
EMS Incident History

ESCI evaluated EMS records from 2018 through 2020 to determine the types, frequency, and dispositions of patients evaluated by KFD personnel. The top 15 medical primary impressions as determined by KFD paramedics are noted in the following figure.

Figure 94: Top 15 Medical Primary Impressions

These incident types comprise over 60% of all documented medical primary impressions. Traumatic injury, abdominal pain, and chest pain comprised almost 21% of all primary impressions. ESCI noted that the primary impressions were left blank in 12,447 incident records, which closely correlates with the over 12,000 canceled incidents documented during the study period.

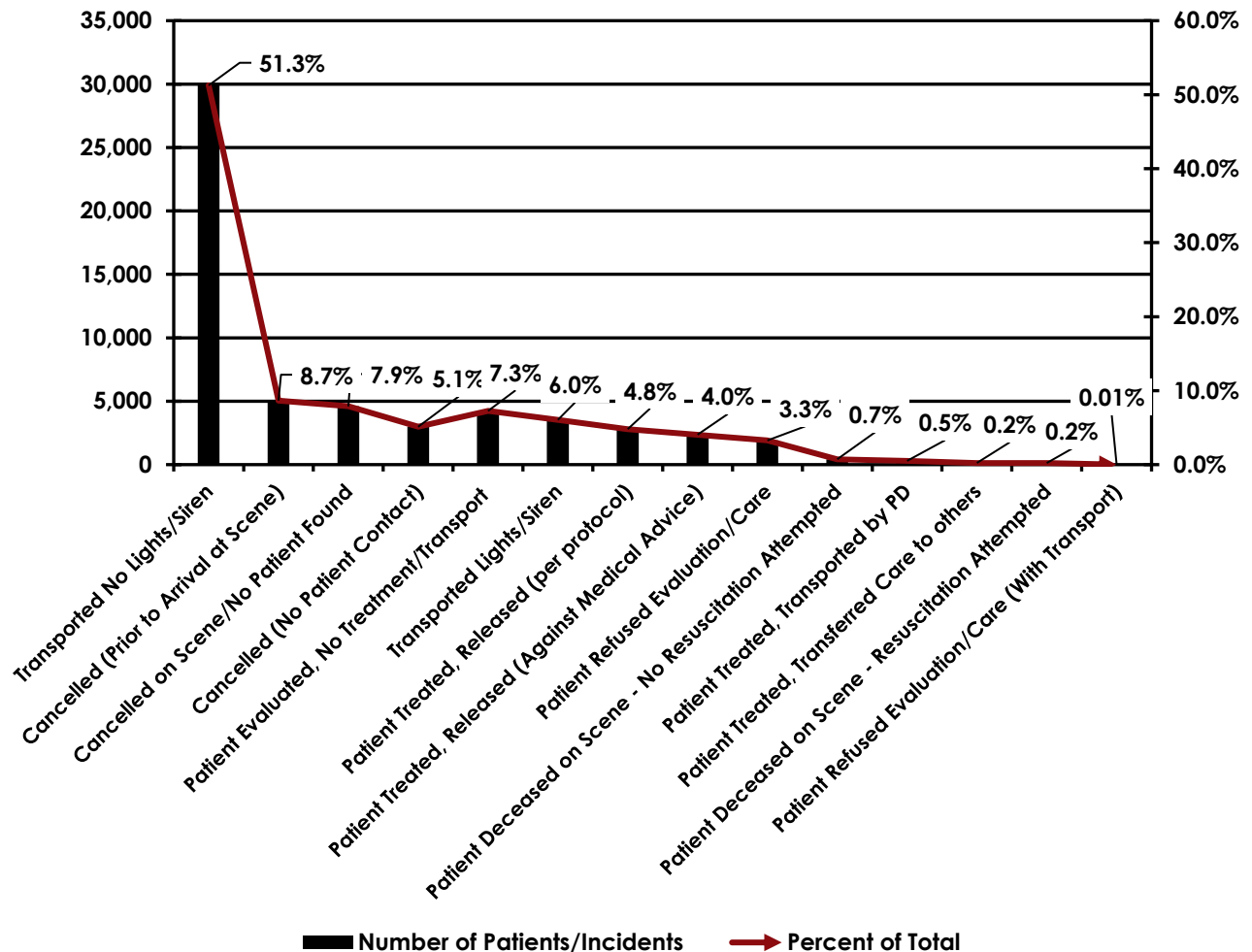
ESCI also evaluated the response mode of the units dispatched to EMS incidents. The following figure summarizes these modes.

Figure 95: KFD EMS Response Modes (2018–2020)

The preceding figure shows that almost 80% of all EMS responses were in emergent (lights & siren) mode, and slightly less than 20% were non-emergent mode.

Finally, ESCI evaluated patient dispositions during the study period. The following figure summarizes these outcomes.

Figure 96: Patient/Incident Dispositions (2018–2020)



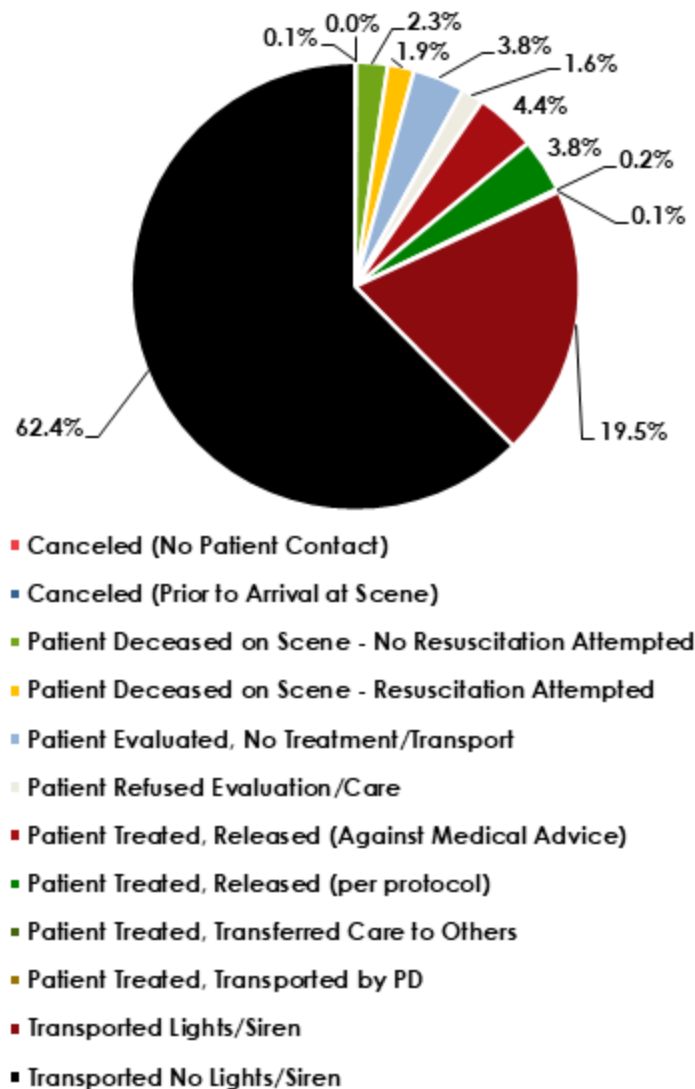
The preceding figure notes that of the 57% of the patients transported, only 6% were transported in an emergent mode (lights and siren). ESCI also noted that almost 30% of all EMS incidents were either canceled or the patient did not require treatment or transport to a medical facility.

Taking it one step further, ESCI analyzed the disposition of the emergent response mode incidents that had the following initial patient complaints as recorded by dispatch:

- Breathing Problems
- Cardiac Arrest/Death
- Chest pain (non-traumatic)
- Heart Problems
- Stab/gunshot wound/penetrating trauma
- Traffic Accident
- Unconscious/fainting

The following figure shows the patient dispositions on these EMS incident types.

Figure 97: Patient Disposition Types by Initial Patient Emergent Complaint (2018–2020)



EMS Response Discussion

As noted previously, almost 80% of all KFD EMS incidents were responded to in emergent mode. Of the potentially critical EMS incident types identified by dispatchers, almost 10% were either treated and released, no treatment was required, treatment was refused, or the incident was canceled. Slightly less than 20% of the transported patients were transported in emergent (lights & siren) mode.

The issue of lights and siren response mode by EMS agencies has been reviewed and studied extensively over the years. A 2017 position paper; *Lights and Siren Use by Emergency Medical Services (EMS): Above All Do No Harm*, published by the U.S. Department of Transportation National Highway Traffic Safety Administration-Office of Emergency Medical Services addressed the issue and effectiveness of lights and siren response and emergent patient transports, especially as it relates to patient outcomes. In the executive summary, the authors stated:

The time saved by using lights and siren (L&S) during response and transport has been evaluated by several studies. These all show that a relatively short amount of time is saved by L&S use. While this may be of clinical importance to patient outcome in critical time-sensitive conditions like cardiac arrest, the consensus among the researchers in this field is that the time is not significant in most of the responses or transports. In addition to the amount of time saved with L&S transport, an equally important discussion is whether that time is clinically important to patient outcome. For most conditions, EMS professionals can provide appropriate care to reduce the importance of saving a few minutes by L&S transport. While we do not fully understand the potential negative physiologic effects from L&S use, any EMS vehicle crash that occurs when exercising the privileges of L&S is detrimental to the health of both EMS providers and their patients.

The high percentage of L&S responses by KFD units should be further explored by the Department to determine if some of the EMS incident types would be more appropriately, and safely, initially responded to in a non-emergent mode.

EMS Billing

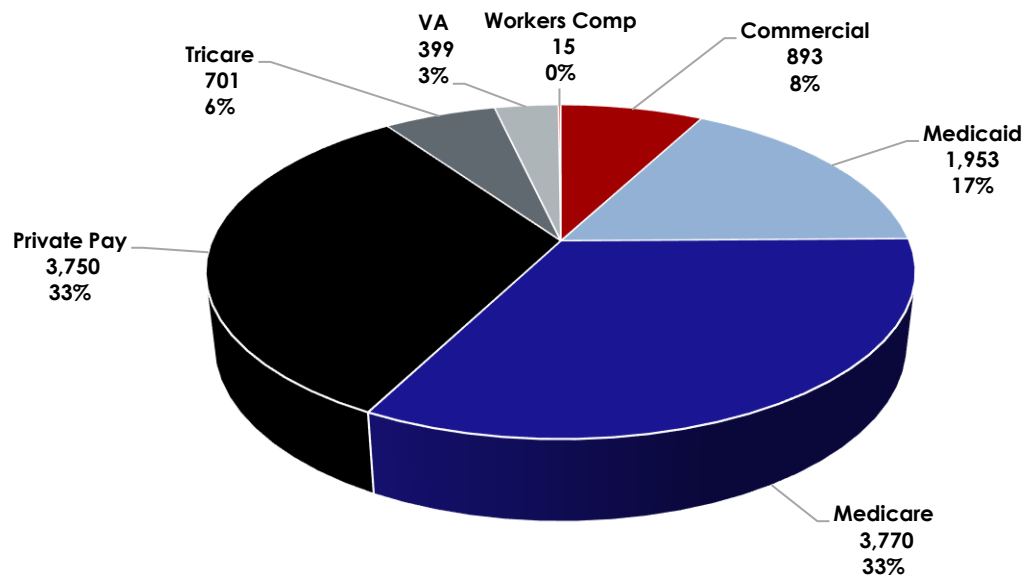
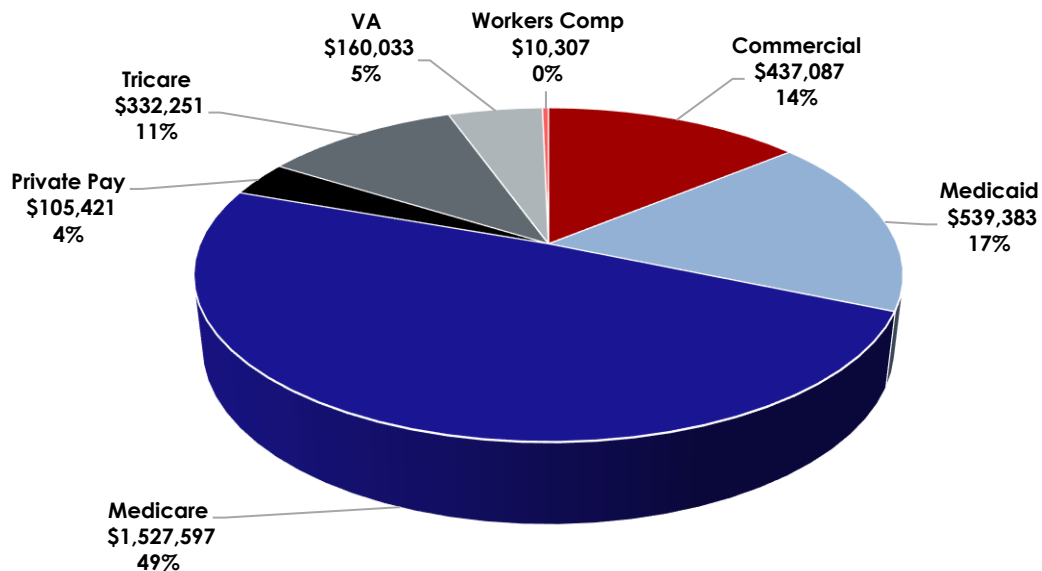
The City of Killeen has contracted with LifeQuest Services®, a third-party billing company, to collect ambulance revenue since 2016. The company charges a percentage of the revenues recovered for this service and provides the City with monthly and annual reporting providing various patient demographic and billing metrics to measure performance. A separate company is used for all City department collection services.

ESCI reviewed the calendar 2020 billing information summarized by payor mix as shown in the following figure. While the patient transports shown reflect the period January-December 2020, billing and revenue information does not correspond directly to these transports due to billing cycle timing (processing of patient reports, coding and sending multiple bills, for example) and the normal lag in receipt of payments from date of transport among other factors. However, since the department has been transporting patients for multiple years prior to 2020, the following analysis gives an approximation of annual performance by payor mix.

Figure 98: Calendar 2020 Ambulance Billing Summary by Payor

Calendar 2020 Payor	Patient Transports		Billing			
	Number	%	Charges	Revenue	% Recovery	% of Total
Commercial	893	7.8%	\$ 691,560	\$ 437,087	63.2%	14.0%
Medicaid	1,953	17.0%	\$1,504,421	\$ 539,383	35.9%	17.3%
Medicare	3,770	32.8%	\$3,042,505	\$1,527,597	50.2%	49.1%
Private Pay	3,750	32.7%	\$2,751,113	\$ 105,421	3.8%	3.4%
Tricare	701	6.1%	\$ 559,725	\$ 332,251	59.4%	10.7%
VA	399	3.5%	\$ 326,678	\$ 160,033	49.0%	5.1%
Workers Comp	15	0.1%	\$ 12,386	\$ 10,307	83.2%	0.3%
Total	11,481	100.0%	\$8,888,389	\$3,112,080	35.0%	100.0%

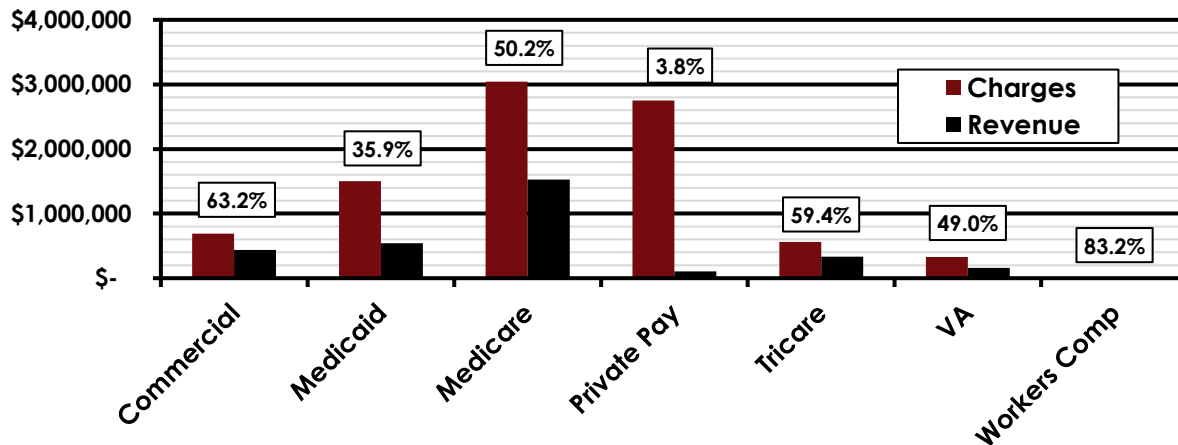
The preceding figure shows the total number of patients transported from January 1 through December 31, 2020, by payor category. Medicare and Medicaid patients make up half of all patients transported at 33% and 17%, respectively. And, while Medicare and Medicaid can be counted upon to provide payment in most cases in a timely manner, there are limits on how much each pays, regardless of the KFD's adopted transport rates. Approximately one-third of patients transported by the KFD fall into the Private Pay category. This is typically the lowest revenue recovery category, and it is no surprise that, while one-third of the KFD transport volume are Private Pay patients, only 4% of the total revenue recovered is derived from this payor category, as shown in the following figures.

Figure 99: Calendar 2020 Ambulance Transports by Payor**Figure 100: Calendar 2020 Ambulance Revenue Recovered as % of Total by Payor**

On the other hand, those patients with commercial insurance, Tricare, or VA coverage, which together comprise 17% of the patient transport volume, typically pay much closer to actual, adopted rates in many cases, and the revenue recovery per patient is much higher. In 2020, while these categories comprised only 17% of the patients transported, they comprised 30% of the revenue recovered.

To better appreciate the disparity between charges and actual revenue recovered by payor category, the following figure provides a side-by-side comparison of charges against what was actually recovered by payor category. The percentage recovered versus the charges is shown for each payor category in this figure as well.

Figure 101: Calendar 2020 Ambulance Charges vs. Revenue Recovered by Payor



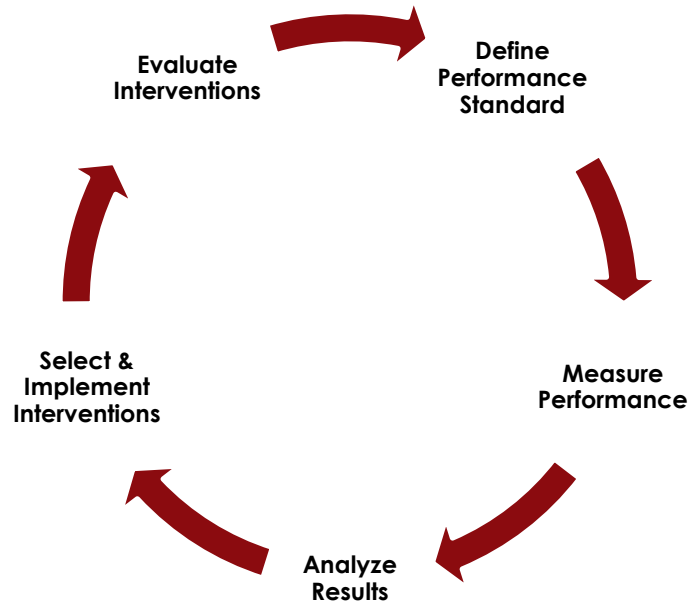
It is quite apparent in the preceding figure that the Private Pay category has a very high demand on KFD resources while providing almost no financial support through revenue recovery. Further, the Department has a high percentage of Medicaid and Medicare patients whose revenue recovery is restricted. The Department will need to continue monitoring payor mix as service demand increases in order to understand how much additional resource will be needed and at what cost to other GF revenue than ambulance billing.

Ground Emergency Medical Transport Program (GEMT)

The Ground Emergency Medical Transport (GEMT) program is a voluntary federal and state program that allows publicly owned or operated emergency ground ambulance transportation providers to receive supplemental payments that cover the difference between a provider's actual costs per GEMT transport and the Medicaid base payment, mileage, and other sources of reimbursement. Government ambulance providers receive cost-based supplemental payments for emergency ground ambulance transportation of Medicaid fee-for-service clients. Texas has adopted this program, and other departments studied by ESCI receive significant ongoing revenue from this program. As of the time of this study, the City does not receive GEMT subsidy funds. This is a program that the City should pursue to help offset the unreimbursed costs for transporting Medicaid and uninsured patients.

EMS Quality Management

KFD's EMS Quality Management (EMSQM) program is codified in KFD Policy-408, which outlines the action steps that comprise the EMSQM process.



The key administrative and operational components that support this process include:

- Patient Care Report (PCR) Reviews
- Field performance evaluations
- Quality Improvement Committee
- Run Reviews
- EMS Protocol Review (Conducted every two years)

PCR Reviews

Per KFD Policy-408, all PCRs are reviewed by the assigned EMS Captain or Acting (Step Up) Captain. However, no more than 10% of the reports can be reviewed by a Step-Up Captain. Each PCR is graded for complete and accurate documentation and adequacy and appropriateness of the patient care. The graded PCRs are uploaded into the ESO® Quality Management module, and the paramedic is notified that they have a PCR that needs to be reviewed. The grading levels are as follows:

Figure 102: Patient Care Report Grading Levels

Grade	Description
Poor	Grossly poor performance; not acceptable
Fair	Fails to meet applicable standards; less than average
Good	Meets all acceptable standards; acceptable
Very Good	Exceeds applicable standards; above average
Excellent	Highest quality of service rendered; exceptional

Paramedics are required to review and respond to all returned PCRs where issues have been identified.

Field Performance Evaluations

EMS Captains perform field evaluations of paramedic performance. These random evaluations are intended to subjectively and objectively observe the performance of field personnel, including but not limited to, effective interpersonal communication skills, scene management, delivery of patient care, skills performance, interagency cooperation, protocol compliance, and professionalism and compassion. A hard copy evaluation form is organized into the following categories: Data Gathering, Differential Diagnosis, Management/Treatment, and Disposition. Each category has the following three grading categories; Needs Improvement, Meets Expectations, Above Expectations.

These evaluations can also be used as part of annual performance evaluations, identification of potential EMS Step-Up Captains, and selection of field preceptors.

Quality Improvement Committee

Overall analysis of the clinical and operational aspects of the KFD EMS delivery system is performed by a Quality Improvement Committee (QIC). The Committee is primarily comprised of the Medical Director, EMS Deputy Chief, and the EMS Captains. Other paramedics may be included, depending on need and interest.

The primary purpose of the Committee is to identify EMS quality care measures, assess overall system performance against those measures, develop improvement strategies, and monitor the impact of these strategies on patient care and outcomes. The Committee meets quarterly and produces a quarterly EMS Quality Improvement Report.

A review of a quarterly report shows a fairly sophisticated and comprehensive analysis of previously identified QI metrics that were selected at the beginning of the year. These metrics included:

- Advanced Airway First Pass Success Rate
- Continuous Positive Airway Pressure (CPAP) Use in Congestive Heart Failure Patients
- Aspirin Administration in Congestive Heart Failure Patients
- Patients receiving pain intervention
- CVA/TIA patients with blood glucose check
- Seizure patients with blood glucose check
- Altered Mental Status patients with blood glucose check

In addition, the Committee evaluated two additional metrics: Effect of a transportation ordinance change to Baylor Scott & White Medical Center, and the impact of ESO® charting on turnaround times at the hospital.

Where applicable, evaluation of these metrics were parsed by shift.

Community Paramedic Program

Killeen's community demographics appear to show a substantial number of the population have one or more characteristics that make them vulnerable to increased risk of fire, injury, medical condition, substance abuse, homelessness, or other conditions that may result in increased demand for EMS services. At the time of this study, KFD does not track EMS patients who may have these conditions in a way that can be easily analyzed (other than age, sex, and presenting medical condition).

Hospitals, fire departments, and EMS agencies across the country today are grappling with the issue of frequent/chronic users and abusers of the EMS system. Patients with substance abuse, mental health, or other chronic medical conditions often call 911, as the system is their only option for receiving timely medical care. Often these patients are simply transported to the hospital, where they are subsequently discharged to only call 911 again a short time later. These situations can result in hospitals being penalized by the federal government for high readmission rates. In fact, in fiscal year 2021, the Centers for Medicare & Medicaid Services fined 2,545 hospitals for having too many Medicare patient readmissions within 30 days between July 2016 and June 2019.²⁶

²⁶ CMS fines 2,545 hospitals for high readmissions: 5 things to know, Becker's Hospital CFO Report, Ayla Ellison, November 2, 2020.

Agencies and communities around the country are now taking innovative steps to try and relieve pressure on the use of EMS and impact on hospital emergency departments by implementing Mobile Integrated Healthcare-Community Paramedicine (MIH-CP) programs. It should be noted that MIH-CP programs have been in place in the United Kingdom, Canada, and Australia for almost two decades. While there may be slight variations in how these programs are implemented, the fundamental goals are the same—extend health care to a patient's home and reduce EMS service demand, ED visits, and hospital readmissions.

MIH-CP programs focus on the highest users of prehospital EMS and emergency departments—typically low-income patients; those with chronic mental and/or physical health issues; patients without means of transportation; substance abusers; and any combination thereof.

MIH-CP involves sending EMTs, Paramedics, or specially trained *Community Paramedics* (CP) into patient homes to provide specialized home care services, such as:

- Hospital discharge follow-up
- Medication reconciliation
- Blood draws and glucose monitoring
- Home safety, social services, and nutritional assessments
- Well baby/child checks
- Blood pressure and oxygen saturation checks
- Post-injury/illness follow-up/wound care
- Illness/medication education and compliance
- Liaison with health care providers

The benefits of using local EMS providers to deliver this specialized type of care include:

- The ability to tailor the program to meet local health care gaps.
- EMS providers already possess most of the required skills and are comfortable and experienced in working in patient homes and environments.
- EMS providers are the largest pool of mobile health care resources available.

Because of the relatively recent implementation of these various programs, scientific evidence of program effectiveness and efficacy is limited. Efforts are underway throughout the United States to determine and verify impacts on EMS performance, system demand, and, most importantly, appropriate patient care. However, there are many anecdotal stories of success in reducing repeat 911 calls for various categories of patients.

A 2018 survey conducted by the National Association of EMTs (NAEMT) revealed that MIH-CP programs were present in 43 states, including Texas. Of those programs, over one-third of them were embedded within fire agencies, and almost 20% were private, hospital-based programs, and 94% of the survey respondents agreed that their program fills a resource gap in their local community.²⁷ At the time of this study, several fire and EMS agencies in Texas have MIH-CP programs, some of which have been in place since 2014 or longer.

Sustainability

The success of MIH-CP programs is largely determined by the sustainability of funding, community support, and support and participation of other health care providers. Grants are often used to launch these programs. However, many grants are short-term and/or one-time funding opportunities and are not well suited to support the long-term operations of an MIH-CP program.

The ability to demonstrate value to the payers over the long term is critical for continued funding. It is important for EMS systems to develop and mutually agree on meaningful metrics with healthcare partners early on in the process, which will demonstrate value to the payer. Additionally, CP programs are well aligned with *the Institute for Healthcare Improvement's Triple Aim* initiative:

- Improving the patient experience of care (including quality and satisfaction).
- Improving the health of populations.
- Reducing the per capita cost of healthcare.

Discussion

ESCI believes the feasibility and sustainability of an MIH-CP program will be determined only by initiating a focused and collaborative community and stakeholder planning effort that addresses the components listed above. AdventHealth's 2020–2022 Community Health Plan identified the following health priority issues for the Killeen community:

- Physical Inactivity
- Mental Illness & Post-Traumatic Stress Disorder (PTSD)
- Food Insecurity
- Poverty
- Diabetes

²⁷ Mobile Integrated Healthcare and Community Paramedicine, 2nd National Survey, NAEMT, Retrieved online: http://www.naemt.org/docs/default-source/2017-publication-docs/mih-cp-survey-2018-04-12-2018-web-links-1.pdf?Status=Temp&sfvrsn=a741cb92_2.

- Access to Transportation
- Smoking and Respiratory Disease
- Obesity

Of these priorities, the hospital chose to address only the first three priorities, relying on other community resources and programs to address the remaining priorities. Of those, Diabetes, respiratory disease, and the secondary medical conditions resulting from obesity may be areas in which an MIH-CP program can address in select patients. ESCI noted that there was no mention or plan to use existing pre-hospital EMS resources to address any of these priorities.

Creation and implementation of an MIH-CP program in Killeen should be done collaboratively and should start with the gathering of data and a needs assessment that involves the participation of key community stakeholders, social service agencies, and health care providers, including but not limited to:

- Mental Health Professionals
- Law Enforcement
- Fire Department
- Health Department
- Hospital Representatives
- Elected officials
- Social service providers
- Faith-based organizations
- Other non-governmental organizations (NGOs) as applicable

The goal of an MIH-CP needs assessment is to identify the vulnerable populations in the community that could benefit from an MIH-CP program, and the types of patients and medical conditions that could be treated through the program. It is beyond the scope of this study to fully define a process for evaluating the need for an MIH-CP program in Killeen. However, the sources cited in this section of the study provide tools, references, and resources for implementing these programs, including providing examples of successful programs throughout the country. ESCI believes that a concerted effort to explore the need and potential of an MIH-CP program should be undertaken.

SUPPORT PROGRAMS

Training & Continuing Medical Education

In this section, ESCI reviews KFD's training practices, compares them to national and other applicable state standards and best practices, and offers recommendations as are appropriate.

Training Administration/General Training Competencies

A variety of training standards and requirements apply to fire department training programs, including those from the following:

- National Fire Protection Association (NFPA)
- International Fire Service Training Association (IFSTA)
- International Fire Service Accreditation Congress (IFSAC)
- National Incident Management System (NIMS)
- Texas Commission on Fire Protection (TCFP)
- Texas Department of State Health Services (DSHS)
- Local Medical Director

The KFD Training Division is managed by a Training Captain. Three Fire Rescue Officers are administratively assigned to this Captain, along with an administrative assistant. The Training Division budget revenues and expenses are not accounted for separately in the Department's budget, with the exception of an outside tuition and travel line item in the expense budget. The Department maintains two distinctly different training programs and related activities: An open enrollment Fire Academy and internal department fire and EMS continuing education training.

The Killeen Fire Academy provides initial firefighter and EMT training to firefighters and civilians wishing to pursue a fire service or EMS career. Two academy sessions are offered annually, starting in January and Jul. Two courses are offered, including TCFP Basic Fire Suppression, which is 16 weeks long, and EMT-Basic, which is eight weeks long. Tuition for the Basic Fire Suppression academy is \$2,500, and the EMT-B Course tuition is \$550. Course size is limited to 30 students per class. Approximately 10-12 TCFP certified instructors are used to deliver this training. Students are organized and grouped into shifts and companies to mirror a traditional fire department organizational structure.

In addition, the Academy holds a high school cadet academy for junior and senior grade students. The program, started in 2003 in partnership with the Killeen Independent School District, trains and certifies approximately 10–20 students per year as Firefighter I and II and EMT-Bs. Eleventh-grade students undergo FFI training and certification, and students who continue into their Senior year complete their FFII and EMT-B certifications. The typical class size for Juniors is 12 to 15 students, and 9 to 10 students in the Senior class.

Department-specific continuing education (CE), fireground manipulative skills maintenance, and other specialized training are conducted on a regular basis to at least meet minimum TCFP, ISO, and Department requirements. Examples of the TCFP annual CE hours' requirements for full-time structural firefighter employees are noted in the following figure:

Figure 103: TCFP Fire Suppression FTE Annual CE Requirements

TCFP CE Annual Requirement	Required Hours
Department Selected Training Topics	18 hours
Wildland Firefighting	4 hours
Aircraft Rescue & Firefighting	2 hours
Fire Suppression	2 hours
Hazardous Materials Technician	8 hours
Fire Instructor	2 hours

All hours over four hours in any one subject area of the Department selected CE training does not count towards the 18 hours minimum requirement, with the exception of the Wildland firefighting 4-hour required annual refresher. Note: Employees carrying a specific certification, but not required to perform those duties do not have to meet the annual C.E. hours required for that certification.

In addition, personnel trained to the EMT, Advanced EMT, and Paramedic level must complete a certain number of hours on specific continuing education topics during their four-year certification period, per the following hours' requirements:

- EMT: 72 hours
- EMT-Advanced: 108 hours
- EMT-Paramedic: 144 hours

Personnel must also complete EMS continuing education on specific topic areas as well. Mandatory topic areas include Preparatory subjects, Airway Management, Patient Assessment, Trauma, Medical, Special Considerations, Clinical related Operations, and Pediatrics. The minimum aggregate time for these topics is 81 hours. Additional hours can be completed in any of the above topic areas, or additional related topic areas to meet the overall minimum hours' threshold for the level of certification attained.

KFD company officers are at least Fire Instructor I certified, and deliver company-level training for their crews.

The following figure summarizes KFD's training for 2020.

Figure 104: KFD Training Hours, 2020

Training Components	Hours
Fire-Related Training	11,624
EMS-Related Training	3,079
Total Training Hours Delivered	14,703
Average Annual Hours per Person	62

As shown in the preceding figure, 79% of all training was non-EMS related, and averaged 48.8 hours per firefighter, well above the TCFP minimum hours requirement. EMS training comprised the remaining 21%, averaging 12.9 hours per firefighter.

New Hire Training

Approximately 50% of new firefighters hired by KFD are already certified TCFP firefighters, either through completion of KFD's Fire Academy program, or other state-sanctioned fire academy programs. This certification includes certifications as Firefighter 1 and II, Haz-Mat Awareness, and Haz-Mat Operations. Once hired, they undergo a two-week indoctrination process that includes completing City and Department paperwork, issuing Department uniforms, turnout gear and equipment, and tours and familiarization of the facilities and equipment at each station, before they are placed into a station assignment and shift.

The other 50% of new firefighters are not TCFP certified and must successfully complete the KFD Fire Academy program, including completing EMT-Basic certification, before being placed into an operations assignment, after which they must successfully obtain certification as a paramedic.

Training Facilities

Adequate dedicated training facilities, props, and equipment are critical components to a safe and effective training program. Contemporary training center facilities incorporate sufficient and flexible classroom and drill ground space(s), computer and audio-visual tools, incident simulation equipment, and individualized study resources.

The KFD training drill ground facilities are comprised of a four-story concrete/brick/steel drill tower with an adjacent two-bay building with a kitchen, bathroom, and classroom, a “Christmas Tree” propane burn prop, a propane fueled vehicle burn prop, a propane tank fire burn prop, and a dumpster fire propane fueled burn prop. The other drill ground is located at Central Station, and is comprised of a three-story Class A burn building constructed of steel Conex boxes.

A large Fire Academy classroom building with three classrooms equipped with contemporary audio-visual equipment, instructional equipment, and props is located immediately adjacent to the Central Fire Station.

Training Record Keeping

A Training Administrative Assistant is responsible for tracking and maintaining accurate training records for all personnel. Instructors, including company officers leading company-level training and drills, are required to submit a hard copy roster with the names of the participants, and a lesson plan or detailed description of the covered subject matter. The hard copy rosters are retained, and the roster information is transferred onto a master spreadsheet to track progress in meeting the annual minimum requirements.

Training is completed through CE Solutions®, which is logged and then transferred by hand into the master spreadsheet as well.

Given the size of the department and complexity of the training provided, hand recording and tracking of training is likely time-intensive, inefficient, and may result in errors and omissions in reporting training activities. In fact, the 2020 EMS training hours submitted by the Department may have been significantly underreported, according to Department representatives.

The Department is planning to transition to the ESO® RMS, which has a robust training “tab” for recording the various types of department training activities. This should improve the efficiency and accuracy of recording training. However, ESCI cautions that early in the process of implementing a new RMS, the Department must identify and create the necessary training activities and certification reports they wish to track on an ongoing basis **before** training personnel on the program and implementation.

Training Program Discussion

Effective administration and delivery of contemporary fire service training programs require proportionally significant resources in a fire department. These activities must be properly budgeted, funded, and managed to ensure personnel are properly and safely trained and prepared for emergency situations.

Killeen appears to have a robust training program for prospective and new firefighter recruits, including an ongoing Firefighter Training/Certification Academy program that generates revenue for the Department. Administering such a diverse and administratively complex program typically includes division budget development, overseeing curriculum development and delivery, monitoring training requirements and certifications, hiring and managing instructors, developing and administering contracts, purchasing, and student administration, just to name a few. These various responsibilities appear to be beyond the scope of typical captain's level duties, and are more in line with chief officer level duties. ESCI developed an example Training Chief job description, based on the Department's current job description template, which is in Appendix B of this report.

ESCI found the Central Station Class A burn room prop to be in fair condition, with burn through compromised areas in a few areas on the structure. Fire stream runoff water migrates towards a nearby creek, requiring the placement of absorbent pads and “pigs” in the water's path to capture contaminants. ESCI understands the Department contacts nearby businesses before live fire evolutions, and distributes N95 respirator masks to workers if requested.

The Department had previously planned to build a new concrete training pad for the Conex burn props immediately east of the station, closer to the creek, and marginally farther away from adjacent businesses. Due to budget issues, this plan has not materialized.

ESCI noted that the Conder Street drill ground is small, limiting the ability to conduct extensive multi-company or complex drill evolutions. The design of the drill tower also limits the types of drills that can be conducted, and does not have a required safety guardrail on the roof perimeter, where rope rescue rappelling drills are occasionally conducted. Lastly, the facility is located in a residential neighborhood with a nearby playground and park. Fire stream runoff migrates towards a surface stormwater runoff collection area, and also requires the placement of absorbent pads and "pigs" to capture contaminants.

In ESCI's opinion, neither the Condor nor Central Station sites are suitable locations for live fire operations due to their small space footprints, proximity to businesses and residential homes, and potential adverse environmental impacts to local waterways.

Additionally, the use of Class A burn materials is now being scrutinized by fire departments across the country due to the generation, and exposure to, potential toxic substances, including carcinogens. As a result, many fire department training facilities now incorporate cleaner burning Class B gas fuel burn structures, which can be closely monitored and controlled during live fire drill evolutions, and also reduces the extensive and ongoing turnout gear contamination and need for continuous cleaning and decontamination. Both Class A and Class B live fire props have their benefits and drawbacks, and ESCI notes the Class B prop as an option if the Department desires to continue to use either of the current location in the foreseeable future.

Life-Safety Services

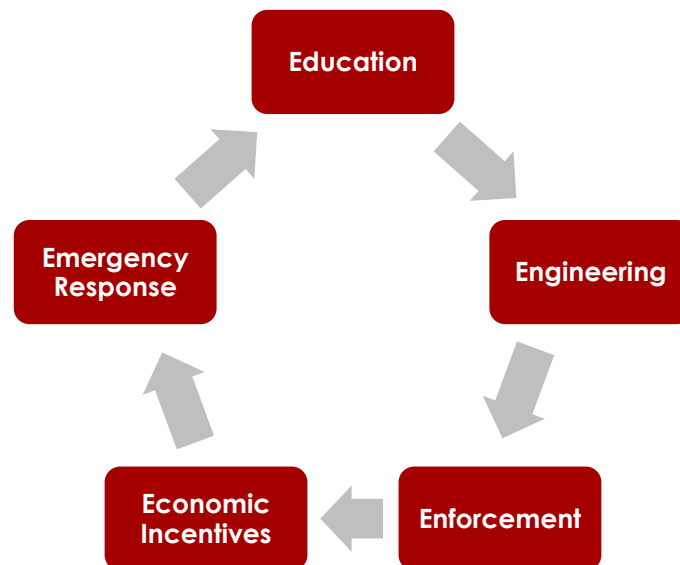
Fire Prevention and Public Education Programs

An aggressive fire and life safety risk management program is a fire department's best opportunity to minimize loss of life, property, and negative community consequences resulting from fire and other community hazards.

The National Fire Protection Association recommends a multifaceted, coordinated risk reduction process at the community level to address local risks. This requires engaging all segments of the community, identifying the highest priority risks, and then developing and implementing strategies designed to mitigate the risks.²⁸

A fire department should review and understand the importance of life-safety programs and initiatives, appreciating their role in the planning process of a community that includes residential, commercial, and industrial properties. Included in modern risk reduction methodology are the 5 E's: Education, Engineering, Enforcement, Economic Incentives, and Emergency Response, as shown in the next figure and discussion.²⁹

Figure 105. The 5 E's of Risk Reduction



²⁸ Kirtley, Edward, *Fire Protection Handbook*, 20th Edition, 2008, NFPA, Quincy, MA.

²⁹ "Community Risk Reduction: Doing More With More," June 1026. NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471, 2016.

- **Education** reduces risk by influencing audiences to refrain from risky or unhealthy behavior or take positive action to reduce risk.
- **Enforcement** reduces risks by conducting fire life safety inspections and using fines and/or other penalties for noncompliance.
- **Engineering** reduces risk by including incorporating new products and technology to modify the environment to prevent or mitigate injuries and deaths.
- **Economic Incentives** are typically offered to encourage better choices and changes in behavior by improving compliance or increasing awareness of community needs.
- **Emergency Response** reduces risk by mitigating the effects of unintentional injuries and save lives.

The fundamental components of an effective life-safety services program are listed in the following figure, accompanied by the elements needed to address each component.

Figure 106: Fire Prevention and Public Education Programs

Program Component	Program Elements
Fire Code Enforcement	Proposed construction and plans review New construction inspections Existing structure/occupancy inspections Internal protection systems design review Storage and handling of hazardous materials
Public Education	Public and specialized education Youth fire setter intervention Dissemination of prevention information
Fire Investigation	Fire cause and origin determination Fire death investigation Arson investigation and prosecution
Pre-Incident Planning	Life-safety loss Economic loss Historic or social loss Environmental impact

Fire Prevention Division Staffing

The Division was previously staffed with a dedicated Fire Marshal position and four Captain Fire Investigator/Inspector positions who are assigned to a 40-hour work schedule. During this study, the Fire Marshal was promoted to Assistant Fire Chief, yet retained Fire Marshal duties, including conducting all necessary new commercial construction plan reviews. He is TCFP certified as a Fire Plans Reviewer and Fire Inspector. According to the Department, backfilling the Fire Marshal position is problematic due to Civil Service rank requirements that the position must be filled with a Battalion Chief. However, none of the current Battalion Chiefs have the necessary fire code enforcement qualifications to fill the position.

The four Captains are commissioned Peace Officers, who are required to successfully complete a law enforcement training academy as part of their job duties. In addition, each must be certified as TCFP Fire Inspectors.

Code Enforcement Activities

Preventing fires is the safest and most effective way to ensure that a community is protected from the risk of fires. A strong fire prevention program, based on locally identified risks and relevant codes and ordinances, reduces the loss of property, life, and the personal and community-wide disruption that accompanies a catastrophic fire.

The City has adopted the 2018 edition of the International Fire Code (IFC-2018) and has supplemented the code with local code amendments, including outdoor burning and fireworks restrictions. Fire code enforcement and administration in incorporated areas of the City is the responsibility of a Fire Marshal. The Fire Marshal oversees an Administrative Assistant and four Fire Inspector/Investigators, three of which are primarily assigned to Arson investigations, and one is assigned primarily to occupancy and fire protection system inspections.

New Construction Inspection and Involvement

An essential component of a fire prevention program is new construction plan reviews and fire protection system inspections. When a new building is constructed, KFD assumes the responsibility to protect the structure for the life of the building. Therefore, KFD has a fundamental interest and duty in ensuring all buildings are professionally designed and constructed to meet applicable building and fire codes and development standards.

Most model codes define the scope and applicability of the code to include:

- New construction—structures, facilities, and conditions arising after code adoption.
- Existing conditions and operations—where required by the code, or where in the opinion of the fire code official, there is a distinct hazard to life or property.
- Change of use or occupancy.³⁰

The City charges for fire plan reviews and fire protection system installations per the following fee schedule that was last approved in October 2020. Fees collected go into the General Fund.

Figure 107: Fire Inspection & Permit Fee Schedule

Occupancy Inspection	Fee
Day Care	\$75
Foster Home	\$50
Hospital	\$180
Nursing Home	\$135
Other	\$50
Fire Protection System Permit & Testing	Fee
Commercial Fire Alarm	\$75
Health Care Facility	\$500 (Initial Permit)
Residential Fire Alarm	\$25
Automatic Sprinkler System	\$125
Fire Alarm System	\$75
Fixed Fire Suppression System	\$60
Fuel Line Pressure Test	\$50
Fuel Tank Pressure Test	\$50
Fuel Tank Storage	\$50
Natural Gas	\$50
Other	\$50
After-Hours Inspection	\$200-1 st Hour, \$100-per hour thereafter
Fire Watch	\$200-1 st Hour, \$100-per hour thereafter

³⁰ Sections 102.1, 102.2, and 102.3 of the International Fire Code, 2018 edition. The International Code Council, Inc., Country Club Hills, IL 60478.

All proposed commercial fire sprinkler systems to be installed must be reviewed and pre-approved by the Insurance Services Office prior to submission to the Building Department.

General Life Safety Inspections

Periodic life safety inspections of existing occupancies are an essential part of an effective fire prevention and risk reduction program and should be performed by personnel trained in conducting inspections. Information provided by the Killeen Building Department indicates that there are 1,921 commercial building structures in the City (excluding multi-family residential structures), and 3,111 individual commercial business addresses (excluding multi-family residential addresses). A GIS map of the building locations reveals that the highest concentrations of businesses are in the downtown city core, south of West Rancier and along West Rancier, along West Veterans Memorial Parkway, and along East Central Texas Expressway.

KFD does not perform routine fire inspections in commercial or multi-family occupancies, unless required by the State. When inspections are performed, either by request, or when a life safety issue is identified, they are documented only by hand on hard copy forms.

Other fire departments studied by ESCI use inspection trained operations assigned personnel to perform routine fire inspections, especially those considered to be “low-risk” occupancies. Not only does this approach add inspection capacity to the Department, but it also has the potential added benefit of ensuring operations personnel maintain familiarity with various occupancies, their uses, and their specific hazards. This information can then be incorporated into pre-fire plans and training.

Interestingly, KFD operations assigned Fire Captains are required to be TCFP certified Fire Inspectors as part of a previous effort to implement a fire company inspection program. However, the program faltered after a short period. However, the Inspector certification requirement remains.

KFD should consider implementing a risk-based inspection model patterned after the recommendations found in NFPA 1730, as shown in the following figure.

Figure 108: NFPA 1730 Minimum Inspection Frequency

Occupancy Risk Classification	Frequency
High	Annually
Moderate	Biennially
Low	Triennially
Critical Infrastructure	Per AHJ

Fire and Life-Safety Public Education Programs

Robust delivery of fire prevention and life safety public education programs can significantly reduce community risk by teaching important safety information, safe behaviors, and life-saving skills.

KFD's public education efforts and resources are somewhat limited, and with the exception of a child car seat inspection program and blood pressure screenings, focuses primarily on fire prevention activities such as Exit Drills In The Home (EDITH), Fire Safety, and smoke/carbon monoxide alarm programs.

Many fire departments across the United States now take a broader approach in addressing life safety issues in their communities. Examples of the wide range of topics addressed in contemporary fire department life safety education programs include:

- Water safety/child drowning prevention
- Elder safety and fall prevention
- Home hazard assessments
- Child fire safety
- Juvenile Fire Setter
- Medication Safety
- Infant/Child car seat inspections
- Bicycle safety/helmet inspections
- Burn prevention
- Holiday Safety (Halloween & Christmas)
- Fireplace Safety
- Generator/Alternative heating sources safety
- CPR courses
- Blood Pressure screening
- FireWise® Wildland Urban Interface fire prevention & defensible space education

In assessing which programs to implement, the Department should evaluate the nature, frequency, impact, and trends of the emergency incidents handled by the Department by reviewing incident data and EMS reports. Focusing on the most pressing life safety issue(s) faced by the community may allow the Department to leverage limited resources in a way that ensures success in implementing an effective specific life safety program.

The U.S. Fire Administration is an excellent resource for guidance in developing public safety education programs. Its guidance organizes the creation and implementation of fire safety education programs into five key steps, which can also be applied to overall life safety education program development:³¹

1. **Assess Your Community**
 - a. Gather demographic information
 - b. Determine fire safety risks
 - c. Write a problem statement
2. **Develop Partnerships**
 - a. Research best practices
 - b. Identify community partners
 - c. Create a community group
3. **Plan & Implement Your Program**
 - a. Develop purpose, goals, and objectives
 - b. Create an action plan
 - c. Assemble program materials
4. **Market Your Program**
 - a. Develop marketing strategies
 - b. Develop a marketing plan
 - c. Create marketing materials
5. **Evaluate**
 - a. Determine evaluation measures
 - b. Track program activity
 - c. Analyze and report the data

³¹ Fire Safety Program Toolkit, U.S. Fire Administration,
https://www.usfa.fema.gov/downloads/pdf/publications/fire_safety_program_toolkit.pdf

While the preceding steps appear simplistic, accomplishing them can be much more complicated. Fortunately, there are many resources available through various local, state, and government agencies, and private companies, that can be leveraged to help “jump start” an effective life safety education program.

Fire Investigation Programs

Accurately determining the cause of a fire is an essential element of an effective fire prevention program. Competently performing fire investigations to determine the cause is critical in the prosecution of arsonists, identifying faulty equipment or careless acts, measuring the effectiveness of fire suppression efforts, and identifying lessons learned that could be shared in the community to prevent reoccurrence.

KFD Fire Inspector/Investigators are Texas Peace Officer certified, and have appropriate TCFP arson and inspector certifications, and are required to maintain continuing education hours to maintain Peace Officer certification. These personnel work closely with KPD officers in conducting investigations, and have an excellent working relationship.

The City experience a significant number of suspicious and arson-caused fires annually. According to the Assistant Chief/Fire Marshal, many of these fires are set by individuals who burn their own property due to financial difficulties. This has apparently been a long-standing problem in the City. As a result, the majority of the Prevention assigned Captains work activities revolve around fire cause determination and investigations. The Captains share “on call” duty, rotating weekly, and average approximately four to five off duty call-backs a week to conduct fire scene investigations. Each Captain is assigned to perform fire inspections and fire protection system acceptance tests approximately one week every four weeks.

Fire Prevention Discussion

The importance of proactive fire prevention and life safety education efforts cannot be overstated. Today's contemporary fire departments understand the importance of proactive education and code enforcement programs that improve community and firefighter safety, and help preserve property and business tax revenues that can be lost through catastrophic fire loss. Specific to the vicarious benefit of improving firefighter safety, the National Fallen Firefighters Foundation™ (NFFF) developed 16 Firefighter Life Safety Initiatives, which formed the foundation of their Everyone Goes Home Program®. Initiative 14 highlights the importance of Fire Department public education programs:

Public Education must receive more resources and be championed as a critical fire and life safety program.³²

The Foundation clearly understands that robust fire and injury prevention programs can help reduce firefighter injury and line of duty death.

Furthermore, even though the number of structure fires has trended downward over several decades, especially residential structure fires, the number of home fire fatalities has stayed fairly constant, and even increased by 10% in 2016, according to the NFPA.³³

It is commonly accepted that a routine fire inspection program can reduce the number of fires and related fatalities and injuries in a community. For example, in 2003, the Shelbyville, Tennessee Fire Department implemented a comprehensive fire prevention program, including fire and all-hazards life safety education and commercial building inspections. Over the following ten years, structure fires decreased by 26%, and fire-related injuries decreased by 40%.³⁴

In making remarks at a national fire safety symposium in 2019, an NFPA representative noted: *"With regards to my topic on fire prevention education, the main cog is an informed public. The public must understand their risk. For example, the general over-confidence toward fire is made evident through the number of home fire fatalities that occur in homes each year where the smoke alarms have been dismantled or are not working due to dead or missing batteries. **On the other hand, when the public is properly educated and informed, they can act to protect themselves. The public also plays a role in holding policymakers accountable for the safety of their communities*** (Emphasis added).³³

The Department does not maintain an inventory of commercial and multi-family buildings, or a current list of target-hazard/high-hazard occupancies that can pose a significant risk to residents and firefighters during an emergency event. Given the size of the community and Department, the lack of a comprehensive commercial building inventory, commercial occupancy inspection program, pre-fire plan program, or a comprehensive public education program should be a significant concern to the Department and City leaders.

³² Everyone Goes Home Implementation Guidebook, Vol. 4, National Fallen Firefighters Foundation, 2008.

³³ Remarks by Lorraine Carli, NFPA, at the 17th Annual President Harry S. Truman Legacy Symposium and the President Truman Fire Forum, May 5-7, 2019.

³⁴ Measuring the Effectiveness of Fire Prevention, Brian Nicholson, LinkedIn, February 3, 2017.

ESCI estimated, based on the number of commercial business addresses provided by the Building Department, the number of inspections that would be required to visit each commercial address on an annual basis, as shown in the following calculation.

228 working days per year (52 weeks per year x 5 days per week) - (11 holidays and 21 leave days per admin. assigned inspector) = **228 potential workdays**

3,111 commercial business addresses ÷ 228 = **13.6 required inspections per day**

Theoretically, each of the current Fire Inspectors would have to perform 3 or more commercial occupancy fire inspections every workday to visit every commercial address on an annual basis, and this calculation does not factor in the complexity of the inspection. In other words, a large industrial complex may take a full day or more to inspect, and a typical strip mall business may only take 20 minutes to inspect. Also, it must be noted that initial inspections can identify fire code issues that result in the need for follow-up re-inspections and referrals, which compound the number of required inspections and resulting paperwork.

ESCI also noted that at the time of the study, the City was contemplating instituting a multi-family residential building inspection program. While the number of apartment buildings was not reported to ESCI by the Department, it is assumed that there are a significant number of additional inspections that would be required on a yet-to-be-determined inspection schedule.

Anecdotal information shared with ESCI related to the number of suspicious fires and arson fires should be very concerning to city leadership. Due to a lack of records, ESCI was unable to identify the demographic traits and trends of city arsonists. A more in-depth and ongoing analysis should be conducted to identify the specific arson demographic characteristics which may be contributing to committing these crimes, and can perhaps be used to identify, educate, and modify a potential arsonist's behaviors and attitudes.

The Department and City should consider adding personnel and resources to the Fire Prevention Division to address the preceding noted deficits in these important programs, as noted in the recommendations section of this report.

ISO and Fire Prevention

The Insurance Services Office (ISO) is an independent company that collects and analyzes data about the delivery and capacity of fire departments across the nation. According to the ISO, its Public Protection Classification Program (PPC) “is a proven and reliable predictor of future fire losses.”

The ISO’s PPC Fire Suppression Rating Schedule (FSRS) evaluates and quantifies four primary elements of a community’s fire protection system:

- **Emergency Communications** (Maximum of 10 points)
- **Fire Department Capabilities** (Maximum of 50 points)
- **Water Supply** (Maximum of 40 points)
- **Texas Exceptions** (Maximum of 6.5 points)

The total possible points that can be awarded is 106.5 points. Once the points have been determined, ISO assigns a Class grade on a scale from 1 to 10. Class 1 represents the highest level of fire protection, and Class 10 represents no fire protection per ISO minimum criteria.

The City has an ISO Class 1 rating, per the last evaluation conducted in 2015. Less than 1% of all fire departments in the nation have a Class 1 rating.

TECHNICAL RESCUE & HAZARDOUS MATERIALS RESPONSE

KFD maintains resources to respond to unique rescue situations and uncontrolled hazardous materials releases. In this section of the report, ESCI evaluated the allocated resources, training, certifications, and equipment required to safely and effectively deploy on these incident types.

Technical Rescue

The KFD Technical Rescue Team is deployed on two rescue units (Rescues 2 and 9). Each unit is minimally staffed 24/7 with two personnel, one of whom is a Technical Rescue Technician (TRT). Off duty TRTs may be recalled to a large-scale or complex rescue incident as necessary.

20 TRTs, one Team Leader, and one Alternate Team Leader are assigned to each shift. In addition, there are 15 Swift Water Rescue Technicians (SRTs) assigned on each shift as well.

The TRTs are trained in the following rescue disciplines:

- Confined space rescue
- High angle and low angle rope rescue
- Trench rescue
- Vehicle/Machinery rescue
- Surface and swift water rescue

All Operations assigned personnel are trained to at least the Awareness level in each of the preceding rescue disciplines. The Department identified that approximately 10 to 14 personnel may be required to perform the necessary functions and roles at the scene of a technical rescue incident.

Funding for team activities, equipment, and apparatus is not segregated out in the Department's expense budget.

Rescue Unit Equipment & Inventory

Rescue 2 and Rescue 9 are equipped with a wide variety of rescue equipment to access and rescue victims in various rescue situations. In general, each unit carries equipment to safely perform the following rescue functions:

- Stabilize vehicles and equipment.
- Lift extremely heavy objects.
- Perform low angle and high angle rope rescues, including lifting victims vertically through narrow openings.
- Remove victims from Immediately dangerous to life and health (IDLH) environments.
- Deconstruct, cut, and spread damaged metal and equipment.
- Secure and remove victims from water.
- Provide BLS and ALS EMS care.
- Confine and stop small hazardous materials releases.

A review of the respective Rescue Unit inventories reveals that Rescue 9 carries significantly more equipment than Rescue 2, much of which is related to vehicle and trench stabilization and extrication. Both units are well equipped with a wide variety of rescue and rescue scene support equipment.

Technical Rescue Training and Procedures

The TRTs are trained and certified using internal department resources and instructors and external subject matter experts. The Department uses in-house certified instructors and instructors from the USAR Texas Task Force 1 for training personnel in swift water rescue and boat operations, and instructors from the Texas A&M Engineering Extension Services (TEEX®) for training and certifying technicians in the other rescue disciplines. Continuing education training and drills for the Rescue Teams are routinely conducted on Saturdays, depending on incident workload, and periodically on other days throughout the year.

ESCI noted that the Department's rescue program does not have formal policies or procedures specific to the rescue program or related specific rescue operations. NFPA 1670: *Standard on Operations and Training for Technical Search and Rescue Incidents* defines the requirements for creating and maintaining a safe and effective technical rescue program. Section 4.1.6 in the Standard states: "The AHJ (Authority Having Jurisdiction) shall establish operational procedures consistent with the identified level of operational capability to ensure that technical search and rescue operations are performed in a manner that minimizes threats to rescuers and others."

Additionally, the Standard states that an AHJ must annually perform an evaluation of the performance of the TRT training and program to ensure it is prepared to effectively and safely deploy in abnormal weather conditions and extremely hazardous or difficult conditions. According to the Department, the TRT Team Leaders and Command staff evaluate the program twice a year.

Hazardous Materials Response

KFD maintains a robust hazardous materials (Hazmat) response program, comprised of 58 Hazmat Technicians, who are also certified Hazmat Safety Officer certified. Almost all personnel are trained to the Hazmat Operations level, and nine personnel are certified Hazmat Incident Commanders.

Hazmat Equipment

The Department maintains a Hazardous Materials Unit (Hazmat 8) and trailer, which is cross-staffed by the Engine 8 and Medic 8 crews as required. The Unit is extensively equipped to perform the following functions at an uncontrolled hazardous materials release:

- Identify and secure a perimeter.
- Test and identify (or categorize) a substance and related hazards.
- Safely confine, contain, stop, or neutralize a release and substance.
- Safely decontaminate personnel and equipment and contain runoff.

HazMat 8 is equipped with Level A and B protective ensembles, communications equipment, and cooling equipment to allow for the safe entry of responders into potential IDLH environments.

EMERGENCY MANAGEMENT

The Office of Homeland Security and Emergency Management (OHSEM) is located within the Fire Department administration, and is managed by an Emergency Management Coordinator (EMC), which is a non-uniformed position reporting the Assistant Fire Chief. The EMC is responsible for coordinating all of the City's emergency management/disaster activities related to mitigation, planning, response, and recovery. The OHSEM is also responsible for managing all disaster-related grants, which at the time of this study included:

- Coronavirus Aid, Relief, and Economic Security (CARES) Act
- Emergency Management Performance Grant (EMPG)
- U.S. Fire Administration Assistance for Firefighter Grant (AFG)—Fire Prevention/Safety Education Grants
- Homeland Security Grant Program (HSGP)
- Disaster Recovery Grants (Incident specific)

The EMC is assisted by a volunteer, who is primarily responsible for reviewing and updating the City's Emergency Operations Plan for approval by the EMC. An Emergency Management Specialist position was created and is projected to be filled in late Spring 2021.

Programmatic activities performed by the OHSEM include:

- Emergency response logistical and planning support to large-scale emergency and non-emergency events.
- Maintaining the City's Emergency Operations Center (EOC).
- Delivering public disaster and life safety education.
- Documenting and managing grants.
- Liaison with local, state, military, regional, and federal emergency management organizations.
- Maintain the City's disaster resource list.
- Manage the City's outdoor and web-based warning systems.
- Facilitating disaster response education for key city employees.

At the time of this study, the City's previously earmarked funding for converting a large space in the Arts & Activities Center into an EOC facility, with adjacent office spaces for OHSEM staff will likely be diverted to address Americans with Disability Act (ADA) access deficiencies in other City-owned buildings. It is unknown if or when this funding will be restored to construct an EOC.

Identifying, obtaining, and outfitting adequate space for a City EOC should be carefully considered. All too often, agencies identify their EOC as an existing multi-purpose room that cannot realistically support long-term emergency operations support needs.

According to the EMC, the City's outdoor warning siren system has not been expanded to ensure recently developed areas in the southern city have adequate siren coverage.

Emergency Management Discussion

In February 2021, the City and region experienced a severe winter storm event (Winter Storm Uri), resulting in county, state, and federal disaster declarations. Killeen was severely impacted, especially the City's power grid and water system. Businesses and homes suffered from power failures, and broken water pipes and sprinkler systems, which resulted in low water pressure and limited water supply throughout the city. Compounding this situation was a large hotel fire in Killeen, where suppression efforts were hampered by low water pressure and damaged fire sprinkler and standpipe systems. Over 100 occupants were displaced into frigid temperatures in the middle of the night, and KFD's OHSEM staff coordinated their transport to a shelter, and coordinated with the American Red Cross to ensure they had sufficient resources and ability to later retrieve their belongings from the hotel.³⁵

Winter Storm Uri's local impact was likely felt by all city residents, and raised awareness of regional, state, and national public utility vulnerabilities that will need to be addressed in the future.³⁶ It also likely served as a "wake-up call" to many residents about the need to better prepare themselves and their families for disasters.

ESCI understands that during this event, the lack of a suitable physical EOC facility added a layer of management complexity and inefficiency. An after-action review (AAR) will soon be conducted with public agencies and responders to share lessons learned from this event, with the goal of identifying necessary mitigation, planning, and education action items.

³⁵ <https://www.kxxv.com/hometown/bell-county/authorities-on-scene-of-massive-hotel-fire-in-killeen>

³⁶ <https://www.vox.com/22308149/texas-blackout-power-outage-winter-uri-grid-ercot>

Coordination and collaboration are foundational tenants in Emergency Management. In an article analyzing disaster command and control and the role of Emergency Management, Waugh, and Streib noted:³⁷

Collaboration is an expectation in emergency management. The NFPA 1600, the international standard for emergency management programs, and the EMAP standard, which was adapted from the NFPA 1600 for public emergency management programs, define programs as "a jurisdiction-wide system that provides for management and coordination of prevention, mitigation, preparedness, response and recovery activities for all hazards. The system encompasses all organizations, agencies, departments, entities, and individuals responsible for emergency management and homeland security.

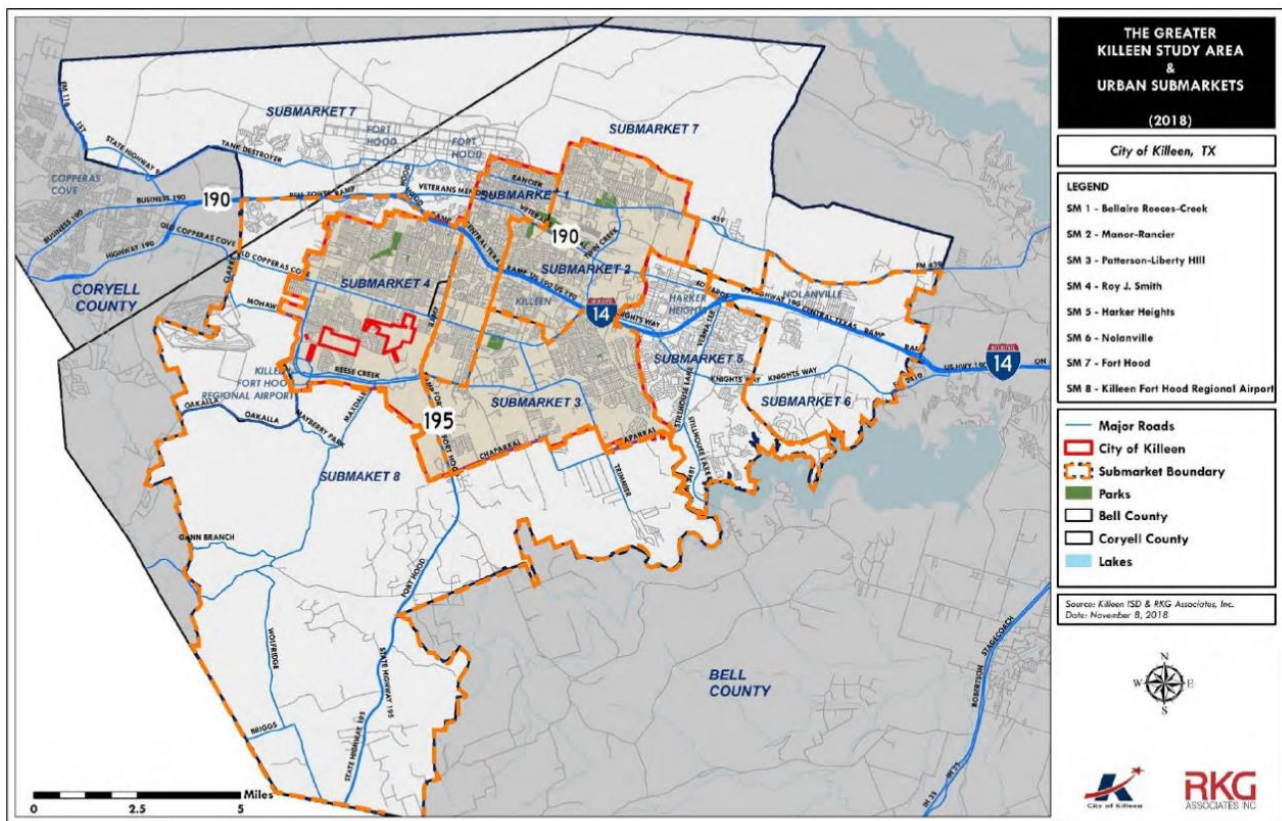
The City's EMC noted that the Killeen Independent School District has a robust Investigations and School Safety Department staffed with personnel responsible for the District's emergency planning, safety programs, and incident investigations. ESCI understands that the OHSEM occasionally coordinates with this group on EM activities. The OHSEM should continue this collaboration, up to and including the sharing of emergency planning and coordination activities.

³⁷ Collaboration and Leadership for Effective Emergency Management, Waugh and Streib, Public Administration Review, December, 2006.

POPULATION GROWTH PROJECTIONS

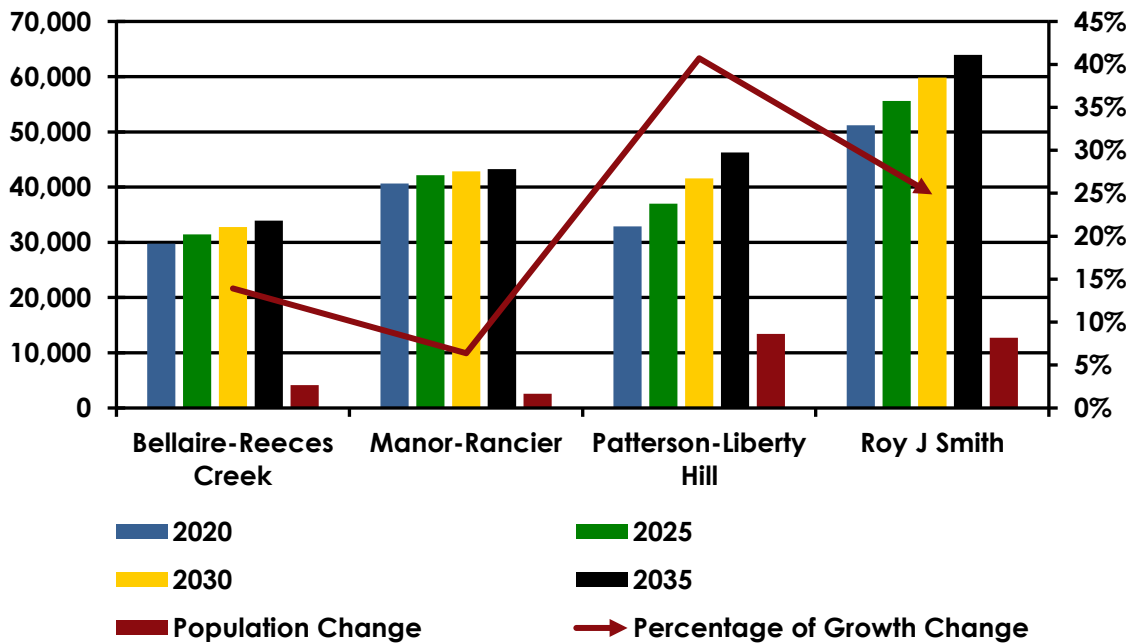
It is no secret that Texas, and the Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA), has experienced significant growth over the past decade, with the City of Killeen experiencing the most population growth compared to other communities in the MSA.³⁸ ESCI reviewed the City's 2010 Comprehensive Plan, and population projection information from an October 2019 Greater Killeen Chamber of Commerce growth study to show the City's potential population growth. This growth is broken down by urban "submarkets," based on school boundaries, to show the areas within the City with the potential for having the most growth. The following figure shows the location of the submarkets 1–4, which are in the Killeen city limits.

Figure 109: Killeen Submarket Map



The following figure shows the growth projections for each of these urban submarkets.

³⁸ Killeen Growth Study, RKG Associates Inc., October 2019.

Figure 110: Killeen Population Growth Projection by Submarket, 2020–2035

As shown in the preceding figure, the Patterson-Liberty Hill and Roy J Smith areas are predicted to have the greatest growth over the next 15 years, at 41% and 25%, respectively. Conversely, the Manor-Rancier area may experience the least growth over the same timeframe with only 6% growth. The aggregate average growth rate of these areas is approximately 21% over the 15-year timeframe, at a 1.4% annual growth rate.

The age trend of the population is another important demographic component that must be taken into consideration in emergency services planning, especially as it relates to EMS incidents. The Chamber of Commerce study projects an almost 90% increase in the population aged 75 and older between 2018 and 2035. This would almost certainly contribute to increased call demand above what may occur simply based on the increased population. However, the City's Planning and Community Development Department Director is skeptical of this projection, and feels it will be much less than a 90% increase.

Lastly, the location and characteristic of development is also a primary consideration as it relates to meeting future emergency response needs. City planning staff believe most of the future growth in the next 15 years will be primarily single-family and two-family residential development, with significant development occurring in the southern area of the City, south of Stagecoach Road, east of State Highway 195.

Significant infill and redevelopment "gentrification" of the downtown area has been identified as a City need, which culminated in the creation of the North Killeen Revitalization Program. At the time of this study, only a few small revitalization projects have been completed, and large projects that fundamentally change the character and population density in the downtown core are not projected to occur for a long time, as many small businesses and restaurants in that area have gone out of business due to the COVID-19 pandemic.

SERVICE DEMAND PROJECTIONS

The previously described population projection indicates that continued population growth and potential expansion of the city limits will likely result in increased demand for emergency services. Besides population changes and demographic shifts in median population ages, it is important to keep in mind that the need for additional resources to address a community's growth and development is not related solely to population growth. Population growth—including transient growth related to commuting workers and visitors—primarily impacts demand for EMS, while development—and the character of development—directly impacts the overall risk that the Fire Department must be prepared to effectively mitigate. However, population can be used as a proxy in projecting incident demand, and population density can also be used as a proxy in quantifying risk since higher population density typically includes high-density multifamily residential structures.

It is also important to understand that the response to various incident types may vary from year to year. This was especially true in 2020, when the COVID-19 pandemic resulted in a reduction (0.2%) in the number of EMS incidents as compared to 2019. ESCI noted that EMS incidents increased by almost 2% between 2018 and 2019, and Service calls increased by almost 77% between 2018 and 2020, while the overall number of fires (NFIRS Category 100) changed very little over the same timeframe.

Three methodologies tied to population were used to project incident demand for the next ten years. The first was simply applying the last 10-year average percentage of population growth experienced by Killeen and applying the 2019 per capita incident rate to determine future incident demand. The year 2019 was used for these projections due to the impact of COVID-19 on emergency service demand, especially EMS incidents.

The second method takes the Chamber of Commerce's predicted average Killeen submarket annual growth rate and projects it out ten years, and applies the 2019 per capita incident rate. The third method applies the Texas Demographic Center's population projection for the overall Killeen Temple Metropolitan Statistical Area and applies the current per capita incident rate. The following figure summarizes the incident calculations from the three methodologies.

Figure 111: Future Incident Projections

Methodology	Projected 2030 Population	Per Capita Incident Rate¹	Total projected 2030 Incidents
Historical 1.6% annual population increase projection	177,756	.15	26,663
1.4% Killeen Sub-market population increase projection	177,076	.15	26,561
Texas Demographic Center Killeen/ Temple MSA 1% population projection	167,533	.15	25,132

¹ Based on 2019 population and total incidents

There is a difference of 10,223 new residents and 1,531 incidents (5.7%) between the historical population increase projection and the Killeen/Temple MSA growth projection. Additionally, ESCI noted that the City's 2030 population projection was 173,431 at the time of this study, which is 4,325 fewer residents than the highest population projection. However, given the overall size of the population and per capita incident rates, the variations between the projections are very small from a service delivery impact perspective.

COMMUNITY RISK ANALYSIS

Community Risk Overview

In developing a comprehensive and accurate Master Plan, ESCI examined existing plans and information related to the City of Killeen's natural, human, and technological hazards. This assessment is critical to identifying the level of community vulnerability, resiliency, and the ability to mitigate these hazards.

Community risk is assessed based on several factors, including population and population density, population demographics, local land use and development, local geography, and natural hazards. These factors should influence the amount and type of resources required to respond and mitigate these hazards.

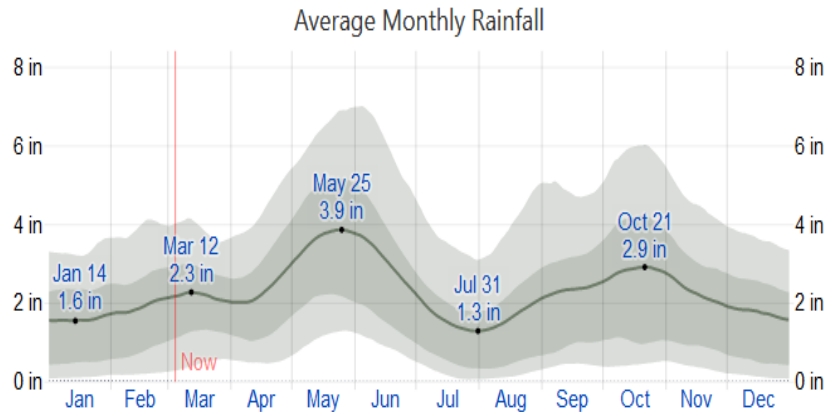
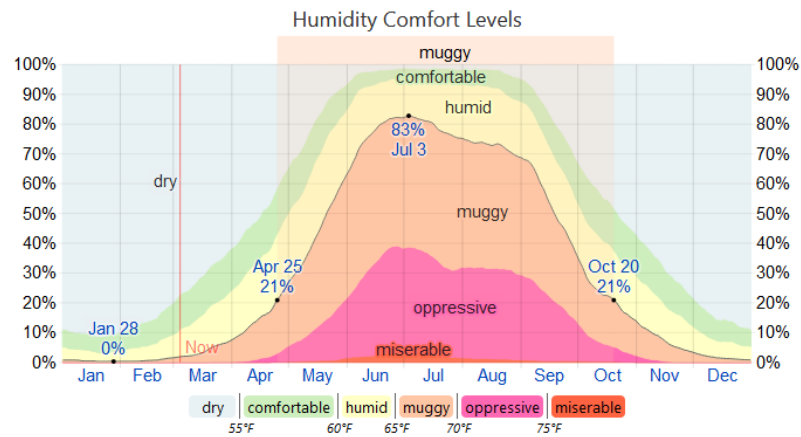
The City's population density and demographics that influence risk exposure are explained in detail earlier in this study. The physical characteristics of the area and the resultant natural hazards are risk factors that must be considered.

Land use and zoning also affect risk. Risk can be characterized as low (e.g., agricultural or low-density housing); moderate (e.g., small commercial and office); or high (e.g., large commercial, industrial, and high-density residential).

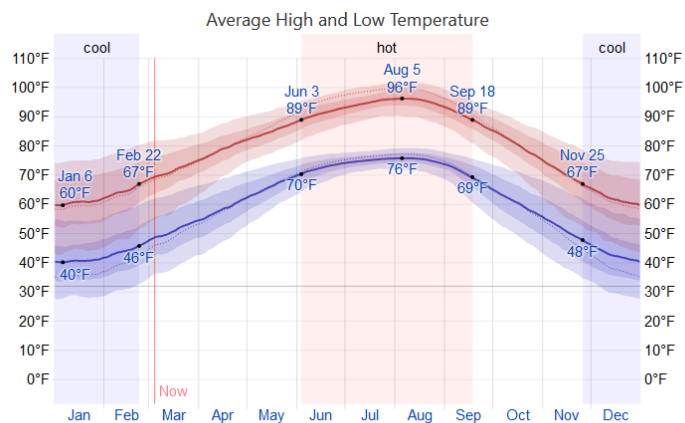
Climate

According to the 2018 Draft Central Texas Council of Governments Hazard Mitigation Action Plan (HazMAP), the County's topography ranges from rolling prairie land in the eastern county to undulating uplands with deep stream valleys, bluffs, and cliffs in the western county area where Killeen is located. The elevation ranges from 450 feet to 1,200 feet. The City is located 890 feet above sea level. The region's climate is classified as humid subtropical and has a wide range of yearly temperature and precipitation fluctuations. Winters are typically mild but may experience significant sudden swings in temperature. Summers are typically dry and hot, with daytime temperatures often exceeding 100° F. Average temperatures range from a low of 46.8° F to 83.5° F.³⁹ The following figures illustrate the fluctuations in humidity and precipitation experienced annually experienced in the region per *Weatherspark.com*.

³⁹ www.Weatherbase.com

Figure 112: Killeen Annual Precipitation**Figure 113: Killeen Annual Humidity**

The percentage of time spent at various humidity comfort levels, categorized by dew point.

Figure 114: Killeen Annual Temperature

The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Much of the annual rainfall is produced by frequent thunderstorm activity, especially in the spring. These storms occasionally produce damaging flash flooding, hail, strong straight-line winds, and tornadoes. As a result, Killeen has invested significant time and effort into preparing and educating the community for violent weather events, which resulted in the formal recognition of the City as a *StormReady*® Community by the National Weather Service (NWS).

Natural Hazards

The 2018 Central Texas Council of Government HazMAP includes specific annex information for the City of Killeen. It is not the intent of this study to restate in detail all of the information contained in the County's plan; however, it is important to summarize the key hazards and risks in the plan to help create a context for this study's recommendations.

Severe Thunderstorms

As previously noted, strong thunderstorms are common in the region, and occasionally result in very severe rainfall, high winds, hail, or tornadoes. By far, this natural hazard is the most common in the region. USA.com® inventoried the following extreme weather events that have occurred within 50 miles of Killeen between 1950 and 2010:

- 1,032 Thunderstorm wind events
- 448 Floods
- 1,258 Hail Events
- 71 Tornadoes

The following natural hazards can result from severe thunderstorms.

- **Microbursts:** A strong, small-scale downdraft of wind that hits the ground and spreads out; there is no rotation as there is with a tornado.
- **Macrobusts:** Another form of straight-line winds similar to a microburst but spread out over a larger area.
- **Tornadoes:** Tornadoes are created when warm, moist air near the ground interacts with cooler air above and rapidly increasing winds that rotate. Tornadoes are extremely violent wind events that can cause catastrophic damage along their path. The strength of tornadoes is quantified in the scale shown in the following figure that corresponds with the tornado's wind speed.

Figure 115: Tornado Intensity, Enhanced Fujita Scale⁴⁰

Scale	Wind Speed	Typical Damage
EF-0	65–85 mph	Minor or no damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage.
EF-1	86–110 mph	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	111–135 mph	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	136–165 mph	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.
EF-4	166–200 mph	Devastating damage. Well-constructed and whole frame houses completely leveled; cars and other large objects thrown, and small missiles generated.
EF-5	> 200 mph	Extreme damage. Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; vehicles thrown hundreds of yards.

Killeen experienced four tornadoes between 1955 and 2017, with the strongest recorded as EF-1, causing less than \$200,000 in damage and no injuries or fatalities. However, stronger tornadoes have struck Bell County over several decades, resulting in three fatalities, 19 injuries, and over \$22 million in property damage. Given the region's climate and tornadic history, the HazMAP identified that future tornado events in Bell County are highly likely as it lies within the far southern border region of what is known as "Tornado Alley."

⁴⁰ Wikipedia. https://en.wikipedia.org/wiki/Enhanced_Fujita_scale.

Flood

Flooding, especially flash flooding, can occur in localized areas in Killeen during heavy rain events, with stormwater runoff into various rivers, creeks, and drainages throughout the City. South Nolan Creek, Creek, Trimmier Creek, and various tributaries flow through the City. According to the HazMAP, between 1996 and 2017, Killeen experienced 12 flooding events, one of which was a flash flood that resulted in two fatalities and one injury in the city.

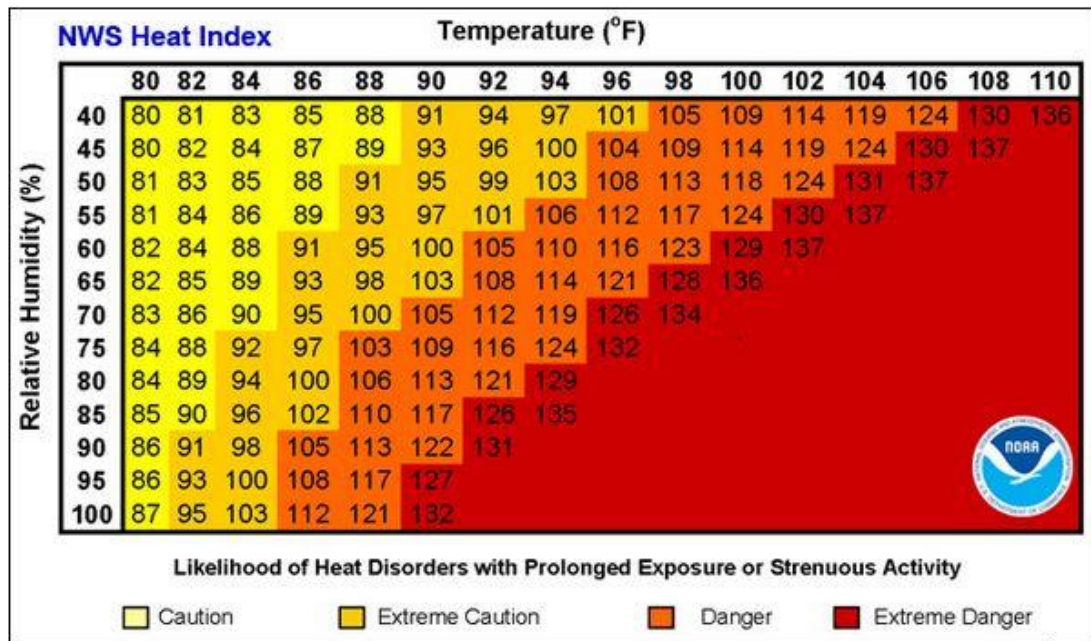
The City has an Environmental Services Division that is responsible for maintaining stormwater drainage systems and managing development in the designated flood plains in the City. The City's Flood zones have been identified and mapped by FEMA.

Extreme Heat

As noted in the climate discussion, the Central Texas region experiences extremely high temperatures in the spring and summer months, which can physiologically strain citizens, and public utilities, causing death, injury, and socioeconomic disruption.

Heat illness is primarily the result of two environmental conditions: High temperature and high humidity. The common term—often used in jest—"It's a dry heat!" has validity. Evaporation of sweat is one way the body regulates temperature. When atmospheric humidity is elevated, any sweat will not evaporate, compromising the body's ability to cool itself. A person's age, overall physical condition, and level of exertion also impact their ability to tolerate heat.

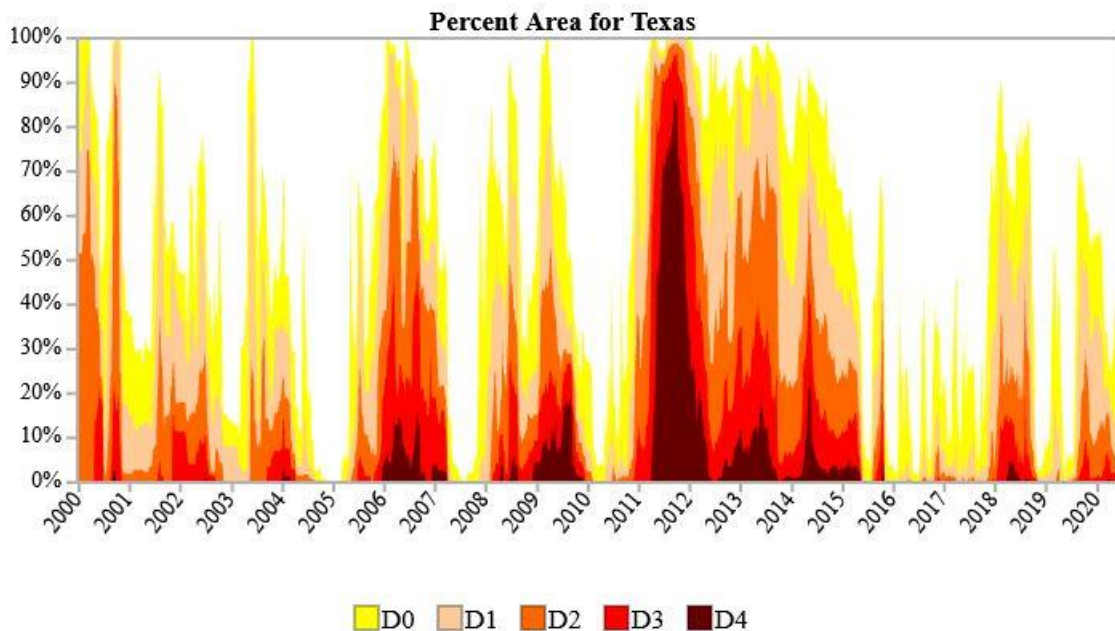
The National Weather Service created the following chart to illustrate the combined danger of high humidity and temperature.

Figure 116: Heat Index Chart

Since 1998 there have been eight recorded extreme heat events in Bell County, three of which resulted in fatalities attributed to the heat. Given the regional climate, future extreme heat events that could impact Killeen are highly likely, with a probability of at least one event per year.

Drought

Drought conditions develop when there is insufficient precipitation to maintain the water needs for domestic and agricultural uses as a result of abnormal weather conditions. Secondly, these conditions can exacerbate the risk of catastrophic wildfires. The Federal National Integrated Drought Information System (NIDIS) monitors drought conditions throughout the United States. The following figure summarizes the drought history of Texas over the past 20 years. The intensity of the droughts is graded from D0—Abnormally Dry to D4—Exceptional Drought.

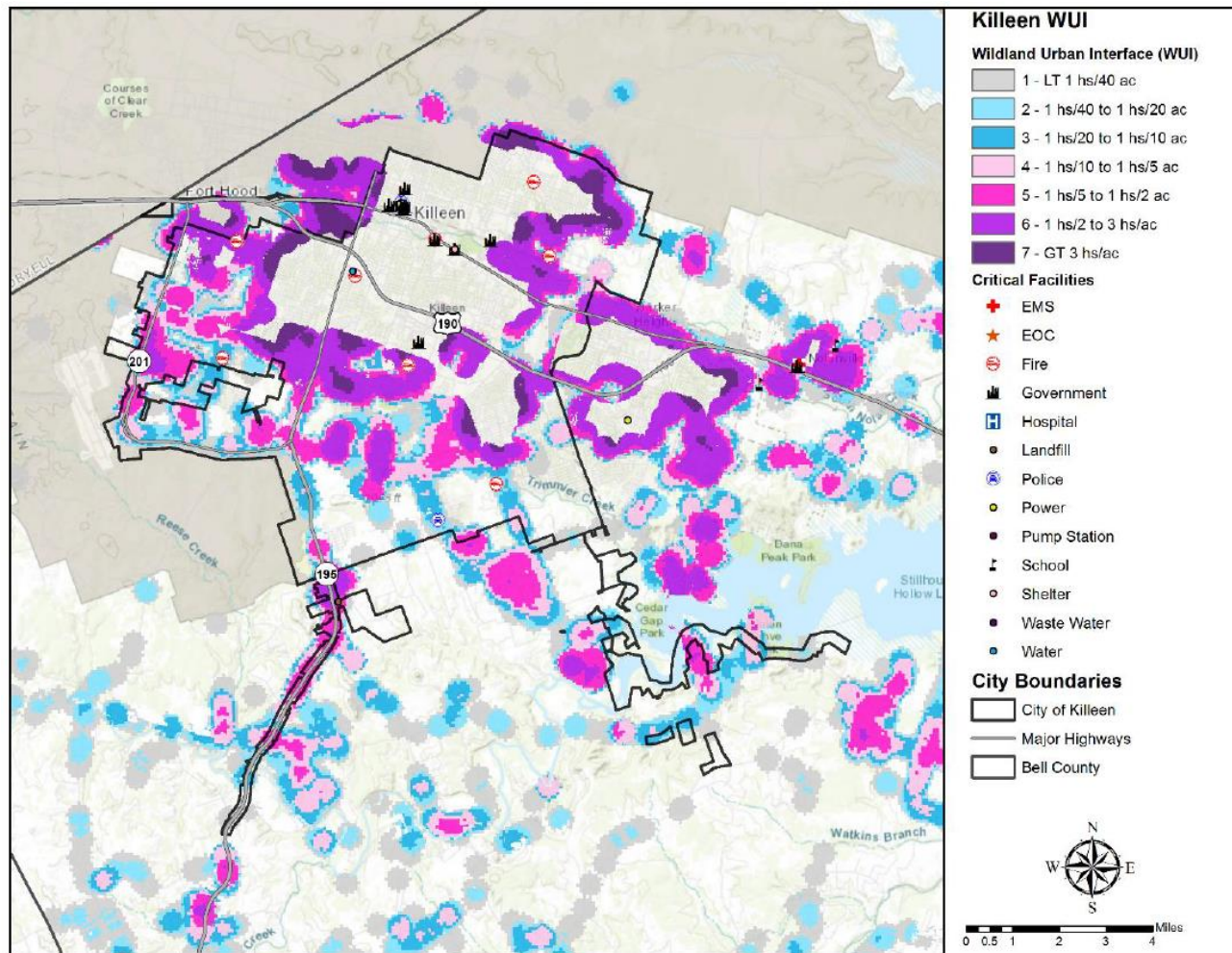
Figure 117: Texas Drought History, 2000–2020

Bell County experienced serious drought conditions through much of 2019, resulting in a disaster declaration in December 2019. Specific to Killeen, the City's recorded annual rainfall was four inches below the average annual rainfall.⁴¹

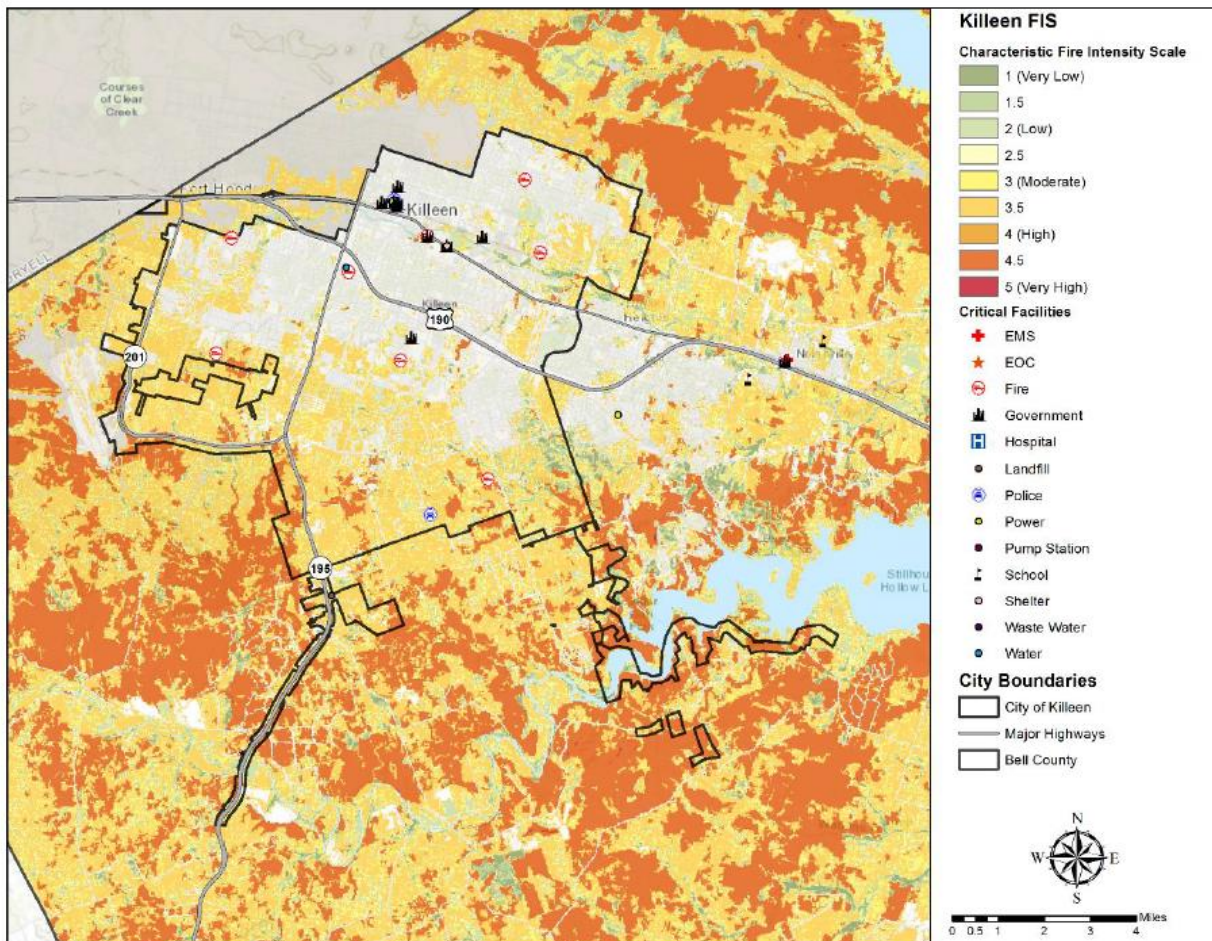
Wildfire

Increased risk of wildfire often results from drought conditions. Wildfire is defined as an uncontrolled fire spreading through wildland vegetative fuels, urban interface areas, or both, where fuels may include structures. These fires are typically caused by lightning or human carelessness. The proximity of development near wildland areas, along with landscaping with indigenous plants in the area, creates what is commonly known as the wildland-urban interface (WUI), which places these structures at significant risk from an approaching wildfire. Also, the secondary effects of smoke and ash can pose significant threats to air quality and health. The HazMAP notes that wildfires are highly likely, but minor in severity throughout the County. However, it also noted that 34% of Killeen residents live within the WUI, as shown in the following figure.

⁴¹ Bell County 1 of 17 counties governor declared as a disaster area, January 7, 2020, Killeen Daily Herald.

Figure 118: Killeen Wildland Urban Interface Areas

According to the Texas Forest Service, 947 wildfires were recorded within the Killeen city limits between 2005 and 2015, burning over 2500 acres. According to the HazMAP, given the regional climate conditions, natural fuel loads, and characteristics of the built environment, wildfires may burn with moderate to high intensity, depending on the fire's location, as shown in the following figure.

Figure 119: Fire Intensity Map, Killeen

Technological (Human-Caused) Hazards

Transportation incidents, structure fires, power outages, and hazardous materials releases are likely the most common technological risks in Killeen.

Transportation

The City's transportation corridors are critical to the City's socioeconomic vitality, stability, and safety. Changes to these systems can affect the response capability of emergency services, supply chains, and fundamental business uses.

Roads

Surface streets dominate the KFD service area. Interstate 14 and the North Central Texas Expressway bisect through the middle of the city from east to west, along with State Highway 190 just north of the interstate. State Highway 195 comes into the heart of the city from the south, terminating at the Interstate 14 interchange. Vehicle accidents and hazardous materials releases are the primary hazards on these roadways.

The balance of the Department's service area consists of a mix of relatively well-interconnected street networks and disconnected neighborhoods characterized by meandering streets and cul-de-sacs.

Railroads

A two-track Burlington Northern Santa Fe railway (BNSF) runs roughly parallel to Interstate 14 from east to west through the heart of the city. This is the only rail transportation corridor in the City. Diesel-powered locomotives haul a wide variety of goods, materials, and hazardous materials.

The primary hazards associated with BNSF trains are a collision with a vehicle that bypasses the safety crossarms and signals at controlled intersections, and derailments that could result in releases of large quantities of hazardous materials. Between 2001 and 2020, there have been 21 reported roadway/rail incidents in Bell County, resulting in five deaths and 11 injuries.⁴² However, there has only been one hazardous materials release involving a rail car during the same time period.

Airports

The City owns and operates a regional airport, Skylark Field (ILE), located approximately three miles east of downtown. The Airport's single 5,495-foot-long runway is used primarily for general aviation use, with an average of over 80 flight operations occurring each day. The FAA recorded seven minor incidents at this airport since 2000, with no injuries or fatalities.

⁴² Federal Railroad Administration, Safety Data website.

Another airport, Killeen-Fort Hood Regional Airport (GRK), is located in the far western area of the city, approximately six miles southwest of downtown. The airport's 10,000-foot-long runway is shared primarily by two commercial airlines and the military, along with some civilian general aviation use.⁴³ The airport is classified as Index E for airport rescue and firefighting (ARFF) requirements, which is the highest protection level requirement due to the large military aircraft using the airport. ESCI was unable to locate historical incident data for this airport. Under the terms of an Automatic Aid Agreement, the Fort Hood Fire Department is responsible for ARFF response to aircraft incidents on the Robert Gray Army Airfield and Killeen Commercial Airport area.

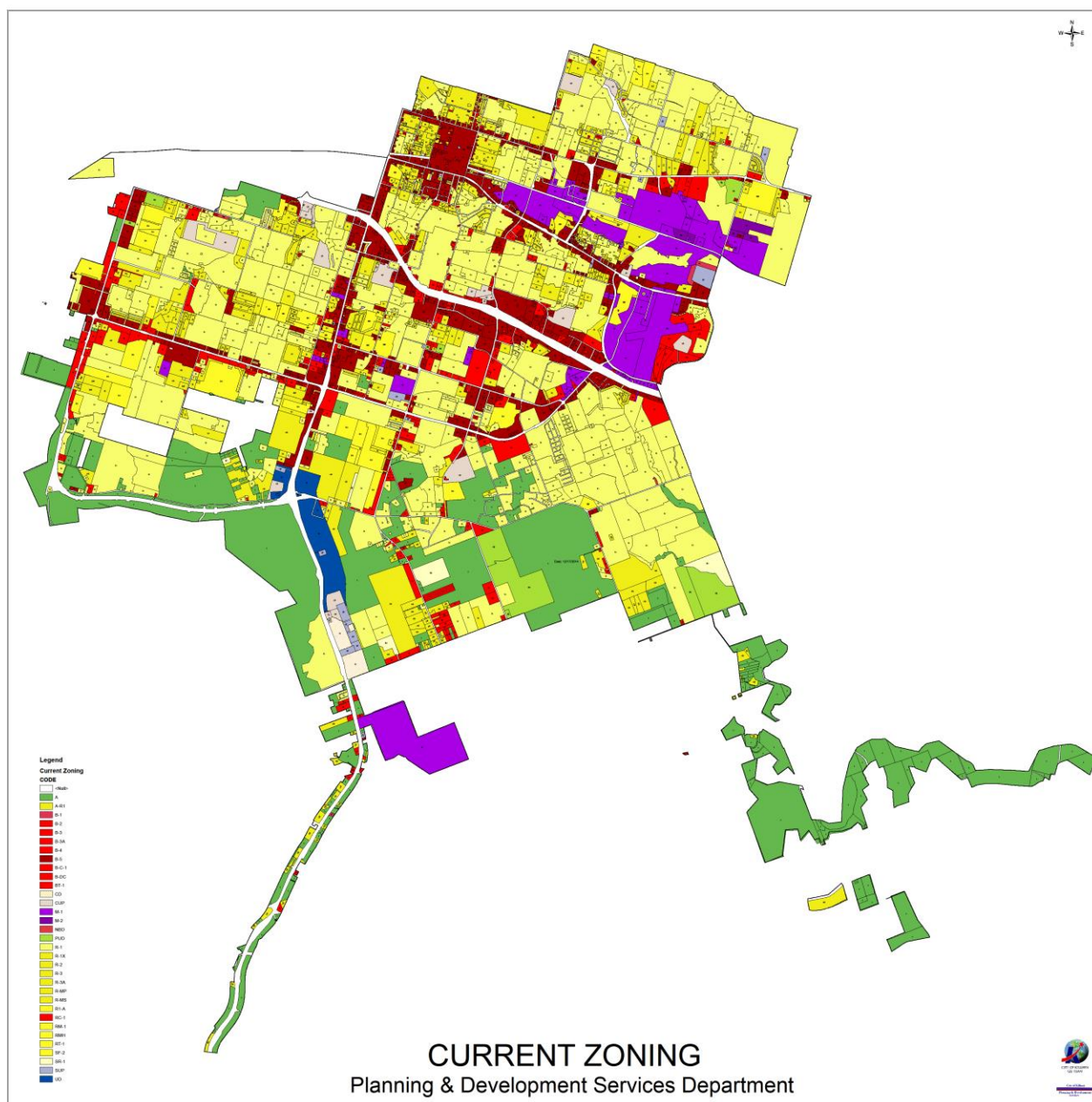
Land Use

ESCI used GIS software and zoning classifications for the City of Killeen to evaluate current and future land use; risk was applied to each classification to present a view of relative community risk. The Killeen service area is a mix of low-, moderate-, and high-risk properties.

- **Low Risk:** Areas zoned for agricultural purposes, open spaces, low-density residential, and other low-intensity uses.
- **Moderate Risk:** Areas zoned for medium-density single-family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- **High Risk:** Higher-intensity business districts, large mixed-use areas, high-density residential, industrial, high-rise buildings, warehouses, and large mercantile centers.

The following figure illustrates the various types of land use in Killeen.

⁴³ City of Killeen website.

Figure 120: Killeen Zoning Map, 2020

Physical Assets Protected

Killeen's built environment is a blend of various types of construction and uses that present varying levels of risk for occupants and emergency responders. In a fire or other significant emergency event in high-risk structures, more emergency response resources are required to quickly and safely mitigate the situation. This section reviews Killeen's built environment and the specific target hazard building risks.

Target Hazards/Critical Infrastructure and Key Resources (CIKR)

The definition of target hazards varies among jurisdictions. For continuity, ESCI uses the FEMA definition of target hazards as “facilities in either the public or private sector that provide essential products and services to the general public, are otherwise necessary to preserve the welfare and quality of life in the community, or fulfill important public safety, emergency response, and/or disaster recovery functions.”

However, almost all communities have additional building types that are considered target hazards, such as large public assembly buildings, schools, medical and congregate care facilities, high-rise office buildings, and buildings with significant historical or cultural significance. The following figure summarizes the number of various Target Hazard structures in the City.

Assigning a risk classification to a building requires evaluation of various factors including, but not limited to, building size, use, construction type, occupancy load, built-in fire protection features, hazardous materials types and amounts, and available water supply to support required fire flow. **However, KFD does not maintain an inventory of commercial structures or target hazards, with the exception of Hazardous Materials Tier II reporting sites.**

Public Assembly Occupancies

Public assembly buildings are considered higher risk because of the large number of occupants, who also are likely unfamiliar with the building layout, including the location of emergency exits and the large open spaces that can allow rapid fire spread. Examples of these occupancy types include theatres, nightclubs, banquet halls, churches, sports arenas, and casinos.

Schools

The Killeen Independent School District has several public-school buildings located in Killeen, including four high schools, eleven middle schools, and thirty-two elementary schools. According to the District's website, the District has over 6,800 employees and 45,500 students.

There are a few private schools and daycare centers located in the City as well. The following figure illustrates the location of the school facilities.

Hospitals and Medical Care Facilities

In-patient medical care facilities present special hazards due to the relative immobility, disabilities, and vulnerabilities of the patients. As a result, these facilities are generally constructed of fire-resistive materials and have highly sophisticated and robust fire detection and suppression systems. The two major medical care facilities in Killeen are AdventHealth Medical Center and Carl Darnell Army Medical Center at Fort Hood. There are a number of tertiary and ancillary medical services facilities and physician offices located in Killeen as well.

Structural Risks

Various buildings in Killeen have unique features, uses, and hazards that increase risks for occupants and firefighters. As a result, significant incidents in these structures may require specialized response capabilities and equipment.

Hazardous Materials

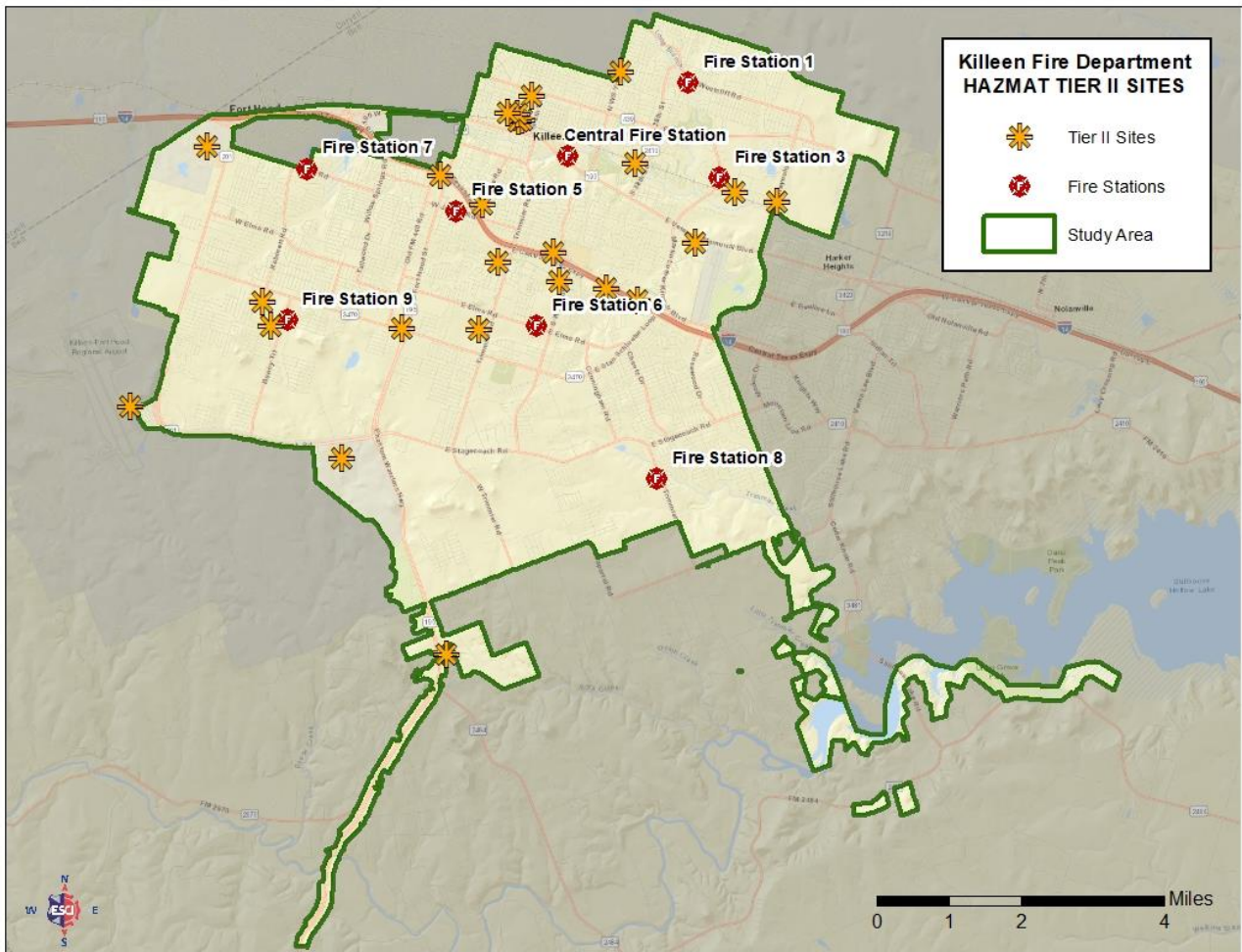
Buildings that use or store significant quantities of hazardous chemicals are special hazards for firefighters, citizens, and the environment during an uncontrolled release. Containing and controlling a chemical release requires special training, certifications, equipment, and procedures. Examples of these resources include Level A or B protective ensembles, overpack drums, plugging and diking kits, atmospheric monitors, and weather monitoring equipment.

Per the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), commonly known as SARA Title III, any location that stores or uses during any one day in a year, an amount of a hazardous chemical equal to or greater than the following limits must disclose the type and amount of chemical to local officials, planning committees, and file information, known as Tier II reports, about each material and the on-site amount with local authorities, planning committees, and the State's Commission on Environmental Quality.

The Tier II reporting thresholds are:

- 10,000 lbs. of hazardous chemicals
- Lesser of 500 pounds or the threshold planning quantity for extremely hazardous substances

The following figure shows the general location of the Tier II sites in Killeen.

Figure 121: Hazardous Materials Tier II Reporting Sites

Risk Assessment Methodology

In early 2021, ESCI asked KFD's leadership team to identify, assess, categorize, and classify fire response risks within the City of Killeen.

The Three-Axis Heron's Formula was used to calculate risk. This model was selected because it provided a more accurate means of communicating the organizational impact of the emergent responses. The formula takes into account the probability of occurrence, the severity of consequence, and the impact to fire department resources.⁴⁴

The Three-Axis Heron's Formula includes the following formula:

$$\text{Risk} = \sqrt{\frac{(\text{PC})^2 + (\text{CI})^2 + (\text{IP})^2}{2}}$$

The risk is graphically illustrated through a three-axis model as follows:

- **P** = Probability (Y-Axis)
- **C** = Consequences (X-Axis)
- **I** = Impact (Z-Axis)

The *probability* of risk was determined by reviewing the KFD incident response records to assess the likelihood of an event. The *consequences* to the community were determined through an evaluation of the incidents' impact on lives and property. The organizational *impact* was determined through a critical tasking and analysis of the KFD personnel needed to mitigate the risk. The following figure illustrates the assessment model.

Figure 122: Risk Assessment Scoring Methodology

Score	Probability	Consequence	Impact
2	Rarely (annual or longer)	No life or property loss	< 4 personnel
4	Quarterly	Life or property impaired	4–7 personnel
6	Monthly	Life or property loss	8–11 personnel
8	Weekly	Loss > 1 life or property loss	12–17 personnel
10	Daily	Loss of > 3 lives or major building	> 17 personnel

⁴⁴ Community Risk Assessment: Standards of Cover, 6th Edition. Center for Public Safety Excellence (2016).

KFD is responsible for providing four major services that include (1) Fire Response, (2) Medical Response, (3) Rescue Response, and (4) Hazardous Materials Response. This risk assessment was applied to each of the aforementioned areas to calculate a risk category of (1) Low, (2) Moderate, (3) High, and (4) Extreme. The ranking scale was set to establish two (2) as the lowest score and ten (10) as the highest score to illustrate the risk score.

Critical Tasking Assessment

Analysis of the critical tasking serves as the foundation of the deployment section of this report to encourage a stronger correlation between risk and resources. To determine this, KFD leadership reviewed the critical tasking to establish the personnel required to mitigate the incident. This is formally known as the *effective response force* (ERF). Additionally, the *reserve capacity* (RC) of the organization is determined by quantifying the remaining personnel available to respond to a concurrent incident(s). The following figure illustrates an example of critical tasking and personnel requirements for each fire risk category, as recommended by NFPA 1710.

Figure 123: Critical Tasking & ERF for Fire-Risk Categories

Task	Low-Risk (Dumpster Fire)	Moderate- Risk (House)	High-Risk (Apartment)	Extreme Risk (High-Rise)
Command	1	1	2	2
Apparatus Operator	1	1	2	1
Handlines (2 members on each)	2	4	6	4
Support Members	2	2	3	
Victim Search & Rescue Team		2	4	4
Ground Ladders/Ventilation		2	4	
Aerial Operator (if ladder used)		(1)	(1)	
Initial Rapid Intervention Team		4	4	
Initial Medical Care Component			2	
Building Fire Pump Monitor (if equipped)				(1)
Hoseline–Floor Above Fire				2
Rapid Intervention Team				4
Accountability Officers (fire floor & floor above)				4
Evacuation management teams				4
Elevator Operations Manager				1
Incident Safety Officer				1
Interior Staging Manager				1
Member Rehabilitation				2
Vertical Ventilation Crew				4
Lobby Control				1
Transport Equipment				2
External Base Operations				1
EMS Crews with Transport				4
Total Required:	6	16 (17)	27 (28)	42 (43)

In the following figures, the Department's minimum staffing level (48) was used to determine the capability of the Department to effectively mitigate different types and sizes of emergency incidents, and the capacity to respond to concurrent incidents.

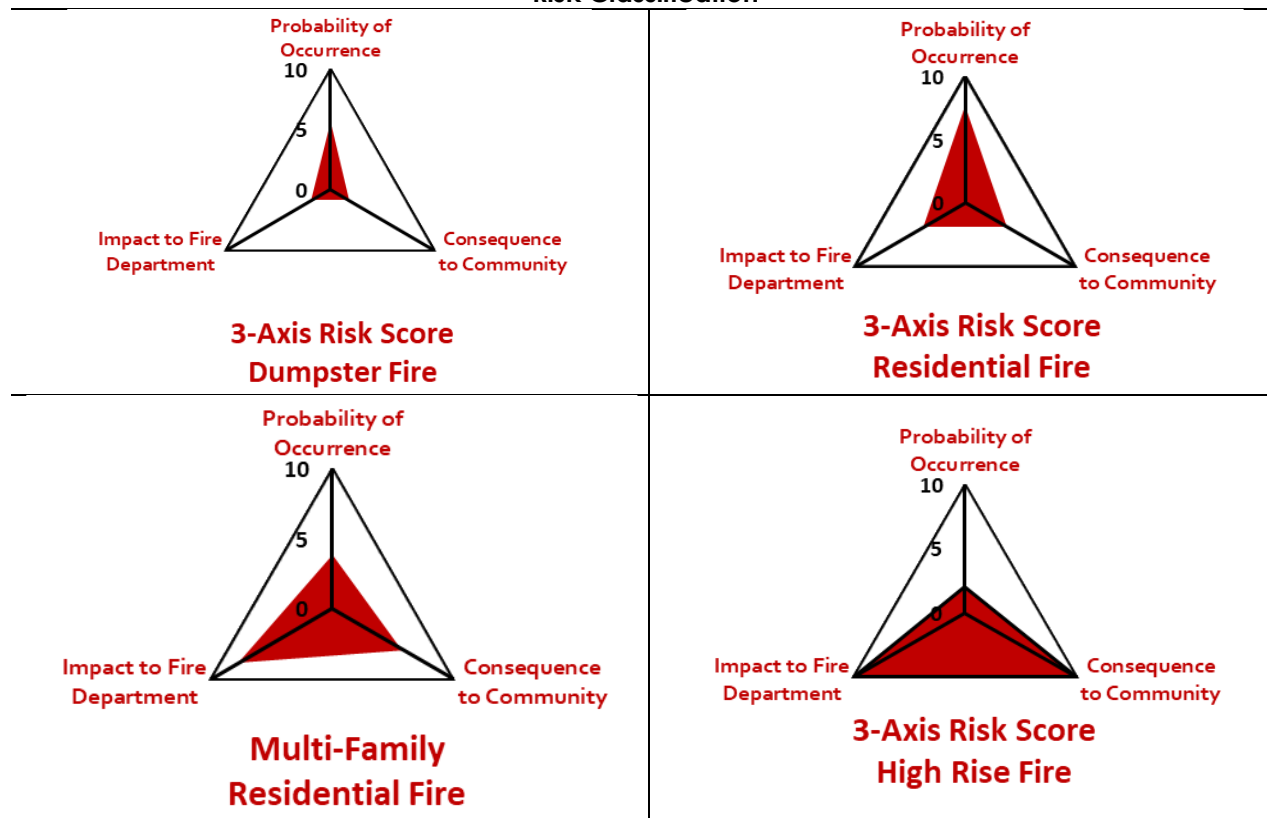
Fire Response

The KFD is responsible for mitigating a wide range of fire-related incidents that range from low-risk dumpster fires to the extreme risk associated with a marina or multi-story apartment fire. As was referenced in the preceding pages, a standardized risk assessment scoring process was applied to a sample incident in each of the risk categories. The KFD is currently staffed to handle low and moderate fire risks. High and extreme risk fires will require additional staffing or aid from neighboring jurisdictions. The following figure illustrates the risks and the organizational and community impact during fire responses.

Figure 124: Fire Incident Risk Assessment

Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	Dumpster Fire			House Fire			Apartment Fire			High-Rise Fire		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	6	2	2	8	4	4	4	6	8	2	10	10
Score Assigned	12.32			33.94			44.18			73.48		
Max/Min Staffing	3 48			3 48			3 48			3 48		
ERF Assigned:	3			15			17			26		
ERF Remaining:	45			33			31			22		

Risk Classification



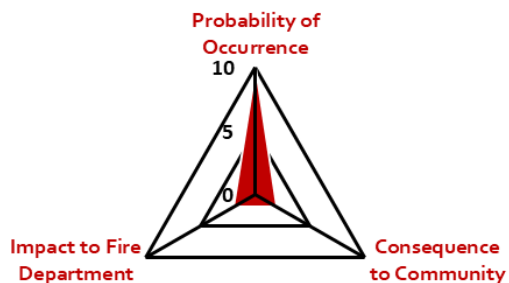
Medical Response

The KFD is a first-responder organization that plays an integral role in stabilizing, treating, and transporting prehospital medical emergencies. All operations personnel are cross-trained firefighter-paramedics. Myocardial infarction (heart attack), stroke, and major trauma patients are best served with early and aggressive pre-hospital intervention and transport. The following figure summarizes the Department's risk and capacity in responding to these types of events and more.

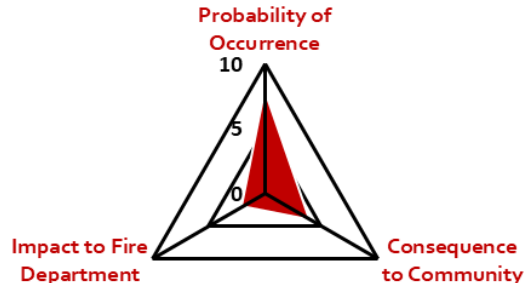
Figure 125: Medical Incident Risk Assessment

Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	Sick Person			Cardiac Arrest			MVC w/3 patients			MCI		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	10	2	2	8	4	2	8	2	2	4	2	4
Score Assigned	20.19			25.92			16.24			13.85		
Max/Min Staffing	3 / 48			3 / 48			3 / 48			3 / 48		
ERF Assigned:	5			6			8			14		
ERF Remaining:	43			42			40			34		

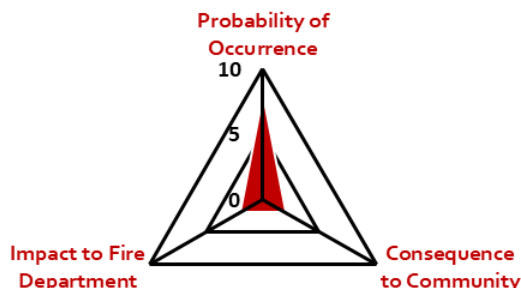
Risk Classification



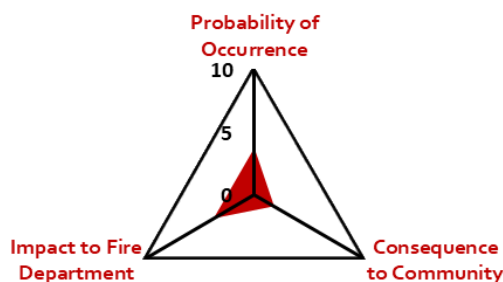
**3-Axis Risk Score
Sick Person**



**3-Axis Risk Score
Cardiac Arrest**



**3-Axis Risk Score
MVC with 3**



**3-Axis Risk Score
MCI**

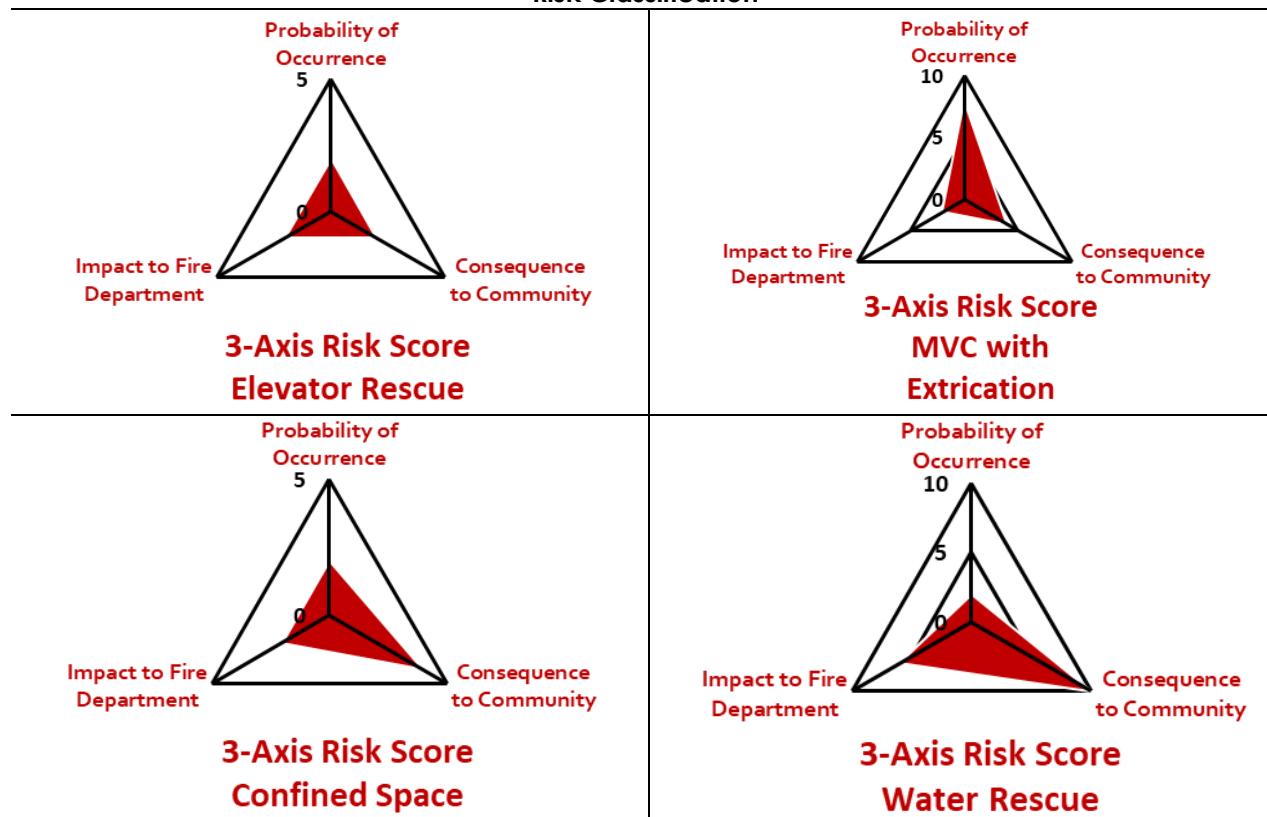
Technical Rescue Response

Unique rescue situations require a wide variety of technical and specialized skills that can sometimes exceed the training, staffing, or equipment needs of a single agency. The KFD is trained and equipped to manage low- to high-risk incidents that range from the routine elevator rescue to the more technical and resource-intensive swift water rescue. The following figure summarizes the Department's risk assessment and response capacity to rescue situations.

Figure 126: Technical Rescue Incident Risk Assessment

Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	Elevator			MVC w/extrication			Confined Space Rescue			Swift Water		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	2	2	2	8	4	2	2	4	2	2	10	6
Score Assigned	4.89			25.92			8.48			45.51		
Max/Min Staffing	3 / 48			3 / 48			3 / 48			3 / 48		
ERF Assigned:	5			8			17			21		
ERF Remaining:	43			40			31			27		

Risk Classification

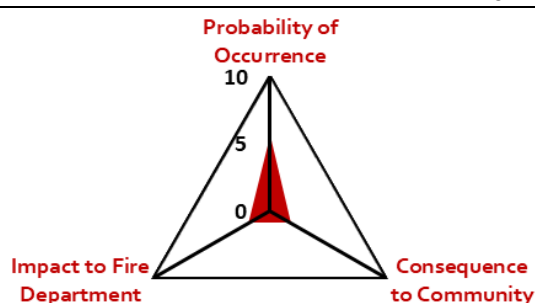
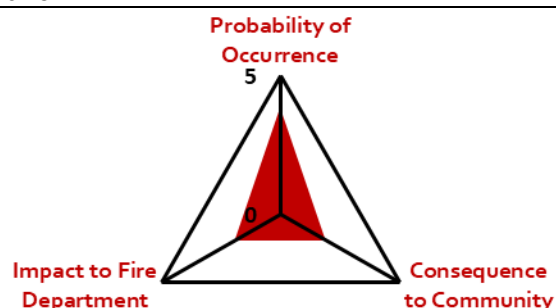
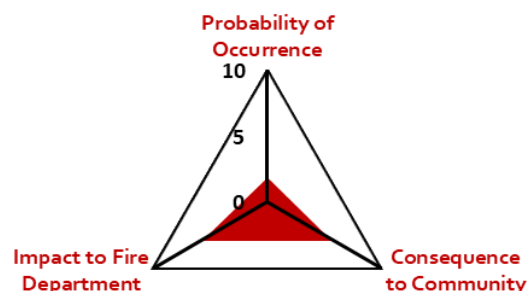
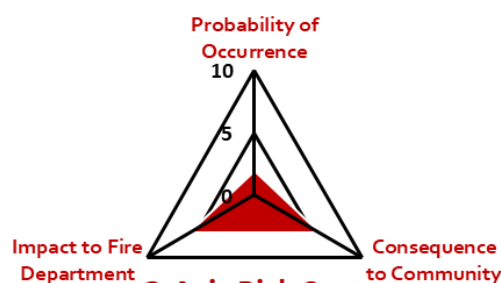


Hazardous Materials Response

Hazardous materials incidents can range in severity from simple low-risk petrochemical spills from a vehicle to large-scale releases of toxic chemicals from a semi-trailer or rail car. The larger the spill, or the toxicity of the released chemical, the more resources will likely be required to safely isolate the area and control the release. In some cases, special technical resources and equipment may be required to control and stop the leak and decontaminate the area and equipment. The KFD is trained to handle a wide range of hazmat incidents, from low-risk fuel spills to large container transportation releases of extremely hazardous substances. Almost all personnel are HazMat Operations level certified, and 58 personnel are Technician level and HazMat Safety Officer certified. The following figure illustrates the risk matrix.

Figure 127: Hazardous Materials Incident Risk Assessment

Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	Fuel Spill			Natural Gas Leak			Semi-Truck Leak			Rail Car Leak		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	6	2	2	4	2	2	2	6	6	2	6	6
Score Assigned	12.32			8.48			28.14			28.14		
Max/Min Staffing	3 48			3 48			3 48			3 48		
ERF Assigned:	3			12			20			20		
ERF Remaining:	45			36			28			28		

Risk Classification**3-Axis Risk Score
Fuel Spill****3-Axis Risk Score****3-Axis Risk Score
Tanker Truck Spill****3-Axis Risk Score
Rail Tank Car
Release****Summary of Risk Analysis**

Similar to many like-sized fire departments studied by ESCI, the KFD deploys resources on a daily basis for low-to-mid risk incident types, which are the most likely incident types to be encountered. Financial constraints and competing governmental priorities often prevent fire departments from staffing to a level that adequately addresses national standards. However, this does not mean that the Department is not able to safely or adequately respond to higher-risk incidents. Rather, it means that initial actions taken may be limited until additional resources arrive from outside mutual/automatic aid departments to assist.

Community Risk Plan

The purpose of this community risk assessment is to provide an overview of the nature of community risk in the KFD service area. The next step would be for the Department to address this assessment by developing a detailed Community Risk Assessment Plan that includes the following components:

- Identification of risks
- Categorization of risks (Low, Moderate, High)
- Development of strategies and tactics to mitigate risks
- Determination of the appropriate level of fire department resources (apparatus and personnel)
- Monitoring, evaluation, and modification of the Community Risk Plan

REVIEW OF RESPONSE STANDARDS & TARGETS

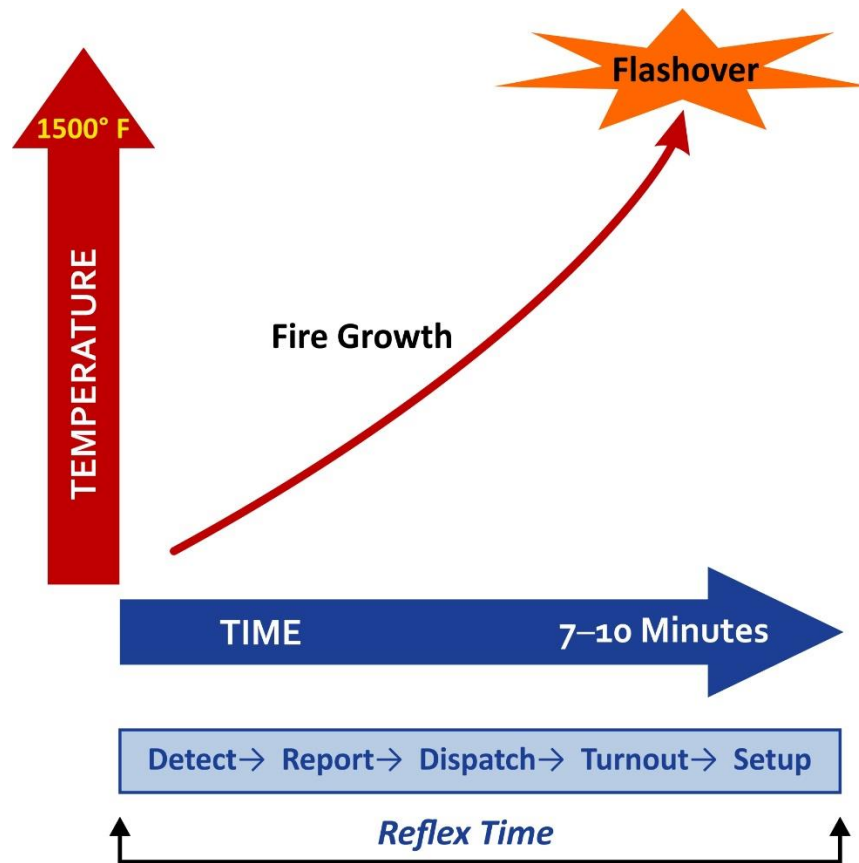
Structure Fire Dynamics

Most structure fires grow and behave in a predictable fashion unless influenced by unusual fuel loads, ignition sources, or other environmental influences (high winds, for example). According to the National Fire Protection Association (NFPA), there are four stages and resulting effects of a building fire:

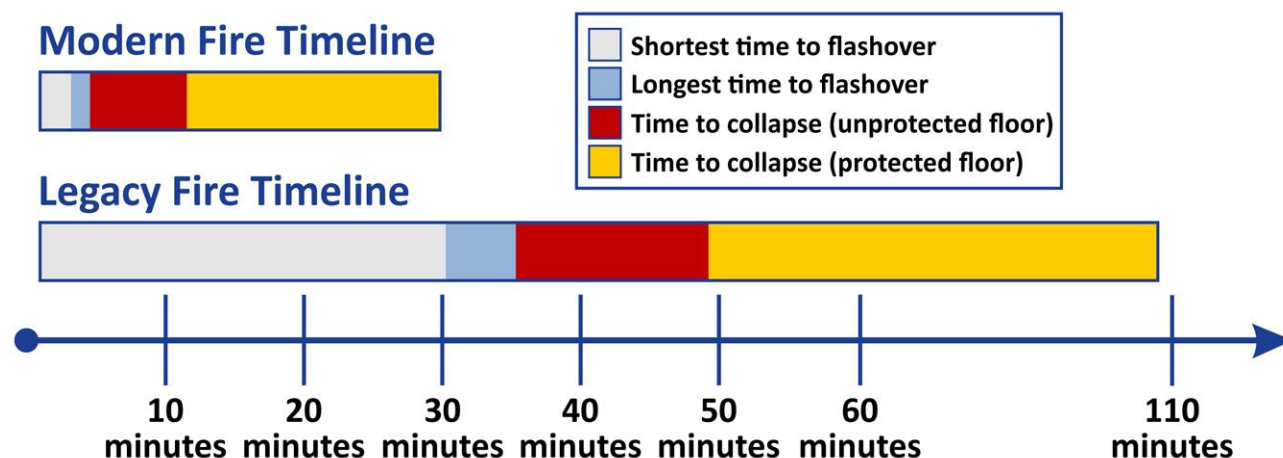
1. **Ignition Phase:** Fuel, oxygen, and heat combine in a chemical reaction, creating an open flame.
2. **Growth Phase:** Additional fuel ignites. Convection and radiation of heat ignite more combustible materials. The size of the fire increases exponentially. Hot gases collect at the ceiling, transferring heat to the rest of the combustibles in the space. At some point, all of the remaining combustible materials may ignite simultaneously in what is commonly called "flashover."
3. **Fully Developed Phase:** Fire is consuming most, if not all, of the combustible materials in the space, and rapidly consumes the available oxygen.
4. **Decay Phase:** The fire has consumed the available fuels, temperature decreases, and fire lessens in intensity.

Flashover usually occurs about five to eight minutes from the appearance of flame in buildings with typical modern furnishings and other fuel loads, and immediately creates a non-survivable environment. Therefore, stopping a fire's progression to flashover is critical in controlling a structure fire and allowing occupants to escape or affect the rescue.

The following figure illustrates the sequence of events during the growth of a structure fire over time, juxtaposed against the fire department response time components.

Figure 128: Illustration of Fire Growth & Fire Department Response Time Components

Today's building and fire codes are meant to eliminate ignition sources, limit fire spread, and ensure occupants safely evacuate if a fire does occur. However, other modern construction techniques may erode these safety factors, including but not limited to energy efficiency requirements (which allow heat from a fire to build more quickly), modern furniture constructed with synthetic materials comprised of hydrocarbons, and lightweight building materials that will fail quickly under direct flame impingement. The following figure illustrates the impact these new factors have on how fast fire spreads and the degradation of building components.

Figure 129: Fire Growth-Modern vs. Legacy Buildings

Source: Underwriters Laboratories

Previous National Institute of Standards and Technology (NIST) research determined that building occupants had approximately 17 minutes to escape before being overcome by heat and smoke. More recent research has lowered this survival time window to as short as three minutes, highlighting the importance of early detection, notification, rapid application of water through built-in suppression systems (fire sprinklers), and rapid response by the fire department.⁴⁵

Structure Fire Operational Requirements

As previously noted, the timeframe to effectively respond to and quickly control a fire in today's built environment is even more imperative. This means today's fire department must have the capability and capacity to quickly respond, deploy, and decisively act to save lives and property, and do so in a manner that minimizes responder risk.

The Occupational Safety and Health Administration (OSHA) and the State of Texas have specific requirements for entry operations into the immediately dangerous to life and health (IDLH) environment commonly found in a building fire or other dangerous confined space operations.

⁴⁵ National Institute of Standards and Technology, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings*, Bukowski, Richard, et al.

Commonly referred to as the “two-in/two-out rule,” these regulations require that two entrants are required if performing operations in an IDLH environment, and at least two properly trained and equipped standby personnel must be standing by outside the IDLH environment, ready to affect a rescue of the entrants if they become incapacitated. However, Texas Administrative Code Title 37, Part 13, Chapter 435.17 specific to firefighting operations allows immediate entry with two rescuers, without a standby rescue team, in an “imminent life-threatening situation” where entry could prevent loss of life or serious injury to the occupants.

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* establishes standards for safe and effective deployment of resources at various types of emergency incidents. Specific to a single-family 2,000-square-foot dwelling fire, the Standard identifies that an initial full alarm assignment should consist of 16 personnel.

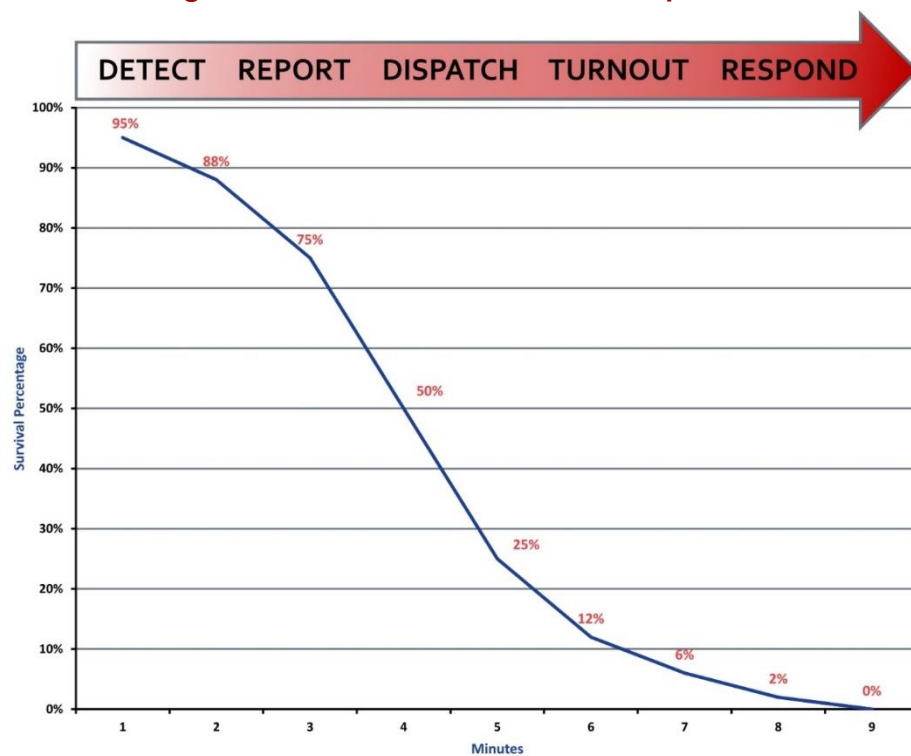
Delivering enough personnel to the scene to accomplish the various tasks required to mitigate an emergency is essential, and many of these tasks must be completed quickly. However, it should be noted that not all fireground tasks need to be completed simultaneously.

Emergency Medical Operational Requirements

Responding rapidly to initiate definitive medical care is critical to a patient's survival, especially in cardiac arrest and major trauma situations. Brain cells are extremely sensitive to lack of oxygen and will begin to die very shortly after the loss of circulation, and may result in irreversible brain damage in as little as six to nine minutes. Cardiac arrest survival chances fall by 7 to 10% for every minute between collapse and defibrillation. The importance of quick response and the application of resuscitation efforts in cardiac arrest cannot be overstated. The American Heart Association (AHA) establishes cardiopulmonary resuscitation guidelines and procedures for cardiac arrest victims, including the use of semi-automatic defibrillators.

The sequence of events that lead to definitive pre-hospital resuscitation is illustrated in the following figure.

Figure 130: Cardiac Arrest Event Sequence



The above figure shows the precipitous decline in the chance for survival, especially after four and one-half minutes, when there may be only a 50% chance of survival even if spontaneous circulation is restored. Note, the sequence and timing noted above, and the fire progression illustration shown in Figure 128: Illustration of Fire Growth & Fire Department Response Time Components are very similar.

Effective Response Force Analysis

ESCI reviewed KFD's daily staffing level and compared it to national consensus standards related to providing enough personnel and resources to quickly mitigate emergency incidents—specifically, structure fires and critical EMS situations.

Typically, structure fires are the most common labor-intensive incidents confronted by a fire department. As shown previously, national criteria recommend at least 15–16 personnel should arrive at the scene of a fire in a single-family residence to ensure safe and effective operations. Even more, personnel may be required as dictated by the size of the building, incident complexity, and/or identified special hazards.

The fire service assesses the relative risk of properties and occurrences based on several factors. Properties with a high risk for fire often require greater numbers of personnel and apparatus to mitigate the fire emergency effectively. Staffing and deployment decisions should be made with consideration of the level of risk involved. The level of risk categories used by CFAI are as follows:

- **Low Risk:** Areas and properties used for agricultural purposes, open space, low-density residential, and other low-intensity uses.
- **Moderate Risk:** Areas and properties used for medium density single-family residences, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- **High Risk:** Higher density business districts and structures, mixed-use areas, high-density residential, industrial, warehousing, and large mercantile structures.
- **Maximum Risk:** A structure or area where an incident could or does result in many severe injuries requiring hospitalization and/or fatalities. Significant damage—temporary or permanent—that impacts essential services or the environment. May result in substantial financial loss, general displacement for an extended duration.

Effective Response Force Discussion

KFD currently deploys two engines, one truck company, one rescue unit, one medic unit, a Battalion Chief, and an EMS Captain on the initial response to a moderate-risk single-family residential structure fire, with an ERF of 15 personnel. This is theoretically one personnel resource short of what is required to perform all of the necessary initial fireground tasks in a timely manner.

This observation is made to simply note that the initial resources dispatched may be slightly under what may be needed to aggressively mitigate a significant incident in its early stage.

RECOMMENDATIONS & STRATEGIES

This Master Plan culminates in a series of recommendations based on the observations and analysis previously discussed. Addressing these recommendations should be approached pragmatically. As such, ESCI grouped them into recommended time frames to address.

Facilitating the adoption and implementation of many of these recommendations will take significant commitment, time, and resources (including finances). The suggested timeframes are intended to introduce a realistic “blueprint” for implementation. However, environmental conditions and circumstances may provide challenges or opportunities to address a recommendation(s) outside of the timeframes identified here.

ESCI has grouped the recommendations into three implementation timeline categories: Short-Term (6 months–1 year), Mid-Term (1–3 years), and Long-Term (3–5 years).

Lastly, these recommendations are just that—recommendations. They are ESCI’s best effort in providing guidance in addressing issues and deficiencies identified during the study period. City leaders and citizens hold the ultimate authority in embracing, revising, or discounting the following guidance.

Short-Term Strategies

Recommendation 1-A: Create a KFD Strategic Plan, spanning a three-to-five-year period as a follow-up to this Master Plan.

This Master Plan should be considered an initial step in charting a future course for the Department in addressing future challenges. However, many of the issues and recommendations in this study will take a “team effort” to address. Identifying the mission, vision, values, initiatives, goals, and objectives of the Department will be critical to ensuring everyone is pulling in the same direction in accomplishing future goals.

Estimated Cost: \$17,000 based on the typical cost for ESCI Strategic Plan development and facilitation. The cost could be less if internal City or local resources are used.

Recommendation 1-B: Deliver performance evaluation training to officers.

ESCI recommends that supervisors receive training on not only using the new performance management software system, but also how to fairly, equitably, and consistently judge and document employee performance.

Recommendation 1-C: Create Driver/Engineer positions.

Unlike many fire departments studied by ESCI, KFD does not have formal fire apparatus Driver/Engineer positions. Given the critical role of these positions on the fireground, ESCI recommends that the position be formally acknowledged by establishing a specific job description, salary levels, and create an appointment/promotional process for filling these positions. This may also help reduce employee attrition, as it would expand the potential for upward career mobility within the Department.

Recommendation 1-D: Add another engine to structure fire initial assignments.

Currently, to ensure that a first alarm assignment to moderate risk residential structure fires is consistent with NFPA recommendations, an additional engine company or medic unit should be initially assigned to structure fire assignments to ensure a minimum of 16 personnel are deployed.

Recommendation 1-E: Review and revise EMS response modes.

Responding lights and sirens to most EMS incidents should be reviewed, and response modes clearly defined. The EMD program used by Bell County Communications Center 911 is designed to identify the acuity of a patient's condition and categorize the incident response mode accordingly. The Department should work with the Center to ensure they dispatch calls consistent with EMD protocols, and dispatched units should respond in a manner consistent with these protocols.

Recommendation 1-F: Identify a short-term suitable storage, vehicle, and equipment repair site and move out of the Support Services Building.

The current Support Services building is unsuitable **and may be unsafe** for continued use as a repair and equipment storage facility. It appears to be structurally compromised, and does not have the necessary space for storage of department supplies or the repair and maintenance of Department equipment and apparatus. The City should identify a suitable existing vacant facility in the City that can be rented or leased, and relocate the Support Services operation. Further, the City should identify a long-term capital facilities plan for a sustained Support Services operation.

Recommendation 1-G: Require use of the station point capture vehicle exhaust systems, and install these systems in all stations and support facilities that maintain apparatus.

During the site visit, ESCI noted that none of the vehicle exhaust systems were connected to parked apparatus, and in some stations, the hoses were either tied in a knot or tied and pulled out of the way by rope. This practice is contrary to Department Policy 500: *Cancer Prevention Risk Reduction*.

The prevalence of cancer in firefighters is well documented, as are the health hazards of the chemicals present in diesel exhaust. Station officers and battalion chiefs should regularly check to ensure these systems are connected to apparatus while inside the stations, especially those where exercise equipment is located in the apparatus bays.

The Department should also seek funding, including federal grants, to install these systems inside the remaining fire stations.

Recommendation 1-H: Improve station workplace safety.

The site visit revealed some workplace safety concerns that were noted in more than one or more stations. ESCI recommends the Department perform the following:

- Install fragmentation containment devices for the filling of oxygen bottles.
- Install no smoking/no combustibles warning signs near oxygen filling locations.
- Ensure oxygen cascade system storage capacity is consistent with 6.3.1.1 storage limits as defined in NFPA 55: *Compressed Gases and Cryogenic Fluids Code*.
- Create a SOG on the filling of portable medical oxygen bottles, and train personnel on proper and safe bottle inspection and filling procedures.
- Install portable or fixed eyewash stations in each fire station.
- Store flammable chemicals and fuels in approved flammable liquids storage cabinets.
- Properly store gasoline in approved safety cans that are in good condition.
- Discontinue the use of extension cords in place of permanent wiring.
- Store turnout gear in protective bags or lockers to reduce UV exposure, degradation, and cross-contamination.
- Create a SOG(s) that address station safety and maintenance requirements, including mandating periodic safety inspections, consistent with the Texas Department of Insurance (TDI) and the Occupational Safety & Health Administration (OSHA) regulations.
- Enlist the help of the TDI Occupational Safety and Health Consultation Program (OSHCON) to survey each station to help identify and resolve workplace safety and health issues.

Recommendation 1-I: Secure personnel records.

All records containing confidential employee information, including birthdates and social security information, should be securely archived under lock and key. Records reportedly stored in an unsecured closet at the Support Services Building should be transferred to a secured storage location, or if no longer required, destroyed.

Recommendation 1-J: Establish maximum consecutive hours worked policy.

As noted in the staffing section of this report, employees can theoretically be scheduled to work overtime shifts or trade shifts that result in inordinately long consecutive work periods (96 hours or more). The Department should establish a maximum consecutive hour worked policy that mandates at least a 12-hour rest period after a certain number of consecutive hours worked (72 hours, for example), unless it is an emergency or deployment situation.

Recommendation 1-K: Continue with plans to add Medic 22.

As shown in the Unit Hour Utilization (UHU) analysis, Medic 2's incident workload is well above the threshold for what is sustainable long-term. The Department's plans to add an additional response resource to respond from the Central Station in the north city area is prudent and should help reduce the overall medic unit workload for Medic 2 and perhaps Medic 5 as well. ESCI used GIS tools to identify the historical number of incidents that were in the planned new Medic 22 response area in an attempt to quantify the potential impact on Medic 2's current incident workload. However, it must be noted that this assumes that the medic units are in service and respond to all of these incidents in each respective response territory. As shown in the concurrent incident analysis previously in the report, KFD has a high number of concurrent incidents, and the incident density in these response areas increases the likelihood the assigned medic unit may not be available to respond to their primary response area.

Recommendation 1-L: Establish local response performance criteria in accordance with 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* to effectively and efficiently meet the current and future needs of the community.

Critical response performance goals specific for the KFD have not been developed. While NFPA 1710 is a valuable source for recommendations, organizations should develop specific performance criteria based on local factors. Engaging and understanding the community's and elected officials' expectations, along with community risk, should be driving factors in this development process. Furthermore, the KFD should review quarterly—but report annually—to the community and elected official's their actual performance for the preceding year as compared to the goals developed, describe the causal factors for failure to achieve any goals or objectives not met, the likely consequences of continued failure to meet those goals it is not currently meeting, and identify steps planned to address the gaps, if any.

Mid-Term Strategies

Recommendation 2-A: Seek Ground Emergency Medical Transport (GEMT) subsidy funding.

The City should explore participating in the federal government's GEMT reimbursement subsidy funding program related to the pre-hospital care and transport of Medicaid patients. Other fire department EMS systems studied by ESCI have received significant and sustained subsidies from this program. ESCI also recommends that the City work with the contracted billing collection company to determine if they have the expertise and solid track record in helping authorized ambulance providers in determining the cost of providing ambulance services, appropriate billing rates, and required documentation that is consistent with current Texas Health and Human Services Commission (HHSC) and the Centers for Medicare and Medicaid Services (CMS) rules.

Recommendation 2-B: Create and implement a commercial occupancy life safety inspection program and a pre-incident planning program, and add personnel to the Fire Prevention Division.

The Department should ensure that all commercial occupancies, including multi-family apartment buildings, are inspected on a regular basis to identify and correct serious fire and life safety code violations. In addition, operations personnel should periodically visit target hazard locations to conduct pre-incident planning.

Many fire departments across the country use operations fire crews to perform cursory inspections of businesses, with the primary focus on becoming familiar with the building's construction, layout, and any special hazards contained within. Key pre-plan information, such as fire alarm panel, sprinkler, and standpipe locations, along with important site hazard information, can be entered into the Department's RMS for quick retrieval if needed during an emergency event. Consider training and deploying fire companies to conduct these inspections, as it can have the additional benefit of allowing personnel to become familiar with the building uses, layouts, and any inherent hazards related to business operations. KFD is well-positioned to implement a similar program, as all of the operations fire captains are already certified fire inspectors.

Given the preceding information, and the possibility of implementation of a citywide multi-family residential building inspection program, ESCI recommends that two Fire Inspectors be added to the Fire Prevention Division, who would be primarily assigned to performing initial and follow-up fire inspections, including supporting follow-up fire inspection referrals of businesses and apartment complexes inspected by fire companies. The following figure summarizes the estimated annual cost (in FY21 dollars) to add these positions.

Figure 131: Estimated Annual Cost of adding 2 Fire Inspectors (FY 21)

Expense	Cost
2 Fire Inspectors	\$177,872
Onboarding cost of 2 replacement FROs	\$15,000
Total:	\$192,872

Recommendation 2-C: Bolster the Department's Public Education Program.

Currently, the Department's public education program focuses on fire prevention-related topics, such as fire safety, fire extinguisher use, calling 911, and smoke/carbon monoxide alarm installation and use. While these topics are important and comprise the foundation of many public education/safety programs for fire departments studied by ESCI, the majority of KFD's emergency responses are EMS-related, and many of which are trauma-related.

Recommendation 2-D: Incorporate Assessment Center components in promotional testing.

Contemporary fire department promotional processes incorporate varied performance-related realistic work situation exercises—also known as an Assessment Center—which are designed to observe a candidate's leadership skills and abilities under standardized testing conditions. Currently, the KFD promotional process is extremely limited, and does not comprehensively or realistically assess a candidate's ability and suitability to be a supervisor.

The Department should work with the City's Human Resources Department to design and incorporate Assessment Center exercises and scenarios into all uniformed promotional processes. ESCI assumes these changes would need to be reviewed and approved by the Killeen Civil Service Commission.

Recommendation 2-E: Require Emergency Vehicle Technician (EVT) certifications for City mechanics who maintain fire apparatus and ambulances.

Today's fire and EMS apparatus contain complex drivetrain, pumping, and electrical systems that require specialized training to be able to repair and maintain them to reliably perform in emergency conditions. The EVT Certification Commission (EVTCC) is a nonprofit organization that offers training, testing, and certifications for mechanics who work on emergency apparatus, including fire engines/aerials, ambulances, ARFF apparatus, and law enforcement vehicles. The Commission has three certification levels for each type of fire and ambulance apparatus, Level I, II, and Master Level III.

EVTCC tests are offered twice a year in various sites across the country, including Texas. A review of the 2021 testing schedule showed that the test is being offered in 10 Texas locations.

Recommendation 2-F: Upgrade the Training Captain to a Chief Officer rank.

As previously noted, the current Training Captain has significant programmatic administrative responsibilities related to the operation and supervision of the Fire Academy and delivery of Department continuing education training. These responsibilities are well beyond what ESCI typically sees in an administrative Captain level job description, and are more aligned with administrative chief officer-level duties. The Department should review the current job duties performed in support of these significant programs, revise the job description, and upgrade this position to a chief officer rank.

Recommendation 2-G: Establish specific policies and procedures for the various technical rescue disciplines.

Per NFPA 1670: *Standard on Operations and Training for Technical Search and Rescue Incidents*, personnel trained and deployed to technical rescue incidents should perform their duties consistent with adopted department standard operating guidelines for technical rescue situations. ESCI recommends that the Department form a committee comprised of Rescue 2 and 9 personnel and Department administrative chief officers to establish basic deployment and operational guidelines for each of the key rescue disciplines, including but not limited to confined space entry/rescue, high and low angle rope rescue, trench rescue, and surface/swift water rescue. These SOGs should be periodically reviewed and modified as necessary to incorporate new procedures, equipment, or changes in industry standards.

Recommendation 2-H: Survey the security risk at the fire stations and increase station/facility security.

The stations appear to have limited physical security measures, comprised mostly of keypad or combination door locks. None of the stations visited had locked or secure parking areas, and can be easily accessed by the public. The Department should engage the Killeen Police Department in conducting the physical security risks on each station property, identify appropriate mitigation measures, and implement improvements, which may include adding locked fencing, removing visual obstructions that hinder surveillance and observation of station grounds, and installation of monitored security systems.

Facility security also appears to be a major issue at the current Support Services Building, as staff have reported numerous break-ins and theft of equipment and supplies. However, ESCI does not recommend adding security measures at this building, as the use of this facility should be discontinued as soon as possible. Lastly, facility security and alarm monitoring features should be considered in design and construction in future new fire facilities.

Recommendation 2-I: Leverage Social Media Platforms and improve the KFD web pages.

The Department should expand the use of social media tools, such as Twitter®, Instagram®, and LinkedIn® to broaden public reach and engagement. Additionally, the use of Twitter® could result in more timely public engagement, instruction, and conversation during high-visibility incidents. Lastly, the city webpage allocated to the KFD should be revamped. Currently, it focuses on fire inspections and permit fees, and contains little to no life safety education information, links, or in-depth information about the Department.

Recommendation 2-J: Evaluate employee turnover.

The 10% turnover in fire personnel should be concerning to the Department and the City. The Department spends a significant amount of money in onboarding and training new firefighters, as well as having to cover vacancies for several months as new firefighters are trained, including covering for employees who must complete the month's long paramedic training program. If this attrition trend continues, the Department should work with the Human Resources Department to conduct an introspective evaluation of the reasons why employees are leaving the organization for reasons other than retirement. A holistic evaluation of recruitment, testing, training, department culture and leadership, and compensation may reveal key issues that compel employees to seek work elsewhere.

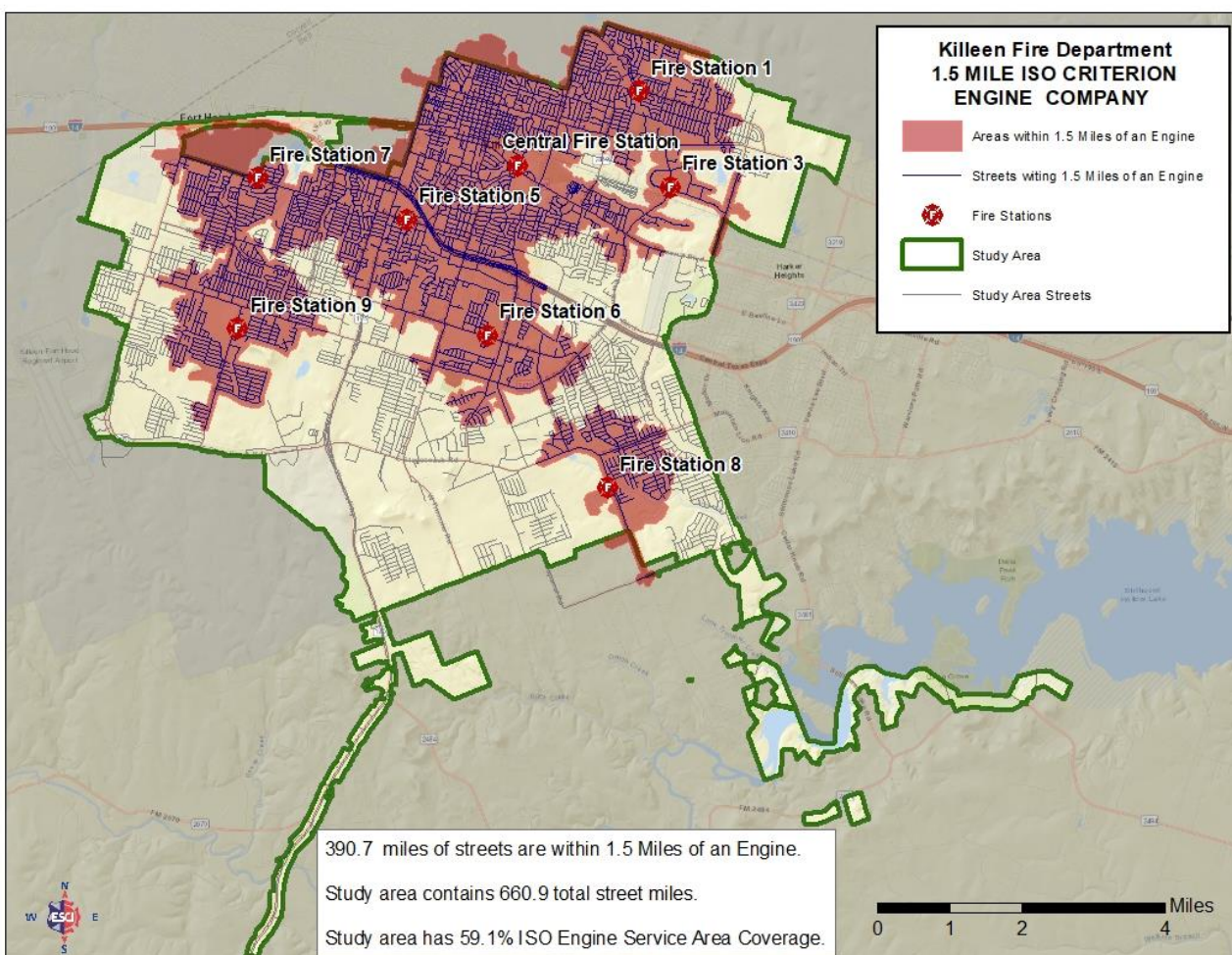
Recommendation 2-K: Create a targeted Anti-Arson Prevention program.

The amount of effort and time spent investigating suspicious fires by KFD Fire Investigators should be proactively addressed. KFD was unable to provide data on arson trends or specific common characteristics of suspected/convicted arsonists and fire-setters. The Department should more closely document and analyze the demographics and characteristics of suspected arsonists and fire-setters to determine common traits and trends, and routinely publish this data. Any trends identified could be addressed using a multi-agency cooperative investigative approach with the Killeen Police Department and the Fort Hood Military Police as appropriate. This effort should also analyze if the city has juvenile fire-setting and playing with fire problem, which is common in many communities, with most firesetters (79%) being less than 11 years old.⁴⁶ If so, the Department should consider establishing a formal juvenile fire-setter education and intervention program.

Long-Term Strategies**Recommendation 3-A: Build and staff a new fire station in the south-central Killeen city area.**

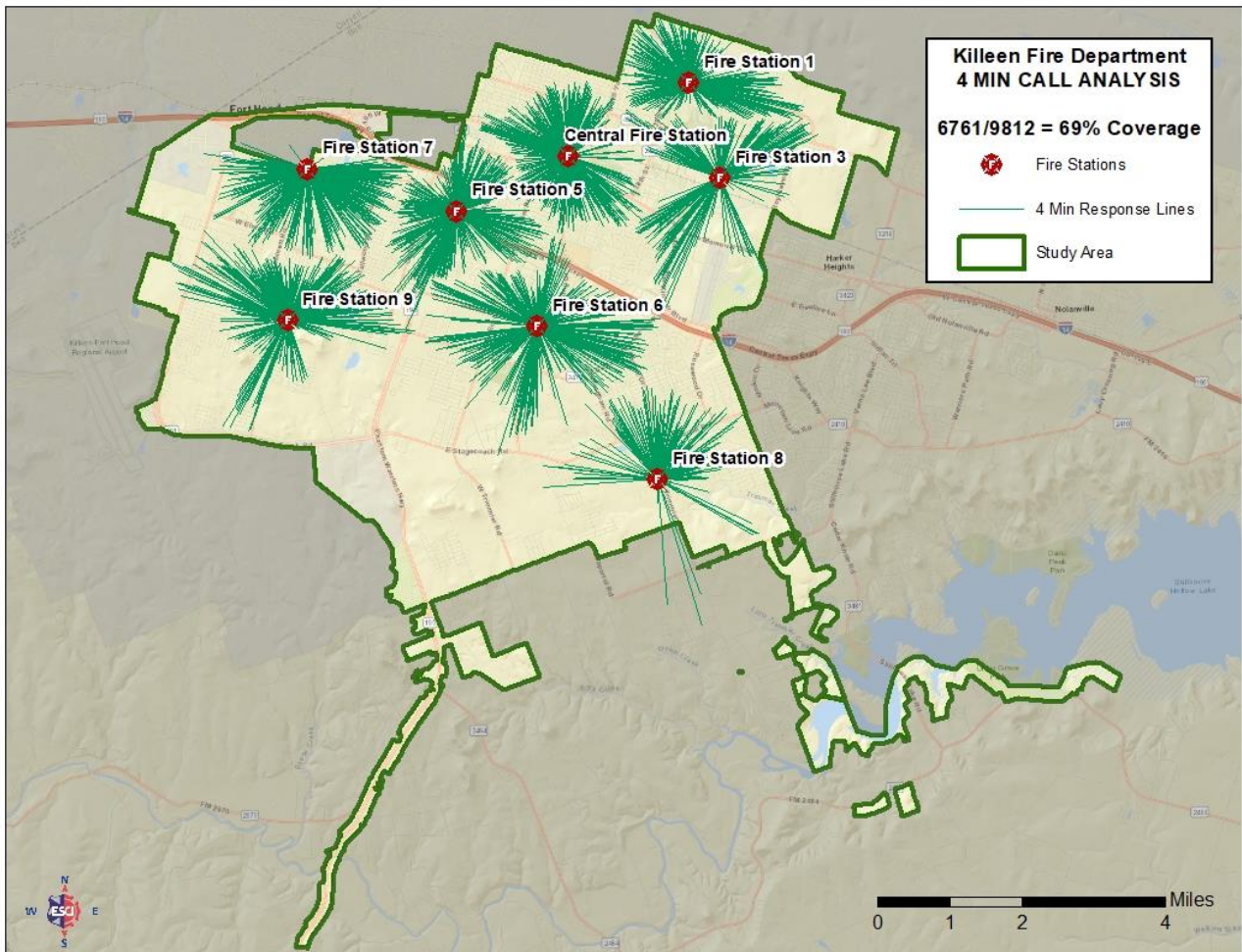
Per the City's Planning and Community Development Department and various growth planning documents, the City of Killeen is slated to grow significantly, especially to the south, just east of State Highway 195. Even without this growth, the analysis performed in this study identified a fire/EMS response coverage gap in this general area, as shown in the following two figures. The first map shows the theoretical 1.5-mile travel distances from each existing fire station. This distance roughly equates to a 4-minute travel time as well.

⁴⁶ Playing with Fire: Structure Fires: Supporting Tables, NFPA Research, May, 2021.

Figure 132: KFD Station Distribution, ISO 1.5-Mile Engine Company Criteria

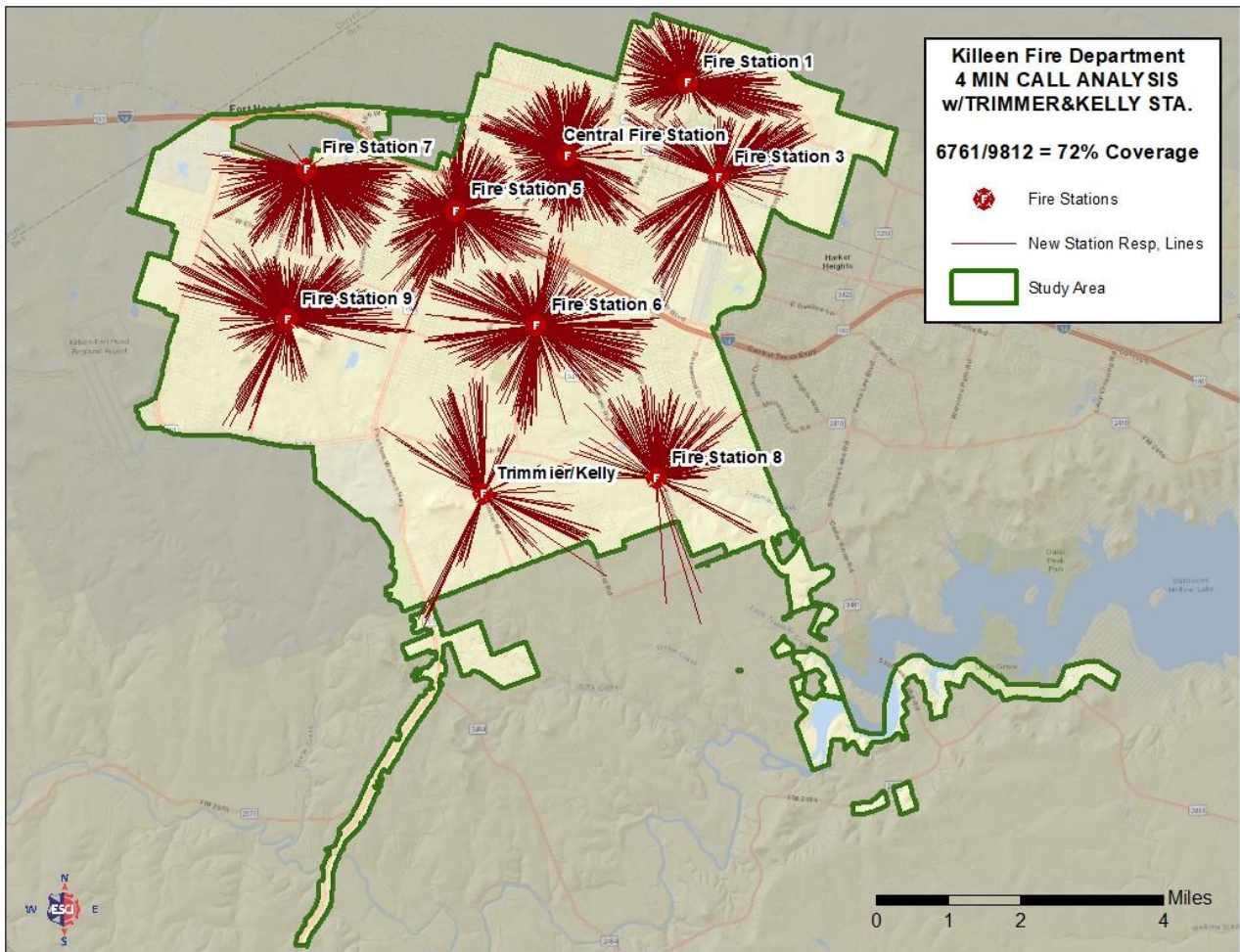
The travel response time gap is clearly evident in the preceding map. In the following map, ESCI plotted the incident locations from July 1, 2020, through December 31, 2020, that were within the four-minute travel time from each of the existing stations. Again, the coverage gap to the southwest is obvious.

**Figure 133: Historical Incident Location Analysis from Existing Stations
(4-minute Response Time)**



Of the 9,812 incidents plotted, 6,671 (69%) were within the four-minute response time coverage from the current station locations. Next, ESCI used GIS modeling to identify a theoretically ideal location (Trimmier Road and Kelly Lane) for a new fire station. The following figure shows the theoretical station coverage during the same time period that occurred in that general area within four-minutes of this location.

**Figure 134: Historical Incident Location Analysis With New Station Location
(4-minute Response Time)**



As shown in the preceding map, overall response coverage increased only by 3%. However, much of the area in this location has yet to be developed or has a fully developed road network, so the coverage area indicated by the number of incidents is somewhat misleading.

The City should begin planning now to build and staff a fire station in this general area, especially as residential, commercial, and institutional development occurs in the future. ESCI cost projections for building, equipping, and staffing a new fire station are contained in the next section of this study.

Recommendation 3-B: Increase outdoor siren coverage in the south areas of the City.

According to the City's Emergency Management Coordinator, ongoing and future development in the southwest area of the city will require the installation of additional outdoor warning sirens to ensure adequate alerting coverage. Given the potential for severe weather, including tornadoes, as identified in the Community Risk Section of this study, ensuring that the City has the ability to alert citizens of impending danger when they may be outdoors is a vital safety responsibility. Outdoor siren alerting has been demonstrated to be an effective notification tool, especially in suburban and rural areas. For example, a large tornado outbreak struck Marshall County, Alabama, in April 2011. The County had recently installed a network of outdoor warning sirens that ended up being in the path of these tornadoes, one of which was a strong EF4 tornado. According to the County's Director of Emergency Management, while there were five fatalities and some injuries, it was estimated that the fatality and injury totals would have been much higher without the warning provided by the newly installed siren system.⁴⁷

The City should expand the outdoor auditory warning coverage as future development and expansion of the city limits occurs.

Recommendation 3-C: Explore the feasibility of implementing a Community Paramedic Program.

Given the community demographics and anecdotal information gathered during ESCI's site visit, the Department, along with local healthcare and social services providers, should enter into a collaborative planning process to identify the need and construct of a Mobile Integrated Healthcare-Community Paramedic program for the Killeen Community. As an initial part of this effort, the KFD should consider adding data fields to their EMS RMS that can be used to track and report out key patient demographics, such as poverty, homelessness, substance abuse, and mental health issues. This information can help quantify the need for an MIH-CP program, the type of resources needed, and help place focus on what types of medical and social issues need to be addressed.

⁴⁷ Tornado Sirens Proved Beneficial in Rural Communities, FEMA, Tools for Practitioners, February 11, 2021.

Recommendation 3-D: Explore ways to increase diversity in the KFD.

The Department should work with the City's Human Resources Department and the local colleges to assess current recruitment strategies to attract and test minority and female applicants. The Department should explore ways to increase interest and applications from minority groups, including minority targeted community outreach.

FINANCIAL BASIS FOR COST PROJECTIONS

To estimate the future costs of adding response resources and facilities as outlined in Recommendation 3-A, it is first necessary to understand current year (Fiscal Year 2021) estimated costs for various decision unit components such as firefighter salary/benefits, onboarding costs, apparatus and equipment costs, and fire station construction and operating costs. Depending upon when these components may be added to the system, the FY 21 costs can be escalated based upon known or anticipated increases due to such influences as projected inflation for each component, City Council authorized pay increases, rising benefit costs, or some combination of factors.

Most revenues and recurring expenditures, as well as minor non-recurring expenditures, comprising the total funding and cost of operating the fire department are found in the City of Killeen General Fund. However, major capital facility construction projects and most large equipment expenditures are accounted for in City Capital Improvement Funds (included here are Funds 347 and 349) which include bond proceeds and related revenues. Some apparatus purchases have also been made from the City Internal Service Fund for Fleet Services. The City operates on an October 1 to September 30 fiscal year and uses a modified accrual basis with a financial resources focus for fund accounting, as identified previously.

Policy decisions regarding the adoption of any enhancements designed to improve service level are generally evaluated based upon projected initial and recurring cost versus the benefit provided. To understand the future costs of any enhancement, it is important to evaluate improvements in terms of "decision units." A decision unit in the case of this Master Plan can be considered a career-staffed ambulance, engine or ladder company, shift battalion chief, or an operating fire station with various staffed units. These decision units are comprised of components such as personnel with various associated initial and recurring costs, capital apparatus and facility acquisition, and recurring capital operating costs.

The following discussion uses actual or estimated KFD FY 21 costs, to the extent they are available, as a basis for costing of various decision unit components whose costs can then be escalated to that point in time when they may be added to the system. In other words, if the City determines that it needs to add an engine company to its operation in three years, the following FY 21 personnel, capital, and operating costs will serve as a basis for the addition of that unit were it to be added in FY 21. The escalation factors for the various components of that decision unit, as estimated from various sources, will then be applied to show the future cost at the point in time the department wishes to add that unit.

Fiscal Year 2021 Personnel Costs

Salary and benefit information for uniformed (operational) positions discussed in the following section was provided by the department for FY 21. The next figure provides the average annualized salary, benefits, and the total compensation costs for various decision unit positions, including Fire Rescue Officer (which includes both Firefighter/EMT and Firefighter/Paramedic certified personnel), Captain, and Battalion Chief. It is anticipated that additional, career-staffed suppression apparatus (engines, rescues, ladder trucks, and ambulances) would require some combination of the Captain and Fire Rescue Officer (Firefighter/Paramedic and Firefighter/EMT) positions.

The Department does not have a formal Driver/Engineer position, and the modeling assumes that someone with the required knowledge, skills, and abilities in the Fire-Rescue Officer classification would fulfill that role at the average annual compensation shown below. Most Fire Rescue Officers are certified as paramedics, and all positions in this classification have been averaged to develop the typical cost of this position in the following figure.

Figure 135: Annual Salary/Estimated Benefits Various KFD Uniformed Positions, FY 21

Position	Average Annual Salary	Average Benefits	Avg. Total Compensation
Fire Rescue Officer	\$ 55,730	\$ 16,123	\$ 71,853
Fire Captain	\$ 81,254	\$ 23,507	\$ 104,761
Battalion Chief	\$ 92,372	\$ 26,723	\$ 119,095

While it might be more appropriate to utilize entry-level compensation figures for additional Fire-Rescue Officer positions added on various units, using the average for the position will give a better “worst-case” cost scenario so that recommended improvements do not end up costing more than originally projected. Since there is no formal, promoted driver/engineer position, it is assumed that anyone assigned to that role would be a more experienced, higher-paid, Fire Rescue Officer.

When adding positions, it is also important to include first-year on-boarding costs along with the recurring cost of each new position. These costs generally vary from department to department but typically include such items as background checks/polygraphs, physicals based upon the NFPA 1582 firefighter standard, recruit school costs, uniforms, SCBA facepieces, Personal Protective Equipment or Turnout Gear and may include radio/technology packages or other items. For purposes of this study, an estimated on-boarding cost of \$7,500 was used for FY 21. After the initial year, these costs would not continue with the added position, and the only recurring costs associated would be the total annual compensation. However, it is also understood that the department's annual operating costs over time would increase due to added PPE replacement, training, and other associated employee costs.

A further factor must be considered when evaluating the potential cost of adding positions. As with any other City employee, firefighters receive time off for various reasons such as vacation, sick, and funeral leave among others. The Killeen Fire Department has determined minimum staffing requirements for various response units based upon risk and response protocols to emergency incidents. These minimum daily staffing needs require that when any firefighter is on leave, and daily staffing drops below the minimum, his or her position must be covered by another firefighter. This leave coverage required to maintain minimum daily staffing is termed the “relief factor.” Based upon historical leave accruals and actual usage, the KFD relief factor goal is approximately 1.28.

The current shift staffing schedule of 24 hours on duty followed by 48 hours off duty means that for every minimum daily riding position on an apparatus, three FTEs are required before considering any leave time (1 FTE x 3 shifts). The relief factor of 1.28 applied to each riding position means that 3.84 FTEs are required to maintain that position and meet minimum staffing requirements. For the purposes of the projections provided for the addition of units, partial FTEs are used to indicate the additional cost of covering leave time. This additional cost could either be accounted for with increased overtime or, as with the hiring of additional FTE as the level of need dictates. In other words, if one 24/48 position is added to the system, 3.84 FTEs are added; one for each shift and 0.84 FTE to cover the relief factor.

Fiscal Year 2021 Capital Apparatus/Equipment Costs

The next figure identifies FY 21 apparatus costs based upon the current KFD specifications for each apparatus class. Also included is the estimated cost to equip each type of vehicle. This table illustrates the first-year capital costs only and does not consider annual or recurring operating costs such as fuel, oil, and routine maintenance costs (parts and labor). To build the most accurate cost of adding each type of apparatus, these recurring costs would need to be considered for future years. The department has developed a comprehensive annual apparatus replacement program whose costs are based upon life expectancy and usage for each vehicle class. This is an industry-standard practice and should incorporate an annual inflation factor. The KFD program includes ambulance re-chassis as part of its EMS apparatus program. The analysis here only considers the full cost of a new ambulance since this would be an added unit rather than a replacement.

Figure 136: Apparatus and Equipment Costs, FY 21

Class	Apparatus	Equipment	Total
Aerial Platform ¹	1,440,059	192,244	1,632,303
Pumper ¹	656,705	182,593	839,298
Brush Truck ²	185,000	20,000	205,000
Medium Duty Rescue ¹	682,738	294,719	977,457
Ambulance ³	225,415	100,000	325,415
SUV ⁴	42,377	10,000	52,377

¹Based upon Siddons-Martin Emergency Group July 2020 apparatus quote

²Based KFD apparatus replacement plan; equipment estimated

³Based upon average cost of four FY 16 ambulances with 4% annual inflation; equipment cost estimated

⁴Based upon average cost of five FY 19 SUVs with 4% annual inflation; equipment estimated

Fiscal Year 2021 Facility Capital/Operating Costs

The last category of costs considered as part of any potential future service level upgrade are those costs associated with fire station construction including both initial construction and annual operating costs. Land costs will vary considerably depending upon many factors, such as market condition, developer proffers, environmental, and other factors. Therefore, land costs are generally not included in the estimated costs of any notional new fire stations.

The last fire station constructed by the City was KFD Fire Station 9 completed in FY 17 whose costs are shown in the following figure. Fire Station design and costing was likely completed in FY 15. The City has two replacement fire stations identified (Stations 4 and 5) as unfunded projects in its CIP⁴⁸ under its capital facilities element. Although funding for these new stations has not yet been identified, estimated costs of \$5.1 million each include design, construction and FF&E costs. The forecast assumes that future fire stations will generally be built using the same design and costs will, therefore, be based upon the Station 9 floor plan with the pricing differential being due to inflation of materials and labor costs.

Figure 137: KFD Fire Station 9 Construction Costs

Category	Cost
Land	Varies
A&E Fees	\$646,251
Construction	\$4,641,401
FF&E	\$193,622
Total	\$5,481,274

Using Construction Analytics inflation factors for non-residential construction as found in Zarenski (2021), the cost to design and build Station 9 in FY 21 and excluding land costs, would be approximately \$6.3 million, as shown in the next figure.⁴⁹ These assumptions provide a very solid basis for projecting the cost of future fire station decision units using a standard station design.

⁴⁸ City of Killeen Capital Improvement Program Fiscal Year 2021–2025.

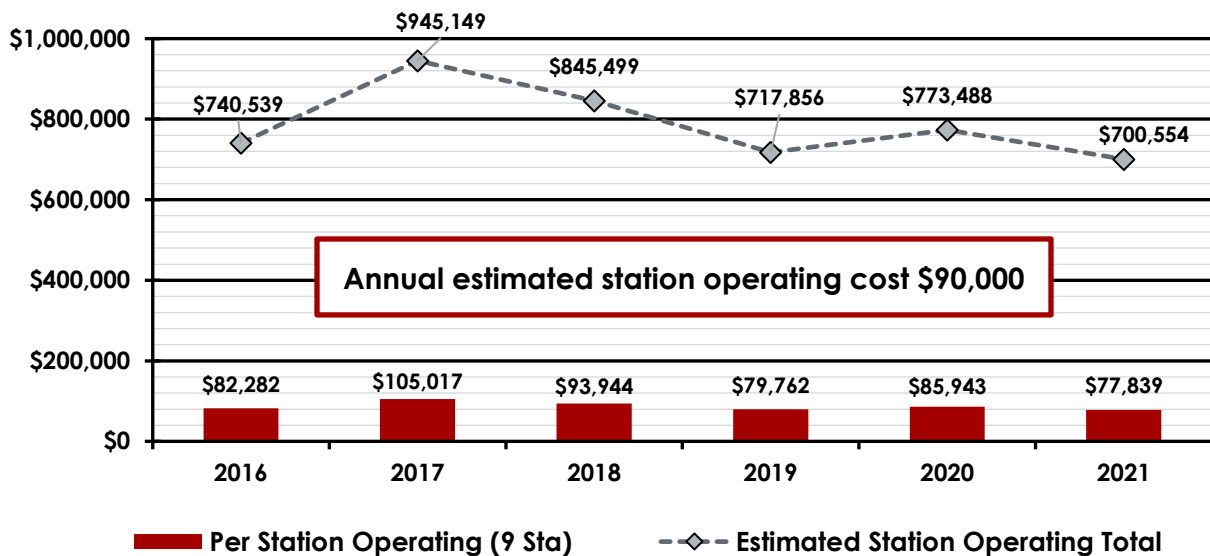
⁴⁹ <https://edzarenski.com/2021/01/26/2021-construction-inflation-e1/>.

Figure 138: Estimated Fire Station Construction Costs, FY 21

Category	Cost
Land	Varies
A&E Fees	\$749,367
Construction	\$5,381,983
FF&E	\$203,889
Total	\$6,335,239
Station Operating	\$90,000

After construction costs are considered, there is an annual operating cost for a new facility that will be comprised of multiple components. Many jurisdictions provide and charge facilities maintenance, utilities, and related operating costs for various fire department and other facilities on a square footage basis as an interfund charge. Fire departments will also budget for some routine station operating costs, such as various O&M needs. Typical operating costs generally budgeted for by departments include printing/copying, telephone and internet, laundry and janitorial, office supplies, minor equipment, books and subscriptions, and other operating supplies. Costs either paid directly or to other internal service departments may include utilities, routine maintenance and janitorial, grounds maintenance, refuse, and pest control services, among others.

Various typical facility-related operating costs for the Killeen Fire Department, as mentioned in the preceding paragraph, have been grouped and are shown in the following figure both in aggregate and on a per station basis (assuming uniform costs distributed across nine fire stations). Between FY 16 and FY 20, total estimated station operating costs, while fluctuating, have averaged approximately \$890,000 annually. Based upon a uniform distribution across nine fire stations, this gives an annual fire station operating cost estimated at approximately \$90,000. For projection purposes, an average annual operating cost of \$90,000 for FY 21 has been used.

Figure 139: Estimated Fire Station Operating Costs, FY 16–21

Fiscal Year 21 Decision Unit Staffing Costs

To provide for relief staffing (sick/vacation and other overtime coverage), the KFD should plan and budget for 3.84 personnel to cover each required seat on an apparatus that is staffed 24/7 using three shifts. In other words, the department will apply a relief factor of 1.28 to each new FTE added. This is shown in the single resource table in the following figure (the uppermost table), which also shows the total number of personnel needed by rank and compensation for an ALS engine, rescue or ladder company, and an ALS ambulance (staffed with at least one paramedic-certified Fire-Rescue Officer).

An engine or rescue unit is staffed by the KFD with a minimum of three firefighters (could be four in some cases) on each of three shifts; two Fire Rescue Officers, at least one of whom is certified as a paramedic, and a company officer (Captain). A ladder or aerial truck should be staffed with four firefighters per shift, so total staffing would include 3.84 additional Fire Rescue Officers versus an engine or rescue. However, it is understood that the KFD currently has a minimum staffing requirement of three per shift on its ladder companies. In that case, the 3-person staffing table can be used to estimate costs.

Each 24-hour seat or riding position requires 3.84 budgeted FTE to ensure minimum daily staffing (one FTE for each of three shifts plus an additional 0.84 FTE as a relief factor). The FY 21 cost per rank needed for one FTE is shown along with the total cost for all personnel required in each rank for all three shifts and relief coverage to maintain the minimum staffing.

Figure 140: Estimated Decision Unit Staffing Costs, FY 21

Single Resource			
Position	FTEs	Unit Cost	Total Cost ¹
Fire Rescue Officer	3.84	\$ 71,853	\$ 275,915
Fire Captain	3.84	\$ 104,761	\$ 402,282
Battalion Chief	3.00	\$ 119,095	\$ 357,286

¹Total cost and FTE count provides for assumed relief factor of 1.28

3-Person ALS Engine/Rescue Company			
Position	FTEs	Unit Cost	Total Cost ¹
Fire Rescue Officer	7.68	\$ 71,853	\$ 551,829
Fire Captain	3.84	\$ 104,761	\$ 402,282
Crew Total	11.52		\$ 954,111

¹Total cost and FTE count provides for assumed relief factor of 1.28

4-Person ALS Engine/Ladder Company			
Position	FTEs	Unit Cost	Total Cost ¹
Fire Rescue Officer	11.52	\$ 71,853	\$ 827,744
Fire Captain	3.84	\$ 104,761	\$ 402,282
Crew Total	15.36		\$ 1,230,026

¹Total cost and FTE count provides for assumed relief factor of 1.28

ALS Ambulance Company			
Position	FTEs	Unit Cost	Total Cost ¹
Fire Rescue Officer	7.68	\$ 71,853	\$ 551,829
Crew Total	7.68		\$ 551,829

¹Total cost and FTE count provides for assumed relief factor of 1.28

Decision Unit Cost Projection

Using the estimated FY 21 decision unit staffing costs provided as a starting point, and making various assumptions about cost increases over time, decision unit costs are projected through FY 26 in the following figure. Personnel salary and benefit costs have been projected to increase annually at 3.35 percent (based upon historical trends) and 3.95%; respectively. Since benefits have historically averaged 22.4% of total compensation, FTE costs are projected to increase at an aggregate of 3.5% annually. Annual operating costs have been projected to increase by 1.3 percent annually based upon an eight-year average for the Southern Region CPI-U prior to the onset of the Covid-19 pandemic, as reported by the U.S. Bureau of Labor Statistics.⁵⁰ It is anticipated that this rate of inflation will continue once the nation recovers from the pandemic and the economy returns to pre-pandemic conditions.

Historical apparatus and equipment costs have been observed by ESCI to increase at approximately 4% annually. According to Zarenski (2019), non-residential construction costs are estimated to have increased at 4–5% over the past five years and are expected to continue increasing at that rate.⁵¹ Construction costs can be as high as three times the Consumer Price Index and are heavily dependent upon labor and material costs as well as construction demand and backlog. Import tariffs on building materials such as steel and other commodities may have an increasing impact as well.

Figure 141: Projected Decision Unit Costs, FY 21 through FY 26

Decision Unit	Personnel Recurring Costs ¹					
	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Fire Res Officer	\$ 275,915	\$ 285,527	\$ 295,474	\$ 305,768	\$ 316,421	\$ 327,444
3-Pers ALS Comp	\$ 954,111	\$ 987,351	\$1,021,749	\$1,057,345	\$1,094,181	\$1,132,300
4-Pers ALS Comp	\$1,230,026	\$1,272,878	\$1,317,223	\$1,363,113	\$1,410,602	\$1,459,745
ALS Ambulance	\$ 551,829	\$ 571,054	\$ 590,949	\$ 611,536	\$ 632,841	\$ 654,889
Captain	\$ 402,282	\$ 416,297	\$ 430,800	\$ 445,808	\$ 461,339	\$ 477,412
Battalion Chief	\$ 357,286	\$ 369,733	\$ 382,614	\$ 395,944	\$ 409,738	\$ 424,013

⁵⁰ <https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category.htm>.

⁵¹ Zarenski, Ed (2019); Construction Cost Inflation-Commentary 2019, in Construction Analytics Economics Behind the Headlines; see <https://edzarenski.com/2018/02/15/inflation-in-construction-2019-what-should-you-carry/>.

Decision Unit	Personnel On-Boarding Costs ²					
	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Fire Res Officer	\$ 28,800	\$ 29,174	\$ 29,554	\$ 29,938	\$ 30,327	\$ 30,721
3-Pers ALS Comp	\$ 86,400	\$ 87,523	\$ 88,661	\$ 89,814	\$ 90,981	\$ 92,164
4-Pers ALS Comp	\$ 115,200	\$ 116,698	\$ 118,215	\$ 119,751	\$ 121,308	\$ 122,885
ALS Ambulance	\$ 57,600	\$ 58,349	\$ 59,107	\$ 59,876	\$ 60,654	\$ 61,443
Captain	\$ 28,800	\$ 29,174	\$ 29,554	\$ 29,938	\$ 30,327	\$ 30,721
Battalion Chief	\$ 22,500	\$ 22,793	\$ 23,089	\$ 23,389	\$ 23,693	\$ 24,001

Decision Unit	Capital Apparatus (Equipped) Cost ³					
	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Engine	\$ 839,298	\$ 872,870	\$ 907,785	\$ 944,096	\$ 981,860	\$1,021,134
Ambulance	\$ 325,415	\$ 338,432	\$ 351,969	\$ 366,048	\$ 380,690	\$ 395,918
Aerial (Platform)	\$1,632,303	\$1,697,595	\$1,765,499	\$1,836,119	\$1,909,564	\$1,985,946
Rescue	\$ 977,457	\$1,016,555	\$1,057,217	\$1,099,506	\$1,143,486	\$1,189,226
Brush Truck	\$ 205,000	\$ 213,200	\$ 221,728	\$ 230,597	\$ 239,821	\$ 249,414
Command Unit	\$ 52,377	\$ 54,472	\$ 56,650	\$ 58,916	\$ 61,273	\$ 63,724

Decision Unit	Capital Facility (Initial and Recurring) Cost ^{2, 4}					
	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Construction	\$6,335,239	\$6,620,325	\$6,918,239	\$7,229,560	\$7,554,890	\$7,894,860
Operating	\$ 90,000	\$ 91,170	\$ 92,355	\$ 93,556	\$ 94,772	\$ 96,004

¹Cost increase based on projected annual total comp increase of 3.5%; includes sufficient FTEs to cover 1.28 relief factor

²Cost increase based on pre-COVID19 8-year historical Southern Region CPI-U average of 1.3% as of December 2019

³Cost increase based upon industry average annual increase of 4%

⁴Cost increase based upon historical non-residential construction cost increase over last four years of 4-5%

The first table in the figure shows total annual staff costs, including relief factor, for single resources (for example one shift Fire Rescue Officer which requires 3.84 FTE in FY 21 costs \$275,915), 3-person ALS engine/rescue and 4-person ALS engine or ladder companies, as well as ALS ambulances as projected from FY 21 through FY 26.

The second table shows what the one-time on-boarding costs would be to hire the number of firefighters needed to fully staff each unit or individual position in any given year over the period. For example, if 11.52 FTE were added in FY 21 to staff a 3-person ALS engine company, it would cost \$954,111 in personnel costs plus \$86,400 in on-boarding costs for a total of \$1,040,511 the first year. Personnel costs would then increase at 3.5% annually so that the personnel costs for the same 11.52 firefighters on that engine company would be \$1,132,300 by FY 26. If a 4-person ladder company were to be added, the personnel costs would need to be escalated by 3.84 additional FTE whenever it was planned. The four-person company would have three Fire Rescue Officers, at least one of whom was paramedic-certified, and one company officer (Captain) assigned per shift.

The last two tables in the figure show the capital costs; the third table shows the equipped apparatus cost throughout the projection period, while the last table shows the facility construction and operating costs through FY 26. Using the projected costs, a standardized station, excluding estimated land costs, would cost approximately \$6.34 million to construct in FY 21 with an annual operating cost of \$90,000. That same station, if constructed in FY 26, would cost approximately \$7.9 million and have an operating cost of \$96,000. Purchasing an equipped engine in FY 21 would cost \$839,298, while that same engine in FY 26 would cost \$1,021,134.

The projected figures for various decision unit components can be used as an approximate guide to determine the cost of implementing various potential enhancements as recommended in the study at whatever point over the next five years the City finds appropriate and is able to fund them.

CONCLUSION

ESCI began this study in early 2021 by reviewing significant amounts of information submitted by the Department, including previous years of incident data, demographic data, local hazard mitigation studies, Department capital assets and maintenance programs, finance data, and population and economic growth projections. This was followed up with several phone interviews and a site visit to gather additional information about the community and Department. This research affirmed ESCI's belief that significant community and economic growth is likely to continue, which will undoubtedly increase the demand for public safety services, especially in the delivery of EMS.

During this study, the COVID-19 Pandemic struck the nation, essentially bringing the nation's economic, educational, and societal infrastructure to a grinding halt. While the long-term economic and societal impacts have yet to be fully identified and understood, they will most certainly affect fire department operations across the country, and KFD and the City of Killeen will likely experience negative impacts as well, and it is anticipated that these impacts may delay robust development in some areas in the City.

ESCI hopes that our analysis and recommendations will assist the City and Fire Department in successfully navigating any unanticipated negative impacts, and that the implementation of our recommendations will ensure the continued provision of high-quality and efficient fire department services well into the future.

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APPENDIX B: EXAMPLE JOB DESCRIPTION—TRAINING CHIEF

CITY OF KILLEEN POSITION DESCRIPTION

Training Division Chief

DEPARTMENT: Fire

DIVISION: Training

SUPERVISOR'S TITLE: Fire Deputy Chief

FLSA STATUS: Non-Exempt

GRADE:

EVALUATION NUMBER:

WORKERS COMP CODE:

GENERAL PURPOSE

To perform a variety of administrative, supervisory and technical work in the supervision and administration of the Fire Department Training Division and the Fire Academy Program.

SUPERVISION EXERCISED

Employee supervises Instructors, Fire Academy students, assigned Division personnel, Captains, and Fire Rescue Officers.

ESSENTIAL DUTIES AND RESPONSIBILITIES

- Develops, maintains, and administers training standards, procedures, and training manuals for the department and the Fire Academy.
- Directs the training of career members of the department and Fire Academy students; makes recommendations to the Fire Chief regarding training programs.
- Evaluates all training policies and procedures and delivery of, including but not limited to: Fire suppression structural/wildland, EMS, Hazmat, and all-risk training.
- Ensures consistent training delivery across the three operational shifts.
- Supervises and performs the continuing evaluation of supervised personnel, including but not limited to, preparation and/or review of the formal performance evaluations of subordinates, correction of work deficiencies, and recommendations of formal disciplinary actions to the Fire Chief.
- Implements and assures continued compliance with the training requirements as outlined by the Department's Medical Director.
- Responsible for the development, review, and maintenance of the comprehensive records as related to training and certification tracking of all department personnel.
- Represents the Department and acts as liaison with outside agencies for training.

- Conducts strategic planning, goal setting, and objective establishment for the Training Division; also responsible for budget planning, development justifications, as well as tracking and reporting for the Training Division.
- Responsible for purchasing and reporting purchases of all materials, equipment and supplies for department training and operation of the Fire Academy or otherwise as directed by the Deputy Chief or the Fire Chief.
- Initiates and develops special projects as applicable, appropriate, or as directed in the area of training, for the improvement and development of training; exercises project management discipline on the projects initiated.
- Defines/recommends, administers, and evaluates certification standards and testing for all department personnel consistent with department training programs.
- Prepare and presents a master training program and schedule, and ensures training schedules and calendars are accurate and up to date.
- Develops, maintains, schedules, and monitors new personnel training orientations and academies for all Department personnel.
- Selects and evaluates instructors.
- Perform the duties of subordinate personnel and instructors as necessary.

ADDITIONAL DUTIES AND RESPONSIBILITIES

- Attend conferences and meetings to maintain proficiency and ensure contemporary training methods and techniques.
- Interact with the public, educational administrators, and other City departments and officials as it relates to Division activities and capital facility needs.
- Direct assigned emergency scene operations under the Incident Command System.
- Perform other duties as assigned.

REQUIRED MINIMUM QUALIFICATIONS

- High school diploma or equivalent.
- Five years (5) years required in Captain's grade.
- Fire Instructor III certification (or ability to achieve certification within one year of appointment).
- Texas Department of State Health Services EMT-B Coordinator (or ability to obtain appointment within XXX amount of time)
- Pass the Battalion Chief (or Deputy) Exam (*or specific Training Chief Assessment Center*).

- Must possess a valid Class B or higher Texas State driver's license without record of suspension or revocation in any state.
- Must not have any felony convictions or disqualifying criminal histories.
- Must be able to read and write the English language.
- Must meet the Civil Service Requirements of the City of Killeen, including basic structural firefighter certification.
- Must be able to pass a medical exam.

KNOWLEDGE, SKILLS, AND ABILITIES:

- Working knowledge of driver safety.
- Working knowledge of first aid.
- Ability to learn the operation of fire suppression and other emergency equipment.
- Ability to learn to apply standard firefighting, emergency aid, hazardous materials, and fire preventive techniques.
- Ability to competently instruct students in a classroom and drill ground environment.
- Ability to perform strenuous or peak physical effort during emergency or training, training activities in adverse weather conditions.
- Ability to act effectively in emergency and stressful situations.
- Ability to follow verbal and written instructions.
- Ability to communicate effectively orally and in writing.
- Ability to establish effective and positive working relationships with employees, other agencies, and the public.
- Ability to maintain regular and punctual attendance.

SPECIAL REQUIREMENTS

Employee must have a valid Texas Driver's License and Firefighter Certification.

TOOLS AND EQUIPMENT USED

EMS equipment, fire apparatus, fire pumps, hoses, and other standard firefighting equipment, safety equipment, ladders, radio, pager, computer, audio-visual devices, phone.

PHYSICAL DEMANDS

The physical demands described here are representative of those that must be met by an employee to successfully perform the essential functions of this job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions.

While performing the essential duties of this job, the employee is frequently required to stand, walk, use hands to finger, handle, or operate objects, tools, or controls; reach with hands and arms. The employee is occasionally required to sit, climb or balance, stoop, kneel; crouch or crawl, talk and hear; and taste or smell.

The employee may occasionally lift and/or move up to 50 pounds and occasionally lift and/or move up to 100 pounds. Specific vision abilities required by this job include close vision, distance vision, peripheral vision, depth perception and the ability to adjust focus.

WORK ENVIRONMENT

The work environment characteristics described here are representative of those an employee encounters while performing the essential functions of this job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions.

While performing the duties of this job, the employee regularly works inside in an office environment, and occasionally in outside weather conditions. The employee occasionally works near moving mechanical parts and in high, precarious places and is occasionally exposed to wet and/or humid conditions, fumes or airborne particles, toxic or caustic chemicals, risk of electrical shock, and vibration.

Possibility of severe injury or loss of life when fighting fires.

The noise level in the work environment is usually moderate, except during certain firefighting or EMT activities when noise levels may be loud.

SELECTION GUIDELINES

Job-related tests.

The duties listed above are intended only as illustrations of the various types of work that may be performed. The omission of specific statements of duties does not exclude them from the position if the work is similar, related, or a logical assignment to the position.

The job description does not constitute an employment agreement between the employer and employee and is subject to change by the employer as the needs of the employer and requirements of the job change.