

# COMPREHENSIVE ANALYSIS OF FIRE SERVICES

## CITY OF ANDOVER, KANSAS

*NOVEMBER 21, 2017*

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## EXECUTIVE SUMMARY

The City of Andover, Kansas (City) retained Citygate Associates, LLC to perform a Comprehensive Analysis of Fire Services for Andover Fire-Rescue (Department) including Butler County Fire District 1 (Fire District), the Andover City Communications Center, and the Butler County Communications Center. This study reviewed the adequacy of the existing deployment system from the current fire station location. The study includes a Standards of Cover (deployment) and a headquarters assessment.

Throughout this report, Citygate makes key findings, and, where appropriate, specific action item recommendations. Overall, there are 33 key findings and 18 specific action item recommendations. These findings and recommendations are presented throughout Sections 3 through 7 and Appendix A of this report and summarized in this Executive Summary for ease of reference.

### **POLICY CHOICES FRAMEWORK**

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First, as the City Council understands, there are no mandatory federal or state regulations directing the level of fire service response times and outcomes. The level of service and resultant costs are a local community choice in the United States. The body of regulations on the fire service provides that *if fire services are provided, they must be done so with the safety of the firefighters and citizens in mind*. There is a constructive tension between a desired level of fire services and the level that can be funded. Thus, many communities do not have the level of fire services they desire. In small communities like Andover, it is even tougher to keep fire service levels consummate with need, along with the other competing city needs.

This deployment analysis will identify that, in the near term, additional investment in fire services is still necessary as the City continues to evolve and consider the service level choices for its fire services. The fundamental policy choices are derived from two key questions:

- ◆ *What outcome is desired for an emergency?* Is the desire to restrict a building fire to the room, building, or block of origin, or is it to provide paramedic care in time to lessen the possibility of preventable death and severe disability?
- ◆ *Should equitable response time coverage be provided to all similar risk neighborhoods?* Once the desired outcomes are stated, the fire and emergency medical services (EMS) deployment system must be designed to cover the most geography in the fewest minutes to meet the stated outcome goals. In Andover, the community has multiple neighborhoods and an unincorporated area that comprises the Fire District. It must be considered whether similarly developed areas, paying the same taxes, should all receive the same response time from a fire services unit.



### **CHALLENGE – FIELD OPERATIONS DEPLOYMENT (FIRE STATIONS)**

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Fire department deployment, simply stated, is about the **speed** and **weight** of the attack. **Speed** calls for first-due, all-risk intervention units (engines, ladder trucks, and/or ambulances) strategically located across a department responding in an effective travel time. These units are tasked with controlling moderate emergencies, preventing the incident from escalating to a second alarm or greater size, which unnecessarily depletes department resources as multiple requests for service occur. **Weight** is about multiple-unit response for serious emergencies, such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled within a reasonable time frame to safely control the emergency, thereby preventing it from escalating to greater alarms.

In this Standards of Cover (SOC) deployment plan, Citygate’s analysis of prior response statistics and use of geographic mapping tools reveals that the City currently has very good fire station coverage in the most populated areas of the City. The deployment system substantially, but not completely, meets the City’s geographic coverage and incident demands. The current station location, for the Fire District’s coverage, based on a rural population density, is meeting best practices of 13:00 minutes. However, the performance times are increasing annually and should be monitored.

For effective outcomes on serious medical emergencies and to keep serious, but still-emerging, fires small, best practices recommend that the first-due fire unit in the City should arrive within **7:30 minutes** of fire dispatch being alerted of an incident, 90 percent of the time. In the City and District, the current fire station system provides the following unit response time performance, across a variety of population density/risk areas for emergency medical and fire incident types.

**Table 1—Call Receipt to Arrival Analysis – 90% Performance**

Agency	Overall	RY 14/15	RY 15/16	RY 16/17
City	07:13	06:49	07:17	07:26
Fire District	11:00	10:39	10:47	12:20

The following are the most recent ambulance response time measures from Butler County Communications.

**Table 2—Ambulance Response Time Analysis – 90% Performance**

Response Component	November 2016–October 2017
Crew Notify to On-Scene	13:39



Within the measures above this study identifies in Section 5 that the fire dispatch processing times by Andover Police are slower than best practices of 90 seconds. Additionally, the Andover fire crew turnout times are also slower than Citygate’s recommendations by 46 seconds. However, the slower than desirable total response times from Table 1 also extend to travel times, as shown in the following table:

**Table 3—Travel Time Analysis – 90% Performance**

Agency	Overall	RY 14/15	RY 15/16	RY 16/17
City	05:09	04:56	05:25	05:06
Fire District	09:57	10:11	09:33	09:43

The Department’s travel times are reflective of the reality that, in urban areas, given the lack of an adequate number of fire stations and the traffic congestion at times, achieving 4:00-minute travel coverage to substantially all the urban density neighborhoods will not be possible to 90 percent of the serious incidents from the existing quantity of fire stations.

#### **OVERALL DEPLOYMENT EVALUATION AND SUMMARY RECOMMENDATIONS**

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The Fire Department serves a diverse and—in the Fire District—spaced-out population pattern that, in some locations, is geographically challenged with open spaces and limited cross access boulevards, all of which limit quick response times. Population drives service demand, and development brings population. The City has historically funded the best fire services it can afford and, even post-recession, continues to do so. The incident volumes in the City and District are modest, and reflective of the smaller population at present.

For the foreseeable future, the City and District will need both a first-due firefighting unit and Effective Response Force (First Alarm) coverage in all parts of the service area, consistent with best practices, if the risk of fire is to be limited to only part of the inside of an affected building, or life-threatening EMS incidents are to be dealt with in time for a better probability of survival.

While the volume of and response times to EMS incidents consume much of the Department’s attention, all communities need a “stand-by and readily available” firefighting force to deploy when fires break out. If the City wants to continue providing the elements below, and be *less dependent* on mutual aid, the City can slightly increase its deployment plan by first keeping the fifth position per day when the Federal Staffing for Adequate Fire and Emergency Response (SAFER) Grant expires, and then as funds permit, fielding another firefighter per day for a total of six for the two Station 1 units.

Citygate suggests that the City set a goal to provide equitable response times over the long term to all similar risk *and population density* neighborhoods to provide for:

- ◆ Depth of response when multiple incidents occur.
- ◆ A concentration of response forces for high risk properties.

For its current risks and likely desired outcomes, the City does not have a sufficient quantity of fire engines spaced across the City's most populated areas. Given the low number of building fires annually, the City can continue to request mutual aid when needed.

While the City cross-staffs its aerial ladder truck and the squad with two firefighters, if the daily crew were increased to six at Station 1, then three crewmembers could be assigned to the engine and then three on the ladder truck/squad.

For firefighting, a six-firefighter response would meet the Occupational Safety and Health Administration (OSHA) safety requirements of 2-in/2-out.<sup>1</sup> Thus, instead of one 2- or 3-firefighter inside team, with six personnel there can be two 2-firefighter attack teams inside the building while two personnel—a firefighter securing outside utility connections or connecting a supply line to the fire hydrant and a pump operator—plus the Chief Officer, all remain outside and capable of rescue should the inside firefighters encounter trouble.

The first deployment step for the City Council in the near term is to adopt updated and complete performance measures from which to set forth service expectations and, on an annual budget basis, monitor and fund fire crew performance for both the City and Fire District. The adopted deployment goals should reflect both an urban/suburban measure for the most populated areas, and a separate measure for the more rural Fire District areas.

## ***FINDINGS AND RECOMMENDATIONS***

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### **Deployment Findings and Recommendations**

Following is a complete list of fire crew deployment findings and recommendations. Findings #1–11 and Recommendations #1–10 are found in Sections 3–6; Finding #33 and Recommendation #18 are found in Appendix A, which is the complete risk assessment for our fire crew deployment evaluation. Findings and recommendations for our headquarters services analysis (Section 7) are shown in the following sub-section.

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<sup>1</sup> This policy requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

- Finding #1:** The City Council has not adopted a complete and best-practices-based deployment measure or set of specialty emergency response measures for all-risk emergency responses for the City and Fire District that includes the beginning time measure from the point of the Communications Center receiving the 9-1-1 phone call, nor a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations and allow the community to understand the level of fire services being provided.
- Finding #2:** On-duty City staffing is inadequate to ensure all of the tasks necessary for a serious residential house fire can be accomplished as needed and even more so if an imminent rescue is present.
- Finding #3:** Mutual and automatic aid fire unit staffing availability and quantity is highly variable (even for Sedgwick County Fire) and thus it is difficult to ensure an adequate number of personnel will respond to a fire in Andover.
- Finding #4:** A small cadre of City volunteer firefighters (currently eight) respond to the fire station for assignment during a structure fire.
- Finding #5:** The current fire station cannot serve the entire City and District within urban/suburban best practice recommendations. Current Station 1 is too far north as well for use at the buildout of the City.
- Finding #6:** The best master plan fire station model for the City to consider at buildout is a three-station model as shown in Map 9 with two new western stations and a third close to the current Station 2 private storage building location.
- Finding #7:** The City's time-of-day, day-of-week, and month-of-year calls for service demands are very consistent. This means the City needs to operate a fairly consistent 24/7/365 response system.
- Finding #8:** The City's call to arrival times are close to best practices for urban areas. The District's are closer to rural area best practices.
- Finding #9:** Neither the City nor County's Communications Center's performance for call processing is close to best practices, and the time lost in dispatch processing cannot be made up by driving faster.
- Finding #10:** The crew turnout times are higher than the best practice recommendation of 2:00 minutes.

**Finding #11:** The travel times within the City limits and District are slightly above best practices, but not yet so bad as to require an immediate fix. Stations and staffing can be added over time as the community evolves.

**Finding #33:** Zones 7, 14, and 19 have significantly more EMS incidents than other zones in the City and Fire District. This increase is likely caused by the response the Fire Department must make to lower priority incidents to assisted living facilities in those zones.

**Recommendation #1:** **Adopt Deployment Measures Policies – CITY:** The City elected officials should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the City. The measures of time should be designed to save patients where medically possible and to keep small but serious fires from becoming greater alarm fires. With this in mind, Citygate recommends the following measures:

- 1.1** **Distribution of Fire Stations:** To treat medical patients and control small fires, the first-due unit should arrive within 7:30 minutes, 90 percent of the time from the receipt of the call in the Communications Center. This equates to a 90-second dispatch time, a 2:00-minute company turnout time, and a 4:00-minute drive time in the most populated areas.
- 1.2** **Multiple-Unit Effective Response Force for Serious Emergencies:** To confine fires near the room of origin, to stop outdoor fires from spreading beyond three acres when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of a *minimum* of one ladder truck, three engines (two engines via mutual aid), and two Chief Officers totaling 13 personnel (based on unit staffing) should arrive within 11:30 minutes from the time of 9-1-1 call receipt in fire dispatch, 90 percent of the time in City areas. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute drive time spacing for multiple units in the most populated areas.
- 1.3** **Hazardous Materials Response:** Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the City response is to

minimize or halt the release of a hazardous substance so it has minimal impact on the community. It can achieve this with a travel time for the first company capable of investigating a HazMat release at the operations level within 6:00 minutes or less, 90 percent of the time. After assessment and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multiple-agency hazardous materials response partnership.

- 1.4 Technical Rescue:** Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first arriving company for assessment of the rescue within 8:00 minutes or less, 90 percent of the time. Assemble additional resources capable of initiating a technical rescue within a total response time of 11:30 minutes, 90 percent of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

**Recommendation #2:** **Adopt Deployment Measures Policies – DISTRICT:** The goal for first unit response in lightly populated areas will be 8 minutes travel for the first-due unit and three units within 16 minutes travel time. All other EMS, firefighting, and specialty response abilities will be provided to the District areas, at a best available response time, from one of three fire stations closer to buildout of the City's current envisioned planning area.

**Recommendation #3:** When the Federal Staffing for Adequate Fire and Emergency Response (SAFER) Grant funds expire, the City should continue to provide a minimum of five firefighters per day.

**Recommendation #4:** When funding is available, in the mid-term, add a third person to the City's daily staffing to ensure three firefighters on the ladder truck/squad.

**Recommendation #5:** In all staffing models, continue to provide firefighter / Advanced Emergency Medical Technicians on a squad to ensure response times faster than the County-wide ambulance service currently provides.

- Recommendation #6:** While the City could study further remodeling of Fire Station 1, Citygate recommends the City pursue a three-fire-station model for future City growth, as mapped in this study. When the funds are available for two sets of three-firefighter crews per day, both new City-located fire stations should be opened.
- Recommendation #7:** The City should continue to co-locate the County ambulance and, as a full fire station in the District can be developed, ask the County to consider adding another ambulance in the Andover area at the District station and consider sharing the staffing expense to deliver two cross-trained firefighter / Advanced Emergency Medical Technicians to enhance not just ambulance services, but additionally fire suppression staffing. The two agencies could then cost-share this added service to the region.
- Recommendation #8:** When the Department reaches three fire stations and/or the after-hours incident demand for Chief Officer coverage becomes unreasonable for two 40-hour staff Chiefs to cover, then the City should add three Battalion Chiefs, one per 24-hour shift for prompt incident command coverage.
- Recommendation #9:** While recruiting and training volunteers is not easy and has an associated expense, the Department should continue this effort as a bridging solution until the area grows and can provide a slightly larger number of career firefighters per day.
- Recommendation #10:** The Department should work on lowering turnout times to under 2:00 minutes and implementing processes to closely track the use and response time of volunteers and mutual aid units.
- Recommendation #18:** The Fire Department should thoroughly investigate the locations and number of responses for lower priority EMS responses such as Alpha and Bravo calls and determine if the Department should continue to respond to these level responses.

## **Headquarters Services Findings and Recommendations**

Following is a complete list of headquarters services findings and recommendations found in Section 7.

**Finding #12:** The community is very appreciative of its Fire Department and service delivery.

**Finding #13:** The Police Department Communications Center is busy with numerous duties and responsibilities, aside from police and fire dispatch. For long periods at night, there is only one dispatcher on duty.

**Finding #14:** The timely transferring of ambulance requests to Butler County Communications as well as the immediate handling of mutual aid is a critical function. Citygate is concerned the police dispatch staffing will not be able to handle the transferring and the coordination of serious EMS and fire emergencies with County Communications when there are also other police units/activities to support.

**Finding #15:** County taxes already pay Butler County Communications to perform dispatching for the City at no additional cost. Given that fire and EMS events are part of a regional system, the City could move fire dispatching to the County to ease local dispatcher load and improve call handling time to that of just transferring callers to the County within 15 seconds, 90 percent of the time.

**Finding #16:** The Department has an excellent fire prevention records database and fire inspection program to ensure fire safety in the community. It is one of the most robust in a city the size of Andover that Citygate has reviewed. However, this service places a significant demand on the single Fire Marshal and single engine fire crew. Eventually, as Andover grows, it will need to add a Fire Inspector / Public Educator position.

**Finding #17:** The Department has not adopted an itemized, annual formal training plan for its firefighters. Doing so is a best practice.

**Finding #18:** The Department has identified required training and hours for all volunteers to achieve, prior to responding to any type of incident.

**Finding #19:** Data input to the Department's training records management system for employee hours is not detailed to the specific class or training activity, leading to more generic training hours records than specifics.

**Finding #20:** All Department members have access to a spare set of personal protective equipment in case theirs becomes contaminated after a fire.



- Finding #21:** The Department has a comprehensive annual medical evaluation for all employees.
- Finding #22:** EMS delivery in Andover is provided by two agencies. The City of Andover provides first responder Emergency Medical Technicians or Advanced Emergency Medical Technicians, and the County ambulance provides paramedic care transport.
- Finding #23:** Several care locations in the core of the City's response area have a very high number of responses for low acuity EMS 9-1-1 calls up to almost a third of all 9-1-1 EMS events in the City.
- Finding #24:** Fire Station 1 is extremely difficult to respond from, during peak travel hours, due to traffic congestion accessing the main arterial street.
- Finding #25:** Department administrative staffing has inadequate space to house and support all employees with offices, perform their duties and functions, and maintain and store supplies and records.
- Finding #26:** The current fire station has inadequate storage space for spare equipment and supplies.
- Finding #27:** The current fire station has inadequate bay space for all apparatus including staff vehicles which must park outside on the ramp.
- Finding #28:** The existing station does not have drive-through apparatus bays, making it safer for maneuvering the apparatus and entering and leaving the fire station.
- Finding #29:** The current single bunk room must serve both male and female firefighters. Additionally, there is a small side room where members sleep. Access to evacuate the spaces if an on-site fire occurred is extremely limited.
- Finding #30:** The City has, in its Capital Projects budget, identified replacement costs and funding sources for vehicles and remodels of fire stations.
- Finding #31:** The City's fleet is well cared for and in good condition. The primary frontline units are new.
- Finding #32:** The City operates the needed fire apparatus and support vehicles to respond to expected risks in the City.

- Recommendation #11:** Staff should review the service enhancement ideas and determine how to best implement them and request funding as needed during the normal annual budget review.
- Recommendation #12:** The City should explore and move fire dispatching to the County Communications Center to improve fire multiple-unit response as well as coordination with EMS when the locally stationed ambulance is not available. Doing so will also ease some of the after-hours burden on police dispatch and add redundancy and insurance that emergency fire dispatch requests will be promptly handled.
- Recommendation #13:** The Department should formalize and adopt a Training Program for all firefighters using National Fire Protection Association recommended best practices.
- Recommendation #14:** The Department should train all members on the proper training code and input that into the records management system.
- Recommendation #15:** The Department should ensure employees are entering specific training hours for very specific classes or activities to ensure a more complete training record.
- Recommendation #16:** Department officials should review the responses to assisted living and nursing home facilities with their administrators and County EMS leadership to determine if alternative responses and remedies are available, with the goal being to reduce low acuity responses by the Fire Department.
- Recommendation #17:** Fire Prevention and Public Education are also primary services and, as Andover grows and the workload exceeds that of the one Fire Marshal, a Fire Inspector / Public Educator should be added.

### **NEXT STEPS**

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The purpose of this assessment is to compare the City's current performance against the local risks to be protected, as well as to compare against nationally recognized best practices. This analysis of performance forms the base from which to make recommendations for changes, if any, in fire station locations, equipment types, staffing, and headquarters programs.

As one step, the City Council should adopt updated and best-practices-based response time goals for the City and provide accountability for the City personnel to meet those standards. The goals identified in Recommendations #1 and #2 meet national best practices. Measurement and

planning as the City continues to evolve will be necessary for the City to meet these goals. Citygate recommends that the City's next steps be to work through the issues identified in this study over the following time lines:

### **Short-Term Steps**

- ◆ Absorb the policy recommendations of this fire services study and adopt updated City performance measures to drive the deployment of firefighting and emergency medical resources.
- ◆ Identify funding and timing for increasing fire unit crew size per day to five when the SAFER Grant expires, and then to six per day.
- ◆ Fully consider and strive to move fire dispatch to the County.
- ◆ Adopt a three-fire-station model for closer to buildout of both the City and District and, in the near term, secure two new City fire station sites at or near the locations recommended in this study.

### **Ongoing Steps**

- ◆ Continue the volunteer program as long as cost-effective.
- ◆ Monitor data and response times for all units and personnel.
- ◆ Implement the staffing and station recommendations in this study as funding permits between now and the envisioned buildout of the City.
- ◆ Maintain a close cooperation with County EMS and work on shared facilities and staffing where feasible.

## SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC’s detailed work product for a Comprehensive Analysis of Fire Services for the City of Andover (City) is presented in this report. Citygate’s scope of work and corresponding Work Plan was developed consistent with Citygate’s Project Team members’ experience in fire crew deployment and administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI).

### 1.1 REPORT ORGANIZATION

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This report is structured into the following sections.

Executive Summary: An overview of the entire report and its findings and recommendations.

- Section 1    Introduction and Background: An introduction to the study and background facts about the City.
- Section 2    Standards of Cover Introduction: An introduction to the Standards of Cover (SOC) process and methodology used by Citygate in this review.
- Section 3    Deployment Goals/Measures and Risk Assessment: An in-depth examination of the City’s ability to meet the community’s risks, expectations, and emergency needs through deployment of firefighters and apparatus.
- Section 4    Staffing and Station Location Analysis: A review of: (1) the critical tasks that must be performed to achieve the City’s desired outcome; and (2) the City’s existing fire station locations and possible future locations.
- Section 5    Response Statistical Analysis: A statistical data analysis of the City’s incident responses and an overall deployment evaluation.
- Section 6    SOC Evaluation and Deployment Recommendations: A summary of deployment priorities and overall deployment recommendations.
- Section 7    Headquarters and Support Functions Staffing Adequacy Review: An analysis of key headquarters functions.
- Section 8    Next Steps: A summary of short-term and ongoing steps.
- Appendix A Risk Assessment Detail: A complete analysis of how the fire and non-fire risk was determined for the City.

### **1.1.1 Goals of Report**

As each of the sections mentioned above imparts information, this report will cite findings and make recommendations, if appropriate, that relate to each finding. All the findings and recommendations throughout Sections 3 through 7 of this report are numbered sequentially. To provide a comprehensive summary, a complete list of all these same findings and recommendations, in order, is found in the Executive Summary. Section 8 brings attention to the highest priority needs and recommended next steps.

This document provides technical information about how fire services are provided, legally regulated, and how the City currently operates. This information is presented in the form of recommendations and policy choices for the City leadership to discuss.

## **1.2 PROJECT SCOPE OF WORK**

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### **1.2.1 Standards of Response Coverage Review**

The scope of the Standards of Response Coverage review included the following elements:

- ◆ Describe the community served and existing deployment
- ◆ Identify and describe community expectations and outcomes
- ◆ Conduct an assessment of risks to be protected, including the service area population and other appropriate demographics
- ◆ Perform a critical tasking study of duties needed at different types of emergencies
- ◆ Perform distribution and concentration studies of fire crew deployment
- ◆ Recommend deployment performance time goals for the City consistent with best practices and national guidelines from the NFPA and the CFAI
- ◆ Conduct an incident response time analysis to review the statistics of prior historical performance
- ◆ Evaluate the current dispatching functions provided by the City
- ◆ Evaluate the current response times for Butler County EMS to the City.

### ***SOC Study Questions***

Our study addresses the following questions:

1. Is the type and quantity of apparatus and staffing adequate for the City's deployment to emergencies?

2. What is the recommended deployment to maintain adequate emergency response times as growth continues to occur?
3. What are the recommended best practices for dispatching of units?

### **1.2.2 Headquarters Staffing Assessment**

- ◆ Assess the Department's administrative and headquarters functions including responsibilities and workflow for administration, prevention, training, and EMS functions.
- ◆ Evaluate support allocation and staffing.
- ◆ Evaluate the use of the volunteer firefighting force.

### **1.2.3 Fire Station 1: Location, Condition, and Space Allocation**

- ◆ Evaluate the current space allocations for administration; fire crew areas such as sleeping quarters, kitchen area, training, office space, and storage; work area for vehicles; and overall building condition.

## **1.3 CITY OVERVIEW<sup>2</sup>**

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### **1.3.1 Geographical Service Area**

The City of Andover is located on the western side of Butler County adjacent to Sedgwick County and the City of Wichita. The City of Andover covers approximately 17 square miles. The City is approximately 2.5 miles wide on its east-west axis and 7.5 miles long on its north/south axis, while the contiguous developed area of the City is only about two miles wide. The City is constrained to the west at 159th Street where it shares a border with Wichita. However, it has possibly significant growth potential to the north, east, and south.

The Department also provides all fire and first responder services to Butler County Fire District 1. The District covers approximately 40 square miles. The City receives approximately \$252,000 in revenue to support that service.

### **1.3.2 City Population**

The City of Andover is one of Kansas's fastest growing cities. When the 2003–2013 Comprehensive Plan was completed, the City had 6,690 residents and had seen a 59 percent increase in population since 1990. Between 2000 and 2010, the City's population grew by 76 percent, which was estimated to be approximately 11,791 people.

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<sup>2</sup> City of Andover Comprehensive Plan

The Wichita Area Metropolitan Planning Organization (WAMPO) projects that by 2040 the City of Andover will have a population of approximately 19,025. Although this represents a lower annual growth rate of the population than the past, the City of Andover Planning Area should still be prepared to absorb an additional 7,234 residents (a 61 percent increase) in the next thirty years.



## SECTION 2—STANDARDS OF COVER INTRODUCTION

### 2.1 STANDARDS OF COVER STUDY PROCESSES

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The core methodology used by Citygate in the scope of its deployment analysis work is the “Standards of Cover” (SOC) 5<sup>th</sup> Edition, which is a systems-based approach to fire department deployment, as published by the Commission on Fire Accreditation International (CFAI). Additionally, Citygate used the 6<sup>th</sup> Edition of the Standards of Cover Manual. This approach uses local risk and demographics to determine the level of protection best fitting the City’s needs.

The Standards of Cover method evaluates deployment as part of the self-assessment process of a fire agency. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

In the United States, there are no federal or state government requirements for a minimum level of fire services. It is a local choice issue for each community to consider and fund as it deems necessary. The CFAI SOC systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board “purchases” the fire and emergency medical service levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than using only a singular component. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss over-worked companies. If a risk assessment for deployment is not considered, and deployment is based only on travel time, a community could under-deploy to incidents.

The Standards of Cover process consists of the following eight parts:

**Table 3—Standards of Cover Process Elements**

Element	Meaning
1. Existing Deployment Policies	Reviewing the deployment goals the agency has in place today.
2. Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies.
3. Community Risk Assessment	Reviewing the assets at risk in the community. (In this Citygate study, see Section 3.2 Community Risk Assessment.)
4. Critical Task Study	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force.
5. Distribution Study	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies.
6. Concentration Study	Reviewing the spacing of fire stations so that building fires can receive sufficient resources in a timely manner (First Alarm Assignment or the Effective Response Force).
7. Reliability and Historical Response Effectiveness Studies	Using prior response statistics to determine the percent of compliance the existing system delivers.
8. Overall Evaluation	Proposing Standards of Cover statements by risk type as necessary.

Fire department deployment, simply stated, is about the speed and weight of the attack. **Speed** calls for first-due, all-risk intervention units (engines, trucks, and Chiefs for incident command) strategically located across a department responding in an effective travel time. These units are tasked with controlling moderate emergencies, thus preventing the incident from escalating to second alarm or greater size, which unnecessarily depletes department resources as multiple requests for service occur. **Weight** is about multiple-unit response for serious emergencies such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled within a reasonable time frame to safely control the emergency, thereby keeping it from escalating to greater alarms.

This deployment design paradigm is displayed in the following table:

**Table 4—Fire Department Deployment Simplified**

	Meaning	Purpose
<b><u>Speed of Attack</u></b>	Travel time of first-due, all-risk intervention units strategically located across a department.	Controlling moderate emergencies without the incident escalating to second alarm or greater size.
<b><u>Weight of Attack</u></b>	Number of firefighters in a multiple-unit response for serious emergencies.	Assembling enough firefighters within a reasonable time frame to safely control the emergency.

Thus, small fires and medical emergencies require a single- or two-unit response with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late, or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes, without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies. For Andover, with one fire station, the challenge is where and when to increase either staffing for daily demand and/or eventually locate a second fire station. Also, sometimes as communities grow, the first fire station location is no longer optimal to cover enough of the community, if the community did not grow outward from the center evenly.

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## SECTION 3—DEPLOYMENT GOALS/MEASURES AND RISK ASSESSMENT

### 3.1 WHY DOES THE CITY'S FIRE DEPARTMENT EXIST AND HOW DOES IT DELIVER THE EXISTING FIRE CREW DEPLOYMENT SERVICES?

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#### 3.1.1 Existing Response Time Policies or Goals—Why Does the Fire Department Exist?

**SOC ELEMENT 1 OF 8\***  
**EXISTING DEPLOYMENT  
POLICIES**

*\*Note: This is an overview of Element 1.  
The detail is provided on page 32.*

The City Council, over the years, has not adopted best-practice-based formal response time policies by risk type. However, the City has a long history of striving to provide fire services that can be documented in Fire Department annual reports, the number of fire companies, and minimum daily staffing. Thus, although no complete policy meeting best practices has been adopted by the City

Council, the City has been budgeting for and providing a level of services that can be documented.

In adopting a response time goal, agencies are encouraged to no longer use an average time measure. As will be explained in the next section, an average measure does not state performance past the average point of a data set. In addition, response time measures should specifically denote a beginning and end point response time and staffing quantity, by risk type, consistent with the recommendations of the NFPA or CFAI best practices. A complete response time goal is a fractile (percent of goal completion) measure that includes dispatch-processing time, crew turnout time, and finally, travel time, along with the type of emergency outcome or staffing needed to accomplish an outcome goal.

The City also has not identified response goals for technical rescue and hazardous materials responses; in addition to firefighting and EMS, response time goals for these incident types are required to meet the Standards of Cover model for the CFAI.

Since the provision of fire services is a local government issue, a common question is, “why set a response time goal?” There are two beneficial reasons to do so, especially in a smaller community such as Andover. First, one or more fire service goals provides accountability for the Council and community to understand if their investment in fire services is providing the level of effort the Council has determined appropriate. Second, when taxpayers ask about fire or EMS services, or a developer has a planned project that could impact fire services, the community can be told “here are the adopted standards we use for fire services, and as such, your question about fire services adequacy is covered by our goal statements and resultant response capability reports by the fire department.”

In this Standards of Cover study, Citygate will recommend revised response time goals to include all risks including fire, EMS, hazardous materials, and technical rescue responses. The goals will be consistent with the CFAI systems approach to response.

### 3.1.2 Existing Outcome Expectations

**SOC ELEMENT 2 OF 8**  
**COMMUNITY OUTCOME**  
**EXPECTATIONS**

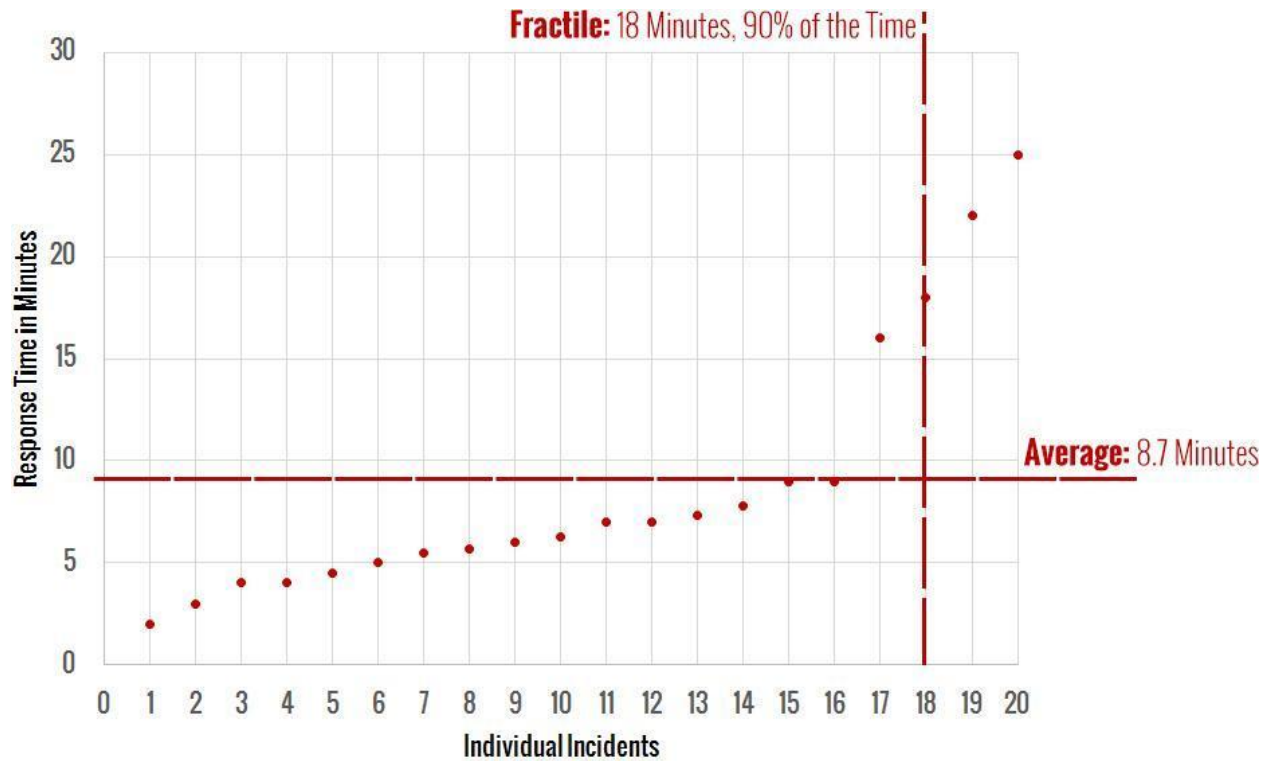
The Standards of Cover process begins by reviewing existing emergency services outcome expectations. This can be restated as follows: for what purpose does the response system exist? Has the governing body adopted any response performance measures? If so, the time measures used need to be understood and good data must be collected.

Current best practice nationally is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically this is called a “fractile” measure.<sup>3</sup> This is because an average only identifies the central or middle point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were way over the average, or just over. For example, if a department had an average response time of 5 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5 minutes were answered in the 6<sup>th</sup> minute, or way out at 10 minutes. This is a significant issue if hundreds or thousands of calls are answered far beyond the average point. Fractile measures will identify, per minute, the number of incidents that are reached up to 100 percent.

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<sup>3</sup> A *fractile* is that point below which a stated fraction of the values lie. The fraction is often given in percent; the term percentile may then be used.

**Figure 1—Fractile Description**



More importantly, within the Standards of Cover process, positive outcomes are the goal and, from that, crew size and response time can be calculated to allow efficient fire station spacing (distribution and concentrations). Emergency medical incidents involve situations with the most severe time constraints. The brain can only live 8–10 minutes without oxygen. Heart attacks are commonly known to deprive the brain of oxygen; however, heart attacks make up a small percentage of oxygen-depriving events. Drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in a 3- to 8-minute time frame. If fire service response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, *all* responding crews must arrive, assess the situation, and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is *beginning* to manage the problem within a 7- to 8-minute total response time. This is right at the point that brain death is becoming irreversible, or that an incipient fire has grown beyond the room of origin and become very serious. Thus, the City needs a first-due response goal that is within a range to give the situation hope for a positive outcome. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not from the time the fire engine actually starts to drive the response route. Ideally, the emergency is noticed immediately and the



9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, 90 seconds. Crew notification and travel time then take additional minutes. Once arrived, the crew must walk to the patient or emergency, assess the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take two or more minutes. This time frame may be increased considerably due to long driveways, apartment buildings with limited access, multi-storied apartments or office complexes, or shopping center buildings such as those found in parts of the City.

Unfortunately, there are situations in which an emergency has become too severe, even before 9-1-1 notification and/or fire department response, for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed system, then only issues like bad weather, poor traffic conditions, or multiple emergencies will slow the response system down. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

For this report, “total” response time is the sum of the alarm processing, dispatch, crew turnout, and road travel time steps. This is consistent with the recommendations of the CFAI.

**Finding #1:** The City Council has not adopted a complete and best-practices-based deployment measure or set of specialty emergency response measures for all-risk emergency responses for the City and Fire District that includes the beginning time measure from the point of the Communications Center receiving the 9-1-1 phone call, nor a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations and allow the community to understand the level of fire services being provided.

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### **3.2 RISK ASSESSMENT**

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The third element of the SOC process is a community risk assessment. Within the context of an SOC study, the objectives of a community risk assessment are to:

- ◆ Identify the values at risk to be protected within the community or service area.

**SOC ELEMENT 3 OF 8**  
**COMMUNITY RISK**  
**ASSESSMENT**

- ◆ Identify the specific hazards with the potential to adversely impact the community or service area.
- ◆ Quantify the overall risk associated with each hazard.
- ◆ Establish a foundation for current/future deployment decisions and risk reduction / hazard mitigation planning and evaluation.

A *hazard* is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. *Risk* is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community.

### **3.2.1 Values to Be Protected**

This section identifies, describes, and quantifies (as data is available) the values at risk to be protected within the City's service area. *Values at risk*, broadly defined, are those tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people, critical facilities/infrastructure, buildings, and key economic, cultural, historic, and/or natural resources.

#### ***People and Buildings***

Residents, employees, visitors, and travelers through a community or jurisdiction are considered to be vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency.

Data from the Butler County Assessor's Office indicated the average value for a single-family residence is \$207,190 in the City of Andover and \$122,334 in Butler County. For commercial property in the City of Andover, the average assessed valuation is \$580,750, and for Butler County the average assessed valuation is \$257,005.

For the 4,053 residential properties and the 292 commercial properties in the City of Andover, the average year built is 1994.

The City continues to also be attractive to larger home builders. This includes homes of 10,000 square feet or more such as those that exist in the Flint Hills neighborhood or elsewhere in the Fire District. The Department considers such large homes to be target hazards, like small commercial buildings. As such they have tactical pre-incident plans for them. In terms of firefighting, a large home is similar to a small commercial building and will require more firefighters to control as compared to a home of less than 2,500 square feet.

At-risk populations typically include children younger than 10 years of age, the elderly, and people housed in institutional settings. Table 5 summarizes key demographic data for the City.

**City of Andover, KS**  
Comprehensive Analysis of Fire Services

**Table 5—Key City of Andover Demographic Data**

Demographic	2015 Data	Percentage
Population	12,293	
Under 10 Years	1,753	14.3%
10–19 Years	2,299	18.7%
20–64 Years	7,059	57.4%
65–74 Years	628	5.1%
75 Years and Older	554	4.5%
Median Age	35.1	
Housing Units		
Owner-Occupied	3,449	
Renter-Occupied	835	
Median Household Size	2.98	
Median Home Value	176,600	
Ethnicity		
White	10,826	88%
Hispanic/Latino	732	5.9%
Black/African-American	235	1.9%
Asian	293	2.4%
Other	10	
Education (Population over 24 Years of Age)		
High School Graduate	1,029	13.7%
Undergraduate Degree	3,116	41.7%
Graduate/Professional Degree	1,323	17.7%
Employment (Population over 15 Years of Age)		
In Labor Force	9,034	
Employed	6,666	72.6%
Median Household Income	83,608	
Population Below Poverty Level	1,202	2.7%
Population with Health Insurance Coverage	11,160	

Source: U.S. Census Bureau 2015 Data

### **3.2.2 Growth and Development**

#### *Overview*

The City of Andover is primarily a bedroom community. Forty-eight percent of the City's working residents are employed in Wichita, and of the City's 3,550 jobs, only 14 percent are held by residents. City residents work in a variety of industries, which supports the City's economic resiliency. The top six industry categories for the residents of the City are manufacturing (18 percent), health care and social assistance (14 percent), educational services (13 percent), retail trade (10 percent), accommodation and food services (13 percent). The City's 10 largest employers provide approximately 45 percent of City's total jobs.

The City's Comprehensive Plan<sup>4</sup> plays a continual role in shaping the City and its character.

The Comprehensive Plan further envisions the following theme:

- ◆ *Andover is the best place to live, work and play.*

Through the development of the General Plan, community members consistently expressed their belief in Andover values of:

- ◆ City shaping, which addresses how the City of Andover will look and feel in the future.
- ◆ Accessibility, which focuses on how people travel in and around the City of Andover.
- ◆ Housing diversity, to look at strategies to expand and broaden the types offered.
- ◆ Quality of life, which addresses preserving and expanding the open space, recreational facilities, and community facilities that make the City of Andover attractive to residents and businesses.
- ◆ Sustainable resources, which have a local focus on creating a community that supports healthy living and embracing residents through their entire life cycle and a regional focus on air quality and water supply.
- ◆ Each of these themes is preserving the quality, diversity, and historic resources of the community's residential neighborhoods.
- ◆ Maintaining a strong, healthy economy that supports locally-owned and local-serving businesses.

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<sup>4</sup> City of Andover Comprehensive Plan 2014–2023

- ◆ Maintaining prudent municipal fiscal policies and practices and operational excellence by City officials and employees.

### ***Projected Growth***

Growth projections in the City of Andover's Comprehensive Plan show a growth of 61 percent to a population of 19,025 by 2040. This is approximately 3,500 dwelling units over the next two decades, which is a substantial impact on building fire risk and the level of fire services for a young, growing city. Andover's entire planning area is 32 square miles (Butler County east of Andover), as compared to the City's current 14 square mile area. Additionally, the Fire Department protects the Fire District by agreement, which is an area of 37 square miles.

### ***Population Density Summary and Impact***

Given that EMS is such a large part of the City's incident responses, as will be explained in Section 5, it follows that population drives calls for service, including resident, employment, and transportation uses. There are no set population density definitions in the United States. Different national groups and the Federal Government use their own definitions. The Commission on Fire Accreditation (CFAI) considers an area as urban when it exceeds more than 2,500 people.

The above figure of course does not take into account the employees and visitors to Andover, nor the pass-through traffic population on Highway 54 and I-35. Given this data, by any measure, the more populated areas served by the Fire Department are urban in nature and, as such, generate emergency demand and the threat of stopping fire spread from structure to structure must be planned for by the City's fire services. The Fire District is sparsely populated, except for pockets of suburban populations. The District area in total would be classified as having a rural population density according to CFAI.

### ***Land Use and Future Development***

Based on the Wichita Area Municipal Planning Organization (WAMPO) projections, it is clear that the City of Andover will need additional infrastructure and development to accommodate the expected growing population. Over the next 30 years, the City's Planning Area could absorb 7,234 additional residents (a 61 percent increase) and 3,574 households (an 89 percent increase).

Land use within the City is predominantly residential, with limited commercial and professional spaces along Andover Road, Central Avenue, and the Highway 54 corridor. The topography of the City is one of a more flat valley floor area surrounded with rolling hills. As such, the street design is curvilinear and development has had to follow the landforms, unlike a flat city that can use an all-right-angle grid layout street design.

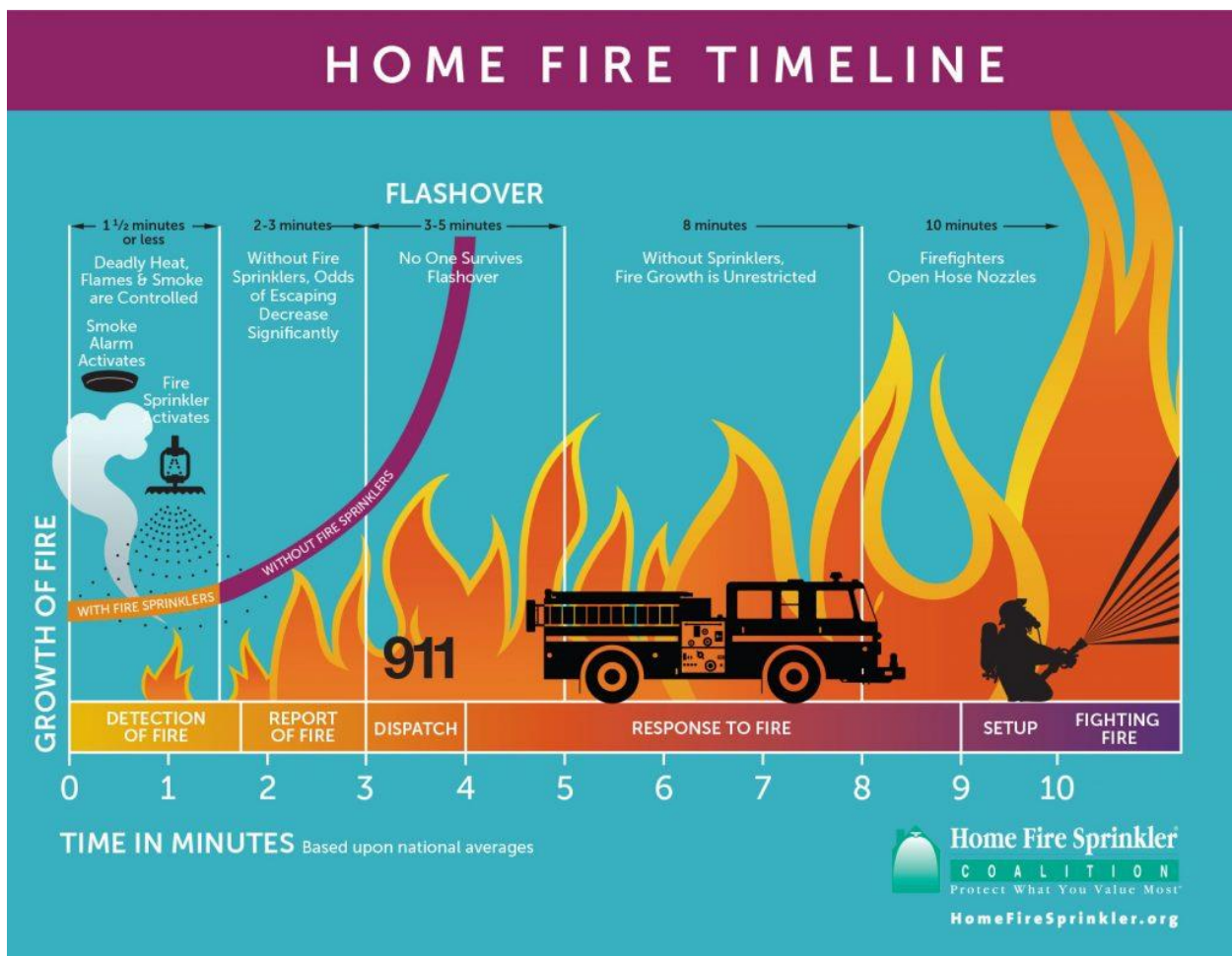
### **3.2.3 Building Fire Risk**

One of the primary hazards in any community is building fires. Building fire risk factors include building density, size, age, occupancy, and construction materials and methods, as well as the

number of stories, the required water flow for firefighting, the proximity to other buildings, built-in fire protection/alarm systems, an available fire suppression water supply, building fire service capacity, fire suppression resource deployment (distribution/concentration), staffing, and response time.

Figure 2 illustrates the building fire progression timeline and shows that flashover, which is the point at which the entire room erupts into fire after all the combustible objects in that room reach their ignition temperature, can occur as early as 3–5 minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

**Figure 2—Home Fire Timeline for Flashover**



There were eight injured civilians from 2013–2016. No injuries were critical. There were no fatalities during this reporting period. There were two fire deaths in 2010. The rate of fire injuries and two deaths in almost a decade is consistent with a smaller, growing community. The types of injuries indicate the need for fire prevention education programs.

### **3.2.4 Medical Emergency Risk**

#### ***EMS Risk Factors***

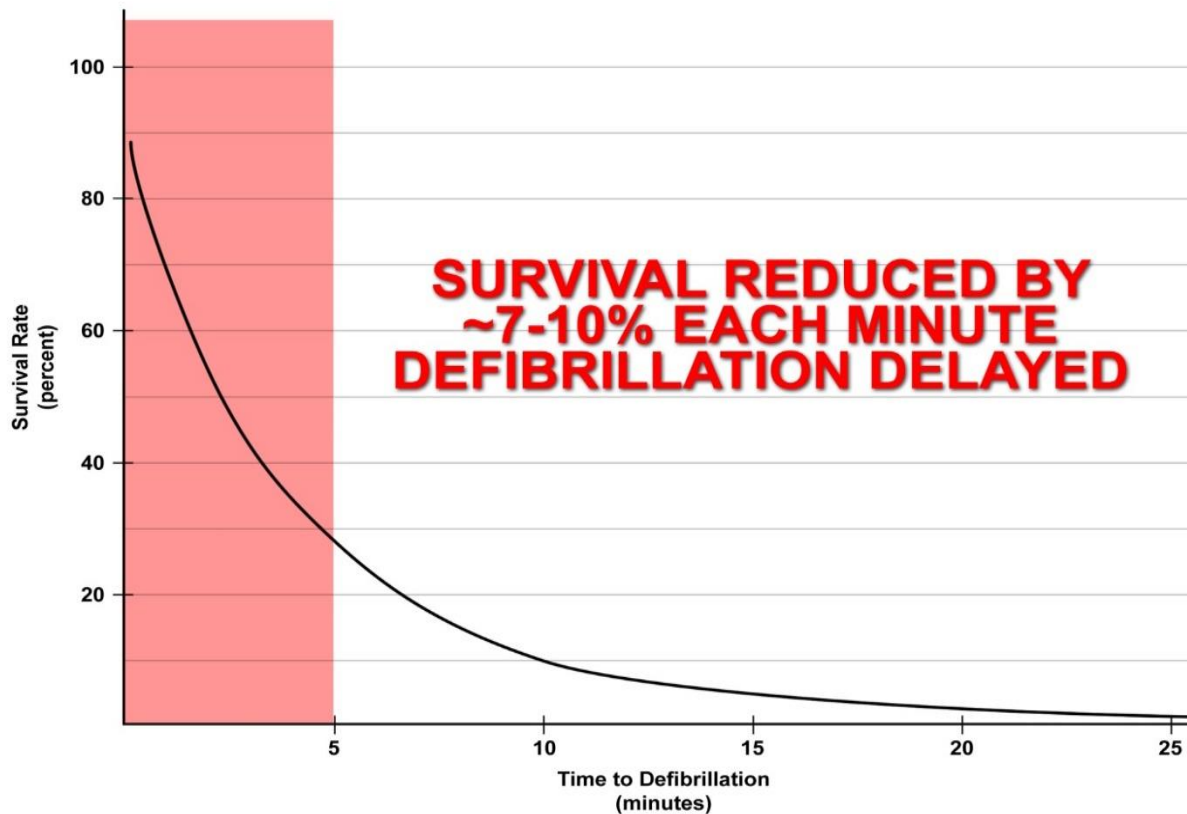
Emergency medical services (EMS) risk in most communities is predominantly a function of population demographics, violence, and vehicle traffic. Relative to population demographics, EMS risk tends to be higher among the very young, the elderly, and uninsured populations. As would be expected, EMS risk is also higher in communities or segments of communities with higher rates of violence. EMS risk is also higher in those areas of a community with high vehicle traffic loads, particularly those areas with high traffic volume travelling at higher speeds. The City, while having all of the above socio-economic factors has risks typical to its development patterns.

EMS risk can also be categorized as either a medical emergency resulting from a health-related condition or event, or traumatic injury. A serious medical emergency is cardiac arrest or some other emergency where there is an interruption or blockage of oxygen to the brain.

Figure 3 illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases. While early defibrillation is one factor in cardiac arrest survivability, other factors can influence survivability as well, such as early CPR and pre-hospital advanced life support interventions.



**Figure 3—Survival Rate for Cardiac Arrest Patients**



### 3.2.5 Risk Assessment Summary

The overall risk ratings Citygate calculated for the City, based on detailed calculations and evaluation of the values at risk and hazards likely to impact the City’s service area, are shown in Table 6. It must be remembered in risk assessments that the scoring methods are designed to reflect a national risk loss experience by type of risk from least to worst effect on a community. While any one community feels their risks are “high,” from a national view in the aggregate, they may be normal or typical. Even at Andover’s current size the assessed value of all property is approximately \$1,245,075,940, which must be protected from loss from not just fire, but loss of jobs and tax base to maintain a viable community.

In the last seven years, loss from fires of all types in the combined City/District has been approximately \$1,179,921 as estimated by the Department. The assessed value of the properties saved was \$2,944,600.

This loss averages to \$168,560 annually, which is somewhat modest and reflects the newness of many of the buildings in the City, fire codes, fire inspections, and a timely career firefighter response. In other words, a complete fire services program is being provided by Andover.

Overall risk for the five hazards related to emergency services provided by the City range from **LOW** to **HIGH** as shown in the following table.

**Table 6—Overall Risk by Hazard**

Incident Type		City
1	Building Fire	Moderate
2	Wildland Fire	Moderate
3	Medical Emergency	High
4	Hazardous Material	Moderate
5	Technical Rescue	Low

### **3.3 EXISTING CITY AND FIRE DISTRICT DEPLOYMENT**

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#### **3.3.1 Existing Deployment Situation—What the Department Has in Place Currently**

**SOC ELEMENT 1 OF 8\***  
**EXISTING DEPLOYMENT**  
**POLICIES**

*\*Note: Continued from page 21.*

As the City has not adopted a best-practices-based response time policy for either the City or District, this study will benchmark the City for urban populated areas, and the Fire District for rural populated areas, against the response time recommendations of NFPA Standard 1710 for career fire service deployment and NFPA Standard

1720 for volunteer department deployment. The urban area response time goals are:

- ◆ Four minutes travel time for the first-due unit to all types of emergencies
- ◆ Eight minutes travel time for multiple units needed at serious emergencies (First Alarm).

In less populated areas, the recommendations are for travel times to be 8–10 minutes for the first-due unit in areas of less than 1,000 people per square mile.

**City of Andover, KS**  
Comprehensive Analysis of Fire Services

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The Department's current daily staffing plan is:

**Table 7—Daily Minimum Staffing per Unit – 2016**

Unit	Number	Staff	Total
1 Engine	3	Firefighters per day	3
1 Rescue Squad or Aerial Ladder Truck <sup>1</sup>	2	Firefighters per day	2
Chief Officer <sup>2</sup>	1	Per day	1
<b>Total Firefighters and Chief Officer</b>			<b>6</b>

<sup>1</sup> Cross-staffed units

<sup>2</sup> Andover Chief Officers work a standard 40-hour work week and have to respond to after-hours emergencies from home

This daily staffing is only adequate for an immediate response to control low severity fires (one hose line with two firefighters) in most of the built-up areas of the City, or handle a 1- to 3-patient EMS event. However, for a serious building fire or EMS call, the assumption is that volunteer personnel and mutual aid units will be available in a timely manner to provide the balance of the staffing needed.

### ***Services Provided***

The City is an “all-risk” fire department providing the people it protects with services that include structure and outdoor fires, technical rescue, and first-responder hazardous materials response, as well as other services.

Given these risks, the City uses a tiered approach of dispatching different types of apparatus from their resources as well as mutual aid to each incident category. The City has its own dispatch center that notifies the Andover Fire Department to respond and transfers callers for EMS incidents or fire mutual aid requests to Butler County Communications for dispatching.

**Table 8—Resources Sent to Common Risk Types<sup>5</sup>**

<b>Risk Type</b>	<b>Minimum Type of Resources Sent</b>	<b>Minimum Personnel Sent<sup>1</sup></b>
1-Patient EMS (Serious Heart Attack)	1 Engine, 1 Squad, 1 Chief, and 1 Butler County EMS Medic Unit	8
Mild to Moderate EMS Patient	1 Squad and 1 Butler County EMS Medic Unit	4
Auto Fire	1 Engine, 1 Chief, and, if a non-fire hydrant area, 1 Water Tender	4 FF
Building Fire	1 Truck, 1 Engine, 2 Chief Officers, and 2 Mutual Aid Engines	10–13 FF
Technical Rescue	2 Squads, 1 Engine, and 2 Chiefs (1 Squad and Chief would be via Mutual Aid)	9 FF
Hazardous Materials	1 Engine, 1 Chief, 1 Squad, and Mutual Aid as/if Required	6 FF

<sup>1</sup> Staffing numbers vary depending on the unit and jurisdiction responding to assist Andover and mutual aid may not respond if they are already committed to a prior incident.

The deployment for structure fires relies heavily on automatic and mutual aid units, especially engine companies. State and federal safety laws require four personnel be on the scene of a structure fire before any member can enter the building to suppress the fire, unless an imminent known life is at risk. Based on Citygate’s deployment data analysis for Andover, there is no definitive data tracked or available to determine the number of volunteer personnel from Andover or other agencies responding to and arriving on scene. The closest career staffed engine companies are from Sedgwick County Fire Station 38 with a minimum daily staffing of three.

### ***OSHA Staffing Policies***

Since 1999, Federal Occupational Safety and Health Administration (OSHA) applied the confined space safety regulations for work inside tanks and underground spaces to America’s firefighters. This requires in atmospheres that are “IDLH” (Immediately Dangerous to Life and Health) that there be teams of two inside and two outside in constant communication, and with the outside pair equipped and ready to rescue the inside pair. This situation occurs in building fires where the fire and smoke conditions are serious enough to require the wearing of self-contained breathing apparatus (SCBA). This is commonly called the “2-in/2-out” policy. This policy requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

<sup>5</sup> Resources identified (including staffing) in this table vary depending on the outside volunteer fire department units responding and number of firefighters on board.

While under OSHA policy, one of the outside “two-out” personnel can also be the incident commander (typically a Chief Officer) or fire apparatus operator, this person must be fully suited-up in protective clothing, have a breathing apparatus donned except for the face piece, meet all physical requirements to enter IDLH atmospheres, and thus be ready to immediately help with the rescue of interior firefighters in trouble.

### **3.4 VOLUNTEER STAFFING TRENDS IN AMERICA**

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While volunteer firefighters are used across the nation, agencies are struggling with recruiting and retaining them.

For many Citygate clients, approximately 45 percent of the volunteers are ages 35–49. Another 22 percent are age 50 or older. Only 4 percent are under age 25, while 27 percent are ages 25–34. In Andover, the volunteers are young, looking for work experience, and move on when offered a career firefighting position. This turnover comes at a cost of equipment and training time to Andover.

The volunteer force in most of America is aging as employment, two-income, commuter-based job families are the new normal. Yet, when needed, structural firefighting is *fire combat* and requires excellent health and physical fitness to last more than a few minutes. The weight alone of the protective clothing, helmet, boots, and breathing apparatus is at least 45 pounds. In addition to carrying the weight, the protective clothing is hot and body heat builds rapidly. The average middle-aged person is not capable of exercising *at or near maximum heart rates* wearing 45 pounds, all while being encapsulated in clothing that does not readily release heat from exertion for even the life span of a breathing air bottle (anywhere from 12 to 21 minutes).

Firefighters have to pass annual medical exams to use self-contained breathing equipment. The health, fitness, and training time commitments all have led to a decline of available volunteers across America at now alarming rates. According to a 2016 NFPA analysis of volunteer firefighter injuries on the fireground, volunteers are 9 percent more likely to be injured than career personnel (52 percent of the time for volunteers compared to 41 percent for career personnel). Another 2016 NFPA report stated that the number of volunteer firefighters per 1,000 population has declined since 1986.

In most “average” suburban areas with commuter-based employment, census data indicates that 15 percent of the population is age 65 or older. Another 23 percent of the population is age 18 or less. This means about 38 percent of the possible volunteer recruitment pool is not available, if one assumes a firefighter can serve in a fire combat (not support) role to age 65. Volunteers must be recruited and retained from the remaining healthy and fit population that is 18–40 years old. In Citygate’s experience, older communities, especially retirement destinations and those with a very high percentage of commuter jobs, are under the most severe strain for volunteer firefighters.

Serving as a volunteer also necessitates being self-employed with flexible hours or having a very flexible employer. Decades ago, most employment was local, and local business owners and/or their employees volunteered for love of community and their employment circumstances allowed it. Across the nation today, many families have two incomes and commute from a suburban area to a metropolitan center for a job. Even many service and retail sales jobs have become internet-based or “nomadic,” where the person providing the service travels to visit clients. Most of these employment situations do not allow the time off for volunteer firefighting.

Communities like Andover should not give up on volunteers, but be realistic that they cannot, going forward, substantially provide a large enough firefighting or paramedic workforce 24/7/365. However, there may be other types of non-firefighting volunteer opportunities in the Department where a cadre of volunteers may be beneficial, such as non-technical fire inspections, public education classes, Community Emergency Response Teams (CERT), and general office support assistance.

## SECTION 4—STAFFING AND STATION LOCATION ANALYSIS

### 4.1 CRITICAL TASK TIME MEASURES—WHAT MUST BE DONE OVER WHAT TIME FRAME TO ACHIEVE THE STATED OUTCOME EXPECTATION?

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**SOC ELEMENT 4 OF 8**  
**CRITICAL TASK TIME**  
**STUDY**

Standards of Cover (SOC) studies use task time information to determine the firefighters needed within a time frame to accomplish the desired fire control objective on moderate residential fires and modest emergency medical rescues.

#### 4.1.1 Firefighting Critical Tasks

The City's Effective Response Force (ERF) to structure fires in built-up, suburban areas includes three engines (two of which are via mutual aid), one ladder truck, and two Chiefs, for a minimum ERF total of **13** personnel—if *mutual aid is immediately available*. Otherwise the Andover-only response is five firefighters plus a Chief Officer from the office or home.

NFPA 1710 recommends an ERF of 15 personnel. The following table shows what a force of 13 can accomplish (six from City and seven from mutual aid). The larger the force (weight of attack), the faster the tasks are completed.

**Scenario:** *The following is a simulated one-story residential structure fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire. Upon arrival they were told approximately 1,000 square feet of the home was involved in fire.*

**Table 9—First Alarm Structure Fire – City Personnel Plus Mutual Aid Personnel<sup>6</sup>**

Company Level Tasks
<b>1<sup>st</sup>-Due Engine (3 personnel)</b>
1. Lay in a hydrant supply line.
2. Stretch the 150-foot, 1¾-inch hose line to the point of access for search and rescue or transitional attack.
3. Operate the pump to supply water and attach hydrant supply line.
4. Assume command of initial operations.
<b>1<sup>st</sup>-Due Truck (2 personnel)</b>
1. If necessary, lay in a hydrant supply line, or
2. Stretch a 2nd 200-foot hose line as a back-up line and for fire attack, or
3. Perform ventilation if required, or
4. Establish the Initial Rapid Intervention Crew.
<b>2<sup>nd</sup>-Due Engine Mutual Aid (3 personnel<sup>1</sup>)</b>
1. If necessary, lay in a hydrant supply line.
2. Pump 1st engine's supply line if needed.
3. Stretch 3rd 1¾-inch hose line if needed.
<b>3<sup>rd</sup>-Due Engine – Mutual Aid (2 or 3 personnel)</b>
1. Establish a dedicated Rapid Intervention Crew.
2. Raise ladders, open concealed spaces, and force entry as needed.
3. Provide salvage and overhaul.
<b>1<sup>st</sup>-Due Incident Commander (1 person)</b>
1. Establish exterior command.
<b>2<sup>nd</sup>-Due Chief Officer (Mutual Aid 1 person)</b>
1. Establish Safety Officer.

<sup>1</sup> For the City structure fire responses an engine with 3 and a Chief Officer will also respond from Sedgwick County.

The duties in Table 9, grouped together, form an *Effective Response Force or First Alarm Assignment*. These tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the emergency from escalating. While firefighters accomplish the above tasks, the incident progression clock keeps running. However, given the City's daily staffing of only five firefighters plus a Chief Officer, not all tasks can be performed before mutual aid arrives.

<sup>6</sup> Subject to responding mutual aid units and staffing



Fire spread in a structure can double in size during its *free-burn* period before firefighting is started. Many studies have shown that a small fire can spread to engulf an entire room in less than 4 to 5 minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire attack and search commence before the flashover point occurs if the outcome goal is to keep the fire damage in or near the room of origin. In addition, flashover presents a serious danger to both firefighters and any occupants of the building.

#### **4.1.2 Emergency Medical Services Critical Tasks**

The City responds to nearly 1,100 EMS incidents per year. These incidents include car accidents, water emergencies, strokes, heart attacks, difficulty breathing, and many other medical emergencies. The wide variety and circumstances of EMS calls makes it difficult and impractical to chart the critical tasks for each call type.

The American Heart Association (AHA) recommends a minimum of two emergency medical technicians and two certified paramedics to adequately operate an emergency cardiac scene. A 2010 EMS study conducted by the National Institute of Standards and Technology (NIST)<sup>7</sup> clearly demonstrates a crew of four first responders on-scene, including two paramedics, is the most expedient and efficient means of delivering advanced emergency medical care.

The City routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, water rescues, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in close proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

City Police dispatchers are responsible for screening calls to establish the correct initial response. The first Fire Department officer on scene amends the response once conditions have been assessed. Standard operating procedures are used to request adequate personnel and resources.

For comparison purposes, the following critical task table reviews the tasks needed on a typical cardiac arrest.

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<sup>7</sup> Report on Residential Fireground Field Experiments, National Institute of Standards and Technology Technical Note #1661, April 2010.

**Table 10—Cardiac Arrest – 7 Personnel (1 Engine, 1 Squad, 1 Ambulance<sup>8</sup>)**

Task	Personnel Required	Type of Treatment Administered
Compressions	1-2	Compression of chest to circulate blood
Ventilate/oxygenate	1-2	Mouth-to-mouth, bag-valve-mask, apply O <sub>2</sub>
Airway control	1-2	Manual techniques/intubation/cricothyroidomy
Defibrillate	1-2	Electrical defibrillation of dysrhythmia
Establish I.V.	1-2	Peripheral or central intravenous access
Control hemorrhage	1-2	Direct pressure, pressure bandage, tourniquet
Splint fractures	2-3	Manual, board splint, HARE traction, spine
Interpret ECG	2	Identify type and treat dysrhythmia
Administer drugs	2	Administer appropriate pharmacological agents
Spinal immobilization	4-6	Prevent or limit paralysis to extremities
Extricate patient	3-4	Remove patient from vehicle, entrapment
Patient charting	1-2	Record vitals, treatments administered, etc.
Hosp. communication	1-2	Receive treatment orders from physician
Treat en route	2-4	Continue to treat/monitor/transport patient
<b>Total</b>	<b>5-7</b>	<b>Personnel required per patient</b>

#### 4.1.3 Critical Task Analysis and Effective Response Force Size

What does a deployment study derive from a company task analysis? The total task needs (as displayed in Table 9 and Table 10) to stop the escalation of an emergency must be compared to outcomes. We know from nationally published fire service “time vs. temperature” tables that after about 4 to 5 minutes of free burning, a room fire will grow to the point of flashover. At this point, the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. Additionally, we know that brain death begins to occur within 4 to 6 minutes of the heart having stopped. Thus, the Effective Response Force must arrive in time to stop these catastrophic events from worsening.

The on-scene tasks discussed show that the residents of the City and District are able to expect positive outcomes, and have a good chance of survival, in a mild to *moderate severity* 1- to 2-patient medical emergency inside the City. This is because the City’s first responding units are typically available in 6:00 minutes or less first unit *travel* time (as identified in Section 5).

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<sup>8</sup> Ambulance provided by Butler County EMS

Mitigating an emergency event is a team effort once the units have arrived. This refers back to the “weight” of response analogy; if too few personnel arrive too slowly, then the emergency will worsen instead of improving. The outcome times, of course, will be longer, with less desirable results, if the arriving force is later or smaller.

The quantity of staffing and the arrival time frame can be critical in a serious fire. Fires in older and/or multi-story buildings could well require the initial firefighters needing to rescue trapped or immobile occupants. If a lightly-staffed force arrives, it cannot simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that the other units arrive in time to complete an effective intervention. Time is one factor that comes from *proper station placement*. Good performance also comes from *adequate staffing* and training. In the critical tasks identified previously, the City’s firefighters can only perform well in terms of time *when mutual aid is close by*. Given how far away mutual aid fire stations are located in neighboring communities, and how few of them exist, the emergency will worsen.

Previous critical task studies conducted by Citygate, the Standards of Cover documents reviewed from accredited fire departments, and NFPA 1710 recommendations all arrive at the need for 15+ firefighters arriving within 11 minutes (from the time of call) at a room and contents structure fire to be able to *simultaneously and effectively* perform the tasks of rescue, fire attack, and ventilation. For a First Alarm building fire Andover sends *a minimum of five on-duty personnel, one Chief Officer, along with automatic and mutual aid companies from other agencies, and a small cadre of City volunteer firefighters report to headquarters to standby for an additional alarm or a response to the fire at the Incident Commander’s direction*.

The staffing of mutual or automatic aid companies, other than Sedgwick County Fire, is not quantifiable. Staffing is dependent on how many volunteers are available to respond in many cases. Sedgwick County Fire is on automatic aid to Andover and has three career personnel on the engine. The City understands that firefighting crews arriving closely together are needed to deliver a positive outcome that protects lives and property by stopping the escalation of the emergency as found by the arriving force. However, with the use of mutual aid and volunteer organizations the staffing varies for each response. From smaller, more volunteer staffed departments, it could be one or five per unit.

A question one might ask is, “If fewer firefighters arrive, *what* from the list of tasks mentioned would not be completed?” Most likely, the search team would be delayed, as would ventilation. The attack lines would only consist of two firefighters, which does not allow for rapid movement above the first-floor deployment. Rescue is conducted with only two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. It must always be remembered: effective deployment is about the **speed** (*travel time*) and the **weight** (*firefighters*) of the attack.

Six initial City firefighters (including the one duty Chief Officer) plus a minimum of seven automatic and mutual aid firefighters could handle a moderate-risk house fire; however, even a blended Effective Response Force of 13 will be seriously slowed if the fire is above the first floor, in a hillside property that is difficult to reach, in a low-rise apartment building, or commercial/industrial building. This is where the capability to add alarms to the standard response becomes important.

Given the fact that the City's First Alarm (Effective Response Force) strives to deliver six of its personnel plus seven via automatic/mutual aid to a moderate risk building fire, it reflects the City's unpublished goal to confine serious building fires near the room(s) of origin, and to prevent the spread of fire to adjoining buildings. This is a typical desired outcome in built-out areas and requires more firefighters more quickly than the typical rural outcome of keeping the fire contained to the building, not room, of origin.

Given that there is not a current City response time policy, the City's current physical response to building fires is, in effect, the City's de-facto deployment measure to built-up suburban/rural areas. Thus, this becomes the baseline policy for the deployment of firefighters.

Critical Tasking Table 9 and Table 10 identifies the required number of personnel necessary to conduct and complete the required tasks for either a structure fire or a serious medical emergency, within the time frame listed, to ensure a safe and positive outcome for residents.

The daily total on duty fire unit staffing for the Fire Department is five personnel plus a duty Chief Officer from the office or home. There are three personnel on the engine and two personnel on the squad or cross-staffed ladder truck. Two full-time Chief Officers from Andover and one part-time Chief rotate being available 24/7/365 for the Incident Commander functions at serious emergencies.

While critical tasking and staffing for EMS calls is appropriate (including Butler County EMS personnel), critical tasking for structure fires is *inadequate*. The City relies heavily on mutual and automatic aid to supplement its staffing. The County Fire unit is frequently not available when assigned to County incidents or covering other County fire station areas. Other mutual aid companies are volunteer-based with staffing varying widely by time of day or day of week. Thus, the staffing plan for serious emergencies is variable and not dependable to ensure that an adequate number of firefighters immediately respond.

<p><b>Finding #2:</b> On-duty City staffing is inadequate to ensure all of the tasks necessary for a serious residential house fire can be accomplished as needed and even more so if an imminent rescue is present.</p>
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**Finding #3:** Mutual and automatic aid fire unit staffing availability and quantity is highly variable (even for Sedgwick County Fire) and thus it is difficult to ensure an adequate number of personnel will respond to a fire in Andover.

**Finding #4:** A small cadre of City volunteer firefighters (currently eight) respond to the fire station for assignment during a structure fire.

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#### ***4.2 DISTRIBUTION AND CONCENTRATION STUDIES—HOW THE LOCATION OF FIRST-DUE AND FIRST ALARM RESOURCES AFFECTS THE OUTCOME***

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The City is served today by one staffed fire station and one inactive volunteer station that only houses an engine and is not part of the deployment model. It is appropriate to understand what the existing station does and does not cover, if there are any coverage gaps needing one or more stations, and what, if anything, to do about them.

In brief, there are two geographic perspectives to fire station deployment:

- ◆ **Distribution** – the spacing of first-due fire units to stop routine emergencies.
- ◆ **Concentration** – the clustering of fire stations close enough together so that building fires can receive sufficient resources from multiple fire stations quickly. As indicated, this is known as the **Effective Response Force**, or, more commonly, the “First Alarm Assignment”—the collection of a sufficient number of firefighters on scene, delivered within the concentration time goal to stop the escalation of the problem.

At the request of the Fire Chief, Citygate used geographic mapping to develop models that measured first-due unit response areas based on current fire station locations using the NFPA urban area recommendation of 4 minutes travel for the first-due unit and 8 minutes travel when multiple units are needed at serious emergencies.

The following series of maps reviews the current coverage, the locations of incidents, and then for a future plan as growth occurs, an improved fire station location model. It has to be remembered that at present, Station 2 is not staffed, is on private property, and is not included on any responses. However, for eastern area response time coverage modeling, the Station 2 area works very well.

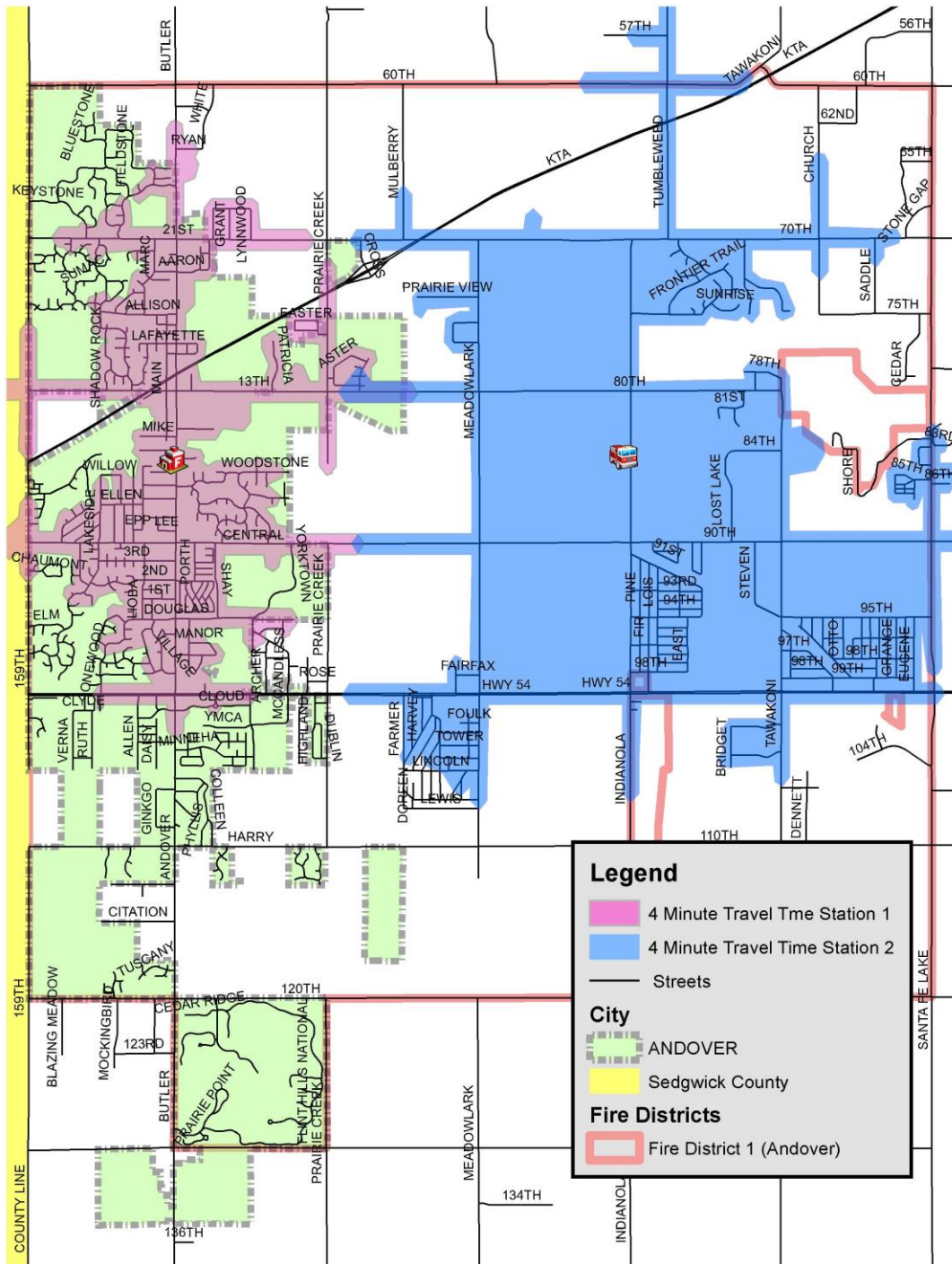
**SOC ELEMENT 5 OF 8**  
**DISTRIBUTION STUDY**

**SOC ELEMENT 6 OF 8**  
**CONCENTRATION STUDY**

**City of Andover, KS**  
Comprehensive Analysis of Fire Services

Map 1 shows how far the coverage extends from the existing fire stations. The coverage does not extend to the northern and southern urbanized areas, and it only overlaps current Station 2 (if staffed in the future) by a small amount on 80<sup>th</sup> Street where the colors overlap.

**Figure 4—Map 1 – Travel Distance at 4 Minutes for Existing Fire Stations**



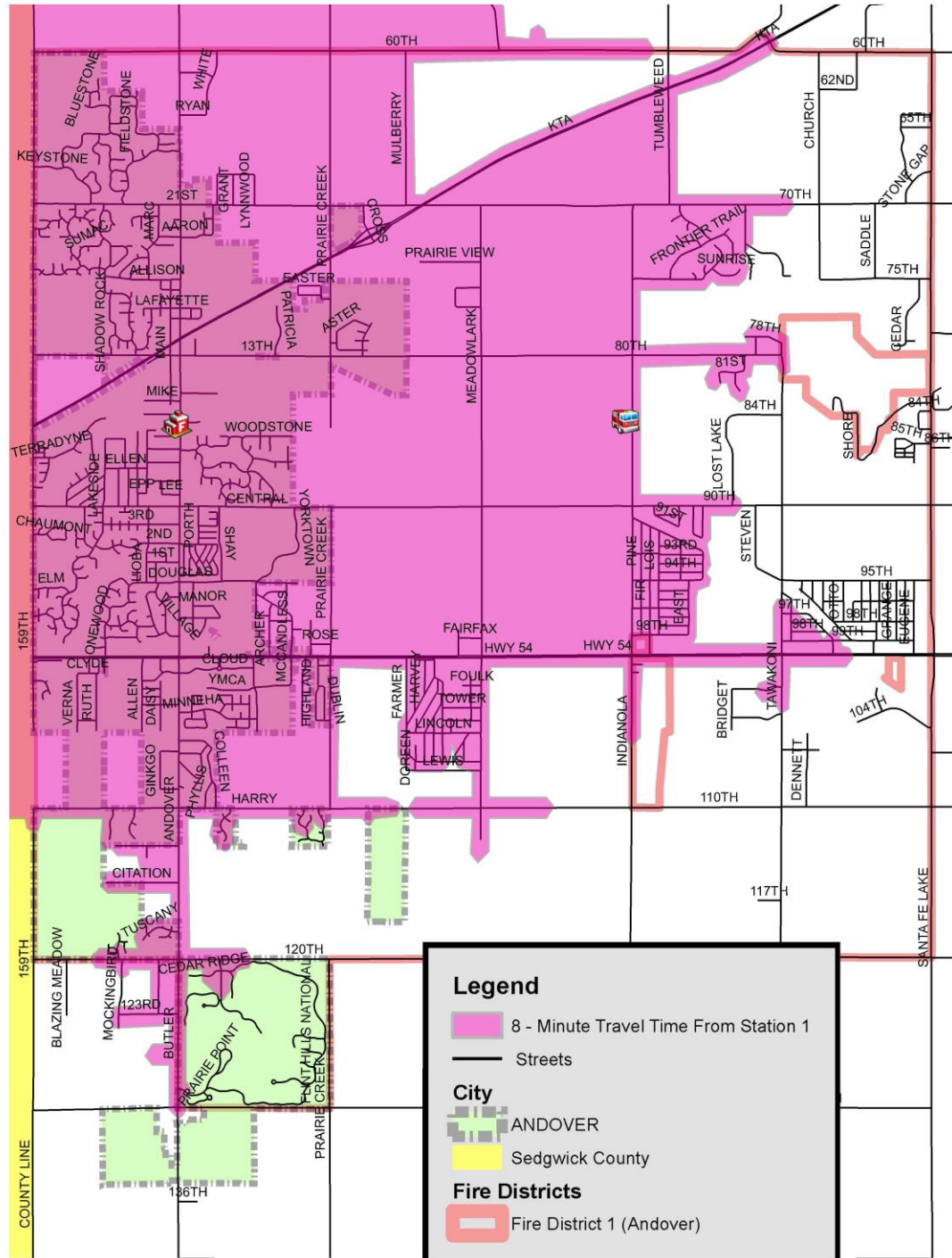




**City of Andover, KS**  
**Comprehensive Analysis of Fire Services**

Map 3 shows how far, at an 8-minute rural travel time, the District populated locations are from current Station 1. As can be seen, not all of the eastern District can be reached at this travel time measure.

**Figure 6—Map 3 – Travel Distance at 8 Minutes from Existing Station 1**

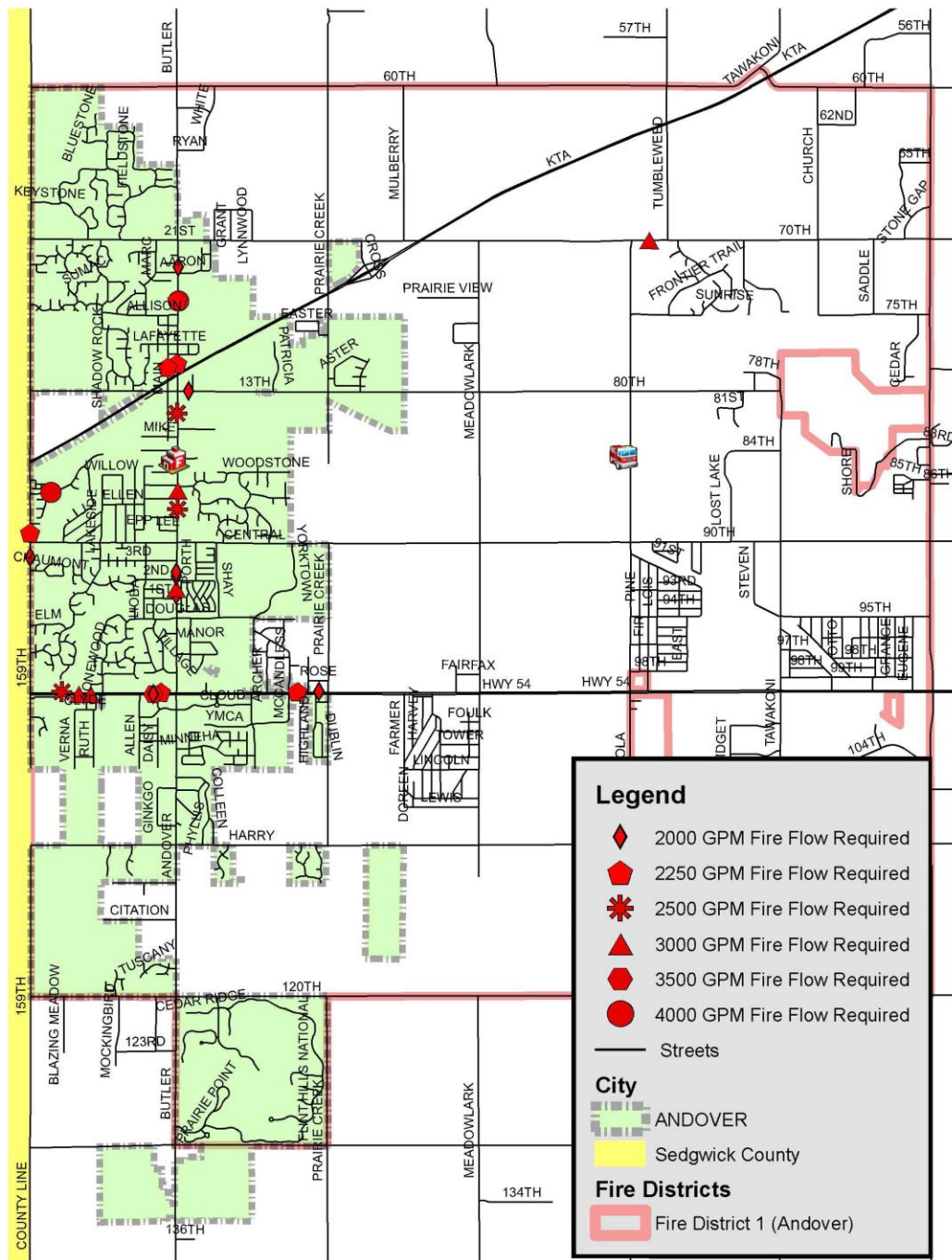




**City of Andover, KS**  
Comprehensive Analysis of Fire Services

Map 4 shows how the building locations that, per the ISO “required fire flow” formula, would need firefighting water to be applied on very serious fires. As can be seen, these sites are few today and mostly located in the main commercial corridor areas within current Station 1’s 4-minute travel time reach.

**Figure 7—Map 4 – Higher Building Fire Risk Sites**

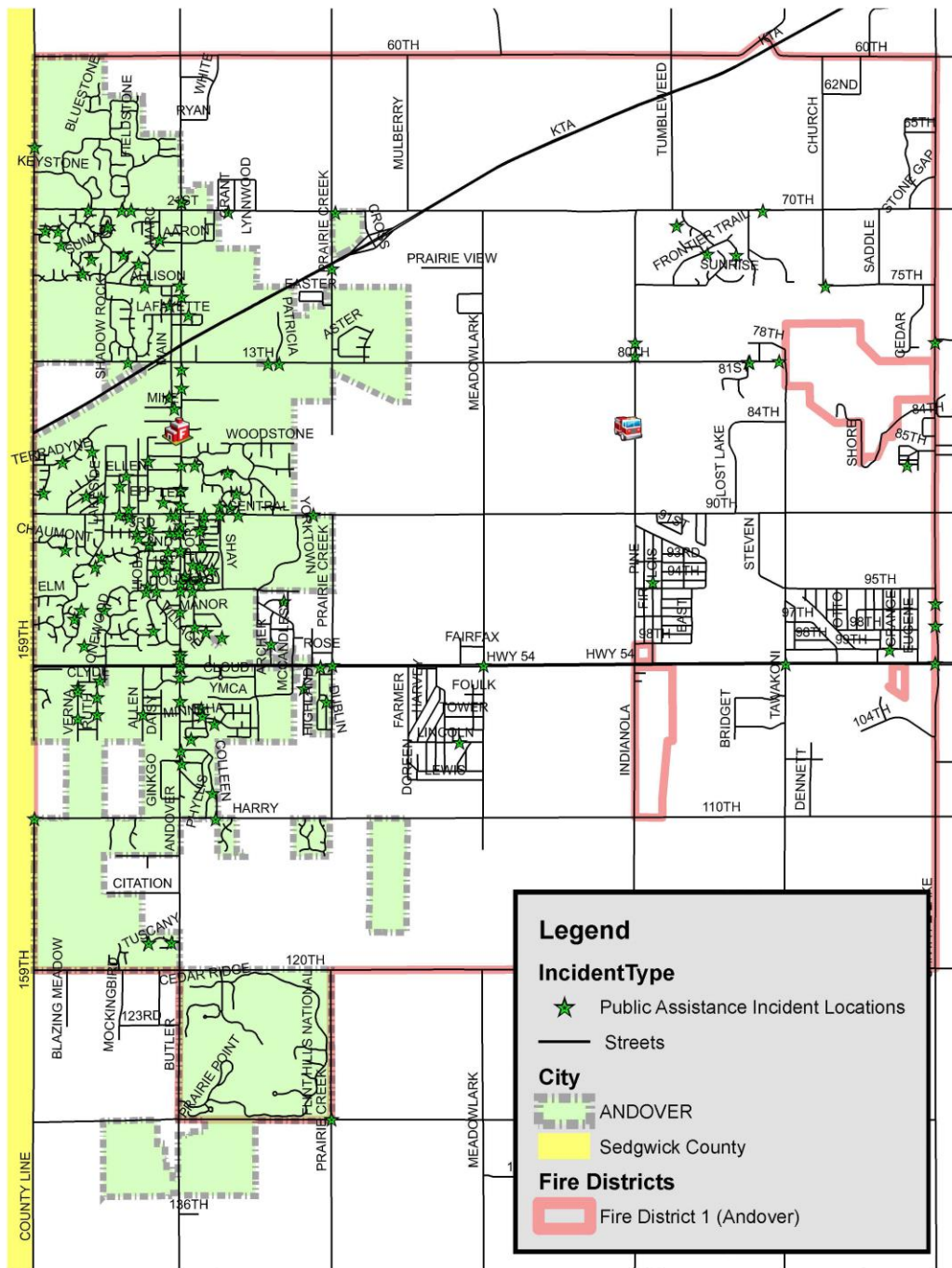




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Comprehensive Analysis of Fire Services

Map 6 shows the location of non-emergency events where the Fire Department staff still respond to assist people with difficult situations, such as gas leaks, fuel spills, mild entrapments, etc. Some of these incidents occurred south of Highway 54 where the current Station 1 coverage does not reach.

**Figure 9—Map 6 – Locations of Public Assistance Incidents in 2016**



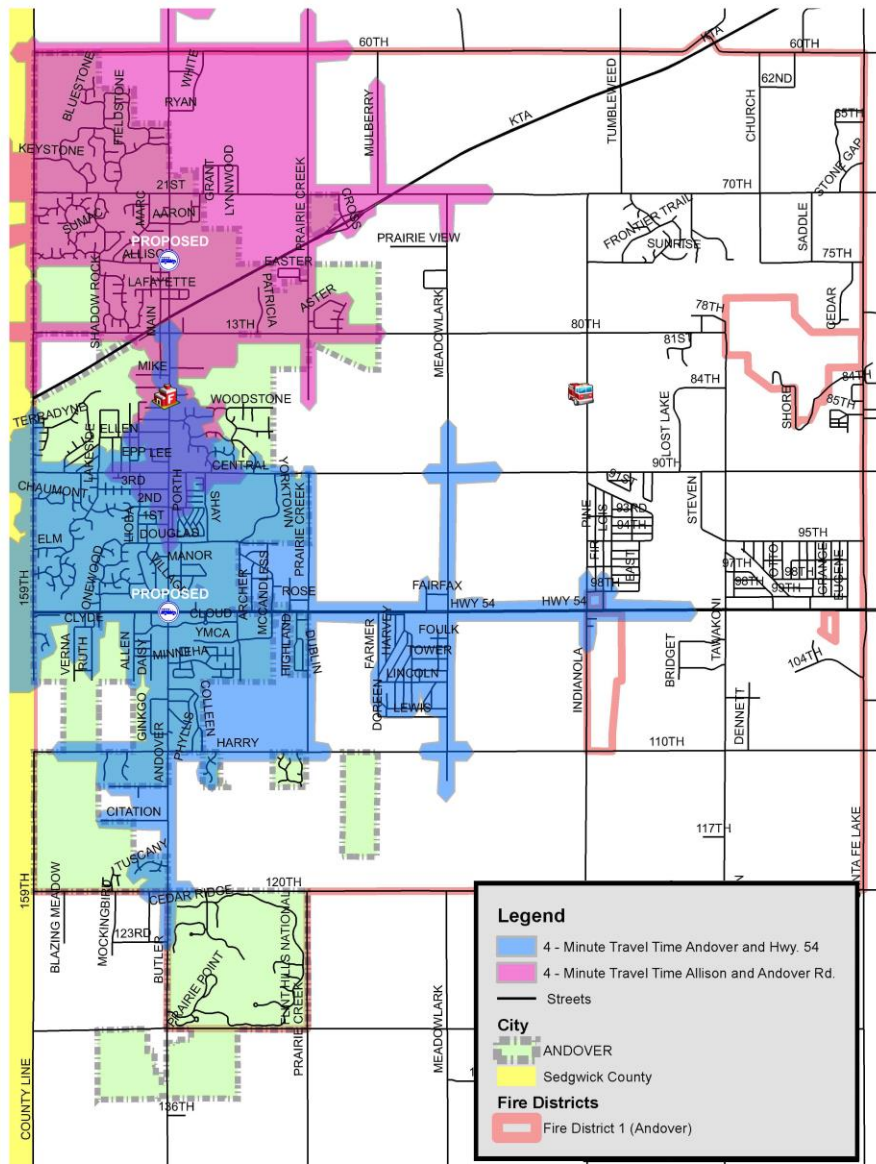


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Given a goal to provide response times typically expected in urban/suburban areas to the north and south parts of the City, it was apparent from the current coverage that no single station, even at a central crossroad, can cover the entire urbanizing area at buildout. Andover Road is a very good north/south location. Not all of the east/west roads are paved yet or extend all the way to the eastern District. But both Highway 54 and 21<sup>st</sup> do, so two test sites were placed near those streets. Map 7 shows the 4-minute travel time coverage from these two sites and they can cover the City area north to south, and overlap slightly in the core area, which is desirable. Neither site can substantially cover the Fire District at this urban measure of 4 minutes travel time. This map does not consider coverage from current Station 1.

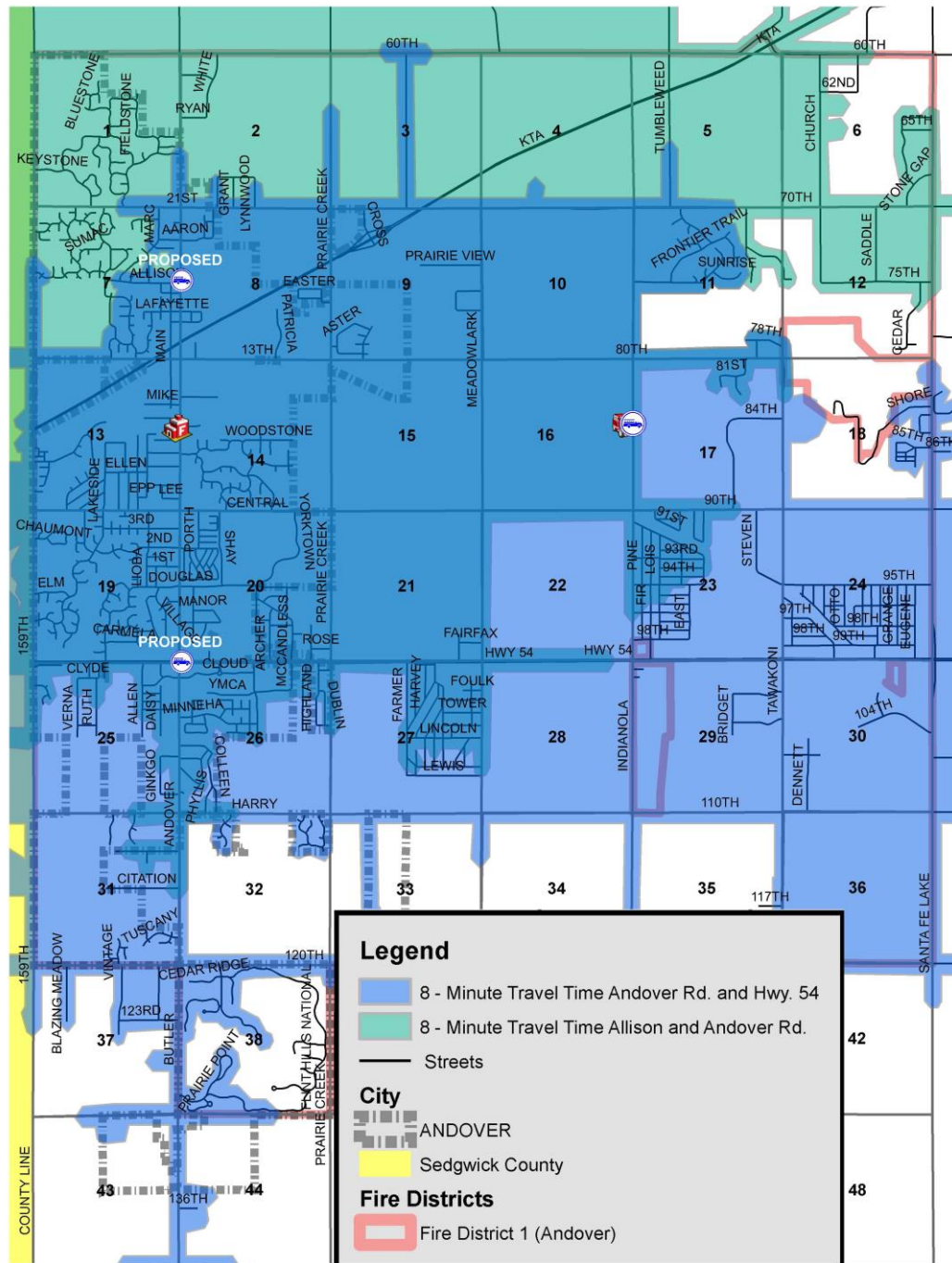
**Figure 10—Map 7 – Future Two CITY Fire Station Locations Scenario at 4 Minutes Travel Time**



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Map 8 shows how two new City fire station locations could provide *rural* 8-minute, single-unit coverage into the District. As can be seen, only one station can just reach the northern or southern corners of the District, and sections of District receive two-unit coverage for serious emergencies.

**Figure 11—Map 8 – Two New CITY Station Locations Scenario at 8 Minutes *Rural* Travel Time**

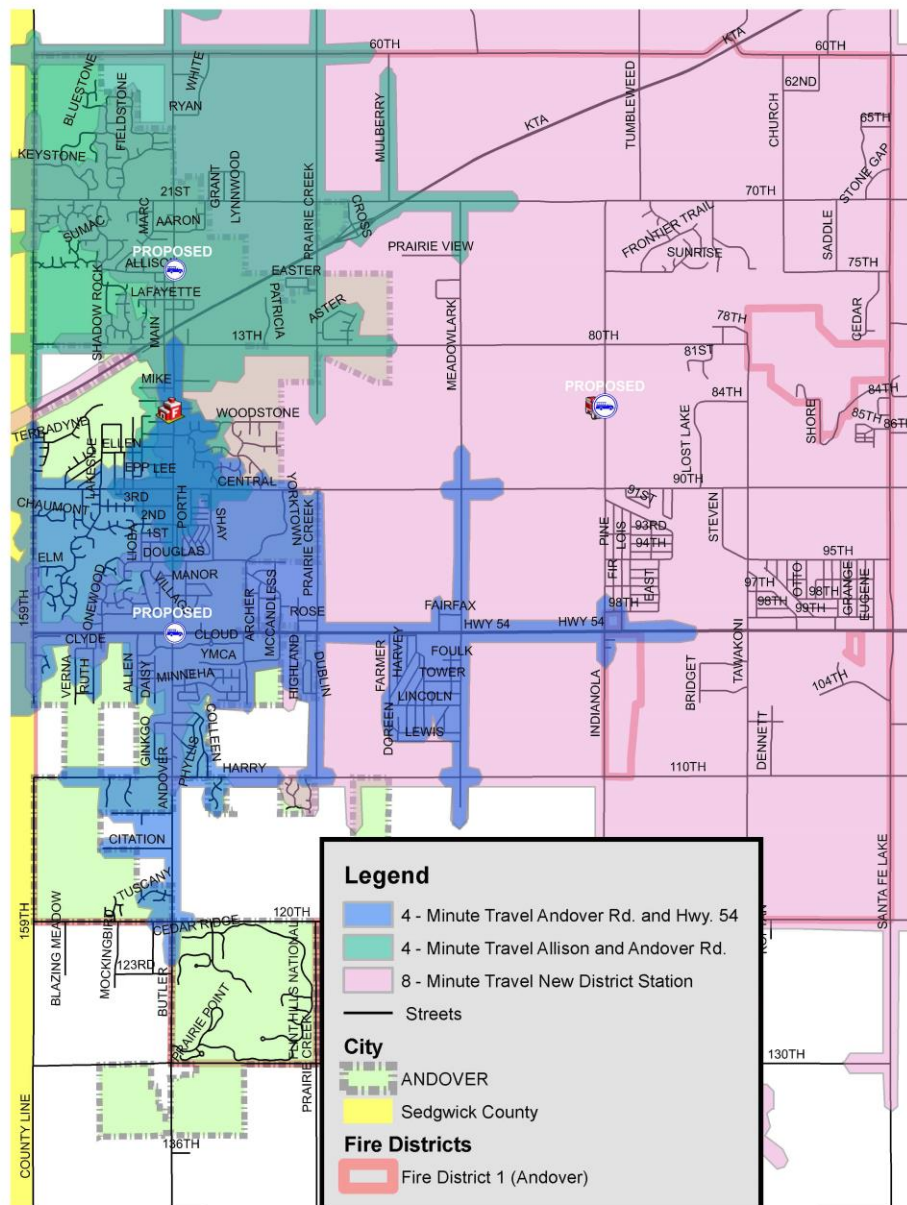


**City of Andover, KS**  
**Comprehensive Analysis of Fire Services**

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When serious incidents require multiple units, Map 9 shows the combined coverage from the two new CITY locations at 4 minutes travel time each for the urban area and a third station in the District (near the current location) at 8 minutes travel for the rural area. As can be seen, the District site at 8 minutes adds desirable third unit coverage into sections of both the northern and southern City new fire station areas. The District station also ensures all areas of the District receive 8-minute travel time coverage, even if neither City station is available. This overlap of two or three units, as shown in the darker colors, is very good planning as the combined City and District areas continue to grow.

**Figure 12—Map 9 – Three New Fire Stations – Multiple-Unit Coverage**



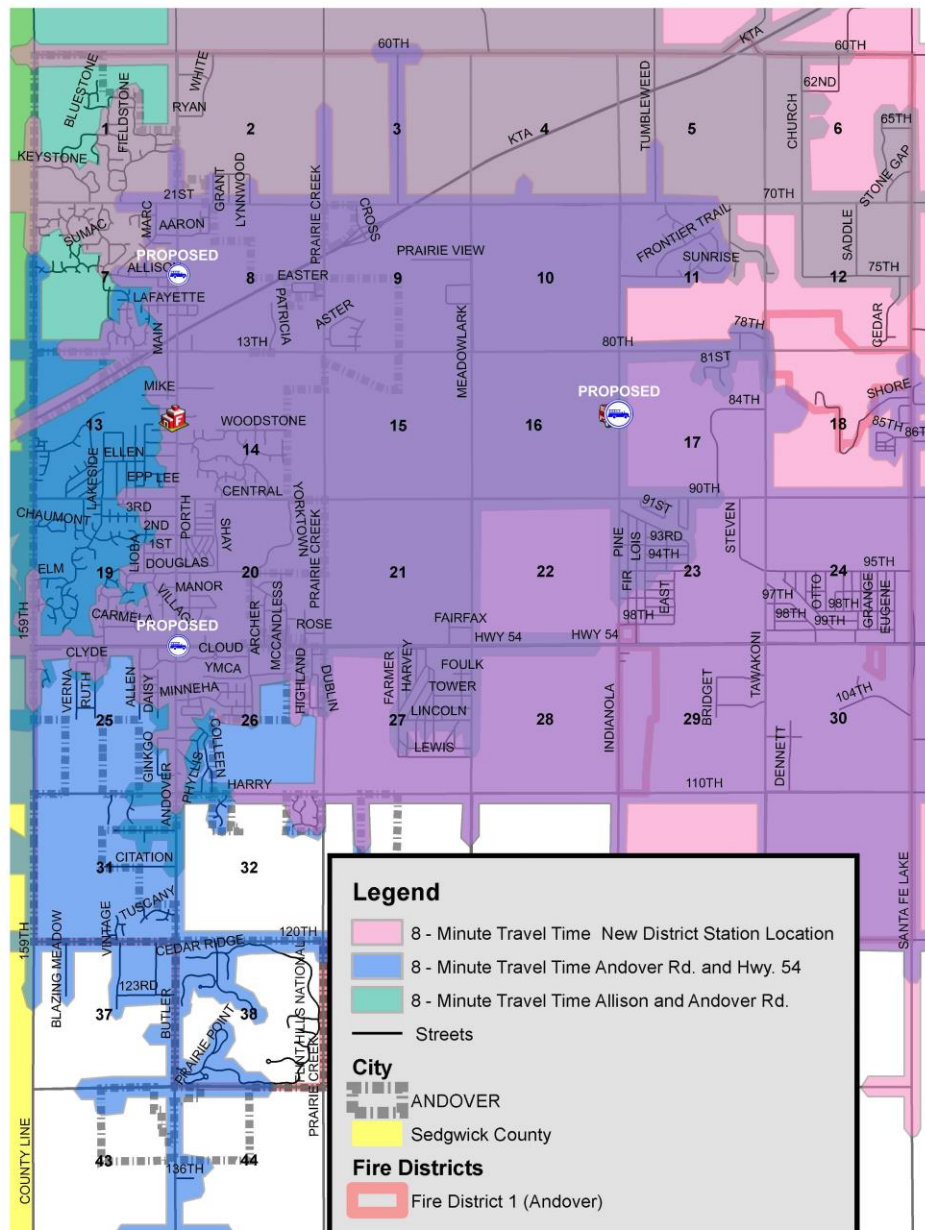


**City of Andover, KS**  
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When serious incidents require multiple units, Map 10 shows the combined coverage from the two new CITY locations and a third station in the District (near the current location), all at 8 minutes travel for the rural area. As can be seen, the District site at 8 minutes adds desirable third unit coverage into western sections of both the northern and southern City new fire station areas. Conversely, much of the western District is covered by two stations within 8 minutes travel time. Such overlap of two or three units, as shown in the darker colors, is very good planning as the combined City and District areas continue to grow.

**Figure 13—Map 10 – Three New Fire Stations – Multiple-Unit Coverage at 8 Minutes**



#### **4.2.1 Geography Coverage Analysis**

A three-station model in a triangle configuration is a *very good result* as all three stations can support each other and the third station in the District would provide 8-minute travel time coverage to all of the Fire District consistent with rural best practices. The third station would also respond into the core of the City within 8 minutes travel time.

Three staffed units with three firefighters each, plus the squad with two, and hopefully ongoing volunteers plus mutual aid career fire units from the west, would provide an Effective Response Force (ERF) to serious emergencies of anywhere from 12 to 15 personnel.

**Finding #5:** The current fire station cannot serve the entire City and District within urban/suburban best practice recommendations. Current Station 1 is too far north as well for use at the buildout of the City.

**Finding #6:** The best master plan fire station model for the City to consider at buildout is a three-station model as shown in Map 9 with two new western stations and a third close to the current Station 2 private storage building location.



## SECTION 5—RESPONSE STATISTICAL ANALYSIS

### 5.1 *HISTORICAL EFFECTIVENESS AND RELIABILITY OF RESPONSE—WHAT STATISTICS SAY ABOUT EXISTING SYSTEM PERFORMANCE*

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**SOC ELEMENT 7 OF 8**  
**RELIABILITY & HISTORICAL  
RESPONSE EFFECTIVENESS  
STUDIES**

The maps described in Section 4 show the GIS response distance times given perfect conditions with no competing calls, with and without traffic congestion, and with units all in place. Examination of the actual response time data in this section provides a picture of how response times are in the real world of simultaneous

calls, rush hour traffic conditions, units out of position, and delayed travel time for events such as periods of severe weather.

#### 5.1.1 Data Set Identification

Andover Fire Department provided National Fire Incident Reporting System (NFIRS v5) incident and computer-aided dispatch (CAD) apparatus response time data for a three-year period from July 1, 2014 through June 6, 2017. This data included 4,630 incidents and 7,111 apparatus response records.

Data was assembled into the following Reporting Years (RYs):

- ◆ RY 14/15      07/01/2014 – 06/30/2015
- ◆ RY 15/16      07/01/2015 – 06/30/2016
- ◆ RY 16/17      07/01/2016 – 06/30/2017

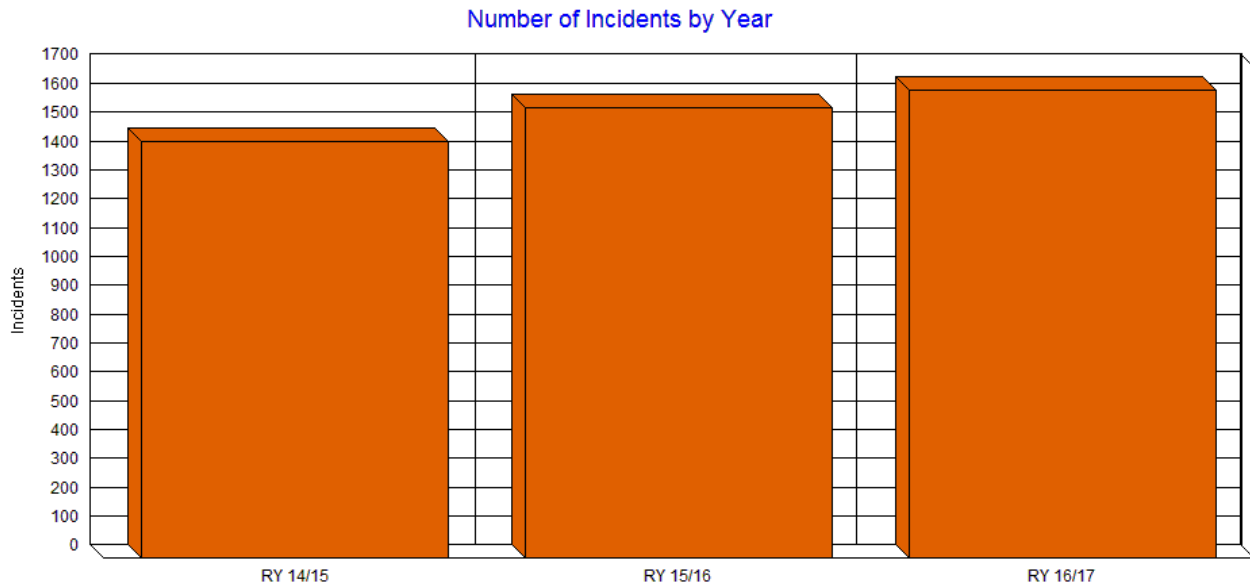
### 5.2 *SERVICE DEMAND*

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In RY 16/17, the Andover Fire Department responded to 1,622 incidents. During this period, Andover had a daily demand of 4.44 incidents, of which 4.32 percent were to fire incidents, 67.76 percent were to EMS incidents, and 27.92 percent were to “other” incident types. During this same period, there were 2,321 apparatus responses. This means there was an average of 1.43 apparatus responses per incident.

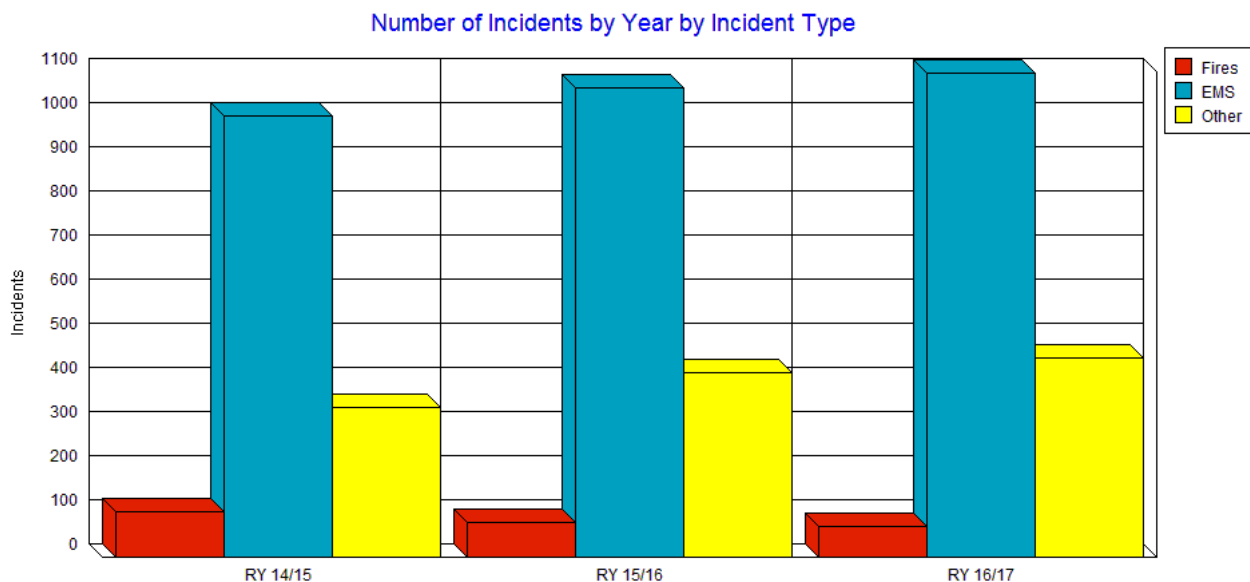
Andover Fire Department experienced a steady growth in the number of incidents from RY 14/15 through RY 16/17, as seen in the following chart.

**Figure 14—Number of Incidents by Year**



The following graph illustrates the number of incidents by incident type. Notice the number of EMS incidents continues to rise in the study period while the number of fires during the same period declined.

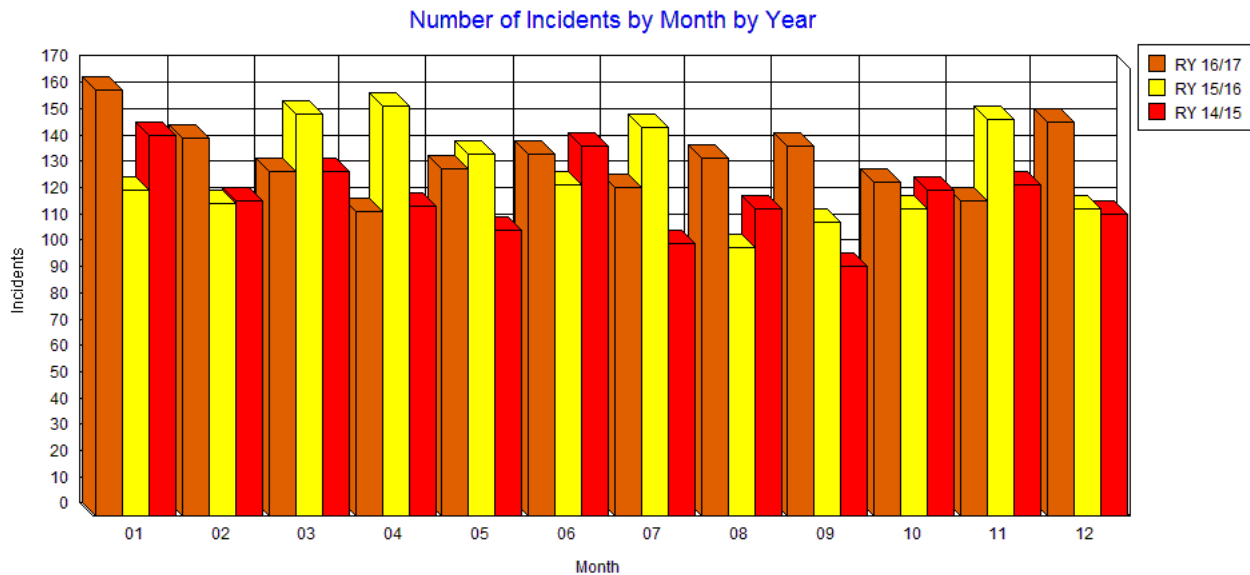
**Figure 15—Number of Incidents by Incident Type**



### 5.2.1 Breakdown of Incident Demand over Time

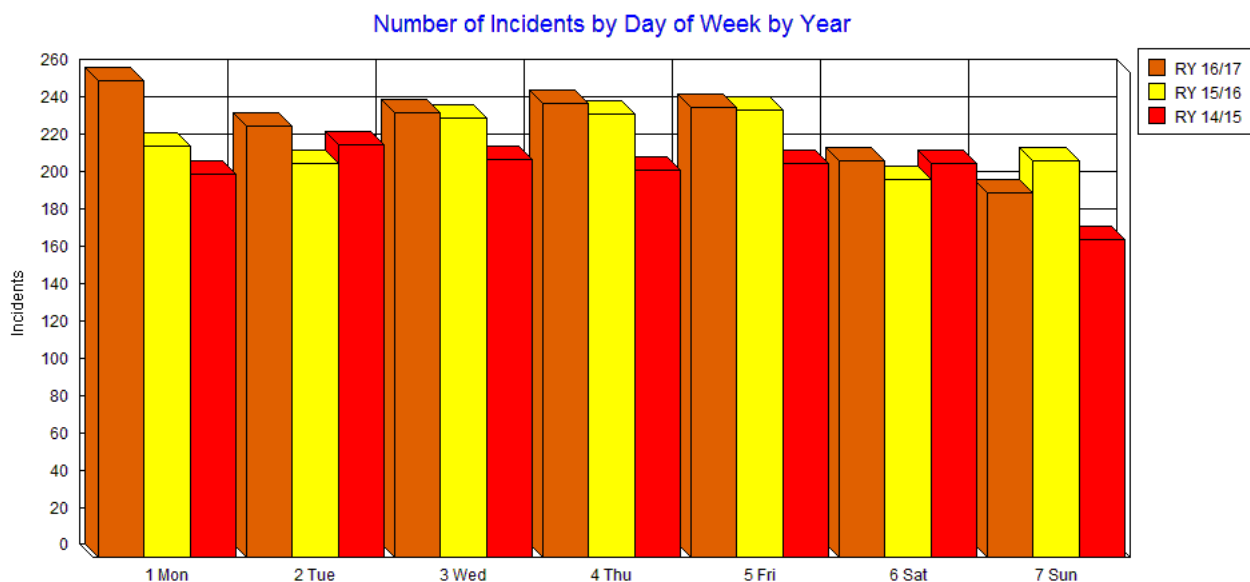
The number of incidents by month modulates year-to-year, with peak activity occurring at several points over the 12 months.

**Figure 16—Number of Incidents by Month by Year**



When broken down by day of week, incident activity tends to build during the work week and tends to peak on Thursday and Friday.

**Figure 17—Number of Incidents by Day of Week by Year**

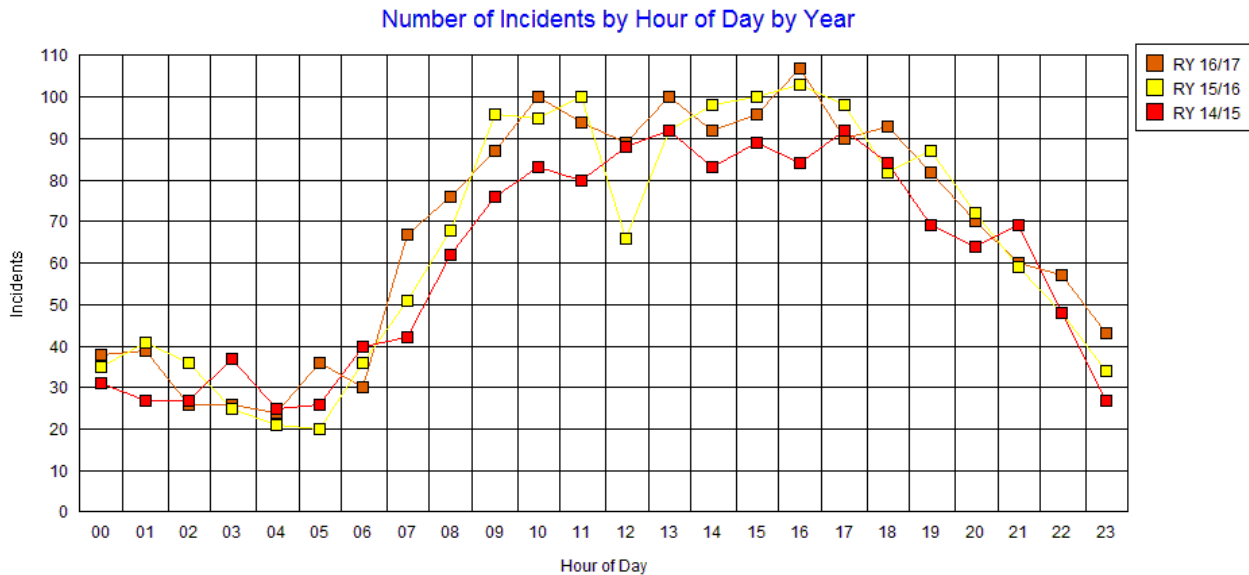


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The following chart shows the breakdown of incidents by hour of the day by year. Activity is consistent by hour of day, with the exception of volatility in the afternoon and early evening hours.

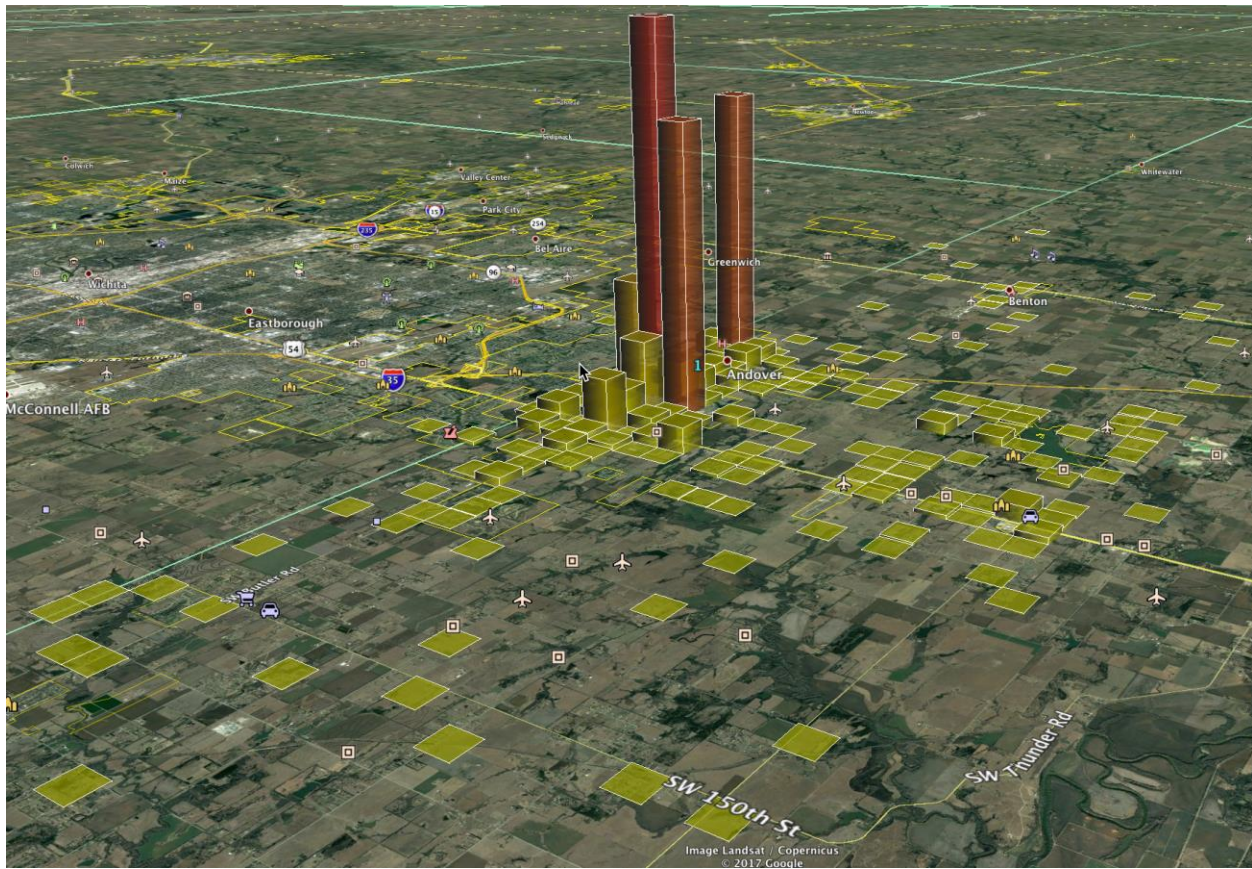
**Figure 18—Number of Incidents by Hour of Day by Year**



**Finding #7:** The City's time-of-day, day-of-week, and month-of-year calls for service demands are very consistent. This means the City needs to operate a fairly consistent 24/7/365 response system.

The following map displays where the *volume* of incident demand occurs across the geography of the City and Fire District. As common sense would suggest, with most incidents being for EMS events, population density drives incident demand. Currently, the volume of demand is in the more intently developed core of the City. The orientation of this map is looking from the southeast to the southwest so that all of the higher areas can be seen. The color of the bar is reflective of total volume, with red being the highest. This is not a response time map.

**Figure 19—Volume of Incident Demand Across City and District Geography**



## 5.2.2 Breakdown of Incident Demand by Type

The following are the activity rankings of incidents by count greater than 10. Notice the strong ranking for EMS incidents. Incidents cancelled en route also rank high on the list. Building fires rank in 9<sup>th</sup> place by volume.

**Table 11—Incidents: Quantity – Incident Type for RY 16/17**

Incident Type	Total
311 Medical assist, assist EMS crew <sup>1</sup>	547
321 EMS call, excluding vehicle accident with injury	457
611 Dispatched & canceled en route	131
554 Assist invalid	55
322 Vehicle accident with injuries	53
622 No incident found on arrival of incident address	53
462 Aircraft standby	30
553 Public service	26
111 Building fire	19
320 Emergency Medical Service, other	16
142 Brush, or brush and grass mixture fire	15
651 Smoke scare, odor of smoke	15
324 Motor vehicle accident no injuries	14
745 Alarm system sounded, no fire – unintentional	12
143 Grass fire	11
735 Alarm system sounded due to malfunction	11
412 Gas leak (natural gas or LPG)	11
131 Passenger vehicle fire	11
561 Unauthorized burning	10
733 Smoke detector activation due to malfunction	10

<sup>1</sup> The use of the 311 NFIRS Incident Type Code as defined in Andover means an Andover Fire Department unit is on scene less than 5 minutes before arrival of Butler County EMS. If it is more than 5 minutes it is then coded as a NFIRS 321 incident.

### ***Incident Quantities by Property Use***

The following chart illustrates the ranking of incidents by property types where there are 10 or more occurrences. While the highest ranked property type is residential housing, the second highest category is 24-hour nursing/care homes. At a rate of 486 in a year, that is about 1.3 per day in a Department that only responds to 4.4 incidents per day. If all types of medical facilities are counted, the total is 577 a year, or 1.6 per day. This high use of the fire and ambulance paramedic ambulance system in a small community is unusual in Citygate's experience. It is normal to see these uses of EMS in the top 10 property types, but not second place.

**Table 12—Incidents: Quantity – Property Type for RY 16/17**

Property Use	Total
419 1 or 2 family dwelling	575
311 24-hour care nursing homes, 4 or more persons	486
429 Multifamily dwellings	78
961 Highway or divided highway	60
331 Hospital – medical or psychiatric	41
931 Open land or field	26
340 Clinics, doctor's offices, hemodialysis centers	37
963 Street or road in commercial area	36
962 Residential street, road or residential driveway	32
141 Athletic/health club	22
519 Food and beverage sales, grocery store	23
215 High school/junior high school/middle school	18
241 Adult education center, college classroom	12
965 Vehicle parking area	12
161 Restaurant or cafeteria	11
342 Doctor, dentist or oral surgeon's office	13

### 5.2.3 Simultaneous Analysis

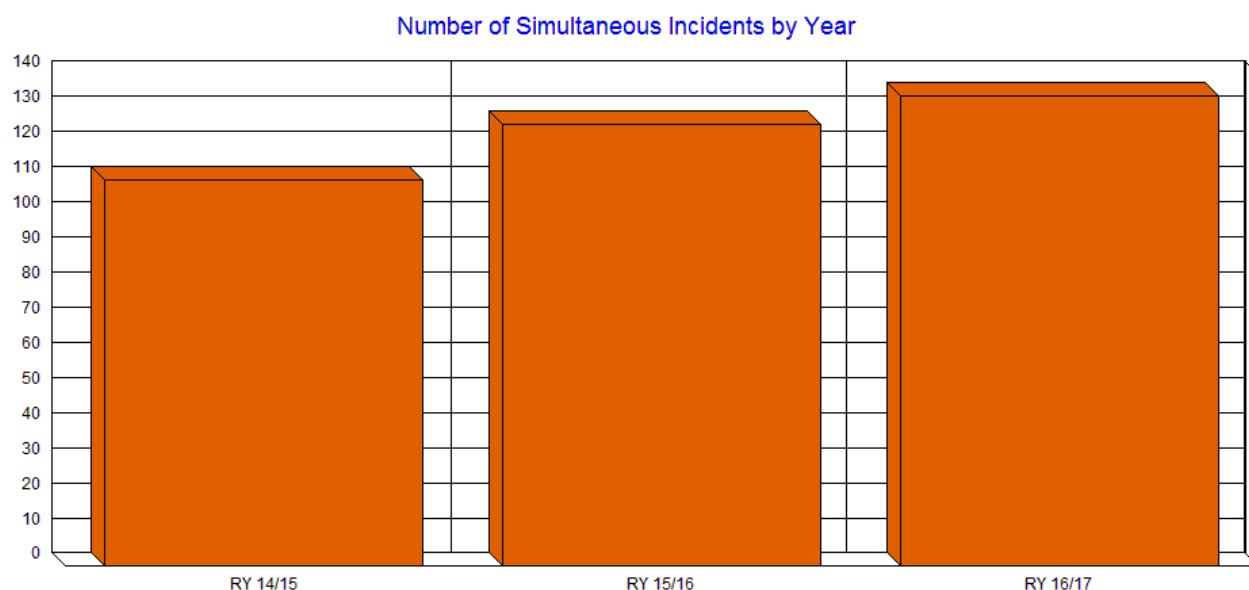
Simultaneous incidents occur when other incidents are underway at the time a new incident occurs. In Andover in RY 16/17, 8.26 percent of incidents occurred while one or more other incidents were underway. The following shows the percentage of simultaneous incidents broken-down by number of simultaneous incidents:

- ◆ 1 or more simultaneous incidents 8.26 percent
- ◆ 2 or more simultaneous incidents 0.49 percent



The following graph shows that the number of simultaneous incidents continues to increase every year of the study period. While two incidents at once is always a concern in a small Department, the current rate of 8 percent is not immediately worrisome given the Department has two response teams, the engine and squad, if both are not assigned to the first incident.

**Figure 20—Number of Simultaneous Incidents by Year**



#### 5.2.4 Unit-Hour Utilization

The utilization percentage for apparatus is calculated by two primary factors: the number of responses and the duration of responses. The following chart is a unit-hour utilization (UHU) summary for the City's units. At the following percent of incident time per hour, the units have the ability to absorb a much higher workload, if the incidents occur one at a time and not in pairs or triplets.

In the following table, the busiest engine is listed first.

Report based on 450 apparatus response records from 7/1/2016 to 6/30/2017. *Note: Engine 16 was only put in service in May 2017. While it is starting to relieve pressure from Engine 1, Engine 16 took over responding to incidents that Engine 1 would have responded to, so one way to view this table of demand by hour is to combine the Engine 16 and Engine 1 counts.*



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**Table 13—Engine Unit-Hour Utilization in RY 16/17<sup>9</sup>**

Hour	E1	E16
00	1.79%	0.00%
01	0.23%	0.00%
02	0.61%	0.00%
03	0.19%	0.48%
04	0.29%	0.00%
05	1.62%	0.00%
06	0.42%	0.00%
07	1.20%	0.29%
08	0.90%	0.65%
09	1.24%	0.11%
10	4.15%	0.28%
11	3.01%	0.53%
12	1.80%	0.38%
13	3.83%	0.65%
14	1.77%	0.63%
15	3.79%	0.33%
16	2.14%	0.64%
17	2.05%	0.16%
18	2.18%	0.18%
19	1.69%	0.25%
20	1.59%	0.18%
21	1.19%	0.71%
22	1.64%	0.04%
23	1.64%	0.00%
Overall	1.71%	0.27%
Runs	382	68

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<sup>9</sup> Engine 16 began responding in May 2017. Prior to that, Engine 1 responded to all calls.

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The following table illustrates the unit-hour utilization for the truck companies' responses into the City in RY 16/17.

*Report based on 183 apparatus response records from 7/1/2016 to 6/22/2017.*

**Table 14—Unit-Hour Utilization – Ladder and Water Tender Companies**

Hour	L15	T11
00	0.44%	0.04%
01	0.06%	0.00%
02	5.12%	0.00%
03	0.00%	0.16%
04	0.18%	0.10%
05	0.81%	0.29%
06	0.28%	0.00%
07	0.46%	0.05%
08	0.86%	0.06%
09	0.62%	4.78%
10	2.08%	1.03%
11	1.41%	0.96%
12	0.98%	0.89%
13	0.67%	0.67%
14	0.49%	0.30%
15	1.53%	1.33%
16	0.47%	0.85%
17	0.44%	0.15%
18	0.49%	1.27%
19	0.34%	0.14%
20	0.21%	0.00%
21	0.30%	0.13%
22	0.18%	0.00%
23	0.39%	0.00%
Overall	0.78%	0.55%
Runs	138	45

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Comprehensive Analysis of Fire Services

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The following table illustrates the unit-hour utilization for the squad company's responses into the City in RY 16/17.

*Report based on 1,172 apparatus response records from 7/1/2016 to 6/30/2017.*

**Table 15—Unit-Hour Utilization – Squad Company**

Hour	R35
00	2.73%
01	3.95%
02	2.56%
03	2.48%
04	2.11%
05	3.55%
06	2.13%
07	4.95%
08	5.20%
09	6.07%
10	8.37%
11	6.39%
12	7.58%
13	6.81%
14	6.24%
15	5.68%
16	8.03%
17	5.83%
18	6.80%
19	6.23%
20	5.96%
21	4.04%
22	4.89%
23	4.15%
Overall	5.11%
Runs	1,172

What should be the maximum utilization percentage on a firefighting unit? During the nine-hour daytime work period, when crews on a 24-hour shift need to also pay attention to apparatus checkout, station duties, training, public education, and paperwork, plus required physical training and meal breaks, Citygate believes the maximum commitment UHU per hour should not exceed 30 percent. Beyond that, the most important element to suffer will be training hours.

For a dedicated unit, such as an ambulance or low-acuity squad working less than a 24-hour shift, UHU can rise to 40–50 percent at a maximum. At that UHU level, peak-hour squad crews must then have additional duty days for training only and not for responding to incidents to meet their annual continuing education and training hours requirements.

### **5.2.5 Automatic and Mutual Aid**

The following table shows aid activity for the three reporting years. These numbers report data collected in the Aid section of NFIRS 5 data, which is completed by Andover staff. These counts do not always reflect if a mutual aid unit came into Andover and handled an incident without an Andover unit. Federal NFIRS only requires one incident record from the first arriving unit.

The following is a breakdown by aid type by year. There are 4,630 incident records being analyzed.

**Table 16—Mutual and Automatic Aid Given and Received**

<b>Aid Type</b>	<b>RY 14/15</b>	<b>RY 15/16</b>	<b>RY 16/17</b>	<b>Total</b>
1 Received	6	2	6	14
2 Automatic Aid Received	13	11	10	34
3 Given	32	28	29	89
4 Automatic Aid Given	30	36	34	100
5 Other Aid Given		3		3
N None	1,364	1,483	1,543	4,390
<b>Total</b>	<b>1,445</b>	<b>1,563</b>	<b>1,622</b>	<b>4,630</b>

Table 16 indicates a Department with low mutual aid activity overall.

A review of the response data for the study period, specifically a review of the responses outside the City and Fire District boundary, indicates a very low number of annual mutual aid responses. Annually the average number of responses outside of the City and Fire District limits is five per month. Many of these responses are created when the primary volunteer fire department does not indicate they are responding and Butler County Communications dispatches Andover to respond.

## 5.2.6 Incident Response by City

**Table 17—Incident Response by City**

City	RY 14/15	RY 15/16	RY 16/17	Total
Andover	1,336	1,458	1,534	4,328
Augusta	50	38	27	115
Benton	29	25	31	85
Rose Hill	12	16	18	46
Towanda	6	7	5	18
Wichita	3	3		6
Benton (Township of)	2	1	2	5

A third way to look at workload locations is to measure responses inside the City of Andover, the Fire District, and then elsewhere in the County.

**Table 18—Incident Jurisdiction and Committed Minutes – 2007–2017**

Area	Calls	Average Minutes Committed (hh:mm:ss)	Total Minutes Committed (hh:mm:ss)	Percent
In District	785	33:27	437:38:15	13.3%
Mutual Aid	355	57:19	339:08:36	10.3%
In City	6,168	24:27	2513:27:36	76.4%
Total	7,308	1:55:13	3290:14:27	100.0%

As can be seen, the majority of the incidents are inside the current Andover City limits and the Fire District. The Fire District and farther-away mutual aid account for 23.6 percent of the incidents. All of the three previous tables indicate a very low number of responses to the adjacent cities annually, as Table 18 represents *a 10-year period*. If these quantities are annualized, incidents occurring outside of the City limits average 140 per year or approximately a .38 per day. The City averages 616 per year or approximately 1.7 incidents per day.

The Department should continue to measure and track the commitment time expense annually to District emergencies, including the appropriate Department/City overhead, to ensure the Fire District pays an appropriate ratio of Andover Fire Department's total costs.

### 5.3 RESPONSE TIME ANALYSIS

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Once the types of incidents are quantified, incident analysis shifts to the time required to respond to those incidents. Fractile breakdowns track the percentage (and count the number) of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments.

#### 5.3.1 Fractile Dispatch Center Processing Time Reporting

As percent of goal measurements to 90 percent in fire and emergency medical services has taken hold in published best practices over the last 15 years, the actual methods on how to conduct the measures have been left to the dispatch centers and their clients. Given lack of consensus direction, Citygate long ago adopted the policy that normal statistical rules testing should *always* be applied as the most accurate and defensible when dealing with a public interest.

We therefore strive to identify a statistically significant sample size that is the largest, most appropriate quantity available. For *emergency* incident dispatch processing, Citygate takes at least one year of data and then from the fire service NFIRS reporting system takes all records that were identified as fire and EMS incidents. Citygate does *not* use special services, public assist, other, hazardous materials spills, gas leaks, etc.

Citygate then measures the beginning of the call processing sequence from the first available CAD time stamp. This first time is typically not 9-1-1 off hook, but ideally, where possible, it is. The outer measure of dispatch processing is the time stamp for crew notification. Citygate understands e-system time lag and, where needed, can take CAD times or phone logger times or radio system times. Even then a few seconds can be lost as systems communicate with each other, such as fire crew alerting systems. So, the time the call is first received to the *beginning* time of crew notification represent the performance time of the personnel in the communications center to dispatch a unit. As such, Citygate takes all emergent time stamps for overall performance. Second, in most smaller fire departments, there are not enough structure fires in a year to obtain a large enough sample size to measure.

As for EMS, in the dispatch centers that use Medical Priority Dispatch Sorting (MPDS), incident types are prioritized from Alpha, the least severe incidents, to Echo, the most acute. Citygate has statistically evaluated in large EMS systems how many Alpha through Echo incidents *as dispatched* actually end up receiving an ambulance on scene, or even a transport. Further still, a very small subset of all incidents actually need advanced paramedic procedures. In doing this work, it is very apparent that a significant percentage of Alpha and Bravo incidents receive acute care transports. On the other end the scale, many Charlie and Delta incidents end up as a no transport or as an EMT, non-paramedic transport. Some of the Echo incidents even end up as low acuity calls.

Therefore, Citygate believes that all EMS calls should be reviewed in the aggregate for call processing times. Where there is a statistically significant sample size, of course, sub-category measures can be applied on Charlie through Echo incidents, or Echo only. Many EMS incidents and building fire reports can turn life threatening post-dispatch. As almost all EMS incidents are Alpha through Delta categories, dispatch processing and crew alerting should be built to efficiently handle these types of incidents.

### **5.3.2 Response Time Performance**

A resident or visitor of the City measures the speed of Fire Department response from the time assistance is requested until the assistance arrives. This measurement is called “call to first apparatus arrival,” or call to arrival. Police and sheriff’s departments, under state law, act as a Public Safety Answering Point (PSAP) for 9-1-1 calls. All 9-1-1 calls for fire service in the City are received by Andover Police, after which calls for ambulance and fire mutual responses are transferred to the County’s dispatch center.

Based on national recommendations, Citygate’s response time test goal for city urban/suburban areas is for the call to arrival to be 7:30 minutes 90 percent of the time. This is comprised of three component parts:

<b>Call Processing Time:</b>	1:30 minutes (receive, determine need, alert crew)
<b>Turnout Time:</b>	2 minutes (notify, don required protective gear, get moving)
<b>Travel Time:</b>	4 minutes (travel time)

Best practice travel time recommendations for rural areas range from 8 to 12 minutes, depending on population density. The following table is the breakdown of fire dispatch call received to first apparatus arrival for the overall City and District by year *for fire and emergency medical incidents*.

**Table 20—Call to Arrival Analysis – 90% Performance**

Area	RY 14/15	RY 15/16	RY 16/17
City	06:49	07:17	07:26
Fire District	10:39	10:47	12:20



The following table shows the most recent ambulance response time measures from Butler County Communications:

**Table 19—Ambulance Response Time Analysis – 90% Performance**

Response Component	November 2016–October 2017
Crew Notify to On-Scene	13:39

For ambulance units, 50 percent of the incidents are reached by 5:17 minutes and 80 percent are reached by 10:00 minutes.

The next set of tables will present the individual segments of total response time—call processing time in dispatch, fire crew turnout time, and travel time—to understand which measure(s) are responsible for the total time being longer than 7:30 minutes.

**Finding #8:** The City’s call to arrival times are close to best practices for urban areas. The District’s are closer to rural area best practices.

### 5.3.3 Call Processing Time

Call processing time measures the time it takes to answer the 9-1-1 call at the Andover Police Communications Center to when the notification is sent to the Fire Department. NFPA 1710’s advice is for 90 percent of the calls to be transferred by Andover to the County within 15 seconds and then dispatched by Butler County within 90 seconds at 90 percent. Where language barriers exist, or medical self-help instructions are needed, these calls should be dispatched within 120 seconds. Communications Center performance is shown in Table 20.

**Table 20—Call Processing Analysis – 90% Performance**

Area	RY 14/15	RY 15/16	RY 16/17
City	02:11	01:51	02:22
Fire District	02:50	02:12	01:33
Butler County Communications <sup>1</sup>	02:50	02:12	01:23 to Critical 03:24 to all others

<sup>1</sup> Butler County Communications has its own dispatch and communications center. These times reflect its performance.

### 5.3.4 Turnout Time

Turnout time measures the time it takes for all crews to hear the dispatch message, don safety clothing, and begin moving the assigned apparatus.

**Table 21—Turnout Time Analysis – 90% Performance**

Area	RY 14/15	RY 15/16	RY 16/17
City	02:31	02:33	02:46
Fire District	01:59	02:35	02:29

While the NFPA and CFAI recommend 60–80 seconds for turnout time, it has long been recognized as a standard rarely met in practical experience. Crews must not just hear the dispatch message, they must also don the personal protective clothing mandated by the Occupational Safety and Health Administration (OSHA) for the type of emergency. Citygate has long recommended that, due to this and the floor plan design of some stations, agencies can reasonably make a 2:00-minute crew turnout time to 90 percent of emergency incidents.

### 5.3.5 Travel Time

The following table shows travel time measures to all emergency incidents. Travel time is defined as the time element between when the Communications Center is notified, either verbally or electronically, that the unit is en route to the call and when it arrives at the address or location street front (not the patient’s side).

**Table 22—Travel Time Analysis – 90% Performance**

Area	RY 14/15	RY 15/16	RY 16/17
City	04:56	05:25	05:06
Fire District	10:11	09:33	09:43

NFPA Standard 1710 recommends a 4:00-minute travel time goal in urban and suburban areas. In rural areas, travel times are recommended to be 8:00–12:00 minutes. As seen in Table 22, both travel times are slightly higher than these goals. There are several reasons for slower travel time, not all of which can be cost-effectively improved. A single staffed fire station, traffic congestion variation, non-grid road network areas, open spaces, and limited cross access boulevards all affect travel time.

- Finding #9:** Neither the City nor County's Communications Center's performance for call processing is close to best practices, and the time lost in dispatch processing cannot be made up by driving faster.
- Finding #10:** The crew turnout times are higher than the best practice recommendation of 2:00 minutes.
- Finding #11:** The travel times within the City limits and District are slightly above best practices, but not yet so bad as to require an immediate fix. Stations and staffing can be added over time as the community evolves.

### **5.3.6 First Alarm (Effective Response Force) Performance to Building Fires**

The City responds to building fires with an Effective Response Force of one ladder truck, three engines (two of which are via mutual aid), and two Chiefs (one Chief is via mutual aid).

This response force is needed to provide enough units when fires are very serious at the time of the 9-1-1 call. However, in a given year, there are few building fires in each station area where the entire force, including mutual aid units, is needed at the incident location. Therefore, the multiple-unit response time sample size is very small.

The best representation for the First Alarm or Effective Response Force units is **travel** time across the City's street network. The NFPA 1710 recommendation is for all units to arrive within 8:00 minutes travel time. During the study period of 2013–2015, there were only two incidents that met the criterion of three engines, one ladder, and at least one Chief Officer. The Department also does not have enough and complete data on the travel times for mutual aid engines. A quantity of two in a year is too volatile to make a conclusion on performance. Other than for incidents requiring more than the staffed engine and squad, the City is totally dependent on mutual aid and/or volunteers.

## SECTION 6—SOC EVALUATION AND DEPLOYMENT RECOMMENDATIONS

### 6.1 OVERALL EVALUATION

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#### **SOC ELEMENT 8 OF 8** **OVERALL EVALUATION**

The Fire Department serves a diverse and—in the Fire District—spaced-out population pattern that, in some locations, is geographically challenged with open spaces and limited cross access boulevards, all of which limit quick response times. Population drives service demand, and development brings population. The City has historically funded the best fire services it can afford and, even post-recession, continues to do so. The incident volumes in the City and District are modest, and reflective of the smaller population at present.

For the foreseeable future, the City and District will need both a first-due firefighting unit and Effective Response Force (First Alarm) coverage in all parts of the service area, consistent with best practices, if the risk of fire is to be limited to only part of the inside of an affected building, or life-threatening EMS incidents are to be dealt with in time for a better probability of survival.

While the volume of and response times to EMS incidents consume much of the Department's attention, all communities need a “stand-by and readily available” firefighting force to deploy when fires break out. If the City wants to continue providing the elements below, and be *less dependent* on mutual aid, the City can slightly increase its deployment plan by first keeping the fifth position per day when the Federal Staffing for Adequate Fire and Emergency Response (SAFER) Grant expires, and then as funds permit, fielding another firefighter per day for a total of six for the two Station 1 units.

Citygate suggests that the City set a goal to provide equitable response times over the long term to all similar risk *and population density* neighborhoods to provide for:

- ◆ Depth of response when multiple incidents occur.
- ◆ A concentration of response forces for high risk properties.

For its current risks and likely desired outcomes, the City does not have a sufficient quantity of fire engines spaced across the City's most populated areas. Given the low number of building fires annually, the City can continue to request mutual aid when needed.

While the City cross-staffs its aerial ladder truck and the squad with two firefighters, if the daily crew were increased to six at Station 1, then three crewmembers could be assigned to the engine and then three on the ladder truck/squad.

For firefighting, a six-firefighter response would meet the Occupational Safety and Health Administration (OSHA) safety requirements of 2-in/2-out.<sup>10</sup> Thus, instead of one 2- or 3-firefighter inside team, with six personnel there can be two 2-firefighter attack teams inside the building while two personnel—a firefighter securing outside utility connections or connecting a supply line to the fire hydrant and a pump operator—plus the Chief Officer, all remain outside and capable of rescue should the inside firefighters encounter trouble.

The first deployment step for the City Council in the near term is to adopt updated and complete performance measures from which to set forth service expectations and, on an annual budget basis, monitor and fund fire crew performance for both the City and Fire District. The adopted deployment goals should reflect both an urban/suburban measure for the most populated areas, and a separate measure for the more rural Fire District areas.

### **6.1.1 Deployment Recommendations**

Based on the technical analysis and findings contained in this Standards of Cover study, Citygate offers the following overall deployment recommendations:

**Recommendation #1: Adopt Deployment Measures Policies – CITY:** The City elected officials should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the City. The measures of time should be designed to save patients where medically possible and to keep small but serious fires from becoming greater alarm fires. With this in mind, Citygate recommends the following measures:

- 1.1 Distribution of Fire Stations:** To treat medical patients and control small fires, the first-due unit should arrive within 7:30 minutes, 90 percent of the time from the receipt of the call in the Communications Center. This equates to a 90-second dispatch time, a 2:00-minute company turnout time, and a 4:00-minute drive time in the most populated areas.

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<sup>10</sup> This policy requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

- 1.2** Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to stop outdoor fires from spreading beyond three acres when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of a *minimum* of one ladder truck, three engines (two engines via mutual aid), and two Chief Officers totaling 13 personnel (based on unit staffing) should arrive within 11:30 minutes from the time of 9-1-1 call receipt in fire dispatch, 90 percent of the time in City areas. This equates to a 90-second dispatch time, 2:00-minute company turnout time, and 8:00-minute drive time spacing for multiple units in the most populated areas.
- 1.3** Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the City response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. It can achieve this with a travel time for the first company capable of investigating a HazMat release at the operations level within 6:00 minutes or less, 90 percent of the time. After assessment and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multiple-agency hazardous materials response partnership.
- 1.4** Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first arriving company for assessment of the rescue within 8:00 minutes or less, 90 percent of the time. Assemble additional resources capable of initiating a technical rescue within a total response time of 11:30 minutes, 90 percent of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.



**Recommendation #2: Adopt Deployment Measures Policies – DISTRICT:**

The goal for first unit response in lightly populated areas will be 8 minutes travel for the first-due unit and three units within 16 minutes travel time. All other EMS, firefighting, and specialty response abilities will be provided to the District areas, at a best available response time, from one of three fire stations closer to buildout of the City's current envisioned planning area.

**Recommendation #3:** When the Federal Staffing for Adequate Fire and Emergency Response (SAFER) Grant funds expire, the City should continue to provide a minimum of five firefighters per day.

**Recommendation #4:** When funding is available, in the mid-term, add a third person to the City's daily staffing to ensure three firefighters on the ladder truck/squad.

**Recommendation #5:** In all staffing models, continue to provide firefighter / Advanced Emergency Medical Technicians on a squad to ensure response times faster than the County-wide ambulance service currently provides.

**Recommendation #6:** While the City could study further remodeling of Fire Station 1, Citygate recommends the City pursue a three-fire-station model for future City growth, as mapped in this study. When the funds are available for two sets of three-firefighter crews per day, both new City-located fire stations should be opened.

**Recommendation #7:** The City should continue to co-locate the County ambulance and, as a full fire station in the District can be developed, ask the County to consider adding another ambulance in the Andover area at the District station and consider sharing the staffing expense to deliver two cross-trained firefighter / Advanced Emergency Medical Technicians to enhance not just ambulance services, but additionally fire suppression staffing. The two agencies could then cost-share this added service to the region.

**Recommendation #8:** When the Department reaches three fire stations and/or the after-hours incident demand for Chief Officer coverage becomes unreasonable for two 40-hour staff Chiefs to cover, then the City should add three Battalion Chiefs, one per 24-hour shift for prompt incident command coverage.

**Recommendation #9:** While recruiting and training volunteers is not easy and has an associated expense, the Department should continue this effort as a bridging solution until the area grows and can provide a slightly larger number of career firefighters per day.

**Recommendation #10:** The Department should work on lowering turnout times to under 2:00 minutes and implementing processes to closely track the use and response time of volunteers and mutual aid units.

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## SECTION 7—HEADQUARTERS AND SUPPORT FUNCTIONS STAFFING ADEQUACY REVIEW

### 7.1 INTRODUCTION

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As part of our deployment assessment Citygate conducted a review of key Fire Department headquarters programs and staffing necessary to support the field crew deployment in the fire station, and other services such as fire prevention. It is considered a good practice to corroborate that the headquarters and support functions are in alignment with the response operations. This ensures that not only are responses timely, but that the personnel are well trained, properly supported, and that fire prevention activities are being performed to reduce calls for service.

### 7.2 COMMUNITY MEETING

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During the on-site visit to the City, Citygate conducted a community meeting to help understand the resident's impressions of their Fire Department and any perceived needs. Approximately 20 people attended the meeting, along with six City staff. Respondents were engaged and interested in fire service delivery outcomes, and very supportive of their Department. Citygate asked specific initial questions related to the following topics: experiences with using the fire or EMS services, community expectations of the Department, any interactions with the Department or its employees, and lastly, overall impressions.

The group overwhelmingly applauded the emergency response component of the Department. They all agreed that:

- ◆ Emergency responses were quick.
- ◆ Personnel were well trained, compassionate, and caring.
- ◆ They solved the problem they were called to solve!

The group also shared their thoughts on what was going well:

- ◆ The Department participates in many community events.
- ◆ Fire station tours and birthday parties are appreciated and informative.

The group also shared ideas for increased customer service. These ideas included:

- ◆ More community outreach on smoke detectors, carbon monoxide detectors, and proper installation and locations.
- ◆ More community fire prevention and life safety outreach, especially to the aging population, including fall prevention, cooking, and overall safety.

- ◆ More focus on escape planning and again, the aging population.
- ◆ The Senior Center members would like to have more interaction with the Fire Chief, as they currently do with the Police Chief, including the “Donut with the Chief Day” gatherings weekly.
- ◆ More shared information, as available, on local facilities and locations with hazardous chemicals and materials.
- ◆ Evacuation planning and drills for the community’s citizens and businesses for natural and man-made disasters.
- ◆ Possible development of a Community Emergency Response Team (CERT) to help the City during a disaster.

**Finding #12:** The community is very appreciative of its Fire Department and service delivery.

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### **7.3    MANAGEMENT ORGANIZATION**

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National Fire Protection Agency (NFPA) 1201<sup>11</sup> states in part, “the [department] shall have a leader and organizational structure that facilitates efficient and effective management of its resources to carry out its mandate as required [in its mission statement].”

A fire department needs a management organization that is properly sized, adequately trained, and appropriately supported. There are increasing regulations to comply with in operating fire services, and the proper hiring, training, and supervision of response employees requires an equally serious commitment to leadership and general management functions.

The Fire Department’s management organization consists of 1 Fire Chief, 1 Assistant Chief (part-time), 1 Deputy Chief, 1 Training Specialist (newly budgeted), and 1 Administrative Assistant as shown in Figure 21, totaling 5 total administration personnel.

In addition, the Department is provided other services by the City Communications Division assigned in the Andover Police Department, the Butler County EMS Division for Advanced Life Support (ALS) for ambulance transport, and the Butler County Communication’s Center for fire mutual aid and EMS dispatch.

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<sup>11</sup> NFPA 1201 – Standard for Providing Emergency Services to the Public (2015 Edition)

**Figure 21—City Management Organization**

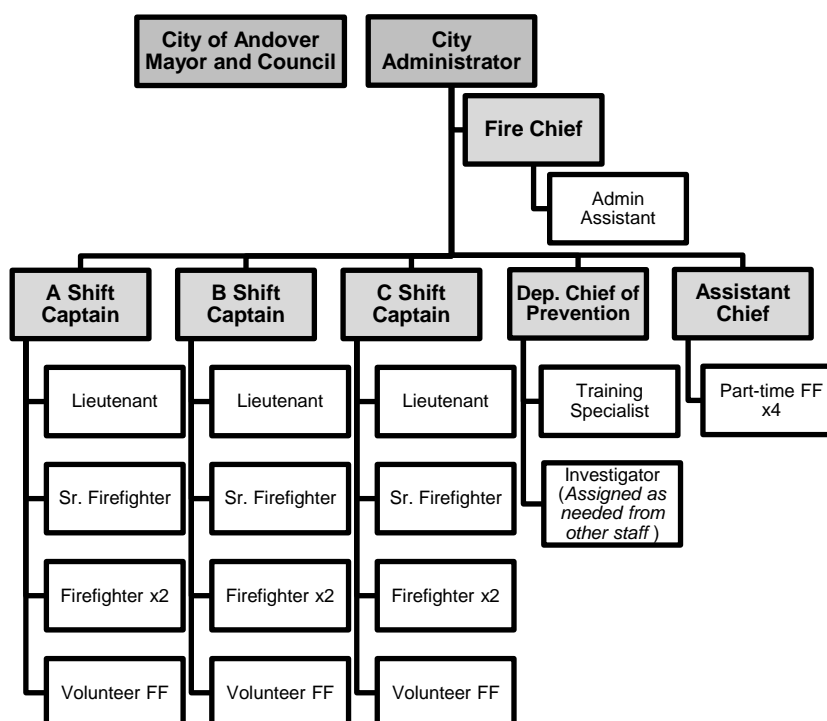


Figure 21 depicts the minimal management structure appropriate to meet the operational and support needs of the City, including an effective chain of command and manageable span of control.

While the organization is currently able to meet mandated responsibilities, it lacks sufficient capacity and depth to conduct organizational performance benchmarking / ongoing evaluation, long-term strategic planning, risk analysis, and more effective community engagement. Many daily and periodic support service needs are handled by the on-duty personnel as “program specialists” under the overall guidance of one of the three Captains.

#### **7.4 COMMUNICATIONS AND DISPATCH**

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The Andover Police Department is the Public Safety Answering Point (PSAP) and primary dispatch center for both the City and Fire District. Staffing in the dispatch center, depending on time of day, ranges from 1 to 2 people per 8-hour shift and typically only one person between 8:00 pm and 6:00 am.

The Police Department dispatch center’s primary function is to answer 9-1-1 emergency calls, dispatch the initial appropriate police and/or fire units to the emergency call, and transfer all



structure fires and EMS calls for service to Butler County Communications for mutual aid fire units and ambulance/medic unit response.

The Andover Police dispatch center, in addition to emergency-related duties, also answers the City Police non-emergency number and performs additional collateral responsibilities including: monitoring prisoners in the holding cell via video camera, answering City Hall after hours telephone lines, answering and responding to public inquiries at the walk-up window and on the non-emergency telephone line, and filing and producing public police record requests.

County Communications is the primary communications center for all mutual aid structure fire dispatches along with the ambulance responses for the City and Fire District. County Communications is an accredited center<sup>12</sup> for EMS dispatching, using a tiered system of questions to ascertain the seriousness of a medical emergency to send the right types of units in the correct time frame. County Communications also gives pre-arrival EMS instructions to the caller if needed to help mitigate the situation.

County Communications, after determining the location and severity of the fire or EMS call, will dispatch the appropriate units for response, including mutual aid and the City Fire Department. The response includes Andover units and requires other Butler and Sedgwick County fire departments to ensure an appropriate ERF is dispatched to serious fires.

**Finding #13:** The Police Department Communications Center is busy with numerous duties and responsibilities, aside from police and fire dispatch. For long periods at night, there is only one dispatcher on duty.

**Finding #14:** The timely transferring of ambulance requests to Butler County Communications as well as the immediate handling of mutual aid is a critical function. Citygate is concerned the police dispatch staffing will not be able to handle the transferring and the coordination of serious EMS and fire emergencies with County Communications when there are also other police units/activities to support.

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<sup>12</sup> Accredited through the International Academies of Emergency Dispatch.

**Finding #15:** County taxes already pay Butler County Communications to perform dispatching for the City at no additional cost. Given that fire and EMS events are part of a regional system, the City could move fire dispatching to the County to ease local dispatcher load and improve call handling time to that of just transferring callers to the County within 15 seconds, 90 percent of the time.

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## **7.5 FIRE PREVENTION AND PUBLIC EDUCATION (COMMUNITY RISK REDUCTION)**

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The Fire Prevention Division consists of the Deputy Chief (Fire Marshal) who is responsible for limited plan review, fire inspection oversight, fire investigations, and public education. Firefighters and other staff assist in the public education and building fire inspections.

### **7.5.1 Fire Prevention and Inspections**

The Department has a very robust fire inspection and pre-fire planning program. Each commercial occupancy has been inspected and reviewed in-depth for risk analysis and fire code compliance. The Department has a list of all commercial occupancies in the City, the frequency of inspections, and the risks associated with that facility.

Fire suppression personnel are assigned the inspections for the buildings within the City. The inspection frequency is determined by the Fire Marshal.

Plan review for code compliance is primarily performed by the City's Building and Safety Department.

**Finding #16:** The Department has an excellent fire prevention records database and fire inspection program to ensure fire safety in the community. It is one of the most robust in a city the size of Andover that Citygate has reviewed. However, this service places a significant demand on the single Fire Marshal and single engine fire crew. Eventually, as Andover grows, it will need to add a Fire Inspector / Public Educator position.

### **7.5.2 Public Education**

To keep the community and citizens safe, a fire department must provide adequate and specific public education to its constituents. The Department delivers public education to the community through many avenues, including daily interactions with the firefighters on incident scenes and when they are out in the community, community activities at the Senior Center, school activities,

annual events and parades for the City, and general everyday activities and interactions with the citizens both on and off duty.

## **7.6 FIRE TRAINING AND FIREFIGHTER SAFETY**

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### **7.6.1 Fire Department Training**

The Training Division is responsible for all Department training and is staffed by a recently promoted Fire Captain. The Department relies heavily on the on-shift Fire Captains to conduct necessary training of its personnel and to ensure compliance.

#### ***Training Program Review***

The Department's Fire Training Program is in its infancy. Prior to this year, there was no formal position with full responsibility for developing or implementing the fire training program.

The recently formed Training Program, headed by a newly promoted Captain, is responsible for all departmental education and training. Training records for all employees is tracked in the Department's RMS. While there is no formalized firefighter training program for the Department, training of firefighters is being accomplished.

Annual training data for 2016 for full-time, part-time, and volunteer personnel was reviewed. Annual training hours for volunteers ranged from 6–248 hours per volunteer. Annual training hours for part-time employees ranged from 20–38 hours per employee and for full-time employees ranged from 115–522 hours.

A more detailed review in the Department's record system for full-time employees determined there were specific generally defined classes they attended with many hours. For example, Emergency Medical Technician (EMT) hours, and a generic term of firefighter training. Training hours were not broken down into more specific classes. Doing so would meet best practices and assist in the investigation of any accidents reviewed by outside authorities.

Volunteers, before they are able to ride on an engine and respond to calls, must complete the "Volunteer Task Book" and initial training requirements. This has proven to be a great success, as the members are well trained and able to perform required tasks as soon as taking a position on the engine.

The Department, as it moves forward in implementing the formalized training program for firefighters, will have a perfect opportunity to identify and implement Department-specific training and processes.

**Finding #17:** The Department has not adopted an itemized, annual formal training plan for its firefighters. Doing so is a best practice.

**Finding #18:** The Department has identified required training and hours for all volunteers to achieve, prior to responding to any type of incident.

**Finding #19:** Data input to the Department's training records management system for employee hours is not detailed to the specific class or training activity, leading to more generic training hours records than specifics.

Each of the following NFPA standards is typically recommended to be included when establishing a firefighter training program.

- ◆ NFPA 1001 *Standard for Fire Fighter Professional Qualifications* – This standard establishes the basic qualifications for Firefighter I and II.
- ◆ NFPA 1002 *Standard for Fire Apparatus Driver/Operator Professional Qualifications* – This standard sets forth the performance objectives for driver/operators of all types of fire apparatus and emergency vehicles.
- ◆ NFPA 1006 *Standard for Technical Rescue Personnel Professional Qualifications* – This standard delineates the performance objectives for firefighters who perform technical rescue.
- ◆ NFPA 1021 *Standard for Fire Officer Professional Qualifications* – This standard covers the four levels of fire officer progression: Fire Officer I, II, III, and IV.
- ◆ NFPA 1031 *Standard for Professional Qualifications for Fire Inspector and Plan Examiner* – This standard describes the professional performances of the fire inspector and plan examiner.
- ◆ NFPA 1041 *Standard for Fire Service Instructor Professional Qualifications* – This standard guides the development of the fire service training instructor through the three levels of advancement: Instructor I, II, and III.
- ◆ NFPA 1401 *Recommended Practice for Fire Service Training Reports and Records* – This standard includes all aspects of training documentation, such as training schedules, reports, records, legal characteristics of training records, record management systems (RMS), and means to evaluate the RMS.
- ◆ NFPA 1403 *Standard on Live Fire Training Evolutions* – This standard outlines the procedures required for safe live fire training.

- ◆ NFPA 1404 *Standard for Fire Service Respiratory Protection Training* – This standard covers the proper use, inspection, maintenance, and program administration of self-contained breathing apparatuses (SCBAs).
- ◆ NFPA 1451 *Standard for a Fire and Emergency Service Vehicle Operations Training Program* – This standard covers the minimum requirements of a vehicle operations training program.

### **7.6.2 Firefighter Safety**

Firefighter safety is a paramount concern for the City and Department. The Department has an active safety program both on scene and in the normal activities in the Department. The City has a risk management program which includes the Fire Department.

Firefighters recently started having annual medical physicals to determine their health and ability to perform firefighting tasks. The physicals are based on NFPA standards and all employees will participate.

Firefighter safety also extends to the incident scene, the most vulnerable place for an injury or accident of firefighters. The City has gone to great lengths to ensure firefighter safety for its members. It has implemented a physical fitness program and a medical evaluation process for its members based on the age of the firefighter.

The Department has taken the step to ensure each member has access to two sets of personal protective equipment (PPE, also known as turnouts). This ensures, after an exposure to fires or other toxic instances the firefighter can change into clean PPE and remain safe from contaminants for the remainder of the shift. The Department has the proper extraction type washers and forced air dryers to ensure proper cleaning of all PPE after an incident.

**Finding #20:** All Department members have access to a spare set of personal protective equipment in case theirs becomes contaminated after a fire.

**Finding #21:** The Department has a comprehensive annual medical evaluation for all employees.

## **7.7 EMERGENCY MEDICAL SERVICES**

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The City operates an EMS first responder program in the Fire Department. Service delivery is available from the squad with two personnel with Advanced Emergency Medical Technician (AEMT) level or the engine company with three personnel with Basic Life Support / EMT skill level. Butler County EMS is the primary provider for *paramedic* care level ambulance service in

Butler County and provides all ambulance transport and all interfacility transfers in the County and City.

Butler County EMS has an ambulance housed in the Andover fire station in separate quarters. The joint location has proven to be a plus considering the ambulance, if in the station, is pre-alerted for responses when police dispatch notify the fire crew.

While the goal is always to deliver the best patient care, in many instances it is not up to the City to determine the method for providing care. Unlike other aspects of firefighting, EMS care is heavily regulated and burdened with mandated oversight requirements. These requirements, while medically necessary, add to the City's overhead cost to provide EMS. The City has no choice but to follow laws and regulations related to training, clinical oversight, data for tracking trends in care and paramedic skills, shelf-life of medical supplies, biomedical equipment certification, controlled drug tracking, etc.

The concept of providing focus and emphasis on Continuous Quality Improvement (CQI) in patient care delivery became a top priority in EMS in the early 1990s. EMS providers and EMS oversight agencies across the United States developed systems that guaranteed objective feedback about performance both internally (to support CQI efforts) and externally (to demonstrate accountability to partners and oversight agencies).

An effective CQI program must be consistent and systematic, based on evidence, and free of any perceived or real punitive involvement. It will include a fact-based decision-making process that involves industry-accepted performance measures and comparison of treatment to standard protocols for patient conditions. It will foster learning and knowledge sharing, and will motivate care providers to be the best possible clinicians with every patient contact.

Clinical training, oversight, and command staff in the EMS program supports the field personnel. In turn, these technical positions must have office support professionals to *support them*. Functions such as recordkeeping, notifications, filing, internal communications, budgeting, purchase requests, telephone inquiries, scheduling, and a multitude of other assignments must be provided by the EMS oversight team.

Citygate reviewed EMS response data for 2014, 2015, and 2016 to determine the actual workload for the Department. The response review determined that specific zones in the City core (Andover Road and Central Avenue cross-streets) were extremely busy. Geographical Information Systems mapping revealed the activities were much greater than other City zones. A more in-depth review by Citygate determined many of these calls were for lower clinical acuity responses, primarily to nursing and elder care facilities. Most are not life-threatening responses even when they result in a transport.

These low acuity medical responses take away the limited resources and time available for training and more urgent emergencies to which the City's firefighter / Advanced Emergency



Medical Technicians respond. Citygate has observed in other communities that the clinical staffing at residential facilities seems to be less capable for even mild emergencies, and as such, overly depend on the 9-1-1 system.

**Finding #22:** EMS delivery in Andover is provided by two agencies. The City of Andover provides first responder Emergency Medical Technicians or Advanced Emergency Medical Technicians, and the County ambulance provides paramedic care transport.

**Finding #23:** Several care locations in the core of the City's response area have a very high number of responses for low acuity EMS 9-1-1 calls up to almost a third of all 9-1-1 EMS events in the City.

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## **7.8 FACILITIES**

### **7.8.1 Fire Station 1 Evaluation**

The City-owned Fire Station 1 was built and constructed in 1994, initially as a volunteer fire station. It has been remodeled a few times to account for the newly purchased ladder truck and additional staff personnel. As the 24-hour staffing component of the Department increased, several internal space utilization changes occurred, mostly in the fire crew quarters and locker room spaces.

The station has 5,600 square feet of apparatus storage space and 3,000 feet of combined office space and living quarters. Of that 3,000 square feet, approximately 1,200 is shared space with Butler County EMS. Butler County EMS is assigned one apparatus bay for the transport ambulance housed in Andover and can also use the multi-purpose training room that is available for community use.

The location of the station is near the geographic mid-point of the City, measured east to west, but 1½ miles north of the geographic center of the City. This location is also not the geographic midpoint of the 36-square mile service district. The station is positioned in northern half of the District while in the western fifth of the service area. The station is positioned on the west side of the major four-lane 40-mph rated roadway. This is the primary north-south thoroughfare through the community. At high traffic times, departing from and returning to the station can be a challenge especially when operating in a non-emergency status.

Most recently, screening walls were removed in the locker room to accommodate additional crew storage lockers and improve travel patterns inside that space. The building and systems are in generally good condition with routine maintenance issues associated with a flat roof. Floor coverings are beginning to show the age of the facility and some have been recoated with epoxy

floor treatments. In 2015, the station saw major structural changes to the apparatus bays to accommodate the newly ordered 107-foot Pierce aerial ladder. This converted approximately 30 feet of accessory use office space to apparatus storage space and removed 15 linear feet of load bearing block wall replacing it with steel beam and column.

This station has two accessory storage shed buildings of approximately 200 square feet each. The sheds house miscellaneous apparatus and building maintenance supplies, seasonal use equipment (large fans and hose test equipment, etc.), past paper records, and other miscellaneous items not able to be stored in the main building.

The station has seven fire apparatus bays and two EMS bays for apparatus storage. Those seven bays house eight apparatus, two Type 1, 1,000 GPM engines, two 4x4 brush trucks (Type 6), two 2,000-gallon water tenders, 1 light duty rescue, and 1 aerial ladder truck, all in non-drive-through configuration. Three staff vehicles are housed outside as covered storage space for those emergency vehicles is not available.

**Finding #24:** Fire Station 1 is extremely difficult to respond from, during peak travel hours, due to traffic congestion accessing the main arterial street.

**Finding #25:** Department administrative staffing has inadequate space to house and support all employees with offices, perform their duties and functions, and maintain and store supplies and records.

**Finding #26:** The current fire station has inadequate storage space for spare equipment and supplies.

**Finding #27:** The current fire station has inadequate bay space for all apparatus including staff vehicles which must park outside on the ramp.

**Finding #28:** The existing station does not have drive-through apparatus bays, making it safer for maneuvering the apparatus and entering and leaving the fire station.

**Finding #29:** The current single bunk room must serve both male and female firefighters. Additionally, there is a small side room where members sleep. Access to evacuate the spaces if an on-site fire occurred is extremely limited.

**Finding #30:** The City has, in its Capital Projects budget, identified replacement costs and funding sources for vehicles and remodels of fire stations.

### **7.8.2 Fire Station 2 Evaluation**

Fire Station 2 is located in the eastern portion of the City. It is more of a storage location for the convenience of the few volunteers than it is a fully capable fire station. The station accommodates one reserve engine and space for spare equipment. The location of the station is on private property owned by a member of the Department and the travel access for the District is restricted due to limited major cross streets. The street network in the area is limited to a small number of major streets able to access the District. The station also includes a meeting area for volunteers and City personnel to use for training and Department meetings. At the present time no volunteers or paid staff respond a unit from the station.

Using this station for daily responses would be difficult, due to limited parking for responding volunteers, no accommodations for 24-hour shifts, including sleeping, and poor infrastructure in the street network to allow for quick responses back to the City.

## **7.9 FIRE APPARATUS AND EQUIPMENT**

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Fire apparatus need to be properly maintained to ensure response readiness, safe arrival, effective operation, and return to readiness for the next assignment. Considering that a fire apparatus driver is entrusted to drive a vehicle weighing up to 17 tons or more at speeds up to 65 miles per hour, often against prevailing traffic at controlled intersections, officials should ensure that the maintenance, as well as the training program, meets all applicable legal and best practice standards.

The fire service generally groups fire apparatus into two categories: (1) engine companies, which are primarily responsible for pumping and delivering water and performing basic firefighting functions, including search and rescue; and (2) truck companies, which are primarily responsible for forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work. Other types of apparatus include water tenders, which are primarily responsible for carrying large quantities of water; squads or rescue companies, which carry a variety of rescue and emergency medical equipment; medic units or ambulances; command vehicles; and other auxiliary or specialized response apparatus. To be effective, fire apparatus must be properly designed and well equipped with the proper hose, appliances, tools, ladders, and other equipment necessary to perform the complex work of firefighting, rescue, emergency medical, and public service tasks.

Two basic NFPA standards apply to fire apparatus:

- ◆ NFPA 1901 *Standard for Automotive Fire Apparatus* – This standard defines the requirements for new fire apparatus designed to be used under emergency conditions to transport personnel and equipment and to support the suppression of fire and mitigation of other hazardous situations.
- ◆ NFPA 1906 *Standard for Wildland Fire Apparatus* – This standard defines the requirements for new fire apparatus designed primarily to support wildland fire suppression operations.

In addition to these standards having application for the development of purchase specifications, there are additional performance standards useful for evaluating in-service apparatus:

- ◆ NFPA 1911 *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus* – This standard defines the minimum requirements for establishing an inspection, maintenance, and testing program for in-service fire apparatus. This standard also includes guidelines for fire apparatus refurbishment and retirement; it identifies the systems and items on a fire apparatus that are to be inspected and maintained, the frequency of such inspections and maintenance, and the requirements and procedures for conducting performance tests on components; and it also provides sample forms for collecting inspection and test data.
- ◆ There should also be a system of testing, maintenance, and repair, which ensures a high state of readiness of apparatus and critical equipment. In 2000, the NFPA issued NFPA 1915 *Standard for Fire Apparatus Preventative Maintenance Program*, which defines the minimum requirements for a fire department preventative maintenance program. Under this standard, the personnel who conduct the preventative maintenance program should meet NFPA 1071 *Standard for Emergency Vehicle Technician Professional Qualifications*. This standard defines the minimum job requirements an emergency vehicle technician should possess. These include the ability to diagnose, maintain, repair, and test the functions of the apparatus.

The Federal Department of Transportation also has motor vehicle safety standards that are applicable to fire apparatus. The City's fire apparatus and vehicle fleet inventory is summarized in Table 23 below.

**Table 23—City Fire Apparatus and Vehicles**

Unit and Radio Number	Build Make	In-Service Year	Pump Capacity	NIMS Type	Status	Replacement Cost
E-1	Pierce	2007	1500	1	Reserve	\$1,394,375
E-10	Central States	1999	1500	1	Reserve	\$532,000
E-16	Pierce	2017	1500	1	Front-line	\$640,000
L-15	Pierce	2016	2000	1	Front-line	\$980,000
R35	Weis	2012	N/A		Front-line	\$203,000
B-11	Unruh	2002	100	6	Front-line	\$68,000
B-12	Unruh	2002	100	6	Front-line	\$77,600
T-11	Mayfield	2002	1000	3	Tender	\$329,000
T-12	Mayfield	2002	1000	3	Front-line Tender	\$339,500
C-1	Chevrolet	2016	N/A		Front-line	\$70,000
C-2	Chevrolet	2011	N/A		Front-line	\$68,000
C-4	Ford	2007	N/A		Training	\$74,375

**Finding #31:** The City's fleet is well cared for and in good condition. The primary frontline units are new.

**Finding #32:** The City operates the needed fire apparatus and support vehicles to respond to expected risks in the City.

### **7.10 HEADQUARTERS AND FACILITIES RECOMMENDATIONS**

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Based on Citygate's headquarters and support services review and findings, we offer the following recommendations:

**Recommendation #11:** Staff should review the service enhancement ideas and determine how to best implement them and request funding as needed during the normal annual budget review.

**Recommendation #12:** The City should explore and move fire dispatching to the County Communications Center to improve fire multiple-unit response as well as coordination with EMS when the locally stationed ambulance is not available. Doing so will also ease some of the after-hours burden on police dispatch and add redundancy and insurance that emergency fire dispatch requests will be promptly handled.

**Recommendation #13:** The Department should formalize and adopt a Training Program for all firefighters using National Fire Protection Association recommended best practices.

**Recommendation #14:** The Department should train all members on the proper training code and input that into the records management system.

**Recommendation #15:** The Department should ensure employees are entering specific training hours for very specific classes or activities to ensure a more complete training record.

**Recommendation #16:** Department officials should review the responses to assisted living and nursing home facilities with their administrators and County EMS leadership to determine if alternative responses and remedies are available, with the goal being to reduce low acuity responses by the Fire Department.

**Recommendation #17:** Fire Prevention and Public Education are also primary services and, as Andover grows and the workload exceeds that of the one Fire Marshal, a Fire Inspector / Public Educator should be added.

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## SECTION 8—NEXT STEPS

### 8.1 NEXT STEPS

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The purpose of this assessment is to compare the City's current performance against the local risks to be protected, as well as to compare against nationally recognized best practices. This analysis of performance forms the base from which to make recommendations for changes, if any, in fire station locations, equipment types, staffing, and headquarters programs.

As one step, the City Council should adopt updated and best-practices-based response time goals for the City and provide accountability for the City personnel to meet those standards. The goals identified in Recommendations #1 and #2 meet national best practices. Measurement and planning as the City continues to evolve will be necessary for the City to meet these goals. Citygate recommends that the City's next steps be to work through the issues identified in this study over the following time lines:

#### 8.1.1 Short-Term Steps

- ◆ Absorb the policy recommendations of this fire services study and adopt updated City performance measures to drive the deployment of firefighting and emergency medical resources.
- ◆ Identify funding and timing for increasing fire unit crew size per day to five when the SAFER Grant expires, and then to six per day.
- ◆ Fully consider and strive to move fire dispatch to the County.
- ◆ Adopt a three-fire-station model for closer to buildout of both the City and District and, in the near term, secure two new City fire station sites at or near the locations recommended in this study.

#### 8.1.2 Ongoing Steps

- ◆ Continue the volunteer program as long as cost-effective.
- ◆ Monitor data and response times for all units and personnel.
- ◆ Implement the staffing and station recommendations in this study as funding permits between now and the envisioned buildout of the City.
- ◆ Maintain a close cooperation with County EMS and work on shared facilities and staffing where feasible.

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## APPENDIX A—RISK ASSESSMENT DETAIL

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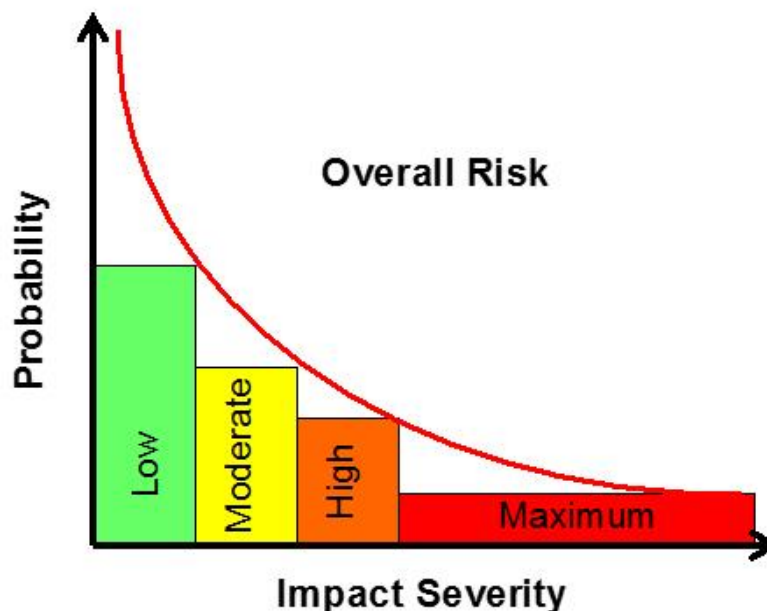
## A.1 RISK ASSESSMENT METHODOLOGY

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The methodology employed by Citygate to assess community risks as an integral element of a Standards of Cover (SOC) study incorporates the following elements:

- ◆ Identification of geographic planning sub-zones (risk zones) appropriate to the community or jurisdiction.
- ◆ Identification and quantification, to the extent data is available, of the specific values to be protected from the various hazards within the community or service area.
- ◆ Identification of the fire and non-fire hazards to be evaluated.
- ◆ Determination of the *probability of occurrence* for each hazard.
- ◆ Identification and evaluation of multiple relevant *impact severity factors* for each hazard by planning zone using agency/jurisdiction-specific data and information.
- ◆ Quantification of *overall risk* for each hazard based on probability of occurrence in combination with probable impact severity, as shown in Figure 22.

**Figure 22—Overall Risk Categories**



Source: Commission on Fire Accreditation International (CFAI): *Community Risk Assessment: Standards of Cover* (6<sup>th</sup> Edition)

To understand the hazards and values to be protected in the City, Citygate used multiple data sources as follows:

- ◆ U.S. Census Bureau population data and demographics
- ◆ Insurance Services Office (ISO) building fire flow and construction data
- ◆ Geographical information systems (GIS) data for the City
- ◆ City of Andover Comprehensive Plan and Zoning information
- ◆ Butler County Local Hazard Mitigation Plan
- ◆ Fire Department data and information
- ◆ Butler County Assessor's Office.

### **A.1.1 Planning Zones**

The Commission on Fire Accreditation International (CFAI) recommends that jurisdictions establish geographic planning zones to better understand risk at a sub-jurisdictional level. For example, portions of a jurisdiction may contain predominantly moderate-risk building occupancies, such as detached single-family residences, while other areas contain high- or maximum-risk occupancies, such as commercial and industrial buildings with a high hazard fire load. If risk were to be evaluated on a jurisdiction-wide basis, the predominant moderate risk could outweigh the high- or maximum-risk and may not be a significant factor in an overall assessment of risk. If, however, those high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then it becomes a more significant risk factor. Another consideration in establishing planning zones is that the jurisdiction's record management system must also track the specific zone for each incident to be able to appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized seven planning zones, incorporating each fire station's first-due response areas.

### **A.1.2 Building Fire Risk Categories**

The CFAI identifies four risk categories that relate to building occupancy as follows:

**Low Risk** – includes detached garages, storage sheds, outbuildings, and similar building occupancies that pose a relatively low risk of harm to humans or the community if damaged or destroyed by fire.

**Moderate Risk** – includes detached single-family or two-family dwellings; mobile homes; commercial and industrial buildings less than 10,000 square feet without a high-hazard fire load; aircraft; railroad facilities; and similar building occupancies where loss of life or property damage is limited to the single building.

**High Risk** – includes apartment/condominium buildings; commercial and industrial buildings more than 10,000 square feet without a high-hazard fire load; low-occupant load buildings with high fuel loading or hazardous materials; and similar occupancies with potential for substantial loss of life or unusual property damage or financial impact.

**Maximum Risk** – includes buildings or facilities with unusually high risk requiring an Effective Response Force involving a significant augmentation of resources and personnel and where a fire would pose the potential for a catastrophic event involving large loss of life and/or significant economic impact to the community.

The City's service area includes residential housing units as well as offices, professional services, retail sales, restaurants/bars, hotels/motels, churches, schools, government facilities, healthcare facilities, and other non-residential buildings.

### **A.1.3 Building Fire Risk Factors**

Building fire risk determination is made using several factors, including type of construction, age of the building, occupancy classification (who and what is in the building), how the building is constructed, and fire and life safety features installed, such as automatic fire sprinklers, fire detection alarms, emergency exit lighting, and enclosed exit corridors.

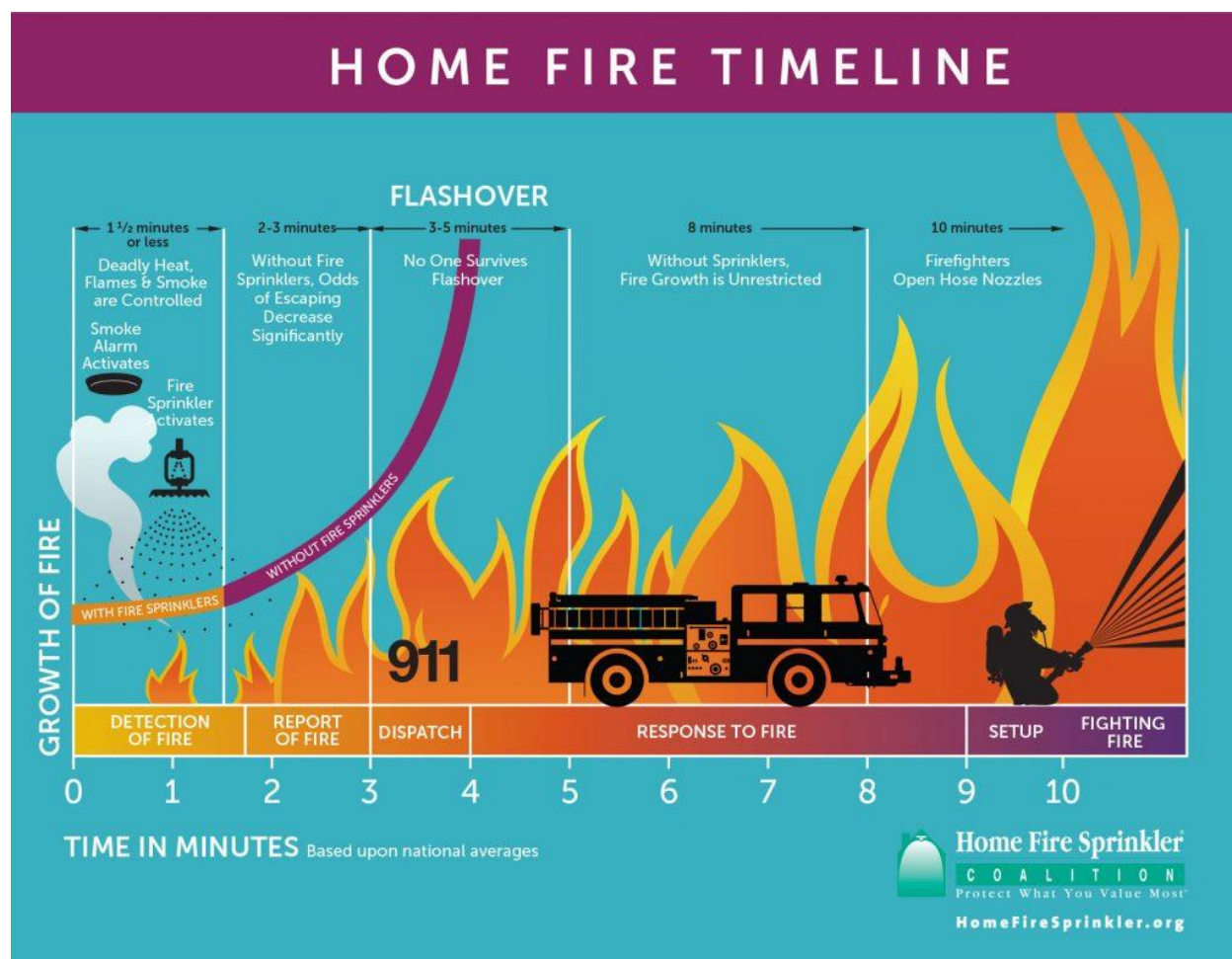
Figure 23 illustrates the fire progression timeline for a building fire and the way automatic fire sprinklers impact fire progression and spread. The graphic also shows that a total response time<sup>13</sup> of approximately 7:30 minutes or less is necessary to stop a building fire before it reaches flashover, which is the point at which the entire room erupts into fire after all the combustible objects in that room reach their ignition temperature. Human survival in a room after flashover is extremely unlikely.

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<sup>13</sup> Time interval from time of receipt of 9-1-1 call to initiation of suppression actions



**Figure 23—Building Fire Progression Timeline<sup>14</sup>**



### **High-Risk Building Inventory<sup>15</sup>**

An evaluation of Andover's building inventory reveals high-risk building uses as they relate to the CFAI building fire risk categories as shown in Table 24. The Department performed an extensive evaluation, based on national best practices,<sup>16</sup> for each of the 206 occupancies in the City and Fire District. There are a small number of higher risk occupancies, as indicated in the table.

The median construction dates for commercial property are 1997 in the City of Andover and 1982 in Butler County.

<sup>14</sup> Source: Home Fire Sprinkler Coalition

<sup>15</sup> Construction dates provided by Butler County Assessor's Office

<sup>16</sup> Federal Emergency Management Agency Risk Assessment Form Emergency Response (RAFER) System

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The predominant overall risk category for the entire protected area, based on the number of occupancies, construction date, and occupancy classification (type), is **Moderate**.

**Table 24—Occupancy Risk Classification by Planning Zone<sup>17</sup>**

Risk	1	6	7	8	9	12	13	14	17	18	19	20	21	22	23	24	25	26	28	29	30	33	38
High			3	3	1		1	2			2	1					2	2					1
Medium	2	1	7	3		1	13	19	1	1	27	15	3	2	1	7	9	8	1	2	3	1	1
Low	1		14	3			7	3			15	7					9	1					
<b>Total</b>	<b>3</b>	<b>1</b>	<b>24</b>	<b>9</b>	<b>1</b>	<b>1</b>	<b>21</b>	<b>24</b>	<b>1</b>	<b>1</b>	<b>44</b>	<b>23</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>20</b>	<b>11</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>

Source: Andover Risk Assessment Form Emergency Response (RAFER) Occupancy Records

### ***High Fire Flow Requirements***

One of the factors evaluated by the Insurance Services Office (ISO) is needed fire flow (NFF), which is the amount of water that would be required, in gallons per minute (GPM), if a building were seriously involved in fire. For the City, the ISO database identifies 123 buildings evaluated, of which 47 have an NFF of 1,500–3,000 GPM and two have an NFF of 3,000–5,000 GPM.

NFF above 2,000 GPM is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would require a commitment of the entire Department's on-duty force and mutual aid units as well. Using a generally accepted figure of 50 GPM per firefighter on large building fires, a fire in a building requiring 2,000 GPM would require 40 firefighters. A significant fire in any of these buildings would likely have high severity.

Table 25 identifies the fire flow locations greater than or equal to 2,000 GPM throughout the City.

**Table 25—High Fire Flow Data by Planning Zone<sup>18</sup>**

NFF	7	13	14	19	20	25	26
>2000 GPM	2	4	1	2	1	4	2

Source: Andover Fire Department ISO Data Report

## **A.1.4 Critical Infrastructure and Key Resources**

Critical Infrastructure and Key Resources (CIKR) is an umbrella term referring to the assets of the United States essential to the nation's security, public health and safety, economic vitality, and way of life. Such assets include power grids, water filtration plants, national monuments,

<sup>17</sup> Only zones with specific occupancy classifications are shown in this table.

<sup>18</sup> Only zones with high fire flows are shown in this table.

government facilities, telecommunications and transportation systems, chemical facilities, and much more.<sup>19</sup> CIKR facilities and their risk properties are fully discussed in Butler County's Local Hazard Mitigation Plan (LHMP).

## **A.2 HAZARD IDENTIFICATION**

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Citygate utilizes prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study.

Additionally, the Butler County's LHMP identifies the natural hazard risks in the City relating to services provided by the City. Citygate did not perform a natural hazard risk analysis as it is very complete within the LHMP. The LHMP identifies earthquake, tornado, flooding/winter storms, and wildfire for natural hazards within the County. The LHMP used the Federal Emergency Management Agency Calculated Priority Risk Index Inventory (CPRI) to develop the overall potentiality for those risks and the impact for the City and its residents. The CPRI did not identify the risk potential by individual planning zones, only the entire City. Although the City has no legal authority or responsibility to mitigate natural hazard risks other than for City-owned facilities, it does provide services related to these hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

The CFAI groups hazards into fire and non-fire categories, as shown in Figure 24. Identification, qualification, and quantification of the various fire and non-fire hazards are important factors in evaluating how resources are or can be deployed to mitigate those risks.

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<sup>19</sup> Source: United States Department of Homeland Security

**Figure 24—CFAI Hazard Categories**

Fire	EMS	Hazardous Materials	Technical Rescue	Disasters
One and Two Family Residential Structures	Medical Emergencies	Transportation	Confined Space	Natural
Multi-Family Structures			Swift-Water Rescue	
Commercial Structures	Motor Vehicle Accidents		High and Low Angle	
Mobile Property		Fixed Facilities	Structural Collapse and Trench Rescue	Man Made
Wildland	Other			

Source: CFAI *Standards of Cover* (5<sup>th</sup> Edition)

Following review and evaluation of the hazards identified in Butler County’s LHMP and the fire and non-fire hazards as identified by the CFAI as they relate to services provided by the City, Citygate evaluated the following hazards for this risk assessment:

1. Building Fire
2. Wildland Fire
3. Medical Emergency
4. Hazardous Materials Release/Spill
5. Technical Rescue
6. Natural Hazards<sup>20</sup>

<sup>20</sup> Natural hazards were detailed in Butler County’s LHMP.

### A.3 SERVICE CAPACITY

Service capacity refers to the City's available response force; the size, types, and condition of its response fleet and any specialized equipment; core and specialized performance capabilities and competencies; resource distribution and concentration; availability of automatic and/or mutual aid; and any other agency-specific factors influencing its ability to meet current and prospective future service demand relative to the risks to be protected.

The service capacity for the City includes five firefighters on duty daily cross-staffing several pieces of apparatus. Fire unit staffing is augmented by volunteer firefighters, the numbers of which fluctuate.

### A.4 PROBABILITY OF OCCURRENCE

*Probability of occurrence* refers to the probability of a future hazard occurrence during a specific period. Because the CFAI agency accreditation process requires annual review of an agency's risk assessment and baseline performance measures, Citygate recommends using the 12 months following completion of an SOC study as an appropriate period for the probability of occurrence evaluation. Table 26 describes the five probability categories and related scoring used for this analysis.

**Table 26—Probability of Occurrence**

Score	Probability of Occurrence	Description	General Descriptors
0	Very Low	Improbable	Hazard occurrence is <i>infeasible</i> or <i>improbable</i> for this location
1	Low	Rare	Hazard <i>could occur</i> at this location under rare or unusual circumstance
2	Moderate	Infrequent	Hazard <i>should occur</i> infrequently at this location
3	High	Likely	Hazard <i>likely to occur</i> regularly at this location
4	Very High	Frequent	Hazard is <i>expected to occur</i> frequently at this location

Citygate's SOC study uses recent multiple-year hazard response data to determine the probability of hazard occurrence during the ensuing 12 months.

## **A.5 IMPACT SEVERITY**

Impact severity refers to the extent of hazard occurrence impacts on people, buildings, lifeline services, the environment, and community, as described in Table 27.

**Table 27—Impact Severity**

<b>Score</b>	<b>Impact Severity</b>	<b>General Descriptors</b>
1	Insignificant	No serious injuries or fatalities Few persons displaced for only a short duration No damage or inconsequential damage None or very minimal disruption to community No measurable environmental impacts Little or no financial loss
2	Minor	Few injuries; minor medical treatment only No fatalities Some persons displaced for less than 24 hours Some minor damage Minor community disruption; no loss of lifeline services Minimal environmental impacts with no lasting effects Minor financial loss
3	Moderate	Some hospitalizations Some fatalities Localized displacement of persons for up to 24 hours Localized damage Normal community functioning with some inconvenience; minor loss of lifeline services Some environmental impacts with no lasting effects, or small environmental impact with long-term effect Moderate financial loss
4	Major	Extensive injuries; significant number of persons hospitalized Many fatalities Significant displacement of many people for more than 24 hours Significant damage requiring external resources Community services disrupted; some lifeline services potentially unavailable Some environmental impacts with long-term effects Major financial loss
5	Catastrophic	Large number of severe injuries and fatalities Local/regional hospitals impacted Large number of persons displaced for an extended duration Extensive damage Community unable to function without significant support; widespread loss of lifeline services Significant environmental impacts and/or permanent damage Catastrophic financial loss; inability to function without significant financial support

## **A.6 OVERALL RISK**

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Overall hazard risk is determined by multiplying the *probability of occurrence score* by the *impact severity score*. The resultant total determines the overall *risk ranking*, as described in Table 26.

**Table 26—Overall Risk Ranking**

Overall Risk Ranking	Overall Risk Score
Low	0–5
Moderate	6–11
High	12–15
Very High	16–20

## **A.7 BUILDING FIRE RISK**

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One of the primary hazards in any community is building fire. Citygate used available data from the City’s records management system, the U.S. Census Bureau, Butler County Assessor’s Office, and the ISO to assist in determining the City’s building fire risk.

Data from the Butler County Assessor’s Office indicated the average value for a single-family residence in the City of Andover is \$207,190 and is \$122,334 in Butler County. For commercial property in the City of Andover, the average assessed valuation is \$580,750, and for Butler County, the average assessed valuation is \$257,005.

For the 4,053 residential properties in the City of Andover, the average year built is 1994, and for the 292 commercial properties, the average year built is 1997.

### **A.7.1 Building Fire Service Demand**

For the three-year period from 2014 through 2016, the City experienced 72 building fire incidents, as summarized in Table 28. Incidents are listed by planning zone.



**Table 28—Building Fire Service Demand by Planning Zone<sup>21</sup>**

Type	Year	1	2	3	6	7	8	10	11	13	14	19	20	21	24	26	43
Building Fire	2014	1		4	2	4			2		1	1	3	1			
	2015						2		1	1		2			1	1	7
	2016	1	2	10	2	10		2				4	6		1		
<b>Total</b>		<b>2</b>	<b>2</b>	<b>14</b>	<b>4</b>	<b>14</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>9</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>7</b>

Source: Andover Fire Department Incident Records

As Table 28 shows, building fires are prevalent in the more densely populated station areas, as would be expected.

### **A.7.2 Probability of Building Fire Occurrence**

Table 29 identifies the probability of overall future building fire occurrence based on building fire service demand history from Table 28.

**Table 29—Overall Probability Future Building Fire Occurrence Score**

Hazard	All Planning Zones
Building Fire	3

### **A.7.3 Building Fire Impact Severity**

Table 30 identifies the City's overall building fire impact severity. Eight civilians were injured from 2013 to 2016. No injuries were critical. There were no fatalities during this reporting period. There were two fire deaths in 2010. The rate of fire injuries and occasionally deaths is consistent with a smaller, growing community. The types of injuries indicate the need for fire prevention education programs.

**Table 30—Overall Building Fire Impact Severity Score**

Hazard	All Planning Zones
Building Fire	2

<sup>21</sup> Only zones with building fire occurrences are shown in this table

#### A.7.4 Overall Building Fire Risk Score and Rating

Table 31 identifies the City’s overall building fire risk rating as *Moderate* based on probability of occurrence from Table 29 and impact severity from Table 30.

**Table 31—Overall Building Fire Risk Score**

Hazard	All Planning Zones
Building Fire	Moderate

### A.8 WILDLAND FIRE RISK

Most of the City is susceptible to a wildland fire; however, the highest risk is in the wildland-urban interface (WUI) areas where human population and related development exist within a predominantly wildland vegetation fuel environment.

#### A.8.1 Wildland Fire Service Demand

Wildland fire demand over the previous three years is shown in Table 32 by planning zone. Only the planning zones in which incidents occurred are shown.

**Table 32—Wildland Fire Service Demand by Planning Zone<sup>22</sup>**

Type	Year	2	3	6	7	9	10	11	12	13	15	16	19	20	21	24	25	26	27	30	32	33	37	41	43
Wildland Fire	2014	1	2	1			1	1	2		2					4	2		1		2	2	1		
	2015			2										1	4	2			3	3					
	2016				1	1			1	1	1	1	1			3	1	1		1				1	2
<b>Total</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>9</b>	<b>3</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>

As Table 32 shows, the City experiences wildland fires in areas where there are large open spaces and wildland fuels present.

#### A.8.2 Probability of Occurrence

Table 33 summarizes Citygate’s determination of probability of future wildland fire occurrence over the next 12 months based on wildland fire service demand from Table 32.

<sup>22</sup> Only zones with wildland fire occurrences are shown in this table

**Table 33—Overall Probability of Future Wildland Fire Occurrence Score**

Hazard	All Planning Zones
Wildland Fire	3

### A.8.3 Wildland Fire Impact Severity

Table 34 summarizes Citygate’s determination of overall wildland fire impact severity.

**Table 34—Overall Wildland Fire Impact Severity Score**

Hazard	All Planning Zones
Wildland Fire	3

### A.8.4 Overall Wildland Fire Risk Score and Rating

Table 35 identifies the City’s overall wildland fire risk rating as *Moderate* based on probability of occurrence from Table 33 and impact severity from Table 34.

**Table 35—Overall Wildland Fire Risk Score**

Hazard	All Planning Zones
Wildland Fire	Moderate

## A.9 MEDICAL EMERGENCY RISK

### A.9.1 Medical Emergency Service Demand

Medical emergency call for service demand over the previous three years is shown in Table 36 by planning zone. Only the planning zones in which incidents occurred are shown.

**Table 36—Medical Emergency Service Demand by Planning Zone<sup>23</sup>**

Type	Year	1	7	8	11	12	13	14	17	19	20	23	24	25	26	27
Medical Emergency	2014	8	114	19	6	5	33	95	1	83	41	3	15	21	27	5
	2015	14	177	20	6	4	89	248	8	125	73	5	13	25	80	12
	2016	31	367	29	21	10	156	575	18	261	169	12	14	59	167	9
Total		53	658	68	33	19	278	918	27	469	283	20	42	105	274	26

<sup>23</sup> Excludes zones with less than 10 total responses.

**Finding #33:** Zones 7, 14, and 19 have significantly more EMS incidents than other zones in the City and Fire District. This increase is likely caused by the response the Fire Department must make to lower priority incidents to assisted living facilities in those zones.

**Recommendation #18:** The Fire Department should thoroughly investigate the locations and number of responses for lower priority EMS responses such as Alpha and Bravo calls and determine if the Department should continue to respond to these level responses.

### **A.9.2 Probability of Occurrence**

Table 37 summarizes Citygate’s determination of probability of future medical emergency occurrence over the next 12 months based on medical emergency service demand history from Table 36.

**Table 37—Overall Probability of Future Medical Emergency Occurrence Score**

Hazard	All Planning Zones
Medical Emergency	4

### **A.9.3 Medical Emergency Impact Severity**

Table 38 summarizes Citygate’s determination of overall medical emergency impact severity.

**Table 38—Overall Medical Emergency Impact Severity Score**

Hazard	All Planning Zones
Medical Emergency	3

#### A.9.4 Overall Medical Emergency Risk Score and Rating

Table 39 identifies the City's overall medical emergency risk rating is **High** based on probability of occurrence from Table 37 and impact severity in Table 38.

**Table 39—Overall Medical Emergency Risk Score by Planning Zone**

Hazard	All Planning Zones
Medical Emergency	High

### A.10 HAZARDOUS MATERIALS RELEASE/SPILL RISK

#### A.10.1 Hazardous Materials Service Demand

The City experienced 192 hazardous material incidents for the three-year study period, as summarized in Table 40. Only the planning zones in which incidents occurred are shown.

**Table 40—Hazardous Materials Service Demand by Planning Zone<sup>24</sup>**

Type	Year	1	7	8	10	11	13	14	19	20	21	22	23	24	25	26	27	29	36
Hazardous Materials	2014	24	15		1		3	4	3			3	1	2	2	1	1		1
	2015	26	9	3		1	5	6	7	6					1	3		1	
	2016	4	2	4			14	4	10	6	4				2	4			
Total		54	26	7	1	1	22	14	20	12	4	3	1	2	5	8	1	1	1

As Table 40 indicates, hazardous material service demand varies by planning zone.

#### A.10.2 Probability of Occurrence

Table 41 summarizes Citygate's determination of probability of a future hazardous material occurrence over the next 12 months based on recent hazardous material service demand history from Table 40.

**Table 41—Overall Probability of Future Hazardous Materials Occurrence Score**

Hazard	All Planning Zones
Hazardous Materials	3

<sup>24</sup> Only zones with hazardous materials are shown in this table.

### A.10.3 Hazardous Materials Impact Severity

Table 42 summarizes Citygate’s determination of overall hazardous material impact severity.

**Table 42—Overall Hazardous Material Impact Severity Score**

Hazard	All Planning Zones
Hazardous Materials	3

### A.10.4 Overall Hazardous Materials Risk Score and Rating

Table 43 identifies the City’s overall hazardous materials risk rating as *Moderate* based on probability of occurrence from Table 41 and impact severity from Table 42.

**Table 43—Overall Hazardous Materials Risk Score**

Hazard	All Planning Zones
Hazardous Materials	Moderate

## A.11 TECHNICAL RESCUE RISK

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### A.11.1 Technical Rescue Service Demand

Over the three-year period from January 1, 2014 through December 3, 2016, the Department responded to 10 technical rescue incidents, mostly involving vehicle accidents with extrication. Only the planning zones in which incidents occurred are shown.

**Table 44—Technical Rescue Service Demand by Planning Zone<sup>25</sup>**

Type	Year	7	14	21	26
Technical Rescue	2014				
	2015	2	2		
	2016			2	4
Total		2	2	2	4

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<sup>25</sup> Only zones where Technical Rescues occurred are listed.

### A.11.2 Probability of Occurrence

Table 45 summarizes Citygate’s determination of probability of a future technical rescue occurrence as **Low** over the next 12 months based on technical rescue service demand history from Table 44.

**Table 45—Overall Probability of Future Technical Rescue Occurrence Score**

Hazard	All Planning Zones
Technical Rescue	1

### A.11.3 Technical Rescue Impact Severity

Table 46 summarizes Citygate’s determination of technical rescue impact severity.

**Table 46—Overall Technical Rescue Impact Severity**

Hazard	All Planning Zones
Technical Rescue	3

### A.11.4 Overall Technical Rescue Risk Score and Rating

Table 47 identifies the City’s overall technical rescue risk rating as **Low** based on probability of occurrence from Table 45 and impact severity from Table 46.

**Table 47—Overall Technical Rescue Risk Score**

Hazard	All Planning Zones
Technical Rescue	Low

## **A.12 NATURAL HAZARD RISK<sup>26</sup>**

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The City of Andover is part of the Butler County LHMP. The LHMP has identified and classified the potential natural hazard risks and severity for the City.

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<sup>26</sup> Natural hazard risk review and determination is found in the Butler County LHMP.



### **A.13 RISK ASSESSMENT SUMMARY**

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Citygate's evaluation of the values at risk and hazards likely to impact the City's service area yields the following conclusions:

- ◆ The City has a diverse urban population density with suburban and rural population densities in the outlying areas.
- ◆ The City's population is projected to grow by 56 percent over the next 15 years.
- ◆ The City has a mix of residential, commercial, office, and industrial buildings typical of other medium-sized cities.
- ◆ The City has varying probabilities of occurrence and severity relative to five hazards that Citygate assessed:
  - Building Fire Risk
  - Wildland Fire Risk
  - Emergency Medical Services Risk
  - Hazardous Materials Risk
  - Technical Rescue Risk

Overall risks for the City range from **Low** to **High**, as shown in the following table.

**Table 48—Overall Risk Assessment Summary**

Risk Type		Rating
1	Building Fire	Moderate
2	Wildland Fire	Moderate
3	Medical Emergency	High
4	Hazardous Material	Moderate
5	Technical Rescue	Low