CITYGATE ASSOCIATES, LLC
PUBLIC SAFETY SERVICES

FIRE SERVICES MASTER PLAN

VOLUME 1 OF 2: TECHNICAL REPORT

CITY OF TAYLOR, TX

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Taylor Texas
CITY OF TAYLOR TX

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EXECUTIVE SUMMARY

The City of Taylor, Texas (City) retained Citygate Associates, LLC (Citygate) to develop a Fire Services Master Plan to assist the City and Fire Department (Department) in designing a plan to provide a safe, effective, and appropriately sized response force for fires, medical emergencies, and other events requiring a specialized emergency fire response as the City grows within the existing corporate limits, including the Samsung semiconductor manufacturing facility annexation.

This report is presented in multiple sections, including this Executive Summary; the study introduction and background information; the detailed master plan analysis supported by maps and response statistics; a review and evaluation of administrative staffing capacity; all findings and recommendations; and the full community risk assessment (**Appendix A**). A Map Atlas of deployment coverage measures is provided in **Volume 2**.

Throughout this report, Citygate makes key findings and, where appropriate, specific action recommendations. Overall, there are 23 findings and 8 recommendations.

POLICY CHOICES FRAMEWORK

As a reminder to the reader, there are no mandatory federal or state regulations directing the level of fire service staffing, response times, or outcomes. The level of service provided, and any resultant costs, is a local policy choice. The body of regulations on the fire service suggests that if fire services are provided, they must be provided with the safety of the firefighters and the pubic in mind. Thus, there is often a constructive tension between the desired level of fire services and the level that can be funded, and many communities may not have the level of fire services they desire. The City's investments in fire services over the past decades serve as its baseline commitment today.

This study identifies that additional investment in fire services is still necessary, with expanded and additional services from the Department as the City continues to evolve. The fundamental policy choices that drive a city's investment in fire services are derived from two key questions:

1. What outcomes are desired for the emergencies to which the Department responds? Is it the desire to provide emergency medical care in time to lessen the possibility of preventable death and severe disability, and to keep a building fire to the room, building, or block of origin?

2. Should equitable response time coverage be provided to all neighborhoods with similar risks (building types and population density) to protect?

Once desired outcomes are identified, fire and emergency medical services (EMS) first responder deployment can then be designed to cover the most geography in the fewest travel minutes to meet the stated outcome goals.

OVERALL DEPLOYMENT SUMMARY

Overall, Citygate finds the Department well organized to accomplish its mission to serve a diverse urban/suburban population over a varied land-use pattern and is committed to continuous improvement using best practices where possible. Citygate finds many positives related to how Department leadership and staff are providing quality services within significant constraints.

The challenges facing the Department and City are like those facing many other agencies and jurisdictions, and this study should be taken as a best practices "tune-up" and forward-looking framework for planning. The most significant challenges facing the Department can be summarized in three themes: (1) staffing capacity, (2) response performance, and (3) the location of Fire Station 3.

Theme 1: Staffing Capacity

Simply summarized, fire service deployment is about the ***speed*** and ***weight*** of response. *Speed* refers to initial response resources—typically engines, ladder trucks, squads, or ambulances—strategically deployed across a jurisdiction within a specified time interval to mitigate routine-to-moderate emergencies. *Weight* refers to multiple-unit responses for more serious emergencies such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents where enough firefighters must be assembled within a reasonable time interval to safely control the emergency and prevent it from escalating into an even more serious event. More importantly, within the SOC process, positive outcomes are the goal. From that goal, crew size and response time can be calculated to determine appropriate fire station spacing (distribution and concentration). Serious medical emergencies and building fires have the most severe time constraints.

Typical desired outcomes in *urban/suburban* density communities like Taylor include preventing death or permanent impairment from medical emergencies where possible and confining building fires to the room or compartment of origin. To achieve this, the initial (first-due) unit should arrive within 7:00 to 8:00 minutes, before brain death becomes permanent or an incipient building fire expands beyond the room or compartment of origin, and the full multiple-unit Effective Response Force (ERF) should arrive within 11:00 to 12:00 minutes with enough personnel to safely perform all the critical tasks necessary to mitigate the emergency.

The Department's current response capacity provides a minimum of six response personnel on duty daily staffing one engine and one quint (combination engine and aerial ladder truck) plus one administrative chief officer operating from the offices or from home after hours, if available.

Citygate asserts this response capacity is insufficient to provide enough personnel to resolve any more serious incident requiring multiple response units without relying on automatic or mutual aid, most of which is too distant to arrive in sufficient time to realize desired urban outcomes.

As the Geographic Information System (GIS) travel time analysis in Section 2.6.1 of this report indicates, 4:00-minute first-unit travel time coverage from the City's two fire station locations covers 72 percent of public road miles, which is considered good urban/suburban-level coverage to facilitate desired outcomes. The Department's multiple-unit ERF to more serious incidents includes two engines and one ladder truck, with the second engine provided through automatic aid from Hutto or further depending on availability, which cannot provide 8:00-minute best practice ERF travel time coverage due to the distance the second ERF engine must travel. This effectively curtails or prevents the Department from realizing desired outcomes for more serious incidents. For a community the size of Taylor, Citygate considers this a low ERF travel time coverage which demonstrates the need for at least one additional staffed apparatus daily as soon as fiscally possible to provide a full ERF without reliance on automatic or mutual aid. In addition, simultaneous incidents occur 15 percent of the time and are increasing annually at an average of approximately 13.5 percent. With one of the two current staffed units committed to an incident, the City and Department have only one remaining unit staffed with three personnel immediately available for either a simultaneous single-unit response or a more serious multiple-unit response. If both units are committed, there is no remaining on-duty response capacity.

Thus, in Citygate's opinion, the City should fund a third three-person response crew daily to provide additional simultaneous incident capacity and *initial* ERF staffing capacity for more serious incidents without reliance on automatic/mutual aid partner agencies. Over the longer term, the City should plan to fund a minimum daily staffing level of 13 personnel plus a shift Battalion Chief. In Citygate's opinion, for a community the size of Taylor, a daily staffing of even 12 is minimally sufficient staffing to meet expected annual service demand including simultaneous incidents, and provide only an initial ERF staffing capacity to resolve more complex/serious incidents while waiting for additional mutual aid ERF staffing to arrive from outside the City as needed.

In addition, the Department's administrative staffing is insufficient to accomplish many of its responsibilities and tasks (as discussed in detail in Section 3), and Citygate recommends adding one chief officer and a .5 full-time equivalent (FTE) administrative support position as soon as fiscally possible to provide additional critical executive and administrative support capacity.

Theme 2: Response Performance

Response performance includes three distinct components: (1) call processing / dispatch, (2) crew turnout, and (3) travel. Call processing / dispatch is the time interval from receipt of the 9-1-1 call in the Williamson County Emergency Communications Center until completion of the dispatch notification to the appropriate fire crew(s). Crew turnout is the time interval from completion of

the dispatch notification until the start of apparatus movement and includes donning the appropriate protective clothing for the incident type, boarding the apparatus, and fastening all seatbelts. Travel is the actual driving time from the start of apparatus movement to arrival at the emergency incident. The following table summarizes 90th percentile response performance by the Department over the four-year study, as well as recommended urban/suburban best practice for each response component.

Table 1—Response Performance (Taken from Table 25)

Response Component	Best Practice		90th Percentile Performance	Performance vs. Best Practice
	Time	Source		
Call Processing / Dispatch	1:30	Citygate	**3:47**	**+ 2:17**
Crew Turnout	2:00	Citygate	**2:35**	**+ 0:35**
First-Unit Travel	4:00	Citygate / NFPA	**6:27**	**+ 2:27**
First-Unit Call to Arrival	7:30	Citygate	**11:11**	**+ 3:41**
ERF Travel	8:00	Citygate / NFPA	**21:00**	**+ 13:00**
ERF Call to Arrival	11:30	Citygate	**25:17**	**+13:47**

As the table shows, call processing / dispatch and first-unit travel performance are slower than recommended best practice goals for urban communities to facilitate positive outcomes. While call processing performance can be improved with training, oversight, accountability, and additional resources as necessary, in Citygate's experience, travel time can only be improved with an additional station to reduce the distance that first units must travel to reach 90 percent of emergency incidents.

ERF travel time performance to more serious incidents, and resultant ERF call-to-arrival performance, is also slower than recommended best practice for urban communities due to the second ERF engine coming from Hutto (or further) under automatic and mutual aid. It should be noted that while only a small percentage of calls for service require a full ERF response, communities need to have an ERF capable of meeting best practice response performance if positive outcomes are expected to be achievable. In the City, the last ERF unit to arrive at the incident, typically the second ERF engine for Taylor, is too far away to arrive within the recommended best practice travel time. This is illustrated in the previous table, which shows ERF travel time performance measuring more than 2.5 times slower than the 8:00-minute recommended best practice goal for urban/suburban density communities. This response performance further indicates the need for the City to build a third fire station as soon as possible to reduce both first-due and ERF travel time performance to facilitate positive outcomes.

Over the longer term, Citygate recommends the City and Department fund a total of three, three-person engines, one four-person ladder, and a Battalion Chief totaling daily staffing of 14 from three stations with the ladder truck from Station 1. Citygate suggests this as an appropriate deployment model given the values to be protected in the City (as described in **Appendix A**), expected future development and related service demand growth, simultaneous incident growth, the City's road network, and extended response times for automatic/mutual aid resources.

Theme 3: Fire Station 3 Location

A third station is needed to cover the southwest City and Samsung annexation if improved first-due and ERF travel time performance to facilitate positive outcomes typical of a suburban city in Texas is desired. Citygate collaborated with City staff to identify a suitable site in the vicinity of Taylor High School as the preferred location to best serve both (1) current sections of the City beyond 4:00-minutes travel time from existing stations and (2) areas of expected future development, including the Samsung facility. Citygate recommends the following fire station siting guidelines.

1. Serve the most people in the shortest travel time possible.
2. Provide a 360-degree service area within the desired first-due travel time goal.
3. Avoid political, natural, or human-built barriers within the first-due travel time goal.
4. Provide immediate or rapid access to primary response travel routes in all primary directions.

Citygate subsequently modeled expected 4:00-minute first-due and 8:00-minute ERF travel time coverage from this location—as shown in Maps Scenario 1 and Scenario 1a (**Volume 2—Map Atlas**) and summarized in the following table.

Table 2—Travel Time Coverage Comparison Summary (From Table 27)

Travel Time Measure	Percentage of Total Road Miles Covered	
	(Current) Station1 and Station 2	With Proposed Station 3
4:00-Minute First-Due	72.4%	78.9%
8:00-Minute ERF – Three City Units	-	88.2%

As the table shows, a third station in the vicinity of Taylor High School improves 4:00-minute first-due travel time coverage by 6.5 percent to 79 percent of total public road miles, which is very

good urban/suburban-level coverage. Three-unit, 8:00-minute ERF travel time coverage improves to 88 percent.

KEY FINDINGS AND RECOMMENDATIONS

The findings and recommendations contained throughout this report are listed in chronological order in Section 4. Following are *key* findings and recommendations.

Key Deployment Findings

Finding #2: Neither the City Council nor the Fire Department have adopted specific response performance measures by policy resolution or operational guideline consistent with fire service best practice recommendations.

Finding #4: The Department's two fire station locations can be expected to provide 4:00-minute first-unit travel time coverage to only 72 percent of the total public road miles in the City, which is weak urban/suburban-level coverage to facilitate positive outcomes.

Finding #5: The Department cannot provide 8:00-minute recommended best practice multiple-unit ERF travel time coverage with only two units inside the City. The Department is reliant on external mutual aid assistance to provide a second ERF engine from Hutto or further depending on availability, which is insufficient multi-unit coverage for a city of Taylor's size.

Finding #6: Service demand increased nearly 21 percent over the four-year study period, including a more than 11 percent increase in 2021 over the previous year.

Finding #7: EMS incidents comprise 66 percent of total service demand while fires account for less than 4 percent.

Finding #8: At least one or more simultaneous incidents occurs 15 percent of the time, primarily impacting Station 1.

Finding #9: Simultaneous incident activity increased 43 percent over the four-year study period, with a 28 percent increase in 2021 over the previous year.

Finding #13: The Department's 90th percentile call to first-unit arrival performance—a fire agency's true customer service measure—is 3:41 minutes slower (49 percent) than the 7:30-minute recommended best practice goal for urban/suburban areas to facilitate positive outcomes and is trending slower each successive year.

Finding #15: The current staffing model of a minimum of six response personnel on duty daily plus an administrative chief officer (as available from office or home) is not capable enough to provide personnel to resolve any more serious incident requiring multiple response units without relying on mutual aid, most of which is too distant to arrive in sufficient time to realize desired outcomes.

Finding #16: Any single incident requiring response from both staffed units leaves no on-duty personnel available to respond to a simultaneous incident.

Finding #19: The City needs an additional fire station as soon as possible to help resolve slower-than-desired first-unit and ERF travel times to facilitate positive outcomes and the related additional service demand of pending and future development projects including the Samsung facility.

Finding #20: A suitable parcel of land in the general vicinity of Taylor High School is the preferred location for Fire Station 3 to provide improved 4:00-minute first-due and 8:00-minute ERF travel time coverage and to serve existing and future development in the southwestern area of the City including the Samsung campus.

Finding #21: The Department needs a third staffed response crew daily—as soon as fiscally possible, and in advance of the completion of Station 3—to provide critical initial ERF staffing capacity (until mutual aid resources can arrive from outside the City) and reserve response capacity for simultaneous incidents.

Key Deployment Recommendations

Near-Term

Recommendation #1: Adopt Deployment Policies: The City Council should adopt complete performance measures to aid deployment planning and monitor performance. The measures should be designed to deliver outcomes that will save patients upon arrival when possible and keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures:

1.1 Distribution of Fire Stations: To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 7:30 minutes from receipt of the 9-1-1 call at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing / dispatch, 2:00 minutes crew turnout, and 4:00 minutes travel time.

1.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine building fires near the room of origin, keep vegetation fires under one acre in size, and treat multiple medical patients at a single incident, a multiple-unit ERF of at least 10 personnel, including at least one chief officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing / dispatch, 2:00 minutes crew turnout, and 8:00 minutes travel time.

1.3 Hazardous Materials Response: To protect the City from the hazards associated with uncontrolled release of hazardous and toxic materials, the fundamental mission of the Department's response is to isolate the hazard, deny entry into the hazard zone, and minimize impacts on the community. This can be achieved with a first-due total response time of 7:30 minutes or less to provide initial hazard evaluation, mitigation actions, or both. After the initial evaluation is completed, a determination can be made whether to request additional resources to mitigate the hazard.

1.4 Technical Rescue: To respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue, first-due units should arrive within a total response time of 7:30 minutes or less to evaluate the situation and initiate rescue actions; additional resources should assemble as needed within a total response time of 11:30 minutes to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #2: Collaborate with Williamson County Emergency Communications to identify factor(s) causing slower-than-recommended call processing / dispatch performance and the steps needed to bring performance into closer alignment with recommended fire service best practice.

Recommendation #3: Identify a suitable site and funding sources for the construction of Station 3 as soon as fiscally possible.

Recommendation #4: If fiscally possible before Station 3 can be opened, fund a second three-person crew at Station 1 to staff an additional engine to (1) provide

critical initial ERF staffing capacity until mutual aid resources can arrive from outside the City and (2) reserve response capacity for simultaneous incidents. This crew would be moved to Station 3 upon completion of construction.

Longer-Term

Recommendation #5: Add a fourth four-person crew daily at Station 1 staffing the ladder truck to bring total minimum daily staffing to 13 plus a chief officer. In Citygate's opinion, this is minimally adequate initial ERF staffing to start to resolve more complex/serious incidents while waiting for additional mutual aid staffing to arrive from outside the City.

Recommendation #6: When Station 3 can be staffed, improve supervision and headquarters capacity by adding three Battalion Chiefs (one per shift) to provide on-duty supervision of response personnel, Department-level program management, and emergency incident command.

Key Administrative Staffing Capacity Findings and Recommendations

Finding #22: The Department is understaffed to accomplish many of its administrative responsibilities, expectations, and workload demands.

Finding #23: The Fire Chief and Assistant Fire Chief regularly work 50 to 60+ hours per week to ensure that the most important responsibilities and tasks are completed, with others not being completed at all due to a lack of capacity.

Recommendation #7: With the addition of a third engine company before Station 3 can be opened, the City should consider funding a third 40-hour assistant chief officer to oversee and manage the Department training program and emergency management responsibilities, provide additional needed executive-level capacity and emergency incident response coverage, and provide expanded leadership succession planning.

Recommendation #8: With the addition of a third engine company before Station 3 can be opened, the City should add a .5 FTE administrative support position to increase capacity and provide vacation/illness relief.

NEXT STEPS

Implementation of study recommendations frequently takes time *and* fiscal capacity. As such, Citygate offers the following suggested next sequential steps.

Near Term

- Review and absorb the content, findings, and recommendations of this report.
- Adopt response performance goals as recommended.
- Begin the multi-year effort to add a third fire station to include identifying revenue sources, timing, property acquisition, design, and construction of Station 3.

Longer Term

- Develop a plan to fund additional daily response and administrative support staffing as identified in this report.
- Monitor response performance against adopted goals.

SECTION 1—INTRODUCTION AND BACKGROUND

The City of Taylor, Texas (City) retained Citygate Associates, LLC (Citygate) to develop a Fire Services Master Plan to assist the City and Fire Department (Department) in designing a plan to provide a safe, effective, and appropriately sized response force for fires, medical emergencies, and other events requiring a specialized emergency fire response as the City grows within the existing corporate limits, including the Samsung semiconductor manufacturing facility annexation.

Citygate's scope of work and corresponding Work Plan was developed in a manner consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with best practices from the criteria of the Commission on Fire Accreditation International (CFAI) and the Texas Commission on Fire Protection (TCFP).

1.1 REPORT ORGANIZATION

This report is comprised of two volumes, with **Volume 1** consisting of the following sections. **Volume 2** includes all maps referenced throughout this report.

Executive Summary: A summary of our analysis with key findings, recommendations, and suggested next steps.

Section 1 **Introduction and Background:** An introduction to this study and relevant background information about the City and Department.

Section 2 **Fire Services Master Plan Analysis:** An introduction to the SOC (deployment) process and methodology used by Citygate in this review; an in-depth review and analysis of the Department's ability to deploy the appropriate resources (apparatus, equipment, and personnel) to protect the community against the fire and non-fire hazards likely to impact the City and ability to meet the community's goals and expectations relative to emergency response performance and desired outcomes.

Section 3 **Administrative Staffing Capacity Review:** A macro-level review and evaluation of the Department's administrative organization and workload capacity.

Section 4 **Findings and Recommendations:** All findings and recommendations contained throughout the report in chronological order.

Appendix A **Community Risk Assessment:** A comprehensive analysis of the fire and non-fire hazards likely to impact the City.

1.1.1 Goals of Report

This report cites findings and makes recommendations, as appropriate, related to each finding. Findings and recommendations throughout this report are sequentially numbered.

This document provides technical information about how fire services are provided and legally regulated and how the Department currently operates. This information is presented in the form of recommendations and policy choices for consideration by the Department and City Council.

The result is a solid technical foundation upon which to understand the advantages and disadvantages of the choices City leadership faces regarding the best way to provide services and, more specifically, at what level of desired outcome and expense.

1.1.2 Limitations of the Report

There are no federal or state regulations mandating the level of fire service staffing, response performance, or outcomes. Through the public policy process, each community is expected to understand the local fire and non-fire risks and its ability to fund and then choose its level of fire services. *If* fire services are provided at all, federal and state regulations specify how to safely provide them for the public and for the personnel providing the services.

While this report and technical explanation can provide a framework for the discussion of Department services, neither this report nor the Citygate team can make the final decisions or cost out every possible alternative in detail. Once final policy choices receive City Council direction, City staff can conduct any final cost and fiscal analyses as typically completed in the City's normal operating and capital budget preparation cycle.

1.2 Project Approach and Methodology

1.2.1 Project Approach

Citygate utilized multiple sources to gather, understand, and model information about the City and Department. Citygate requested and reviewed relevant background data and information to better understand costs, service levels, and the history of service-level decisions, including prior studies.

In virtual meetings, Citygate conducted focused interviews of the Department's project team members and other project stakeholders. Citygate reviewed demographic information about the City including the potential for future growth and development. Citygate also obtained map and response data from which to model current and projected response travel time with the goal to identify the location(s) of stations and crew quantities required to best serve the City as it currently exists while also facilitating future growth and development.

Once Citygate gained an understanding of the City and its fire and non-fire risks, Citygate developed a model of fire services that was tested against the travel time mapping and prior

response data to ensure an appropriate fit. Citygate also evaluated future City growth and service demand and evaluated potential alternative emergency service delivery models. Subsequently, Citygate proposed an approach to address both current and longer-term needs. The result is a framework for enhancing Department services while meeting reasonable community expectations and fiscal realities.

1.2.2 Study Methodology

Following is a description of the eight elements of the Standards of Coverage (SOC) process used for this analysis.

1. Existing Deployment – Understanding and describing the history, formation, authority, and general description of the Department and the distinct community it serves; the services the Department provides; and its existing deployment model and performance measures.

2. Community Outcome Expectations – A review of typical expectations for fire, EMS, and special hazard responses and outcome expectations in urban/suburban communities.

3. Community Risk Assessment – An assessment of fire and non-fire risks, to include a description of the values to be protected, the hazards likely to impact the community served as they relate to services provided by the Department, the probability of occurrence and likely impact severity by hazard type, and an overall assessment of risk by hazard and planning zone.

4. Critical Task Analysis – A review of the essential tasks that must be performed, and the number of personnel required, to deliver a stated outcome for an Effective Response Force (ERF).

5. Distribution Analysis – Modeling of fire station spacing and resultant *single-unit* travel time coverage using Esri's ArcGIS software mapping tool to facilitate desired outcomes for routine, less complex emergencies.

6. Concentration Study – Modeling of fire station spacing and resultant *multiple-unit* ERF travel time coverage to deliver the appropriate number of personnel in sufficient time to facilitate desired outcomes and prevent the escalation of larger, more complex emergencies.

7. Reliability and Historical Response Effectiveness Studies – An analysis of recent historical incident response data to determine the percentage of conformance to established response performance and recognized best-performance goals that the Department's current deployment system delivers.

8. Overall Deployment Evaluation – An overall evaluation of the Department's existing deployment relative to conformance with current performance metrics and recommended best practices for the City's values at risk, including what is working well, where improvements are needed, and which new resources, if any, would be needed to implement the recommendations. Recommendations include appropriate risk-specific response performance goals.

1.2.3 Scope of Work

Citygate's approach to this Fire Services Master Plan involved:

- Requesting and reviewing relevant City, County, and Department data and information.
- Interviewing City and Department personnel and other key study stakeholders.
- Modeling fire station travel time coverage utilizing Esri StreetMap Premium, a geographic mapping software program.
- Reviewing and analyzing prior incident data and plotting the results on graphs and geographic mapping exhibits using StatsFD™, an incident response time analysis program.
- Identifying and evaluating future City population and related development growth.
- Reviewing service demand by hazard type.
- Recommending appropriate, hazard-specific response performance goals.

1.3 CITY OVERVIEW

Located 29 miles northeast of Austin in central Texas, the City encompasses 22.6 square miles and has a population of nearly 17,000 residents.[1] Founded in 1876 as a railroad shipping point and incorporated in 1882, the City is a home-rule city utilizing a Council-Manager form of governance. Four Councilmembers are elected from single-member districts and one Councilmember is elected at large to staggered three-year terms, with the Mayor and Mayor Pro Tem elected by the five Councilmembers. Over the last several years, the City has made significant capital facility investments to attract new businesses and improve its economic base and community vitality, with nearly 20 companies expanding or relocating to Taylor since 2008. The City's Adopted Budget for fiscal year (FY) 2022 is $36.35 million.

[1] Source: Esri Community Analyst Community Profile (2022).

1.3.1 Future Growth and Development

The City's Comprehensive Plan projects that Taylor's population will grow by approximately 2.4 percent annually through 2025 and by 5.7 percent annually over the ensuing 20 years to 2045, with a total population approaching 40,000 by 2040.[2] In addition, the Comprehensive Plan establishes restricted and controlled growth areas, as well as preserved, reserved, intended growth, and infill areas as shown in the following figure.

[2] City of Taylor Envision Taylor Comprehensive Plan (Updated April 2022), Figure 19.

Figure 1—Intended Growth Sectors

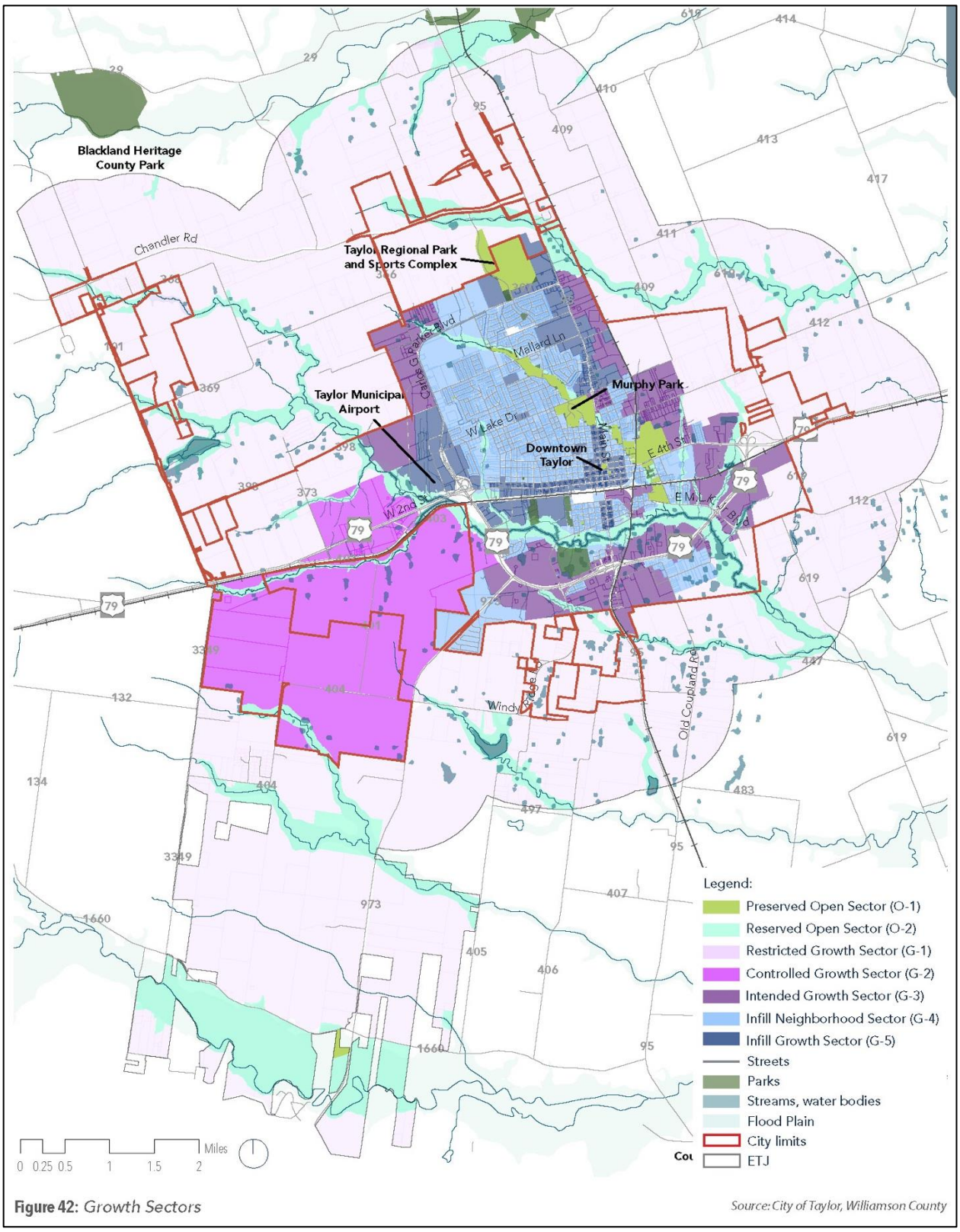


Figure 42: *Growth Sectors*

Source: City of Taylor, Williamson County

The following figure shows intended future land uses within the City.

Figure 2—Intended Future Land Uses

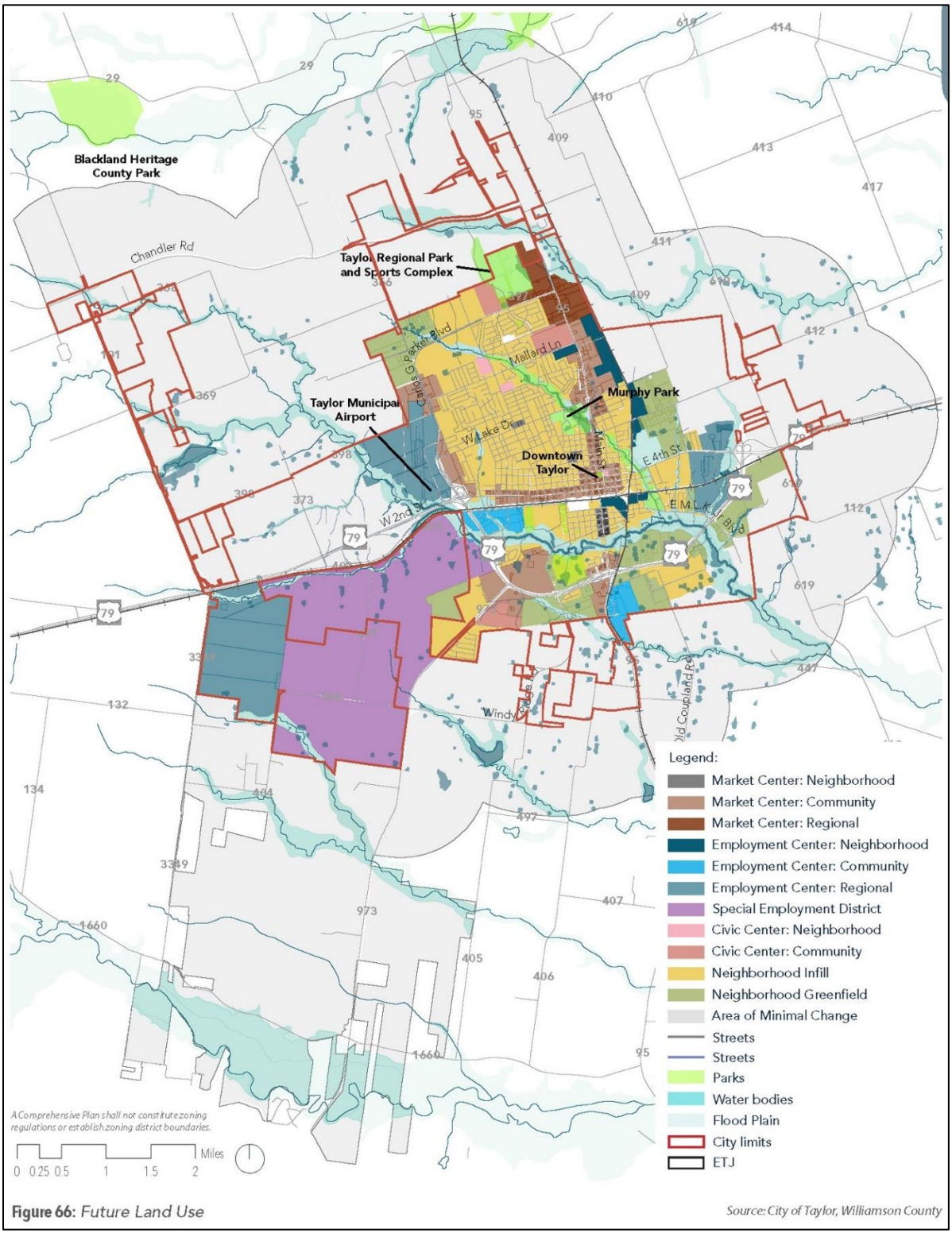


Figure 66: *Future Land Use*

Source: City of Taylor, Williamson County

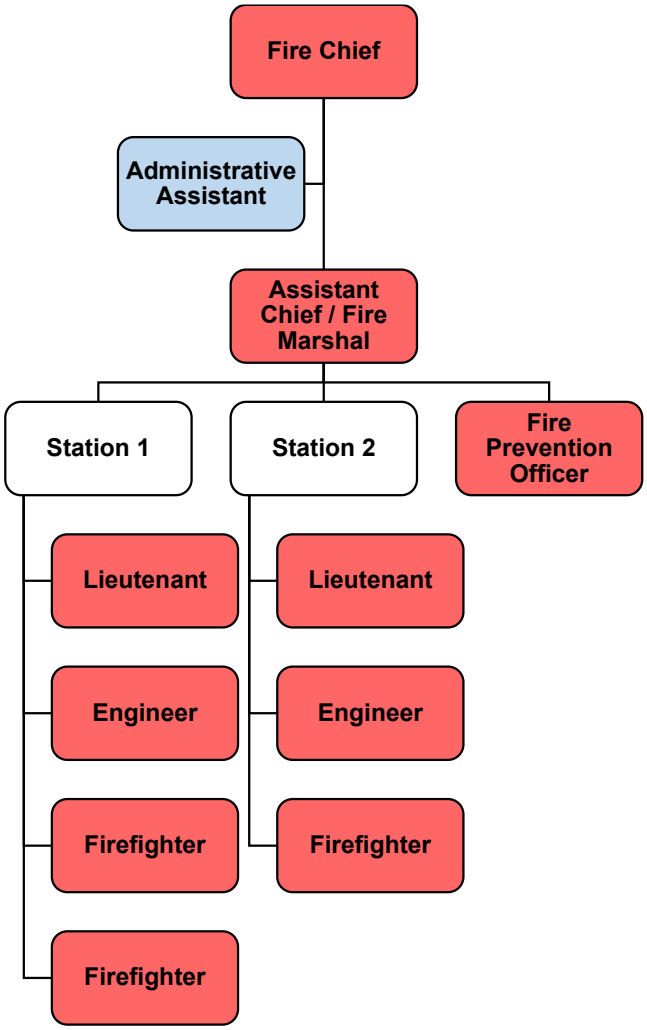
In addition to the six million-square-foot Samsung semiconductor manufacturing facility currently under construction, a rail park between Taylor and Hutto is envisioned to become a major industrial park to include 500,000-square-foot buildings to support Samsung and other anticipated future commercial/industrial businesses.

1.4 FIRE DEPARTMENT OVERVIEW

1.4.1 Organization

The Taylor Fire Department provides fire suppression, Basic Life Support (BLS) pre-hospital emergency medical, rescue, initial hazardous materials response and decontamination, fire prevention/code enforcement, fire investigation, emergency management, fire safety education, and other related services with a staff of 25 personnel organized as shown in the following figure.

Figure 3—Fire Department Organization



1.4.2 Facilities and Resources

The Department provides services from two fire stations, with a minimum daily staffing of six personnel, as summarized in the following table.

Table 3—Fire Department Facilities, Resources, and Daily Response Staffing

Station	Address	Year Built	Response Resources	Minimum Daily Staffing
1	200 Washburn Street	2006	**Truck 1** Brush 1	**3** **
2	705 Carlos G Parker NW	2002	**Engine 2** Brush 2 Tender 4	**3** ** **
			Total Daily Staffing	**6**

BOLD indicates normally staffed resource

** Cross-staffed as needed depending on type of incident

1.4.3 Service Capacity

Service capacity refers to the Department'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 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 Department's service capacity for fire and non-fire risks consists of a minimum of six response personnel on duty daily staffing one engine and one quint (combination engine and aerial ladder truck) from the Department's two fire stations. The two administrative chief officers work 8:00 a.m. – 5:00 p.m. Monday through Friday, and respond to more serious incidents as available from the office or home after hours. The Department has an automatic mutual aid agreement with Williamson County Emergency Services District #3 in Hutto. While the Avery-Pickett Volunteer Fire Department is also located in the City and responds to incidents in the unincorporated areas outside Taylor, the City has no control over its staffing level, response availability, or level of training. The Department also has two Type-6 wildland engines and one water tender that can be cross-staffed by the on-duty personnel as needed.

All response personnel are trained to the emergency medical technician (EMT) level capable of providing BLS pre-hospital emergency medical care. Ground Advanced Life Support (ALS) ambulance service is provided by Williamson County EMS with two ambulances stationed in the City. Air ambulance service, when needed, is available from Starflight in Austin or PHI Air Medical in Temple.

Response personnel are also trained to the US Department of Transportation Hazardous Material First Responder Operational level to provide initial hazardous material incident assessment, hazard isolation, and decontamination as participants in the Williamson County Hazardous Material Response Team. Most Department response personnel are further trained to the Hazardous Material Technician level. The nearest fully-staffed Hazardous Materials Response Team is in Austin. Response personnel are further trained in Confined Space Awareness.

Finding #1:	The Department's physical response unit types are appropriate to protect against the hazards likely to impact the City.

SECTION 2—FIRE SERVICES MASTER PLAN ANALYSIS

This section provides a detailed analysis of the Department's current ability to deploy and mitigate hazards within the City. The response analysis uses prior response statistics and geographic mapping to help the Department and the community visualize what the current response system can and cannot deliver.

2.1 STANDARDS OF COVERAGE PROCESS OVERVIEW

The core methodology used by Citygate in the scope of its fire services master planning work is the *Standards of Response Cover*, fifth and sixth editions, a systems-based approach to fire department deployment published by the CFAI. This approach uses local risk and demographics to determine the level of protection best fitting a community's needs.

The Standards of Coverage (SOC) method evaluates deployment as part of a fire agency's self-assessment process. This approach uses risk and community outcome expectations to help elected officials make informed decisions regarding fire and EMS deployment levels. Citygate has adopted this multiple-part systems approach as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

In contrast to a one-size-fits-all prescriptive formula, this systems approach to deployment 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 body "purchases" the fire and EMS 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 solely using a single component. For instance, if only travel time is considered and the frequency of multiple calls is not, the analysis could miss overworked companies. Alternatively, if a risk assessment for deployment is not considered, and deployment is based only on travel time, a community could under-deploy to incidents.

Fire service deployment, simply summarized, is about the ***speed*** and ***weight*** of response. *Speed* refers to initial response (first-due) of all-risk intervention resources (e.g., engines, ladder trucks, and specialty units,) strategically deployed across a jurisdiction for response to emergencies within a travel time sufficient to control routine to moderate emergencies without the incident escalating to greater size or severity and achieve desired outcomes. *Weight* refers to multiple-unit responses for more serious emergencies, such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents where enough firefighters must be assembled within a time interval to safely control the emergency and prevent it from escalating into an even more serious event. The following table illustrates this deployment paradigm.

Table 4—Fire Service Deployment Paradigm

Element	Description	Purpose
***Speed** of Response*	Response time of initial all-risk intervention units strategically located across a jurisdiction	Controlling routine-to-moderate emergencies without the incident escalating in size or complexity.
***Weight** of Response*	Number of firefighters in a multiple-unit response for serious emergencies	Assembling enough firefighters within a reasonable time frame to safely control a more complex emergency without escalation.

Thus, smaller fires and less complex emergencies require a single- or two-unit response (engine or specialty resource) within a relatively short response time. Larger or more complex incidents require more units and personnel to control. In either case, if crews arrive too late or the total number of personnel is too few for the emergency, they are drawn into an escalating and more dangerous situation. The science of fire crew deployment is to spread crews out across a community or jurisdiction for quick response to keep emergencies small with positive outcomes without spreading resources so far apart that they cannot assemble quickly enough to effectively control more serious emergencies.

2.2 CURRENT DEPLOYMENT

SOC ELEMENT 1 OF 8
EXISTING DEPLOYMENT POLICIES

Nationally recognized standards and best practices recommend using three incremental measurements to define response time: dispatch center call processing, crew alerting and response-unit boarding (commonly called crew turnout), and actual travel (driving time).[3] Ideally, the clock start time is when the 9-1-1 center receives the emergency call. In some cases, however, the call must then be transferred to a separate fire dispatch center. In this setting, the response time clock starts when the fire center receives the 9-1-1 call into its computer-aided dispatch (CAD) system.

Neither the City nor the Department have adopted a response performance policy or goal, which is inconsistent with fire service best practice as established by the Commission on Fire Accreditation International.

The most recently published NFPA best practices have decreased recommended call processing / dispatch processing time to 1:00 minute for events with an imminent threat to life or significant

[3] Source: NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2020 Edition).

property damage and 1:30 minutes for hazardous materials or technical rescue incidents, for joint response with law enforcement involving weapons, or for language barriers.[4] However, in Citygate's experience, very few dispatch centers can achieve this level of performance, and Citygate thus continues to recommend 1:30 minutes as an achievable call processing performance goal.

Further, for crew turnout, 60 to 80 seconds is recommended, depending on the type of protective clothing that must be donned. Again, in Citygate's experience, very few fire agencies can achieve this level of performance, and Citygate has long recommended 2:00 minutes as an achievable crew turnout performance goal.

Best practice for first-unit travel in urban/suburban density areas is 4:00 minutes or less, and 8:00 minutes or less for the multiple-unit ERF for more serious emergencies.[5]

If the travel time measures recommended by the NFPA and Citygate are added to Citygate's recommended call processing / dispatch and crew turnout performance goals, then a realistic 90 percent first-unit response performance goal is 7:30 minutes from the time the Williamson County Emergency Communications receives the call. This includes a 1:30 minute call processing / dispatch, 2:00 minute crew turnout, and 4:00 minute travel time.

Finding #2:	Neither the City Council nor the Fire Department have adopted specific response performance measures by policy resolution or operational guideline consistent with fire service best practice recommendations.

2.2.1 Current Deployment Model

Resources and Staffing

The Department's current deployment model and daily staffing provides six personnel, and a chief officer depending on availability, via two response unit types from two fire stations to resolve low-risk building fires and other emergencies requiring a multiple-unit response.[6]

Response Plan

The Department is an all-risk fire agency providing the population it protects with services that include fire suppression; BLS pre-hospital emergency medical services; rescue; initial hazardous materials response and decontamination; and other non-emergency services, including fire

[4] Source: NFPA 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (2019 Edition).
[5] Source: NFPA 1710 (2020 Edition).
[6] NFPA 1710 (2020 Edition).

prevention/code enforcement, fire investigation, fire safety education, emergency management, and other related services.

Given these risks, the Department utilizes a tiered response plan calling for different types and numbers of resources depending on incident/risk type. The Williamson County Emergency Communications Center's CAD system selects and dispatches the closest and most appropriate resource(s) pursuant to the Department's response plan, as summarized in the following table.

Table 5—Response Plan by Type of Emergency

Incident Type	Response	Total Staffing
Structure – Commercial	2 Engines (1 auto aid), Truck, Chief Officer	10
Structure – Residential	2 Engines (1 auto aid), Truck, Chief Officer	10
Medical Emergency	Engine or Truck	3
Vegetation Fire	Engine, Brush	6
Vehicle Fire	Engine, Truck	6
Vehicle Collision	Engine, Truck	6
Hazardous Materials	Engine, Truck, Chief Officer	7
Technical Rescue	Engine, Truck, Chief Officer	7

Source: Taylor Fire Department

Finding #3: The Department has a standard response plan that considers risk and establishes an appropriate initial response for each incident type; each type of call for service receives the combination of engines, ladder trucks, and command officers customarily needed to effectively control that type of incident based on Department experience.

2.3 OUTCOME EXPECTATIONS

SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The SOC process begins by reviewing existing emergency services outcome expectations. This includes determining for what purpose the response system exists and whether the governing body has adopted any response performance measures. If it has, the time measures used must be understood, and reliable data must be available.

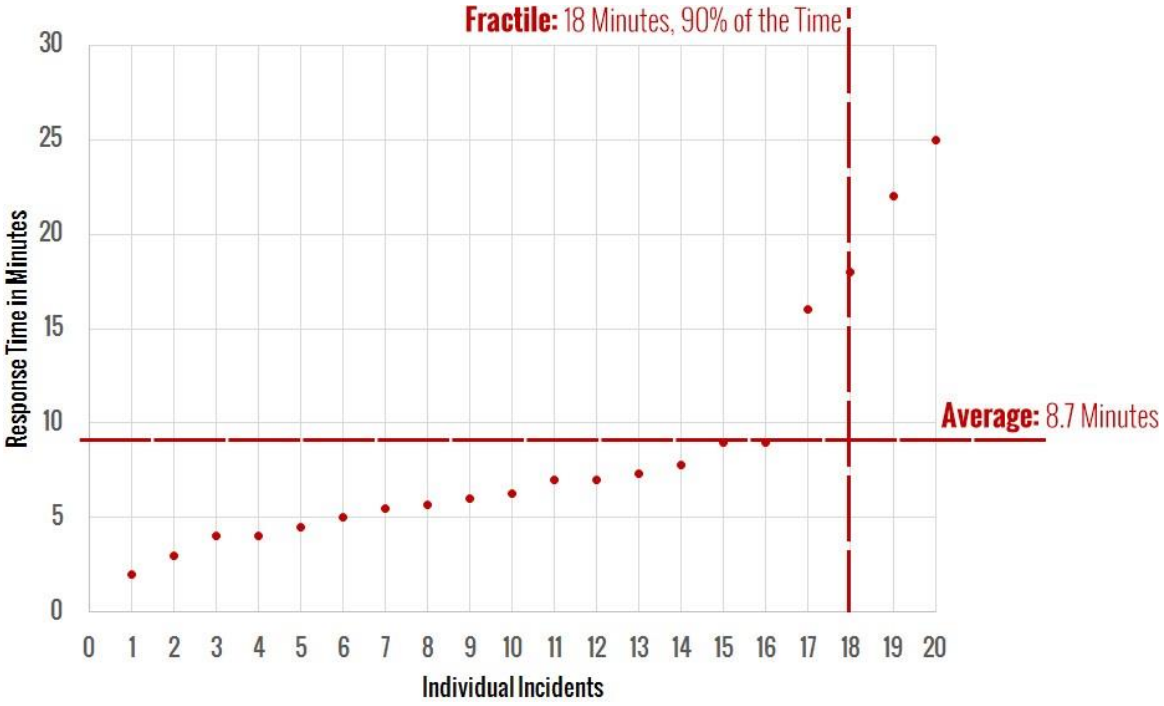
Current national best practice is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically, this is called a fractile measure.[7] Measuring the average only identifies the central or middle point of response time performance for all calls for service in the data set, making it impossible to know how many incidents had response times that were far above the average or just above.

For example, the following figure shows response times for a hypothetical small fire department that receives 20 calls for service each month. Each response time has been plotted on the graph from shortest response time to longest response time. The figure shows that the average response time is 8.7 minutes; however, the average response time fails to properly account for four calls for service with response times far exceeding a threshold in which positive outcomes could be expected. In fact, it is evident in the figure that 20 percent of responses are far too slow, and this hypothetical jurisdiction has a potential life-threatening service delivery problem. Average response time as a fire service delivery measurement is simply not sufficient. This is a significant issue in larger cities if hundreds or thousands of calls are answered far beyond the average point.

By using the fractile measurement with 90 percent of all responses, this hypothetical jurisdiction has a response time of 18:00 minutes, 90 percent of the time. Stated another way, 90 percent of all responses are 18:00 minutes or less. This fractile measurement is far more accurate at reflecting the service delivery situation of this small agency.

[7] A *fractile* is that point below which a stated fraction of the values lies. The fraction is often given in percent; the term percentile may then be used.

Figure 4—Fractile versus Average Response Time Measurements



More importantly, within the SOC process, positive outcomes are the goal. From that, crew size and response time can be calculated to provide appropriate fire station spacing (distribution and concentration) to achieve the desired goal(s). Emergency medical incidents include situations with the most severe time constraints. The brain can only survive 4:00 to 6:00 minutes without oxygen. Cardiac arrest and other events can cause oxygen deprivation to the brain. Cardiac arrests make up a small percentage, with drowning, choking, trauma conditions, or other similar events having the same effect. In a building fire, a small incipient fire can grow to involve the entire room in 6:00 to 8:00 minutes, spreading rapidly horizontally and vertically to involve other rooms and threatening the safety of any occupants who have not already evacuated. 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 spreads beyond the room of origin.

From the time 9-1-1 receives the call, an effective deployment system is *beginning* to manage the problem within a 7:00- to 8:00-minute total response time. This is right at the point that brain death is becoming irreversible, and a building fire has grown to the point of leaving the room of origin and becoming very serious. Thus, the City needs a first-due response goal that is within that 7:00-minute to 8:00-minute range if the desire is to facilitate positive outcomes in these time-constrained events. It is important to note that fire or medical emergency events continue to deteriorate from the time of inception, not from the time the fire engine or ambulance starts driving to the incident. 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 about 1:00 minute in the best of circumstances. Crew notification and travel time take additional minutes. Upon arrival, the crew must approach the patient or emergency, assess the situation, and appropriately deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 minutes or more. This time frame may be increased considerably due to long driveways, apartment buildings with limited access, multiple-story buildings, or enclosed shopping centers.

Unfortunately, there are times when the emergency has become too severe, even before the 9-1-1 notification or fire department response, for the responding crew to achieve a positive outcome. However, when an appropriate response time goal is combined with a well-designed deployment system, only anomalies like severe weather, poor traffic conditions, or multiple emergencies slow down the response system. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

For this assessment, total response time is the sum of the call processing / dispatch, crew turnout, and road travel time intervals, which is consistent with CFAI best practice recommendations.

2.4 COMMUNITY RISK ASSESSMENT

The third element of the Standards of Coverage (SOC) process is a community risk assessment. Within the context of an SOC study, the objectives of a community risk assessment include:

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

- Identifying the values at risk to be protected within the community or service area.
- Identifying the specific hazards with the potential to adversely impact the community or service area.
- Quantifying the overall risk associated with each hazard.
- Establishing 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 entire community.

2.4.1 Risk Assessment Methodology

The methodology employed by Citygate to assess community risks as an integral element of an 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 at risk to various hazards within the community or service area.
- Identification of the fire and non-fire hazards likely to impact the community or service area relative to services provided by the fire agency.
- Determination of the probability of occurrence for each hazard.
- Determination of the *likely* impact severity for each hazard by planning zone.
- Determination of overall risk by hazard considering probability of occurrence and likely impact severity according to the following table.

Table 6—Overall Risk Categories

Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Low*	*Moderate*	*High*
Unlikely	*Low*	*Low*	*Low*	*Moderate*	*High*
Possible	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Probable	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Frequent	*Low*	*Moderate*	*High*	*Extreme*	*Extreme*

2.4.2 Values to Be Protected

Broadly defined, *values* are those tangibles of significant importance or value to the community or jurisdiction that are potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people, buildings, critical facilities/infrastructure, and key economic, cultural, historic, or natural resources.

People

Residents, employees, visitors, and travelers in a community or jurisdiction are 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. At-risk populations

typically include children younger than 10 years, the elderly, and people housed in institutional settings. Key demographic data for the City includes the following:[8]

- More than 30 percent of the population is under 10 years of age or 65 years of age and older.
- The City's daytime population is 7 percent more than the resident population, indicating some employees live outside the City.
- The City's population is predominantly White (56 percent), followed by other races (34 percent), Black / African American (9 percent), and Asian (1 percent), with those of Hispanic/Latino ethnicity representing 42 percent of the population.
- Of the population over 24 years of age, slightly more than 82 percent have a high school or equivalent education.
- Of the population over 24 years of age, nearly 18 percent have an undergraduate, graduate, or professional degree.
- Of the population older than 15 years of age, 96 percent are in the workforce.
- The median household income is $59,555.
- The population below the federal poverty level is 11.1 percent.
- Nearly 15 percent of the population does not have health insurance coverage.

Buildings

The City has more than 6,500 housing units and approximately 650 businesses, including offices, professional services, retail sales, restaurants/bars, motels, churches, schools, government facilities, healthcare facilities, and other business types as described in **Appendix A**. Of note is the 1,300-acre Samsung semiconductor manufacturing campus being constructed in the southcentral section of the City, which includes an estimated six million square feet of planned building space.

Critical Facilities

The US Department of Homeland Security defines Critical Infrastructure / Key Resources as those physical assets essential to the public health and safety, economic vitality, and resilience of a community, such as lifeline utilities infrastructure, telecommunications infrastructure, essential government services facilities, public safety facilities, schools, hospitals, airports, etc. As shown in the following table, the Department identified 34 critical facilities in the City. A hazard

[8] Source: Esri Community Profile (2022 data) and US Census Bureau American Community Survey (ACS) data.

occurrence with significant impact severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Table 7—Critical Facilities – Taylor, TX

Critical Facility Category	Number
Communications	1
Education	5
Government Services	8
Healthcare	4
Public Safety	4
Transportation	3
Utility	9
Total	**34**

Source: City of Taylor

Cultural, Economic, Historic, and Natural Resources

The City has approximately 650 businesses employing nearly 9,000 people, as well as cultural, historic, and natural resources to protect, as identified in **Appendix A**.

2.4.3 Hazard Identification

Citygate utilized prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency- and jurisdiction-specific data and information to identify the hazards to be evaluated for this study. Following review and evaluation of the hazards identified in the 2018 City of Taylor Hazard Mitigation Plan (HMP), and the fire and non-fire hazards identified by the CFAI as they relate to services provided by the Department, Citygate evaluated the following six hazards for this risk assessment:

1. Building fire
2. Vegetation/wildland fire
3. Medical emergency
4. Hazardous material release/spill
5. Technical rescue
6. Aviation incident

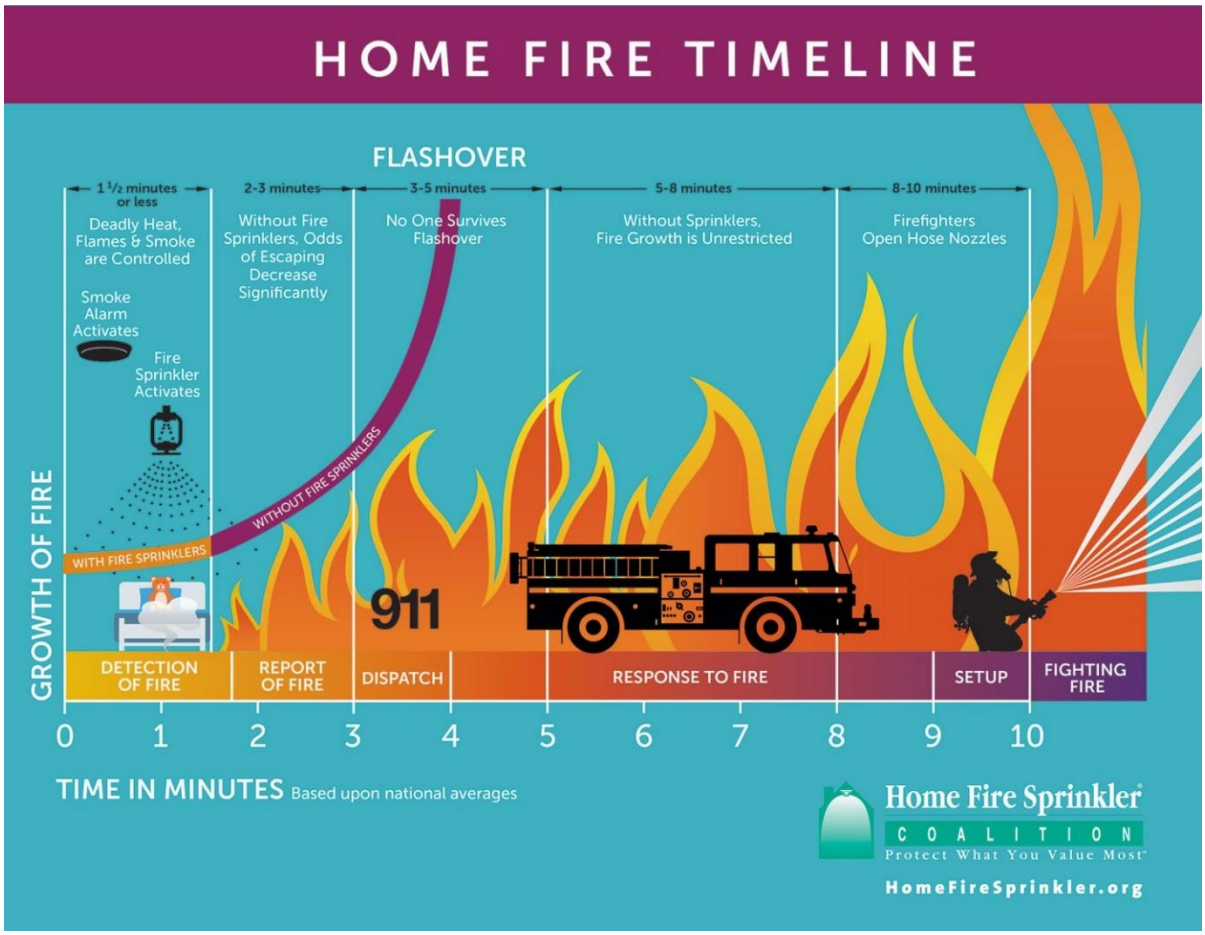
Because building fires and medical emergencies have the most severe time constraints if positive outcomes are to be achieved, following is a brief overview of building fire and medical emergency risk. **Appendix A** contains the full risk assessment for all six hazards.

Building Fire Risk

One of the primary hazards in any community is building fire. Building fire risk factors include building size, age, construction type, density, occupancy, and number of stories above ground level; required fire flow; proximity to other buildings; built-in fire protection/alarm systems; available fire suppression water supply; building fire service capacity; fire suppression resource deployment (distribution/concentration); staffing; and response time.

The following figure 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 3:00 to 5:00 minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

Figure 5—Building Fire Progression Timeline

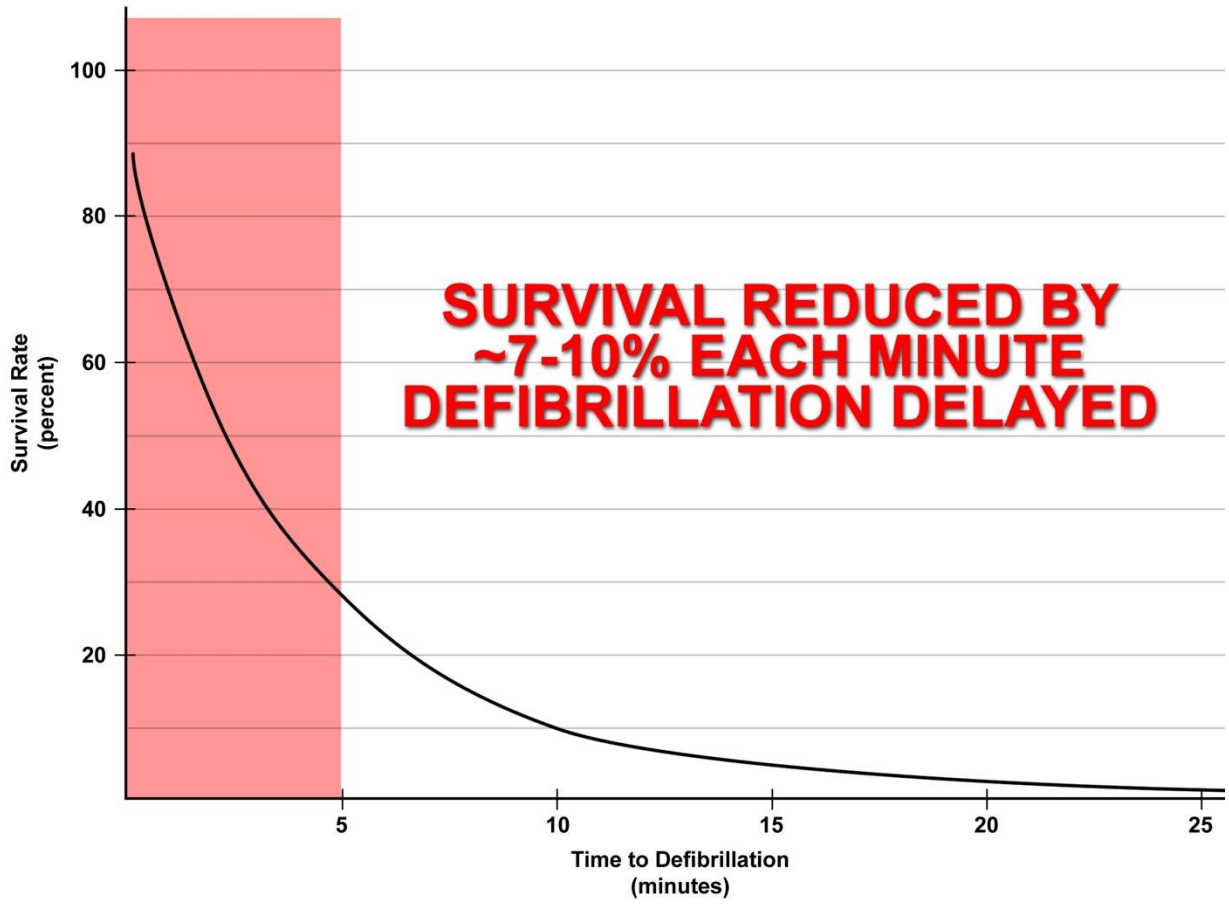


Source: http://www.firesprinklerassoc.org.

Medical Emergency Risk

Fire agency service demand in most jurisdictions is predominantly for medical emergencies. The following figure illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases.

Figure 6—Survival Rate versus Time of Defibrillation



The Department currently provides BLS pre-hospital emergency medical services, with operational personnel trained to the EMT level.

2.4.4 Risk Assessment Summary

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

1. The Department serves a diverse urban/suburban population with densities ranging from fewer than 75 to more than 3,000 people per square mile over a varied land use pattern.

2. The City's population is projected to more than double to nearly 40,000 by 2040.

3. The City has residential and non-residential buildings to protect, as identified in this assessment.

4. The City also has economic and other resource values to be protected, as identified in this assessment.

5. The City and County have mass emergency notification systems to effectively communicate emergency notifications and information to the public in a timely manner.

6. The City's overall risk for six hazards related to emergency services provided by the Fire Department range from **Low** to **High**, as summarized in the following table.

Table 8—Overall Risk by Hazard

Hazard		Planning Zone	
		Station 1	Station 2
1	Building Fire	*Moderate*	*Moderate*
2	Vegetation/Wildfire	*Low*	*Low*
3	Medical Emergency	*High*	*High*
4	Hazardous Materials	*Moderate*	*Moderate*
5	Technical Rescue	*Moderate*	*Moderate*
6	Aviation Incident	*Low*	*Low*

2.5 Critical Task Time Measures—What Must Be Done over What Time Frame to Achieve the Stated Outcome Expectation?

SOC Element 4 of 8
Critical Task Time Study

SOC studies use critical task information to determine the number of firefighters needed within a time frame to achieve desired objectives on fire and emergency medical incidents. The following tables illustrate critical tasks typical of building fire and medical emergency incidents, including the minimum number of personnel required to complete each task. These tables are composites from Citygate clients in urban/suburban departments similar to Taylor's, with units staffed with three personnel per engine or ladder truck. It is important to understand the following relative to these tables:

- It can take considerable time after a task is ordered by command to complete the task and achieve the desired outcome.

- Task completion time is usually a function of the number of personnel that are *simultaneously* available. The fewer firefighters available, the longer some tasks will take to complete. Conversely, with more firefighters available, some tasks are completed concurrently.
- Some tasks must be conducted by a minimum of two firefighters to comply with safety regulations. For example, two firefighters are required to search a smoke-filled room for a victim.

2.5.1 Critical Firefighting Tasks

The following table illustrates the critical tasks required to control a common single-family dwelling fire with four response units for a total ERF of **10** personnel (two engines—one of which is from mutual aid—one ladder truck, and one chief officer). These tasks are taken from typical fire department's operational procedures, which are consistent with the customary findings of other agencies using the SOC process. No conditions exist to override the Occupational Safety and Health Administration's (OSHA) two-in/two-out safety policy, which requires that firefighters enter atmospheres that are immediately dangerous to life and health, such as building fires, in teams of two while two more firefighters are outside and immediately ready to rescue them should trouble arise.

Scenario: *Simulated approximately 2,000-square-foot, two-story, residential fire with unknown rescue situation. Responding companies receive dispatch information typical for a witnessed fire. Upon arrival, they find approximately 50 percent of the second floor involved in fire.*

Table 9—First Alarm Residential Fire Critical Tasks – 10 Personnel

Critical Task Description		Personnel Required
First-Due Engine (3 Personnel)		
1	Conditions report	1
2	Establish supply line to hydrant	2
3	Deploy initial fire attack line to point of building access	1–2
4	Operate pump and charge attack line	1
5	Or skip the above and establish incident command	1
6	Conduct primary search within OSHA regulations	2
Second-Due Engine (3 Personnel)		
1	If necessary, establish supply line to hydrant	1–2
2	Deploy backup attack line	1–2
3	Establish Initial Rapid Intervention Team (IRIT)	2
First-Due Truck (3 Personnel)		
1	Secure utilities, if not already completed	1-2
2	Conduct initial search and rescue, if not already completed	2
3	Deploy ground ladders to roof	1–2
4	Establish horizontal or vertical building ventilation	1–2
5	Open concealed spaces as required	2
Chief Officer		
1	Transfer of incident command from first- or second-in company officer	1
2	Establish exterior command and incident safety	

Grouped together, the duties in the previous table form an ERF, or First Alarm Assignment. These distinct tasks must be performed to effectively achieve the desired outcome; arriving on-scene does not stop an emergency from escalating. As firefighters accomplish these tasks, the incident progression clock continues to run.

Fire in a building can double in size during its free-burn period before fire suppression is initiated. Studies have shown that a small fire can spread to engulf an entire room in fewer than 4:00 to 5:00 minutes after free burning has started. Once the room is completely superheated and involved in flashover, the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire suppression and search/rescue operations 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 life-threatening situation to both firefighters and any building occupants.

2.5.2 Critical Medical Emergency Tasks

The Department responds to more than 1,500 EMS incidents annually, including vehicle accidents, strokes, heart attacks, difficulty breathing, falls, childbirths, and other medical emergencies. For comparison, the following table summarizes the critical tasks required for a cardiac arrest patient.

Table 10—Cardiac Arrest Critical Tasks – 1 Engine/Truck + ALS Ambulance (Total 5 Personnel)

Critical Task		Personnel Required	Critical Task Description
1	Chest compressions	**1–2**	Compression of chest to circulate blood
2	Ventilate/oxygenate	**1–2**	Mouth-to-mouth, bag-valve-mask, apply O_2
3	Airway control	**1–2**	Manual techniques/intubation/cricothyroidotomy
4	Defibrillate	**1–2**	Electrical defibrillation of dysrhythmia
5	Establish I.V.	**1–2**	Peripheral or central intravenous access
6	Control hemorrhage	**1–2**	Direct pressure, pressure bandage, tourniquet
7	Splint fractures	**2–3**	Manual, board splint, HARE traction, spine
8	Interpret ECG	**2**	Identify type and treat dysrhythmia
9	Administer drugs	**2**	Administer appropriate pharmacological agents
10	Spinal immobilization	**2–5**	Prevent or limit paralysis to extremities
11	Extricate patient	**3–4**	Remove patient from vehicle, entrapment
12	Patient charting	**1–2**	Record vitals, treatments administered, etc.
13	Hospital communication	**1–2**	Receive treatment orders from physician
14	Treat en route to hospital	**2–3**	Continue to treat/monitor/transport patient

2.5.3 Critical Task Analysis and Effective Response Force Size

The time required to complete the critical tasks necessary to stop the escalation of an emergency (as shown in the previous tables) must be compared to outcomes. As shown in nationally published fire service time-versus-temperature tables, a building fire will escalate to the point of flashover after approximately 4:00 to 5:00 minutes of free burning in an enclosed room. At this point, the entire room is engulfed in fire, the fire extends rapidly both horizontally and vertically, and human survival near or in the room of fire origin becomes impossible. Additionally, brain death begins to occur within 4:00 to 6:00 minutes of the heart stopping. Thus, the ERF must arrive in time to prevent these emergency events from becoming worse.

The Department's daily staffing provides an ERF of 10 firefighters to a building fire—if they can arrive in time—which the statistical analysis of this report will discuss in depth. Mitigating an emergency event is a team effort once the units have arrived. This refers to the *weight* of response analogy; if too few personnel arrive too slowly, the emergency will escalate instead of improving. The outcome times, of course, will be longer and yield less-desirable results if the arriving force is smaller or arrives later.

The quantity of staffing and the arrival time frame can be critical in a serious fire. Fires in older or multiple-story buildings could require the initial firefighters to rescue trapped or immobile occupants. If the ERF is too small, rescue and firefighting operations *cannot* be conducted simultaneously.

Fires and complex medical incidents require additional units to arrive in time to complete an effective intervention. Time is one factor that comes from *proper station placement*. Performance also comes from *adequate staffing* and training. However, where fire stations are spaced too far apart, and one unit must cover another unit's area or multiple units are needed, these units can be too far away and the emergency will escalate, result in a less-than-desirable outcome, or both.

Previous critical task studies conducted by Citygate, the National Institute of Standards and Technology, and the NFPA find that all units need to arrive at a moderate-risk building fire within 11:30 minutes (from the time of 9-1-1 call) with a total of 16–17 firefighters to be able to perform the tasks of rescue, fire suppression, and ventilation simultaneously and effectively.

A question one might ask is, "If fewer firefighters arrive, *what* from the list of identified tasks 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 of the hose line above the first floor in a multiple-story building. Rescue must be conducted by at least two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Effective deployment is about the **speed** *(travel time)* and the **weight** *(number of firefighters)* of the response.

An initial response of 10 personnel is **insufficient** to handle a moderate hazard confined building fire; however, even this ERF will be seriously slowed if the fire is above the first floor in a low-rise apartment building or commercial/industrial building. This is where the capability to add additional personnel and resources to the standard response becomes critical.

Given that the Department's ERF plan delivers 10 personnel to a building fire, it reflects a goal to confine serious building fires to or near the room of origin and to prevent the spread of fire to adjoining buildings. This is a typical desired outcome in urban/suburban communities and requires more firefighters more quickly than the typical rural outcome of keeping the fire contained to the building, not room, of origin.

The Department's current physical response to building fires is, in effect, its de facto deployment measure—*if those areas are within a reasonable travel time from a fire station*. Thus, this becomes the baseline policy for the deployment of firefighters.

2.6 Distribution and Concentration Studies—How the Location of First-Due and First Alarm Resources Affects Emergency Incident Outcomes

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

The Department's service area is served by two fire stations deploying the resources and staffing identified in Section 2.1.1. Using geographic mapping tools, it is appropriate to understand what the existing stations do and do not cover within specified travel time goals, if there are any coverage gaps, 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 control routine emergencies before they escalate and require additional resources.
- **Concentration** – the spacing of fire stations sufficiently close to each other so that more complex emergency incidents can quickly receive sufficient resources from multiple fire stations. As indicated, this is known as the **Effective Response Force** (ERF) 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.

To analyze first-due fire unit travel time coverage, Citygate utilizes Esri's StreetMap Premium, a geographic mapping tool that can measure travel time over a street network. For this calculation, Citygate used the base map and street travel speeds calibrated to actual fire apparatus travel times from previous responses to simulate real-world travel time coverage. Using this tool, Citygate ran several deployment tests and measured their impact on the service area. A 4:00-minute first-due and 8:00-minute ERF *travel* time were used for this analysis consistent with best practice response performance goals for positive outcomes in urban/suburban areas.

2.6.1 Deployment Baselines

All maps referenced can be found in **Volume 2—Map Atlas**.

Map #1 – General Geography, Station Locations, and Response Resource Types

Map #1 shows the City boundaries and fire station locations. This is a reference map for other maps that follow. Station symbols denote the type of staffed fire apparatus at each station. The engine and the ladder truck are staffed with a minimum of three personnel each.

Map #2 – Risk Assessment: Risk Planning Zones

This map shows the two planning zones used for the risk assessment element of this study, each of which correlates with the respective fire station first-due response area.

Map #2a – Risk Assessment: Population Density

Map #2a shows the City's population density by census block. As the map illustrates, the population density ranges from fewer than 75 to more than 3,000 people per square mile.

Map #3 – Station Distribution: 4:00-Minute First-Due Travel Coverage

This map shows in green the 72.4 percent of the total public road miles in the City that should be expected to be reached within 4:00 minutes of travel time from the Department's two fire stations *without traffic congestion* and assuming the responding unit is in station. While 72 percent coverage is considered good urban/suburban-level coverage to facilitate desired outcomes, note the gap in coverage west of Highway 95 between the two stations that is likely reachable within 5:00 minutes travel time. Citygate also modeled 4:00-minute travel time coverage with automatic aid, however there was no change in coverage due to the nearest automatic aid engine in Hutto being more than 4:00 minutes travel time from Taylor.

The purpose of response time modeling is to determine response time coverage across a jurisdiction's geography and road network. There should be some overlap between station areas so that a second-due unit can have a chance of an acceptable response time when it responds to a call in a different station's first-due response area.

Map #4 – Station Distribution: Insurance Services Office 1.5-Mile Coverage

Map #4 displays the Insurance Services Office (ISO) recommendation that urban fire stations be spaced three miles apart to cover a 1.5-mile *distance* response area. Depending on a jurisdiction's road network, the 1.5-mile measure typically equates to a 3:30- to 4:00-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As can be seen, the 1.5-mile ISO coverage for the City is significantly less than the 4:00-minute *travel time* coverage in Map #3.

Map #5 – 8:00-Minute ERF Travel Coverage

Citygate modeled 8:00-minute travel time for a minimum initial ERF of two units stationed in Taylor—one engine, one ladder truck, and one chief officer. A second ERF engine from Hutto can only reach the western limits of the City in a travel time of 8:00 minutes. In Citygate's experience, this is very *weak and insufficient ERF* travel time coverage for an urban/suburban community the size of Taylor and demonstrates the need for at least one additional staffed apparatus within the City to provide a more robust multi-unit response that facilitates desired community outcomes.

Map #6 – 8:00-Minute Ladder Truck Travel Coverage from Station 1

Map #6 shows that the Department's single ladder truck can be expected to reach 91 percent of the public road miles in the City within 8:00 minutes travel time from Station 1, which is *excellent* urban/suburban coverage.

Map #7 – 8:00-Minute Chief Officer Travel Coverage from Station 1

This map shows that a chief officer can be expected to reach nearly 93 percent of public road miles within the City in 8:00 minutes' travel time from the Administrative Offices adjacent to Station 1. The two chief officers work 8:00 a.m. – 5:00 p.m. Monday through Friday.

Map #8 – All Incident Locations

Map #8 shows the location of all incident responses from January 1, 2018, through December 31, 2021, illustrating calls for service occurred on nearly every street segment in the City.

Map #9 – Emergency Medical Services and Rescue Incident Locations

This map illustrates the location of only the emergency medical and rescue incident locations over the same four-year period. With most of the calls for service being medical emergencies, virtually all road segments of the City utilized pre-hospital emergency medical services. This data is consistent with the population densities in Map #2a since humans drive EMS calls for service.

Map #10 – All Fire Locations

Map #10 displays the location of all fires within the service area over the same period, which includes any type of fire, including vehicle, dumpster, vegetation, and building fires. There are obviously fewer fires than medical or rescue calls. Even given this fact, it is evident that fires occur in nearly all sections of the City.

Map #11 – Building Fire Locations

This map shows the locations of all building fire incidents. While the number of building fires is obviously a smaller subset of total fires, it shows that building fires occurred mainly in the core area of the City in both fire station response areas.

Map #12 – Emergency Medical Services and Rescue Incident Location Densities

This map displays, by mathematical density, where clusters of EMS and rescue incident activity occurred over the four-year study period. In this set, the darker density color plots the highest concentration of EMS and rescue incidents. This type of map makes the location of frequent workload more meaningful than simply mapping the locations of all EMS and rescue incidents, as was shown in Map #9.

This perspective is important because and effective deployment system needs an overlap of units to ensure the delivery of multiple units when needed for more serious incidents or to handle simultaneous calls for service, as is evident for the higher medical incident density areas of the City.

Map #13 – Fire Incident Location Densities

Map #13 shows the hot spots for all types of fire incidents (as shown in Map #10).

Map #14 – Building Fire Incident Location Densities

Map #14 shows the hot spots for building fire incidents (as shown in Map #11).

Scenario 1 – 4:00-Minute First-Due Travel Coverage with Proposed Station 3

Scenario 1 shows that 4:00-minute first-due travel time with a proposed Station 3 on the south side of Wesley Miller Lane—east of Route 973 across from Taylor High School—should reach *79 percent* of total public road miles in the City compared to 72 percent from the existing two stations.

Scenario 1a – 8:00-Minute ERF Travel Coverage with Proposed Station 3

Scenario 1a shows what the Department's initial ERF could be with two City-based engines, one ladder truck, and one chief officer—which should reach *88 percent* of total public road miles in the City, compared to zero percent from the existing two stations and reliance on automatic aid from Hutto for a second ERF engine.

2.6.2 Travel Time Road Mile Coverage Measures

In addition to the visual displays of coverage that maps provide, the following table summarizes travel time coverage.

Table 11—Travel Time Coverage Summary

Map	Travel Time Measure	Total Public Road Miles	Road Miles Covered	Percent of Total Miles Covered
3	**4:00-Minute First-Due**	178	**129**	**72.4%**
3a	**4:00-Minute First-Due with Automatic Aid**	178	**129**	**72.4%**
4	**ISO 1.5-Mile Station Spacing**	178	**91**	**51.1%**
5	**8:00-Minute ERF – Two City Units**	178	**162**	**90.7%**
6	**8:00-Minute Truck from Station 1**	178	**162**	**90.7%**
7	**8:00-Minute Chief Officer from Station 1**	178	**166**	**92.8%**
Scenario 1	**4:00-Minute First-Due with Proposed Station 3**	178	**141**	**78.9%**
Scenario 1a	**8:00-Minute ERF with Proposed Station 3**	178	**157**	**88.2%**

As the table shows, a 4:00-minute best practice provides first-unit coverage to 72 percent of the City's total public road miles, which Citygate considers *good* coverage for a single unit to facilitate desired urban/suburban outcomes. The 8:00-minute ERF coverage is *extremely poor*—not as it relates to public road miles, but as it contains only two City-based units.

Finding #4: The Department's two fire station locations can be expected to provide 4:00-minute first-unit travel time coverage to only 72 percent of the total public road miles in the City, which is weak urban/suburban-level coverage to facilitate positive outcomes.

Finding #5: The Department cannot provide 8:00-minute recommended best practice multiple-unit ERF travel time coverage with only two units inside the City. The Department is reliant on external mutual aid assistance to provide a second ERF engine from Hutto or further depending on availability, which is insufficient multi-unit coverage for a city of Taylor's size.

2.7 STATISTICAL ANALYSIS

SOC ELEMENT 7 OF 8
RELIABILITY & HISTORICAL RESPONSE EFFECTIVENESS STUDIES

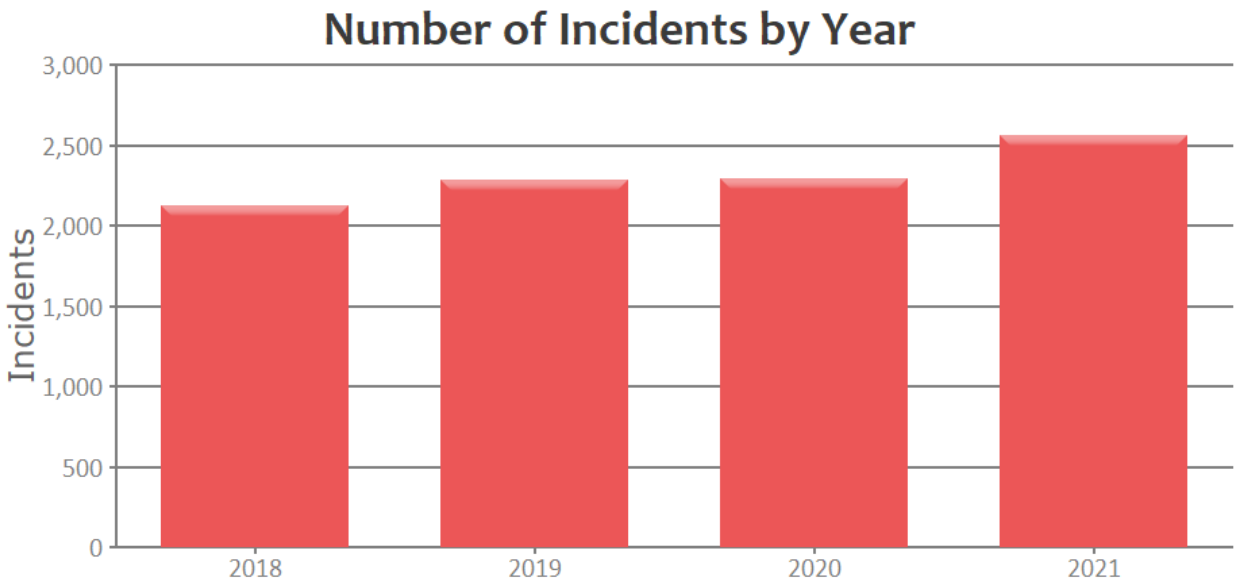
The maps described in Section 2.6 and presented in **Volume 2—Map Atlas** show the ideal situation for response times and response effectiveness given no competing calls, units out of place, or simultaneous calls for service. Examination of the response time data provides a picture of actual response performance with simultaneous calls, rush hour traffic congestion, units out of position, and delayed travel time for events such as periods of severe weather.

The following subsections provide summary statistical information regarding the Department and its services.

2.7.1 Service Demand

The Department provided four years of data covering the period from January 1, 2018, through December 31, 2021, for this analysis. The data was gathered from multiple sources, including more than 9,000 incidents, as summarized in the following figure. As the figure illustrates, service demand increased nearly 21 percent over the four-year study period, including a more than an 11 percent increase in 2021 over the previous year.

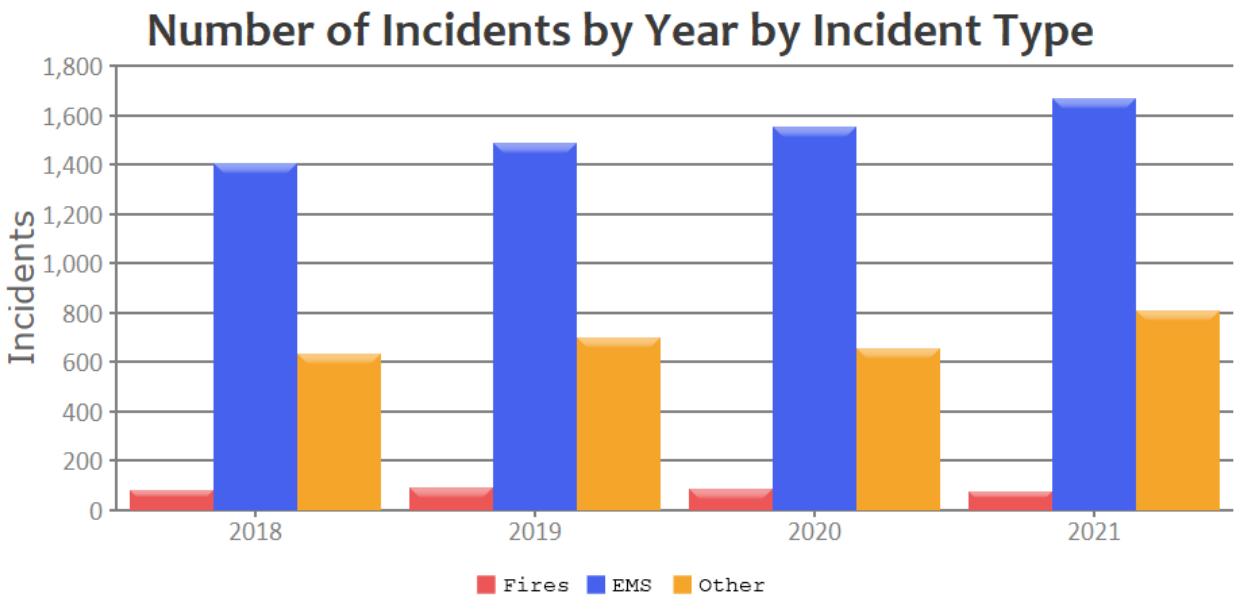
Figure 7—Total Service Demand by Year



Finding #6:	Service demand increased nearly 21 percent over the four-year study period, including a more than 11 percent increase in 2021 over the previous year.

The following figure illustrates that 66 percent of all calls for service are EMS-related, with fires of all types accounting for just under 4 percent of total service demand.

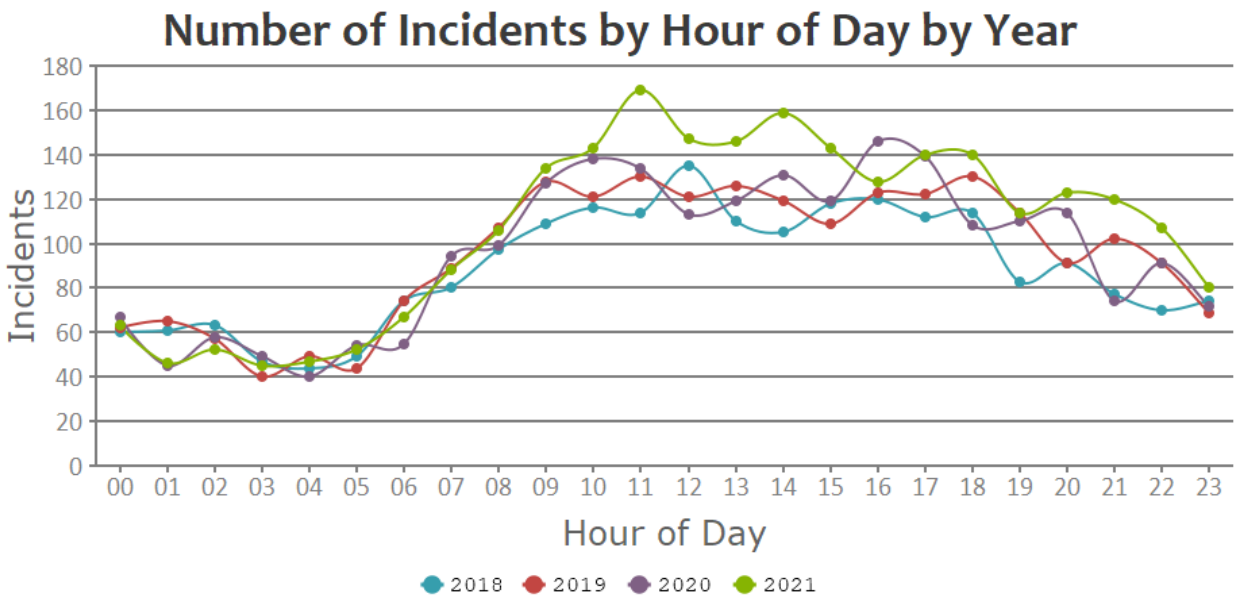
Figure 8—Number of Incidents by Year by Incident Type



Finding #7:	EMS incidents comprise 66 percent of total service demand while fires account for less than 4 percent.

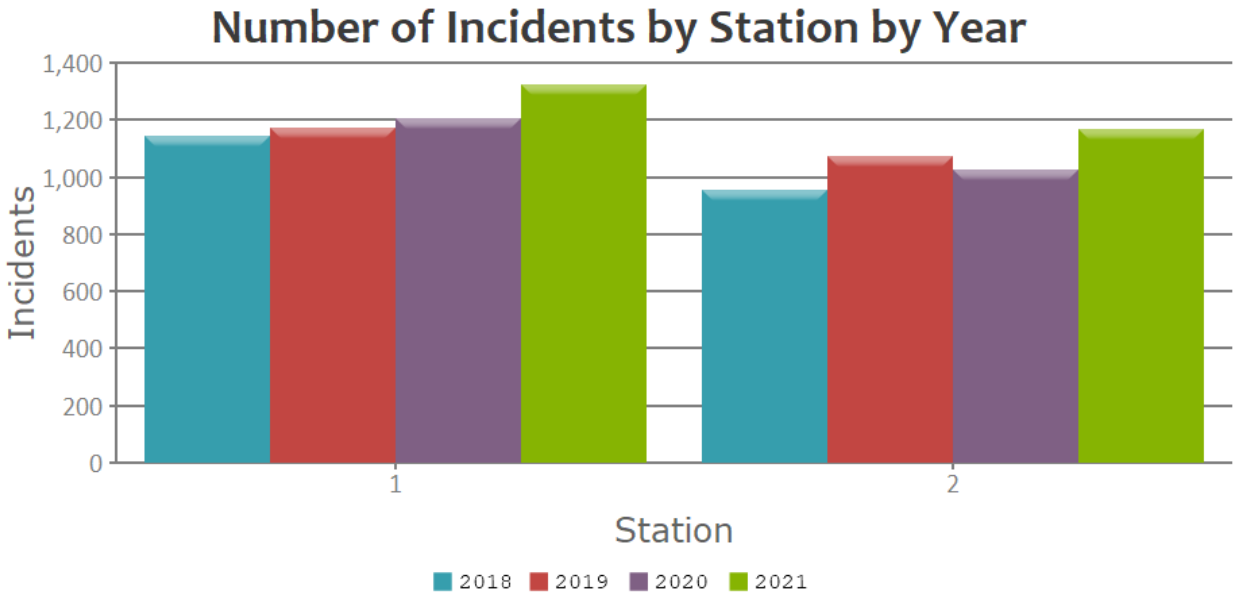
The following figure shows service demand by hour of day and illustrates peak service demand occurs from mid-morning through late evening, although calls for service occur at all hours of the day and night.

Figure 9—Number of Incidents by Hour of Day by Year



The following figure shows service demand by station area by year, and also reflects the higher increase in 2021 (at both stations) than previous years.

Figure 10—Number of Incidents by Station by Year



The following table ranks service demand by National Fire Incident Reporting System (NFIRS) three-digit incident type code over the four-year study period, with the corresponding percentage of total service demand over the same period. Only incident types with more than 100 calls for service over the four years are shown.

Table 12—Service Demand by Incident Type (2018–2021)

Incident Type	Total	Percent of Total
311 Medical assist, assist EMS crew	**5,559**	60.03%
611 Dispatched and canceled en route	**548**	5.92%
554 Assist invalid	**466**	5.03%
324 Motor vehicle accident no injuries	**269**	2.90%
322 Vehicle accident with injuries	**210**	2.27%
735 Alarm system sounded due to malfunction	**159**	1.72%
700 False alarm or false call, other	**140**	1.51%
553 Public service	**139**	1.50%
444 Power line down	**107**	1.16%
412 Gas leak (natural gas or LPG)	**106**	1.14%
111 **Building fire**	**101**	1.09%

The following table ranks incidents by property use. Only property uses with 100 or more calls for service over the four years are shown.

Table 13—Incidents: Quantity – Property Use by Year

Property Use	Total	Percent of Total
419 1 or 2 family dwelling	**4,178**	45.11%
429 Multi-family dwellings	**1,187**	12.82%
311 24-hour care nursing homes, 4 or more persons	**485**	5.24%
961 Highway or divided highway	**459**	4.96%
962 Residential street, road, or residential driveway	**310**	3.35%
UUU Undetermined	**209**	2.26%
965 Vehicle parking area	**186**	2.01%
963 Street or road in commercial area	**122**	1.32%
960 Street, other	**118**	1.27%
400 Residential, other	**115**	1.24%
340 Clinics, doctors' offices, hemodialysis centers	**100**	1.08%

2.7.2 Simultaneous Incident Activity

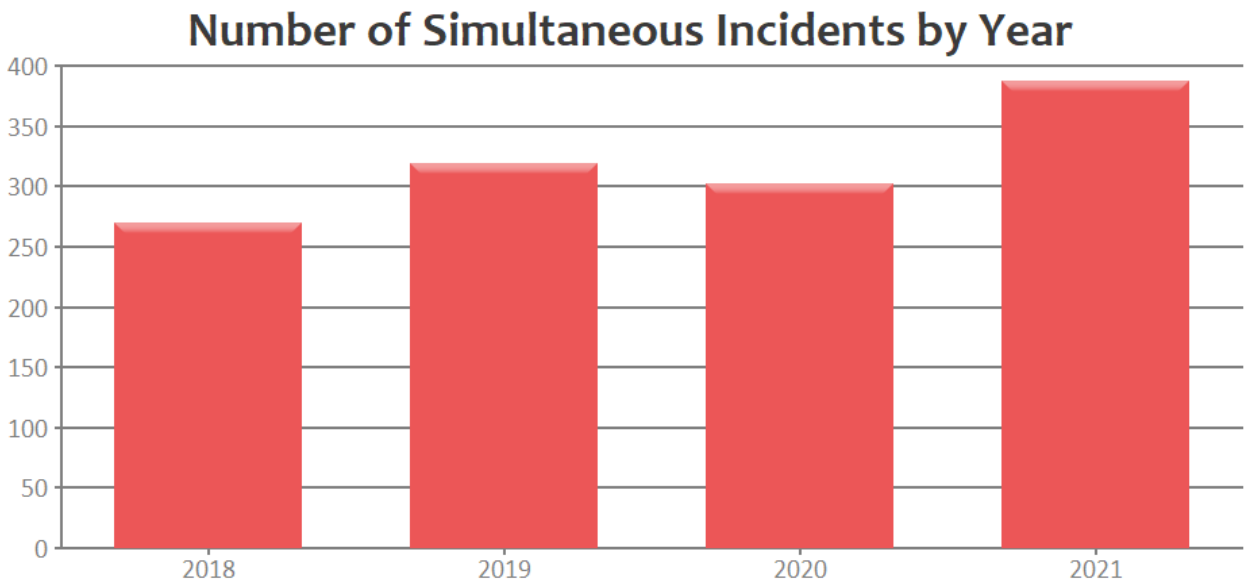
The following table shows that 15 percent of all incidents occurred while one or more other incidents were underway in 2021.

Table 14—Simultaneous Incident Activity – 2021

Number of Simultaneous Incidents	Percentage
1 or more	**15.16%**
2 or more	1.72%
3 or more	0.12%

The following figure shows that simultaneous incident activity increased approximately 43 percent over the four-year study period, with a 28 percent increase in 2021 from 2020.

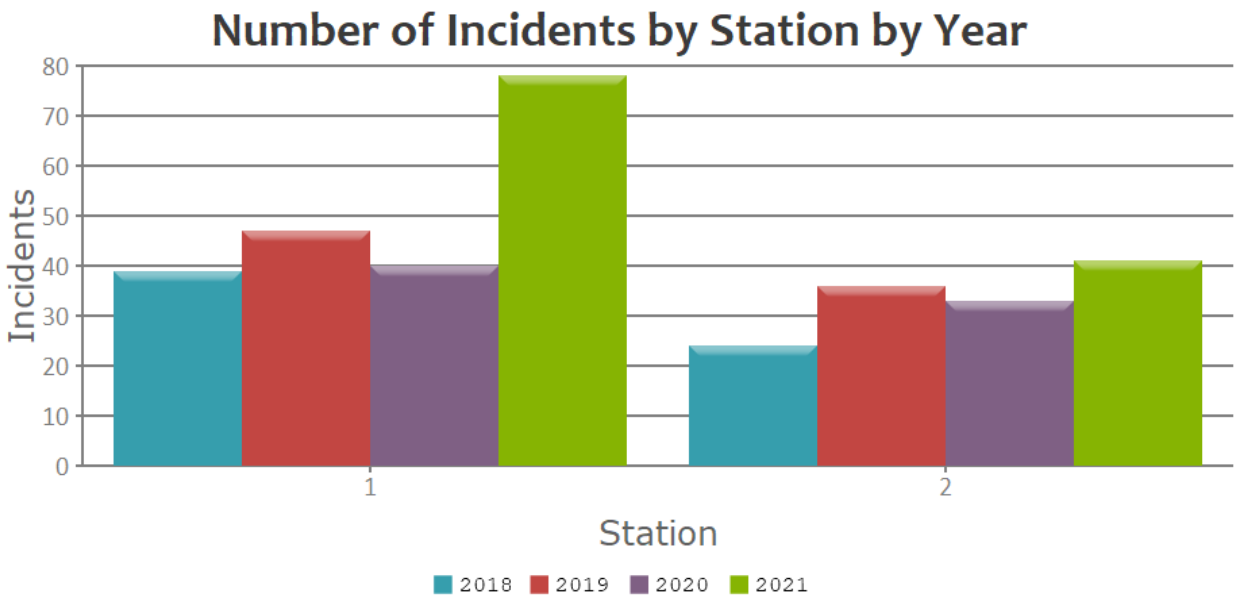
Figure 11—Simultaneous Incident Activity by Year



In larger jurisdictions, simultaneous incidents in different station areas have very little operational consequence; however, when simultaneous incidents occur within a single station area, there can be significant delays in response times when those calls require a response from another station area.

The following figure shows single-station simultaneous incident activity primarily impacted Station 1.

Figure 12—Single-Station Simultaneous Incident Activity by Station by Year



Finding #8:	At least one or more simultaneous incidents occurs 15 percent of the time, primarily impacting Station 1.
Finding #9:	Simultaneous incident activity increased 43 percent over the four-year study period, with a 28 percent increase in 2021 over the previous year.

2.7.3 Apparatus Deployment – Simultaneous Incident Impact

The following table shows **apparatus** responses for 2021. The **columns** show the home station for primary apparatus resources. The **rows** identify the station area where incidents occurred.

The table displays the number of responses to incidents in each station area. Highlighted cells indicate apparatus operating in their home station area. In 2021, Station 1 contributed 117 responses into Station 2's response area, and Station 2 contributed 170 responses into Station 1's response area, showing simultaneous incidents in the same station area occur a relatively low percentage of the time.

Table 15—Apparatus: Quantity – Assigned Station by Incident in Station – Primary Apparatus – 2021

Station Area	Assigned Station Apparatus		Total
	Station 1	Station 2	
Station 1	**1,314**	170	**1,484**
Station 2	117	**1,184**	**1,301**
Total	**1,431**	**1,354**	**2,785**

2.7.4 Unit-Hour Utilization

The unit-hour utilization percentage for apparatus is calculated using the number of responses and the duration of those responses to show the percentage of time a unit is committed to an active incident during a given hour of the day. In Citygate's experience, a unit-hour utilization of 30 percent or higher over *multiple* consecutive hours becomes the point at which other responsibilities such as training are not completed. The following table shows unit-hour utilization for the Department's two staffed apparatus for 2021, illustrating that neither company is nearing the 30 percent saturation rate.

Table 16—Unit-Hour Utilization (2021)

Hour of Day	Truck 1	Engine 2
0:00-1:00	3.55%	3.20%
1:00-2:00	4.02%	3.10%
2:00-3:00	2.36%	2.95%
3:00-4:00	2.97%	2.83%
4:00-5:00	1.76%	3.69%
5:00-6:00	3.92%	2.67%
6:00-7:00	3.68%	3.43%
7:00-8:00	5.11%	6.82%
8:00-9:00	8.76%	8.29%
9:00-10:00	6.00%	8.36%
10:00-11:00	5.93%	6.68%
11:00-12:00	10.25%	8.06%
12:00-13:00	5.92%	6.78%
13:00-14:00	6.43%	6.89%
14:00-15:00	9.88%	8.71%
15:00-16:00	9.82%	8.17%
16:00-17:00	5.60%	6.68%
17:00-18:00	8.94%	6.72%
18:00-19:00	7.14%	10.12%
19:00-20:00	6.04%	5.30%
20:00-21:00	5.57%	8.98%
21:00-22:00	5.94%	7.57%
22:00-23:00	8.49%	6.74%
23:00-24:00	5.11%	6.41%
Overall	**5.97%**	**6.21%**

2.7.5 Aid Activity

The following table illustrates aid given and received from outside the City over the four-year study period. As the table shows, the Department provided more than twice as much aid as it received.

Table 17—Aid Type by Year

Aid Type	2018	2019	2020	2021	Total
Aid Received	18	25	21	17	**81**
Aid Given	47	46	61	28	**182**
Total	**65**	**71**	**82**	**45**	**263**

2.7.6 Operational Performance

This section summarizes response performance for the first apparatus to arrive at emergency incidents, including the number of minutes and seconds necessary for 90 percent completion of:

- Call processing / dispatch
- Turnout
- Travel
- Dispatch to arrival
- Call to arrival

The following response performance analysis includes only fire and EMS emergency responses, which are the most time-sensitive and severe threat to life and property calls for service.

Call Processing / Dispatch

Call processing measures the time interval from receipt of the 9-1-1 call until completion of the dispatch notification. Call processing performance depends on what is being measured. If the first incident timestamp takes place at the time the public safety answering point (PSAP) physically answers the 9-1-1 call (at times, calls can be briefly held in queue), then call processing begins at *PSAP Time*. If a later time stamp is used well into the dispatcher listening to the caller, such as *Alarm Time* (typically when information has been entered into the computer and the *Enter* key is pressed or the call is transferred to a separate fire dispatch center), the processing time segment only represents a portion of the entire processing operation.

In addition, not all requests for assistance are received via landline 9-1-1. Generally, there are numerous ways that requests for assistance are received, including landline telephone, cellular telephone, SMS text message, fire or police officer-initiated requests, TTY/TDD operator, etc., each of which has a separate timestamp at a different point in the call processing operation. This is not as much of a factor if most requests are received via 9-1-1 PSAP.

It is important to note that the most recent NFPA best practice recommendation for dispatch processing time for high-priority fire and EMS emergencies with a significant threat to life or

property loss is 1:00 minute, 90 percent of the time.[9] In Citygate's experience, very few dispatch centers can achieve that level of performance, thus Citygate continues to use a 1:30-minute best practice goal for call processing / dispatch performance.

The following table summarizes 90th percentile call processing / dispatch performance by year.

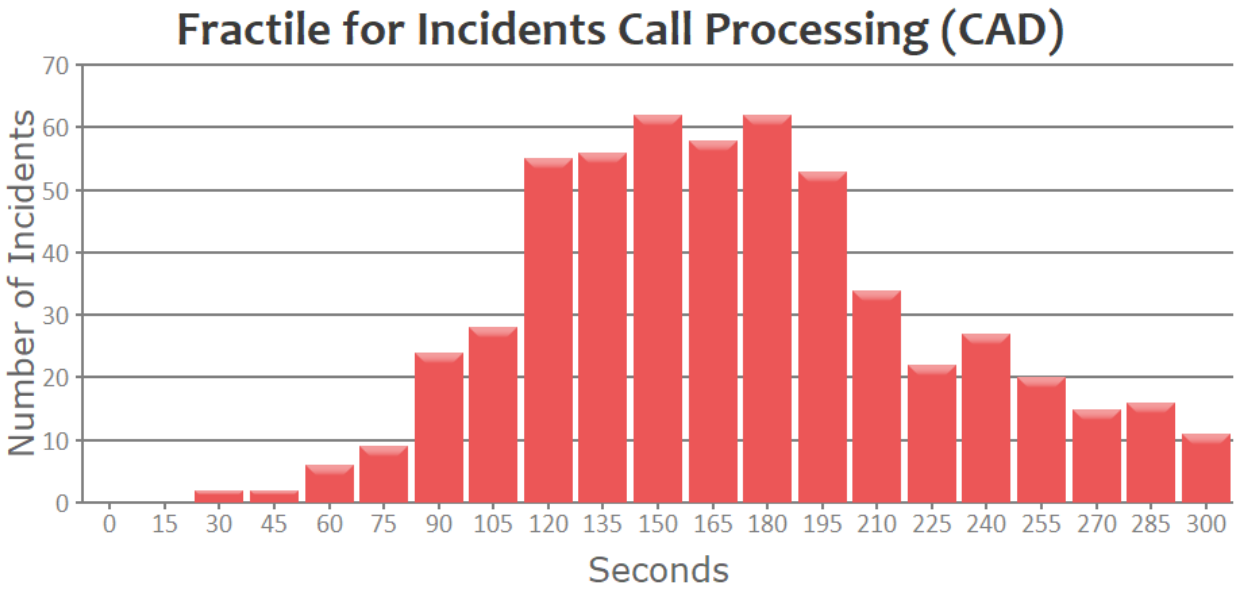
Table 18—90th Percentile Call Processing / Dispatch Performance

Call Processing / Dispatch	Overall	2018	2019	2020	2021
Department-Wide	**3:47**	2:51	3:50	4:11	4:04

As the table shows, call processing / dispatch performance at 3:47 minutes is *2:17 minutes slower* (152 percent) than the 1:30-minute best practice standard. This performance also *slowed nearly 43* percent over the four-year study period. Poor call processing performance is response time that cannot be regained with faster crew turnout or travel performance.

The following figure shows that peak call processing occurs at 2:30–3:00 minutes, with a high number of calls taking even longer.

Figure 13—Fractile for Call Processing Performance



[9] Source: NFPA 1221 (2019 Edition).

Finding #10: At 3:47 minutes, 90th percentile call processing / dispatch performance is *more than 150 percent slower* than the 1:30-minute recommended best practice goal and slowed nearly 43 percent over the four-year study period.

Turnout

Turnout is the time interval from completion of the dispatch notification until the start of apparatus travel toward the incident. While the most recent NFPA recommendation for crew turnout performance is 1:00 minute at 90 percent reliability for EMS incidents and 1:20 minutes at 90 percent reliability for fire incidents,[10] in hundreds of fire department studies, Citygate has found that few, if any, departments are able to achieve this level of performance. Thus, for many years Citygate has recommended a 2:00-minute best practice goal for crew turnout at 90 percent or better reliability. The following table summarizes the Department's 90th percentile crew turnout performance by year and shows overall performance over the four-year study period was *29 percent slower* than the 2:00-minute recommended best practice goal.

Table 19—90th Percentile Turnout Performance

Crew Turnout	Overall	2018	2019	2020	2021
Department-Wide	**2:35**	2:31	2:32	2:38	2:37

The following table displays turnout performance by time of day using six-hour time blocks: AM1 is from midnight to 5:59 a.m., AM2 is from 6:00 a.m. to 11:59 a.m., PM1 is from noon to 5:59 p.m., and PM2 is from 6:00 p.m. to 11:59 p.m. As the table shows, turnout performance is slower than the 2:00-minute goal at all hours and is slowest during early morning sleeping hours, which is to be expected.

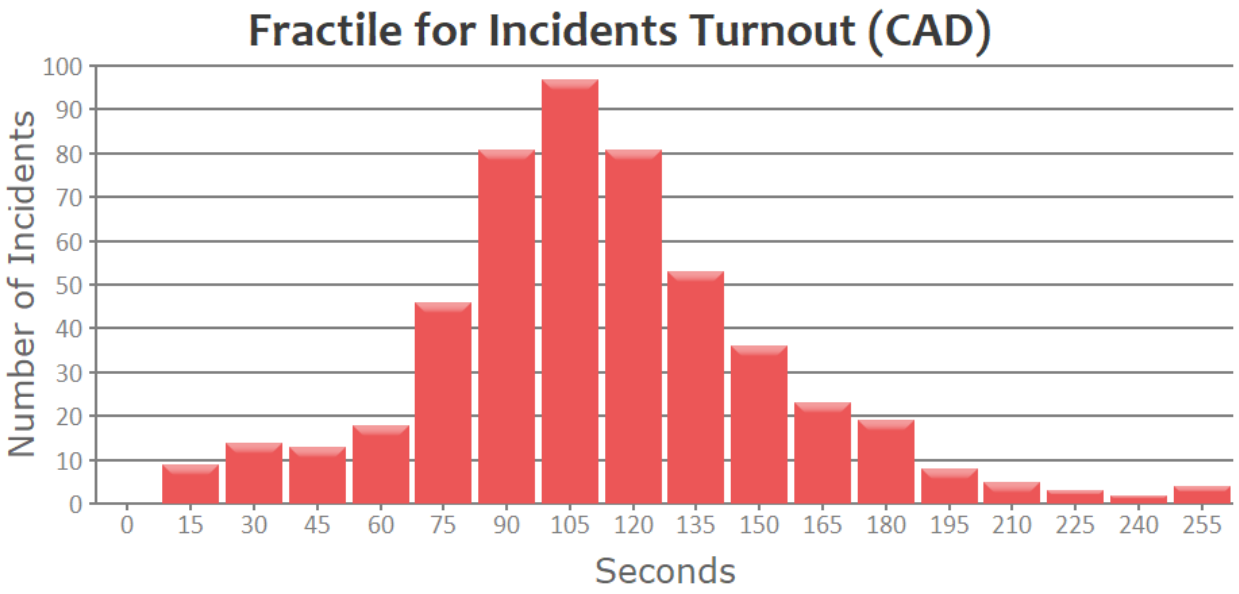
Table 20—Turnout Performance by Six-Hour Time Blocks

Station	AM1	AM2	PM1	PM2
Station 1	3:26	2:19	2:16	2:18
Station 2	3:20	2:30	2:18	2:32

The following figure shows that peak crew turnout occurs at 1:45 minutes; however, a significant number of calls for service take longer than the 2:00-minute best practice goal.

[10] Source: NFPA 1710 (2020 Edition).

Figure 14—Fractile for Turnout Performance



Finding #11: Crew turnout performance is 35 seconds (29 percent) *slower* than the 2:00-minute recommended best practice goal.

Fire Station Distribution: First-Unit Travel

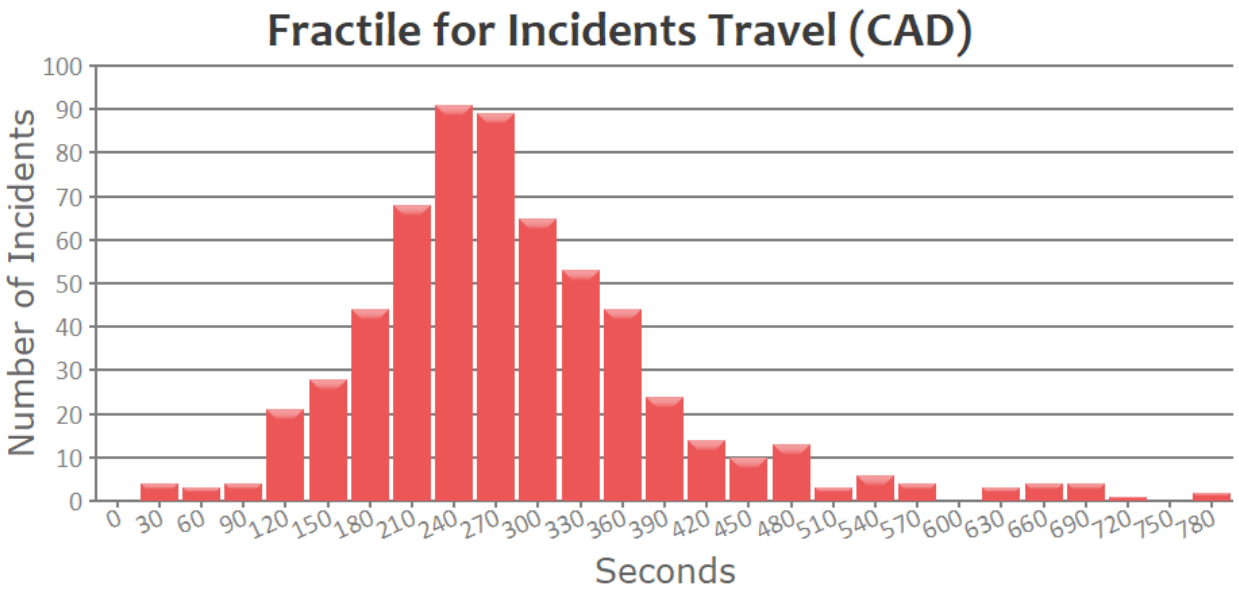
Travel performance measures the time interval from the beginning of first-due apparatus movement to arrival at the emergency incident. For urban/suburban jurisdictions, 4:00 minutes is the recommended best practice goal to facilitate positive outcomes. As the following table shows, the Department's 90th percentile first-unit travel performance is nearly *2:30 minutes slower* (61 percent) than the Citygate- and NFPA-recommended 4:00-minute best practice goal for urban communities to facilitate positive outcomes.

Table 21—90th Percentile First Unit Travel Performance

First Unit Travel	Overall	2018	2019	2020	2021
Department-Wide	**6:27**	6:23	6:18	6:19	6:41

The following figure shows peak travel performance occurs at 4:00 minutes (240 seconds); however, there are a large number of fire and EMS calls with more than 4:00 minutes travel time.

Figure 15—Fractile for First-Due Travel Performance



Finding #12: The Department's 90th percentile first-unit travel performance is nearly *2:30 minutes slower* (61 percent) than the Citygate- and NFPA-recommended 4:00-minute best practice goal for urban areas to facilitate positive outcomes.

Fire Station Distribution: Call to First-Unit Arrival

Call to first-unit arrival performance is a fire agency's ***primary customer service metric*** that measures time from receipt of the 9-1-1 call until the first unit arrives at the emergency incident. For urban population areas, Citygate recommends a 7:30-minute first-unit call-to-arrival goal at 90 percent compliance.[11] As the following table shows, the Department's 90th percentile call-to-arrival performance is *3:41 minutes slower* (49 percent) than the 7:30-minute recommended best practice goal, and trending slower each year.

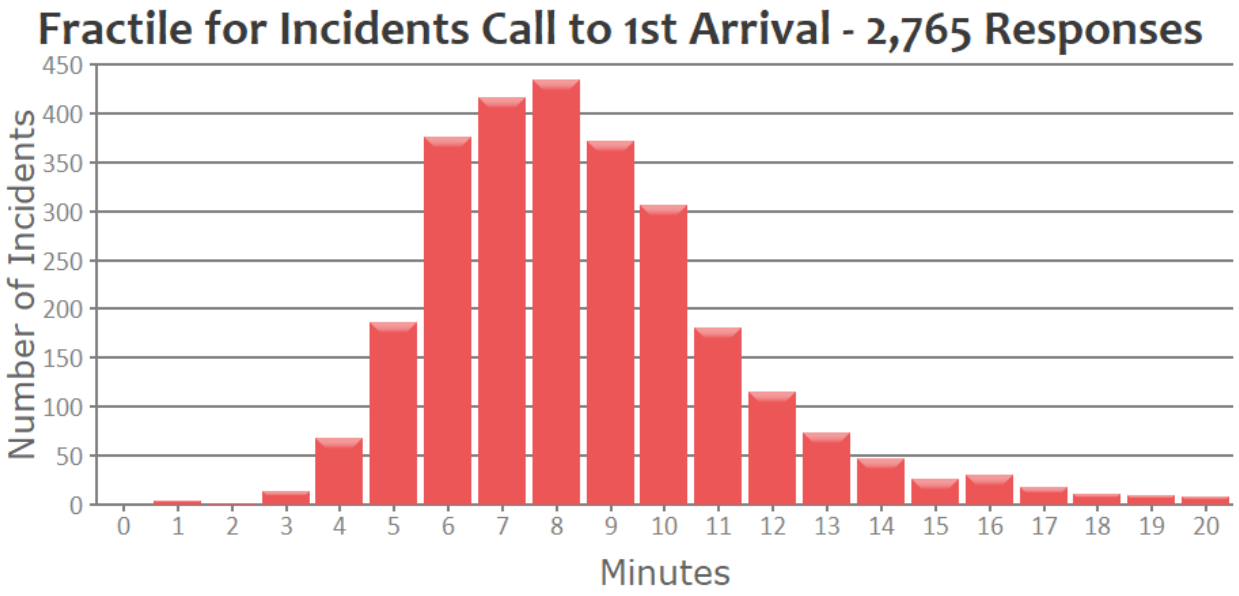
Table 22—90th Percentile Call to First-Unit Arrival Performance

Call to First Unit Arrival	Overall	2018	2019	2020	2021
Department-Wide	**11:11**	9:44	10:55	11:41	12:04

[11] The 7:30-minute call to first-unit arrival goal in urban areas includes 1:30 minutes for call processing / dispatch, 2:00 minutes for crew turnout, and 4:00 minutes for travel.

The following figure illustrates peak call to first unit arrival performance occurs at 8:00 minutes, with the right shifted graph showing a high number of fire and EMS incidents with longer call-to-arrival time.

Figure 16—Fractile for First-Unit Call-to-Arrival Performance



Finding #13: The Department's 90th percentile call to first-unit arrival performance—a fire agency's true customer service measure—is *3:41 minutes slower* (49 percent) than the 7:30-minute recommended best practice goal for urban/suburban areas to facilitate positive outcomes and is trending slower each successive year.

Fire Station Concentration: Effective Response Force (First Alarm) Travel

The Department's ERF for building fires includes two engines (one being mutual aid from outside the City), one ladder truck, and one chief officer for a total of 10 personnel. Excluding incidents with outlier time stamps, over the four-year study period there were only 11 incidents where the entire ERF arrived with a 90th percentile travel performance of 21:00 minutes as shown in the following table, which is *13:00 minutes (162 percent) slower* than the 8:00-minute recommended best practice for urban communities. This slower-than-desired ERF travel performance is the result of the automatic or mutual aid that is required to obtain a second ERF engine from Hutto or further depending on availability. This automatic/mutual aid requires 10:00 minutes (or longer) travel time to reach incidents inside the City.

Table 23—90th Percentile ERF Travel Performance

ERF Travel	Overall	2018	2020	2021
Department-Wide	21:00	16:34	19:30	21:00

Fire Station Concentration: Effective Response Force (First Alarm) Call to Arrival

90th percentile ERF call-to-arrival performance over the four-year study period was 25:17 minutes, which is *13:47 minutes (120 percent) slower* than Citygate's recommended 11:30-minute best practice goal for urban areas as summarized in the following table. Again, the slower-than-desired performance is due to the second ERF engine being an automatic/mutual aid unit. It should also be noted that this performance measure was calculated from a very small data set, which can be very volatile.

Table 24—90th Percentile ERF Call-to-Arrival Performance

ERF Call to Arrival	Overall	2018	2020	2021
Department-Wide	25:17	19:29	22:31	25:17

Finding #14: 90th percentile ERF travel performance and ERF call-to-arrival performance are *more than double* the recommended best practice goal for urban communities due to the automatic or mutual aid needed for the second ERF engine coming from Hutto or further depending on availability.

Response Performance Summary

The following table summarizes the Department's operational response performance over the four-year study period. As the table illustrates, *all* response performance components are *slower to significantly slower* than recommended best practices for urban/suburban communities to facilitate positive outcomes.

Table 25—90th Percentile Response Performance Summary

Response Component	Best Practice		90th Percentile Performance	Performance vs. Best Practice
	Time	Source		
Call Processing / Dispatch	1:30	Citygate	**3:47**	**+ 2:17**
Crew Turnout	2:00	Citygate	**2:35**	**+ 0:35**
First-Unit Travel	4:00	Citygate / NFPA	**6:27**	**+ 2:27**
First-Unit Call to Arrival	7:30	Citygate	**11:11**	**+ 3:41**
ERF Travel	8:00	Citygate / NFPA	**21:00**	**+ 13:00**
ERF Call to Arrival	11:30	Citygate	**25:17**	**+13:47**

2.8 Overall Deployment Evaluation

SOC Element 8 of 8
Overall Evaluation

The Department serves a diverse urban/suburban population with a mixed residential and non-residential land-use pattern.

Annual service demand is already higher than expected for a City the size of Taylor and increased nearly 21 percent over the most recent four years, with a more than 11 percent increase in 2021 over 2020. EMS incidents comprise 66 percent of total service demand while fires account for less than four percent.

Citygate finds the Department's response apparatus types to be appropriate to protect against the hazards likely to impact the City. Citygate also asserts that the minimum daily staffing of six response personnel plus a chief officer is insufficient to provide enough personnel to resolve any more serious incident requiring multiple response units without relying on automatic or mutual aid, which is mostly too distant to arrive in sufficient time to realize desired urban/suburban outcomes. In addition, any single incident requiring *both* staffed units leaves no on-duty personnel available to respond to a simultaneous incident, which are currently occurring 15 percent of the time and increasing annually at an average of approximately 13.5 percent.

If desired outcomes include preventing death or minimizing permanent impairment resulting from a medical emergency where possible, limiting building fire damage to only part of the inside of an affected building, or both, then the City will need both first-due unit and multiple-unit ERF coverage in all neighborhoods within a total response time goal to facilitate these outcomes. While Citygate's recommended first-due unit response performance goal for urban/suburban communities is 7:30 minutes or less from 9-1-1 dispatch notification to arrival, the Department's current first-unit call-to-arrival performance is more than 11:00 minutes, which is 3:41 minutes

slower (49 percent) than best practice and trending slower each year—mostly due to slower call processing / dispatch and first unit travel time. Although call processing performance may be improved with dispatcher training and accountability, travel time can only be improved, in Citygate's opinion, with an additional staffed station to reduce the *distance* first units must travel to reach 90 percent of emergency incidents.

While no single unit is approaching workload saturation, Citygate is concerned with the Department's ability to provide equitable *speed* of response to large sections of the City and sufficient *weight* of response capacity for more serious emergencies *without requiring automatic or mutual aid* given the values to be protected, overall service demand increasing an average of 6.5 percent annually, a simultaneous incident rate of 15 percent (increasing 13.5 percent annually), current daily staffing, and first-due and ERF travel time performance.

Given expected travel time coverage (as discussed in Section 2.6.1 and summarized in Table 11), slower-than-desired first-unit and ERF travel times (as summarized in Table 25), and prospective future development and related service demand including the Samsung facility, the City needs an additional fire station as soon as possible.

Citygate collaborated with City staff to identify a suitable site in the vicinity of Taylor High School as the preferred location for a third fire station to best serve current sections of the City beyond 4:00 minutes travel time and areas of expected future development including the Samsung facility.

Citygate subsequently modeled expected 4:00-minute first-due and 8:00-minute ERF travel coverage from this location, as shown in Maps Scenario 1 and Scenario 1a (**Volume 2—Map Atlas**) and summarized in the following table.

Table 26—Travel Time Coverage Comparison Summary

Travel Time Measure	Percentage of Total Road Miles Covered	
	Current Two Stations	With Proposed Station 3
4:00-Minute First-Due	72.4%	78.9%
8:00-Minute ERF	90.7%	88.2%

As the table shows, the ERF with a third station offers coverage of slightly fewer road miles. This is due to a unit from a third station in the southwest region of the City not being able to reach the northeast corner of the City within 8:00 minutes. While a third station is needed as soon as possible to reduce response travel times, in Citygate's experience, it typically takes a minimum of two to three fiscal years to fund, plan, and construct a new fire station facility. Citygate further asserts that the City has an immediate need for a third on-duty response crew and recommends that the

City fund and staff a second on-duty crew daily at Station 1 to provide critical additional ERF and simultaneous incident staffing capacity in advance of the completion of Station 3. This third crew would then be moved to Station 3 upon completion of that facility. Over the longer term, the City will need a fourth response crew daily at Station 1 for the ladder truck, to provide adequate *initial* ERF staffing to start to resolve more complex/serious incidents, particularly at the Samsung facility or other large buildings/facilities, while waiting for additional mutual aid staffing to arrive from outside the City. At that point or sooner, as funding can be made available, Citygate recommends the City add three Battalion Chiefs (one per shift) to provide on-duty supervision of shift personnel, Department-level program management, emergency incident command, and expanded executive succession planning and development.

2.8.1 Deployment Findings and Recommendations

Based on the technical analysis and findings contained in this assessment, Citygate makes the following deployment findings.

Finding #15: The current staffing model of a minimum of six response personnel on duty daily plus an administrative chief officer (as available from office or home) is not capable enough to provide personnel to resolve any more serious incident requiring multiple response units without relying on mutual aid, most of which is too distant to arrive in sufficient time to realize desired outcomes.

Finding #16: Any single incident requiring response from *both* staffed units leaves no on-duty personnel available to respond to a simultaneous incident.

Finding #17: No single response unit is approaching Citygate's recommended 30 percent Unit-Hour Utilization (UHU) workload saturation.

Finding #18: Many sections of the City do not currently receive equitable speed of response and sufficient weight of response capacity for more serious emergencies.

Finding #19: The City needs an additional fire station as soon as possible to help resolve slower-than-desired first-unit and ERF travel times to facilitate positive outcomes and the related additional service demand of pending and future development projects including the Samsung facility.

Finding #20: A suitable parcel of land in the general vicinity of Taylor High School is the preferred location for Fire Station 3 to provide improved 4:00-minute first-due and 8:00-minute ERF travel time coverage and to serve existing and future development in the southwestern area of the City including the Samsung campus.

Finding #21: The Department needs a third staffed response crew daily—as soon as fiscally possible, and in advance of the completion of Station 3—to provide critical initial ERF staffing capacity (until mutual aid resources can arrive from outside the City) and reserve response capacity for simultaneous incidents.

Citygate offers the following deployment recommendations for consideration by the Department and City.

Near-Term

Recommendation #1: **Adopt Deployment Policies:** The City Council should adopt complete performance measures to aid deployment planning and monitor performance. The measures should be designed to deliver outcomes that will save patients upon arrival when possible and keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures:

1.1 **Distribution of Fire Stations:** To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 7:30 minutes from receipt of the 9-1-1 call at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing / dispatch, 2:00 minutes crew turnout, and 4:00 minutes travel time.

1.2 **Multiple-Unit Effective Response Force for Serious Emergencies:** To confine building fires near the room of origin, keep vegetation fires under one acre in size, and treat multiple medical patients at a single incident, a multiple-unit ERF of at least **10** personnel, including at least one chief officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing / dispatch, 2:00 minutes crew turnout, and 8:00 minutes travel time.

1.3 **Hazardous Materials Response:** To protect the City from the hazards associated with uncontrolled release of hazardous and toxic materials, the fundamental mission of the Department's response is to isolate the hazard, deny entry into the hazard zone, and minimize impacts on the community. This can be achieved with a first-due total response time of 7:30 minutes or less to provide initial hazard evaluation, mitigation actions, or both. After the initial evaluation is completed, a determination can be made whether to request additional resources to mitigate the hazard.

1.4 **Technical Rescue:** To respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue, first-due units should arrive within a total response time of 7:30 minutes or less to evaluate the situation and initiate rescue actions; additional resources should assemble as needed within a total response time of 11:30 minutes to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #2:	Collaborate with Williamson County Emergency Communications to identify factor(s) causing slower-than-recommended call processing / dispatch performance and the steps needed to bring performance into closer alignment with recommended fire service best practice.
Recommendation #3:	Identify a suitable site and funding sources for the construction of Station 3 as soon as fiscally possible.
Recommendation #4:	If fiscally possible before Station 3 can be opened, fund a second three-person crew at Station 1 to staff an additional engine to (1) provide critical initial ERF staffing capacity until mutual aid resources can arrive from outside the City and (2) reserve response capacity for simultaneous incidents. This crew would be moved to Station 3 upon completion of construction.

Longer-Term

Recommendation #5:	Add a fourth four-person crew daily at Station 1 staffing the ladder truck to bring total minimum daily staffing to 13 plus a chief officer. In Citygate's opinion, this is minimally adequate initial ERF staffing to start to resolve more complex/serious incidents while waiting for additional mutual aid staffing to arrive from outside the City.
Recommendation #6:	When Station 3 can be staffed, improve supervision and headquarters capacity by adding three Battalion Chiefs (one per shift) to provide on-duty supervision of response personnel, Department-level program management, and emergency incident command.

SECTION 3—ADMINISTRATIVE STAFFING CAPACITY REVIEW

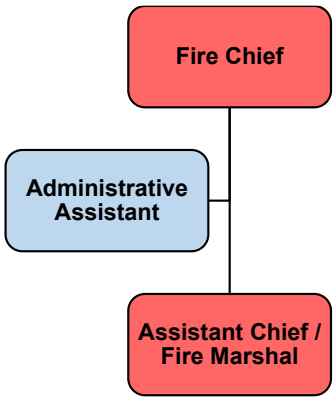
As an element of this Fire Department Services Evaluation, Citygate conducted a macro-level review and evaluation of the Department's administrative support staffing organization and workload capacity.

NFPA 1201 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]."[12] Best practices call for a management organization and headquarters programs with adequate staffing to provide a properly trained, equipped, and supported response force to ensure prompt response and safe, competent service delivery. Compliance regulations for fire services operation are increasing, so the proper hiring, training, and supervision of operational personnel requires a significant commitment from leadership and general management.

3.1 ADMINISTRATIVE ORGANIZATION

The City's Adopted FY 2022 Annual Budget authorizes 3.0 full-time equivalent (FTE) Fire Department administrative support positions organized as shown in the following figure. This staff is responsible for overall Department administration and management of all Department programs and services, and administrative support for the 21 operational response personnel.

Figure 17—Fire Department Administrative Organization



3.2 KEY ADMINISTRATIVE STAFF RESPONSIBILITIES

3.2.1 Key Fire Chief Responsibilities

- Overall administration of Department programs and functions

[12] NFPA 1201 – Standard for Providing Emergency Services to the Public (2015 Edition).

- Ensure alignment of Department policies, goals, and objectives with City Council goal
- Direct hiring, training, promotion, and development of all Department personnel
- Develop and manage Department budget
- Departmental personnel management
- Direct and control Department administrative functions
- Maintenance of all Department policies and standard operating procedures
- Department-level training program management
- Strategic/long-term planning
- Develop subordinate staff
- Develop and maintain effective performance measures
- Ensure effective communications, cooperation, and coordination with City Council, City Manager, and other City departments
- Citywide Emergency Management Coordinator
- Develop, maintain, and implement Citywide emergency plans
- Emergency incident response/command
- Ensure investigation of fire causes
- Fire incident reporting system administration/oversight

3.2.2 Key Assistant Fire Chief / Fire Marshal Responsibilities

- Adoption and enforcement of the Fire Code
- Review of all new development projects and building permits for conformance with applicable fire and life safety codes, ordinances, and regulations
- Inspection of new building construction for conformance with applicable fire and life safety codes, ordinances, and regulations
- Plan review and inspection of fire protection and detection systems for conformance with applicable codes, ordinances, and regulations and for appropriate design, installation, and operation
- Inspection of designated building occupancies for conformance with applicable fire and life safety codes, ordinances, and regulations

- Certificate of Occupancy inspections
- Residential License daycare and adult care inspections
- Code enforcement and hazard abatement
- Fire/arson investigations
- Fire safety and public education
- Emergency incident response/command

3.2.3 Key Administrative Assistant Responsibilities

- Telephones, mail, correspondence, office reception
- Accounts payable
- Prepare reports
- Submit and maintain Departmental records and reports
- Department records management
- Office supplies/equipment
- Prepare correspondence, reports, documents, forms, etc.
- Answer telephones, provide information to public
- Maintains Department calendar and schedules Public Relations events, inspections, etc.

3.3 Administrative Staffing Capacity Review Summary

Citygate's review and evaluation of the Department's administrative staff's workload capacity found it to be understaffed to meet current responsibilities, expectations, and workload demand. While the most important responsibilities and tasks are being completed, many others are not being completed due to a lack of capacity, or are not being completed within desired timeframes, or at the expected level of detail. The Fire Chief and Assistant Fire Chief regularly work 50 to 60+ hours per week. These two chief officers share all incident command / safety officer responsibilities 24/7/365 and may not be *immediately* available after normal business hours or on weekends or holidays. Further, some Department-level processes are performed by a single person with no redundant capacity, resulting in potential single points of failure of critical Department-level business processes in the event of an extended or unexpected absence.

Overall, Citygate found the Department's administrative organization lacks sufficient workload capacity for long-term planning, research, data collection/analysis, records management,

coaching/mentoring, emergency management, and many of the more mundane responsibilities such as reviewing and updating policies and procedures, Department-level plans, etc. Citygate also finds that only two chief officers working 50-60+ hours every week merely to manage the most important responsibilities and provide emergency incident command and safety officer coverage 24/7/365 is untenable over the longer-term and provides very limited Department leadership succession planning and development.

Based on this assessment, Citygate recommends that the City consider funding a third chief officer as soon as possible to oversee and manage the Department training program and emergency management responsibilities, provide needed additional executive-level capacity and emergency incident response coverage, and provide expanded leadership succession planning. This additional capacity will also help ensure that all key administrative responsibilities and expectations can be completed within a normal 40-hour workweek and will help reduce or eliminate potential single points of failure. Over the longer term, the City and Department should plan for additional administrative support capacity as operational response staffing and Department programs grow.

Finding #22: The Department is understaffed to accomplish many of its administrative responsibilities, expectations, and workload demands.

Finding #23: The Fire Chief and Assistant Fire Chief regularly work 50 to 60+ hours per week to ensure that the most important responsibilities and tasks are completed, with others not being completed at all due to lack of capacity.

Recommendation #7: With the addition of a third engine company before Station 3 can be opened, the City should consider funding a third 40-hour assistant chief officer to oversee and manage the Department training program and emergency management responsibilities, provide additional needed executive-level capacity and emergency incident response coverage, and provide expanded leadership succession planning.

Recommendation #8:	With the addition of a third engine company before Station 3 can be opened, the City should add a .5 FTE administrative support position to increase capacity and provide vacation/illness relief.

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SECTION 4—FINDINGS AND RECOMMENDATIONS

Pursuant to the research and analysis conducted for this study, following are Citygate's deployment findings and recommendations.

4.1 DEPLOYMENT FINDINGS

Finding #1: The Department's physical response unit types are appropriate to protect against the hazards likely to impact the City.

Finding #2: Neither the City Council nor the Fire Department have adopted specific response performance measures by policy resolution or operational guideline consistent with fire service best practice recommendations.

Finding #3: The Department has a standard response plan that considers risk and establishes an appropriate initial response for each incident type; each type of call for service receives the combination of engines, ladder trucks, and command officers customarily needed to effectively control that type of incident based on Department experience.

Finding #4: The Department's two fire station locations can be expected to provide 4:00-minute first-unit travel time coverage to only 72 percent of the total public road miles in the City, which is weak urban/suburban-level coverage to facilitate positive outcomes.

Finding #5: The Department cannot provide 8:00-minute recommended best practice multiple-unit ERF travel time coverage with only two units inside the City. The Department is reliant on external mutual aid assistance to provide a second ERF engine from Hutto or further depending on availability, which is insufficient multi-unit coverage for a city of Taylor's size.

Finding #6: Service demand increased nearly 21 percent over the four-year study period, including a more than 11 percent increase in 2021 over the previous year.

Finding #7: EMS incidents comprise 66 percent of total service demand while fires account for less than 4 percent.

Finding #8: At least one or more simultaneous incidents occurs 15 percent of the time, primarily impacting Station 1.

Finding #9: Simultaneous incident activity increased 43 percent over the four-year study period, with a 28 percent increase in 2021 over the previous year.

Finding #10: At 3:47 minutes, 90th percentile call processing / dispatch performance is more than 150 percent slower than the 1:30-minute recommended best practice goal and slowed nearly 43 percent over the four-year study period.

Finding #11: Crew turnout performance is 35 seconds (29 percent) slower than the 2:00-minute recommended best practice goal.

Finding #12: The Department's 90th percentile first-unit travel performance is nearly 2:30 minutes slower (61 percent) than the Citygate- and NFPA-recommended 4:00-minute best practice goal for urban areas to facilitate positive outcomes.

Finding #13: The Department's 90th percentile call to first-unit arrival performance—a fire agency's true customer service measure—is 3:41 minutes slower (49 percent) than the 7:30-minute recommended best practice goal for urban/suburban areas to facilitate positive outcomes and is trending slower each successive year.

Finding #14: 90th percentile ERF travel performance and ERF call-to-arrival performance are more than double the recommended best practice goal for urban communities due to the automatic or mutual aid needed for the second ERF engine coming from Hutto or further depending on availability.

Finding #15: The current staffing model of a minimum of six response personnel on duty daily plus an administrative chief officer (as available from office or home) is not capable enough to provide personnel to resolve any more serious incident requiring multiple response units without relying on mutual aid, most of which is too distant to arrive in sufficient time to realize desired outcomes.

Finding #16: Any single incident requiring response from both staffed units leaves no on-duty personnel available to respond to a simultaneous incident.

Finding #17: No single response unit is approaching Citygate's recommended 30 percent Unit-Hour Utilization (UHU) workload saturation.

Finding #18: Many sections of the City do not currently receive equitable speed of response and sufficient weight of response capacity for more serious emergencies.

Finding #19: The City needs an additional fire station as soon as possible to help resolve slower-than-desired first-unit and ERF travel times to facilitate positive outcomes and the

related additional service demand of pending and future development projects including the Samsung facility.

Finding #20: A suitable parcel of land in the general vicinity of Taylor High School is the preferred location for Fire Station 3 to provide improved 4:00-minute first-due and 8:00-minute ERF travel time coverage and to serve existing and future development in the southwestern area of the City including the Samsung campus.

Finding #21: The Department needs a third staffed response crew daily—as soon as fiscally possible, and in advance of the completion of Station 3—to provide critical initial ERF staffing capacity (until mutual aid resources can arrive from outside the City) and reserve response capacity for simultaneous incidents.

4.2 DEPLOYMENT RECOMMENDATIONS

4.2.1 Near-Term

Recommendation #1: **Adopt Deployment Policies:** The City Council should adopt complete performance measures to aid deployment planning and monitor performance. The measures should be designed to deliver outcomes that will save patients upon arrival when possible and keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures:

1.1 **Distribution of Fire Stations:** To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 7:30 minutes from receipt of the 9-1-1 call at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing / dispatch, 2:00 minutes crew turnout, and 4:00 minutes travel time.

1.2 **Multiple-Unit Effective Response Force for Serious Emergencies:** To confine building fires near the room of origin, keep vegetation fires under one acre in size, and treat multiple medical patients at a single incident, a multiple-unit ERF of at least **10** personnel, including at least one chief officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt at the Williamson County Emergency Communications Center, 90 percent of the time. This equates to 1:30 minutes call processing

/ dispatch, 2:00 minutes crew turnout, and 8:00 minutes travel time.

1.3 **Hazardous Materials Response:** To protect the City from the hazards associated with uncontrolled release of hazardous and toxic materials, the fundamental mission of the Department's response is to isolate the hazard, deny entry into the hazard zone, and minimize impacts on the community. This can be achieved with a first-due total response time of 7:30 minutes or less to provide initial hazard evaluation, mitigation actions, or both. After the initial evaluation is completed, a determination can be made whether to request additional resources to mitigate the hazard.

1.4 **Technical Rescue:** To respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue, first-due units should arrive within a total response time of 7:30 minutes or less to evaluate the situation and initiate rescue actions; additional resources should assemble as needed within a total response time of 11:30 minutes to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #2: Collaborate with Williamson County Emergency Communications to identify factor(s) causing slower-than-recommended call processing / dispatch performance and the steps needed to bring performance into closer alignment with recommended fire service best practice.

Recommendation #3: Identify a suitable site and funding sources for the construction of Station 3 as soon as fiscally possible.

Recommendation #4: If fiscally possible before Station 3 can be opened, fund a second three-person crew at Station 1 to staff an additional engine to (1) provide critical initial ERF staffing capacity until mutual aid resources can arrive from outside the City and (2) reserve response capacity for simultaneous incidents. This crew would be moved to Station 3 upon completion of construction.

4.2.2 Longer-Term

Recommendation #5: Add a fourth four-person crew daily at Station 1 staffing the ladder truck to bring total minimum daily staffing to 13 plus a chief officer. In Citygate's opinion, this is minimally adequate initial ERF staffing to start to resolve more complex/serious incidents while waiting for additional mutual aid staffing to arrive from outside the City.

Recommendation #6: When Station 3 can be staffed, improve supervision and headquarters capacity by adding three Battalion Chiefs (one per shift) to provide on-duty supervision of response personnel, Department-level program management, and emergency incident command.

4.3 Administrative Staffing Capacity Findings

Finding #22: The Department is understaffed to accomplish many of its administrative responsibilities, expectations, and workload demands.

Finding #23: The Fire Chief and Assistant Fire Chief regularly work 50 to 60+ hours per week to ensure that the most important responsibilities and tasks are completed, with others not being completed at all due to lack of capacity.

4.4 Administrative Staffing Capacity Recommendations

Recommendation #7: With the addition of a third engine company before Station 3 can be opened, the City should consider funding a third 40-hour assistant chief officer to oversee and manage the Department training program and emergency management responsibilities, provide additional needed executive-level capacity and emergency incident response coverage, and provide expanded leadership succession planning.

Recommendation #8: With the addition of a third engine company before Station 3 can be opened, the City should add a .5 FTE administrative support position to increase capacity and provide vacation/illness relief.

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APPENDIX A—RISK ASSESSMENT

A.1 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

The third element of the Standards of Coverage (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.
- 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 entire community.

A.1.1 Risk Assessment Methodology

The methodology employed by Citygate to assess community risks as an integral element of an 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 at risk to 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.
- Evaluation of *probable* impact severity for each hazard by planning zone using agency/jurisdiction-specific data and information.
- Determination of overall risk by hazard according to the following template.

Table 27—Overall Risk Template

Probability of Occurrence	Probable Impact Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Low*	*Moderate*	*High*
Unlikely	*Low*	*Low*	*Low*	*Moderate*	*High*
Possible	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Probable	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Frequent	*Low*	*Moderate*	*High*	*Extreme*	*Extreme*

For this study, Citygate used the following data sources to understand the hazards and values to be protected in the City:

- Esri and U.S. Census Bureau population and demographic data
- City and County geographical information systems data
- City and County General Plans and zoning information
- Williamson County Hazard Mitigation Plan
- City of Taylor 2018 Hazard Mitigation Plan
- Fire Department data and information

A.1.2 Risk Assessment Summary

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

1. The Fire Department serves a diverse urban/suburban population with densities ranging from fewer than 75 to more than 3,000 people per square mile over a varied land use pattern.
2. The City's population is projected to more than double to nearly 40,000 by 2040.
3. The City has residential and non-residential buildings to protect, as identified in this assessment.
4. The City also has economic and other resource values to be protected, as identified in this assessment.

5. the City and County have mass emergency notification systems to effectively communicate emergency notifications and information to the public in a timely manner.

6. The City's overall risk for six hazards related to emergency services provided by the Fire Department range from Low to High, as summarized in the following table.

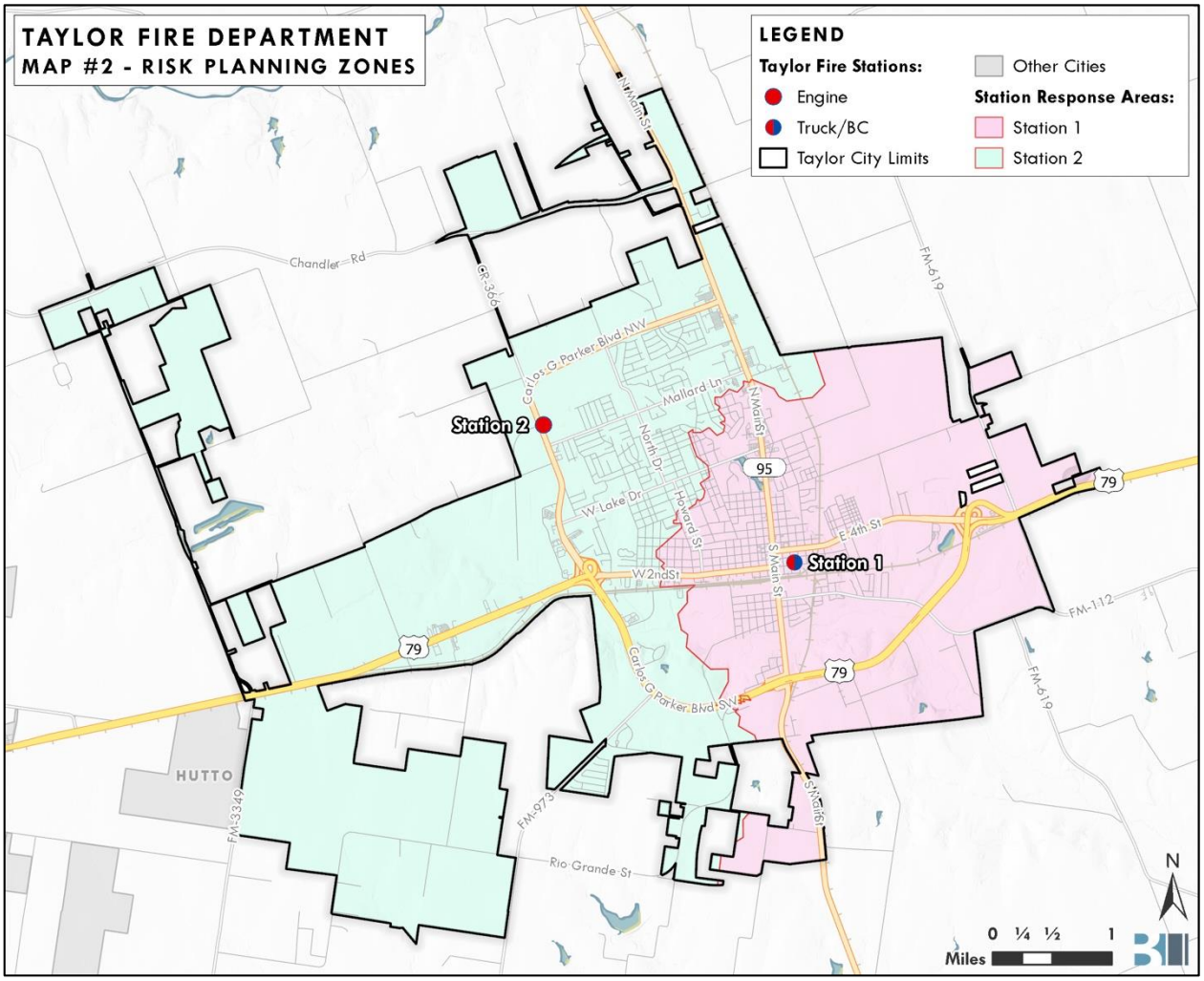
Table 28—Overall Risk by Hazard

Hazard		Planning Zone	
		Station 1	Station 2
1	Building Fire	*Moderate*	*Moderate*
2	Vegetation/Wildfire	*Low*	*Low*
3	Medical Emergency	*High*	*High*
4	Hazardous Materials	*Moderate*	*Moderate*
5	Technical Rescue	*Moderate*	*Moderate*
6	Aviation Incident	*Low*	*Low*

A.1.3 Planning Zones

The Commission on Fire Accreditation International (CFAI) recommends 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 may 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, high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then they become 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 appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized two planning zones corresponding with each existing fire station's first-due response area, as shown in the following map.

Figure 18—Risk Planning Zones



A.1.4 Values at Risk to Be Protected

Values at risk, broadly defined, are 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, or natural resources.

People

Residents, employees, visitors, and travelers in a community or jurisdiction are 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. At-risk populations typically include children under the age of 10, the elderly, and people housed in institutional settings. The following table summarizes key demographic data for the City.

Table 29—Key Demographic Data – Taylor, TX

Demographic	2022
Population	**16,740**
Under 10 years	13.90%
10–14 years	6.80%
15–64 years	62.70%
65–74 years	9.60%
75 years and older	7.00%
Median age	37.3
Daytime population	17,955
Housing Units	**6,656**
Owner-Occupied	61.10%
Renter-Occupied	32.60%
Vacant	6.40%
Median Household Size	3.23
Median Home Value	$248,207
Race/Ethnicity	
White	56.20%
Black / African American	9.00%
Asian	0.80%
Other / Two or More Races	34.00%
Hispanic/Latino Origin	42.40%
Diversity Index	80.8
Education (population over 24 years of age)	
High School Graduate	82.30%
Undergraduate Degree	11.90%
Graduate/Professional Degree	5.70%
Employment (population over 15 years of age)	**7,910**
In Labor Force	96.00%
Unemployed	4.00%
Median Household Income	$59,555
Population Below Poverty Level	11.10%
Population without Health Insurance Coverage	14.90%

Source: Esri Community Analyst (2022) and U.S. Census Bureau

Of note from the previous table is the following:

- More than 30 percent of the population is under 10 years of age or 65 years of age and older.
- The City's daytime population is 7 percent more than the resident population, indicating some employees live outside the City.
- The City's population is predominantly White (56 percent), followed by other races (34 percent), Black / African American (9 percent), and Asian (1 percent), with those of Hispanic/Latino ethnicity representing 42 percent of the population.
- Of the population over 24 years of age, slightly more than 82 percent have a high school or equivalent education.
- Of the population over 24 years of age, nearly 18 percent have an undergraduate, graduate, or professional degree.
- Of the population older than 15 years of age, 96 percent are in the workforce.
- The median household income is $59,555.
- The population below the federal poverty level is 11.1 percent.
- Nearly 15 percent of the population does not have health insurance coverage.

The City's Comprehensive Plan projects that Taylor's population will grow by approximately 2.4 percent annually through 2025 and then by 5.7 percent annually over the ensuing 20 years to 2045, with a total population approaching 40,000 by 2040.[13]

Buildings

The City has more than 6,500 housing units and approximately 650 businesses, including offices, professional services, retail sales, restaurants/bars, motels, churches, schools, government facilities, healthcare facilities, and other business types.[14] Of note is the 1,300-acre Samsung semiconductor manufacturing campus being constructed in the southcentral section of the City, which includes an estimated 6 million square feet of planned building space.

Building Occupancy Risk Categories

The CFAI identifies the following four risk categories that relate to building occupancy:

[13] City of Taylor Envision Taylor Comprehensive Plan (Updated April 2022), Figure 19.
[14] Source: Esri Community Analyst Community Summary and Business Summary (2021).

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 with fewer 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 with 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 (ERF) 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 or significant economic impact to the community.

Evaluation of the City's building inventory identified 36 high/maximum-risk building uses as they relate to the CFAI building fire risk categories, as summarized in the following table.[15]

Table 30—High-Risk Building Occupancies

Occupancy Classification		Number[1]	Risk Category[2]
A-1	Assembly	**1**	***Maximum***
H	Hazardous	**5**	***Maximum***
I	Institutional	**11**	***High***
R-1	Hotel/Motel	**5**	***High***
R-2	Multi-Family Residential	**13**	***High***
R-3.1	Assisted Living	**1**	***High***
	Total	**36**	

[1] Source: City of Taylor
[2] CFAI *Standards of Cover* (Fifth Edition)

[15] This table does NOT include any of the planned Samsung campus buildings.

Critical Facilities

The U.S. Department of Homeland Security defines critical infrastructure and key resources as those physical assets essential to the public health and safety, economic vitality, and resilience of a community, such as lifeline utilities infrastructure, telecommunications infrastructure, essential government services facilities, public safety facilities, schools, hospitals, airports, etc. The Department identified 34 critical facilities as shown in the following table. A hazard occurrence with significant impact severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Table 31—Critical Facilities – Taylor, TX

Critical Facility Category	Number
Communications	1
Education	5
Government Services	8
Healthcare	4
Public Safety	4
Transportation	3
Utility	9
Total	**34**

Source: City of Taylor

Economic Resources

Of the approximately 650 businesses employing more than 8,700 people in the City, top industries include services and retail trade.[16] Top employers with more than 100 employees include:[17]

- Electric Reliability Council of Texas (ERCOT)
- Taylor Independent School District
- Durcon, Inc.
- E.R. Carpenter Co.
- Baylor, Scott, and White
- H.E.B. Grocery Co.

[16] Source: Esri Community Business Summary (2022).
[17] Source: City of Taylor 2021 Comprehensive Annual Financial Report.

- CoreCivic
- City of Taylor
- Walmart
- Burrow Cabinets/TaylorCraft Cabinet Doors

Natural Resources

Key natural resources to be protected within the City include Bull Branch, Heritage Square, Fannie Robinson, Murphy, and Taylor Regional Parks.

Cultural/Historic Resources

Key cultural/historic resources within the City include:

- Howard Theater
- Moody Museum
- Historic Downtown
- Dr. James Lee Dickey House

A.1.5 Hazard Identification

Citygate utilized 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. The 2018 City of Taylor Hazard Mitigation Plan (HMP) identifies the following 12 hazards with potential to impact the City.[18]

1. Floods
2. Wildfire
3. Tornado
4. Drought
5. Dam/Levee Failure
6. Expansive Soils
7. Extreme Heat
8. Hailstorm

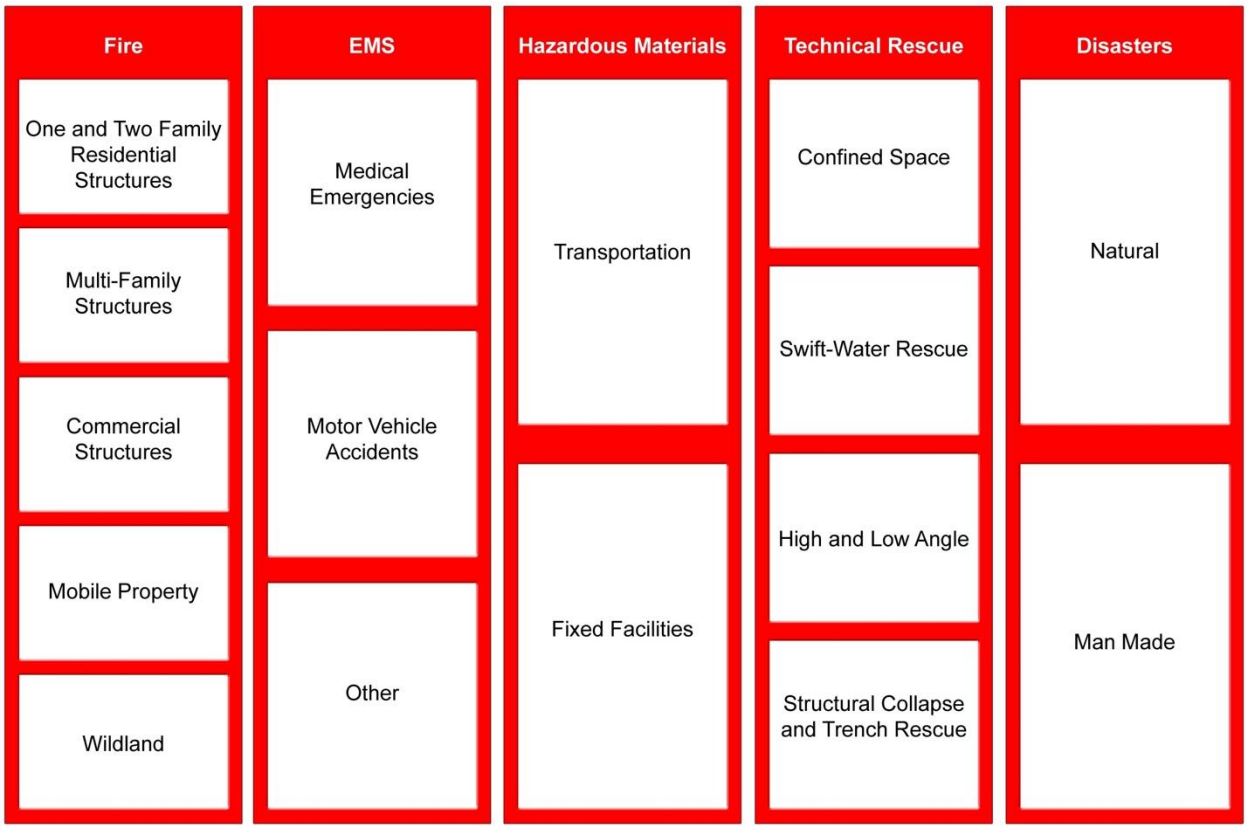
[18] 2018 Hazard Mitigation Plan prepared for the Cities of Taylor and Thrall, and Lower Bushy Creek WCID, Table 2.

9. Severe Winter Storms
10. Windstorms
11. Lightning
12. Train Derailment

Although the Department has no responsibility to initiate pre-event mitigation measures for any of these hazards other than potentially wildfire, it does provide response services related to all 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 the following table. 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.

Figure 19—Commission on Fire Accreditation International Hazard Categories



Source: CFAI *Standards of Cover* (Fifth Edition)

Subsequent to review and evaluation of the hazards identified in the 2018 Taylor HMP and the fire and non-fire hazards as identified by the CFAI as they relate to services provided by the Department, Citygate evaluated the following six hazards for this assessment:

1. Building fire
2. Vegetation/wildland fire
3. Medical emergency
4. Hazardous material release/spill
5. Technical rescue
6. Aviation incident

A.1.6 Service Capacity

Service capacity refers to the Department'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 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 Department's service capacity for fire and non-fire risks consists of a minimum of six response personnel on duty daily staffing one engine and one quint (combination engine and aerial ladder truck) from the Department's two fire stations. The two administrative chief officers work 8:00 a.m. – 5:00 p.m. Monday through Friday, and respond to more serious incidents as available from the office or home after hours. The Department has an automatic mutual aid agreement with Williamson County Emergency Services District #3 in Hutto. While the Avery-Pickett Volunteer Fire Department is also located in the City and responds to incidents in the unincorporated areas outside Taylor, the City has no control over its staffing level, response availability, or level of training. The Department also has two Type-6 wildland engines and one water tender that can be cross-staffed by the on-duty personnel as needed.

All response personnel are trained to the Emergency Medical Technician (EMT) basic level, capable of providing Basic Life Support (BLS) pre-hospital emergency medical care. Paramedic ambulance service is provided by Williamson County EMS with two ambulances stationed in the City. Air ambulance service is provided by Starflight from Austin or PHI Air Medical from Temple.

Response personnel are also trained to the US Department of Transportation Hazardous Material First Responder Operational level to provide initial hazardous material incident assessment, hazard isolation, and decontamination as participants in the Williamson County Hazardous Material Response Team. Most Department response personnel are further trained to the Hazardous

Material Technician level. The nearest fully-staffed Hazardous Materials Response Team is in Austin. Response personnel are further trained in Confined Space Awareness.

Technical rescue capability, when needed, is available from the Williamson County Technical Rescue Response Team coordinated through the County Fire Marshal's Office.

Although Samsung will have on-site emergency services available during all hours of construction and operations, including EMS / occupational health, environmental health, hazardous material and rescue technicians, the facility will rely on local response capacity for more serious events.

A.1.7 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. The following table describes the five probability of occurrence categories and related characteristics used for this analysis.

Table 32—Probability of Occurrence Categories

Probability	General Characteristics	Expected Frequency of Occurrence
Rare	• Hazard ***may occur*** under exceptional circumstances.	> 10 years
Unlikely	• Hazard ***could occur*** at some time. • No recorded or anecdotal evidence of occurrence. • Little opportunity, reason, or means for hazard to occur.	1–10 years
Possible	• Hazard ***should occur*** at some time. • Infrequent, random recorded or anecdotal evidence of occurrence. • Some opportunity, reason, or means for hazard to occur.	1–23 months
Probable	• Hazard will ***probably occur*** occasionally. • Regular recorded or strong anecdotal evidence of occurrence. • Considerable opportunity, reason, or means for hazard to occur.	1–4 weeks
Frequent	• Hazard is ***expected to occur*** regularly. • High level of recorded or anecdotal evidence of regular occurrence. • Strong opportunity, reason, or means for hazard to occur. • Frequent hazard recurrence.	Daily to weekly

Citygate's SOC assessments utilize recent, multiple-year hazard response data to determine the probability of hazard occurrence for the ensuing 12-month period.

A.1.8 Impact Severity

Impact severity refers to the *probable* extent a hazard occurrence impacts people, buildings, lifeline services, the environment, and the entire community. The following table summarizes the five impact severity categories and related general criteria used for this analysis.

Table 33—Impact Severity Categories

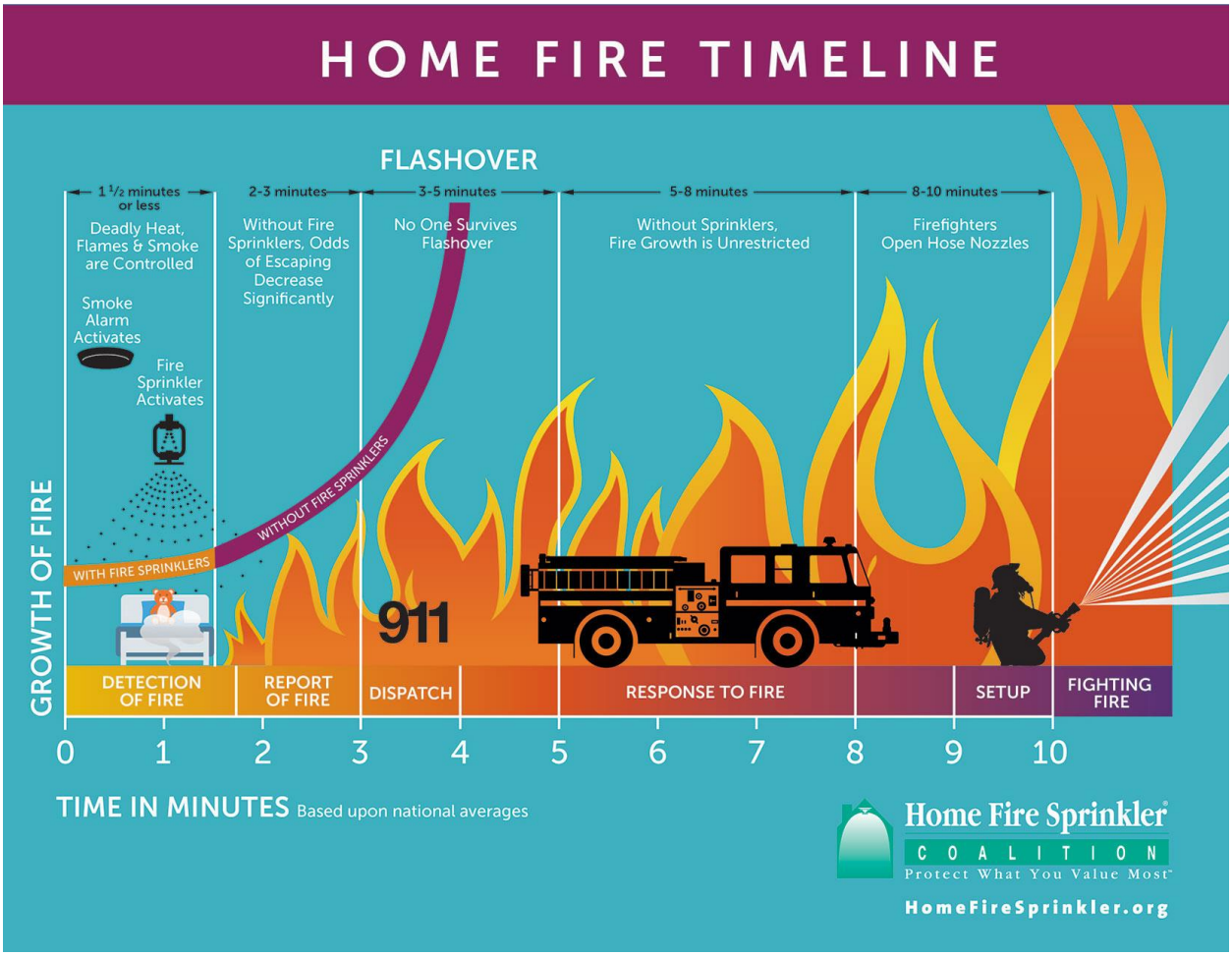
Impact Severity Category	Characteristics
Insignificant	• No injuries or fatalities • No to few persons displaced for short duration • Little or no personal support required • None to inconsequential damage • None to minimal community disruption • No measurable environmental impacts • None to minimal financial loss • No wildland Fire Hazard Severity Zones (FHSZs)
Minor	• Few injuries; no fatalities; minor medical treatment only • Some displacement of persons for less than 24 hours • Some personal support required • Some minor damage • Minor community disruption of short duration • Small environmental impacts with no lasting effects • Minor financial loss • No wildland FHSZs
Moderate	• Medical treatment required; some hospitalizations; few fatalities • Localized displacement of persons for fewer than 24 hours • Personal support satisfied with local resources • Localized damage • Normal community functioning with some inconvenience • No measurable environmental impacts with no long-term effects, or small impacts with long-term effect • Moderate financial loss • Less than 25% of area in *Moderate* or *High* wildland FHSZs
Major	• Extensive injuries; significant hospitalizations; many fatalities • Large number of persons displaced for more than 24 hours • External resources required for personal support • Significant damage • Significant community disruption; some services not available • Some impact to environment with long-term effects • Major financial loss with some financial assistance required • More than 25% of area in *Moderate* or *High* wildland FHSZs; less than 25% in *Very High* wildland FHSZs
Catastrophic	• Large number of severe injuries requiring hospitalization; significant fatalities • General displacement for extended duration • Extensive personal support required • Extensive damage • Community unable to function without significant external support • Significant impact to environment and/or permanent damage • Catastrophic financial loss; unable to function without significant support • More than 50% of area in *High* wildland FHSZs; more than 25% of area in *Very High* wildland FHSZs

A.1.9 Building Fire Risk

One of the primary hazards in any community is building fire. Building fire risk factors include building size, age, construction type, density, occupancy, number of stories above ground level, required fire flow, proximity to other buildings, built-in fire protection/alarm systems, available fire suppression water supply, building fire service capacity, fire suppression resource deployment (distribution/concentration), staffing, and response time. Citygate used available data from the Department and the U.S. Census Bureau to assist in determining the City's building fire risk.

The following figure 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 three to five minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

Figure 20—Building Fire Progression Timeline



Source: http://www.firesprinklerassoc.org

Population Density

The population density in the City ranges from fewer than 75 to more than 3,000 people per square mile.[19] Although risk analysis across a wide spectrum of other Citygate clients shows no direct correlation between population density and building fire *occurrence*, it is reasonable to conclude that building fire *risk* relative to potential impact on human life is greater as population density increases, particularly in areas with high-density, multiple-story buildings.

Water Supply

A reliable public water system providing adequate volume, pressure, and flow duration in close proximity to all buildings is a critical factor in mitigating the potential impact severity of a community's building fire risk. Potable water is provided by the City Water Utilities Department and according to Department staff, many areas of the City have undersized or dead-end water mains.

Building Fire Service Demand

For the four-year period from January 1, 2018, through December 31, 2021, the Department responded to 144 building fire incidents, comprising 1.55 percent of total service demand over the same period, as summarized in the following table.

Table 34—Building Fire Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Building Fire	2018	10	16	6	**32**	1.51%
	2019	16	20	9	**45**	1.97%
	2020	19	4	7	**30**	1.31%
	2021	21	8	8	**37**	1.45%
	Total	**66**	**48**	**30**	**144**	**1.55%**
Percent Total Station Demand		1.36%	1.14%	15.79%		

As the table shows, building fire service remained relatively constant over the four-year study period, with the highest number of fires in Station 1's response area.

[19] Source: Esri Community Analyst 2020 Daytime Population Density.

Building Fire Risk Assessment

The following table summarizes Citygate's assessment of the City's building fire risk by planning zone.

Table 35—Building Fire Risk Assessment

Building Fire Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Probable*	*Probable*
Probable Impact Severity	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***

A.1.10 Vegetation/Wildfire Risk

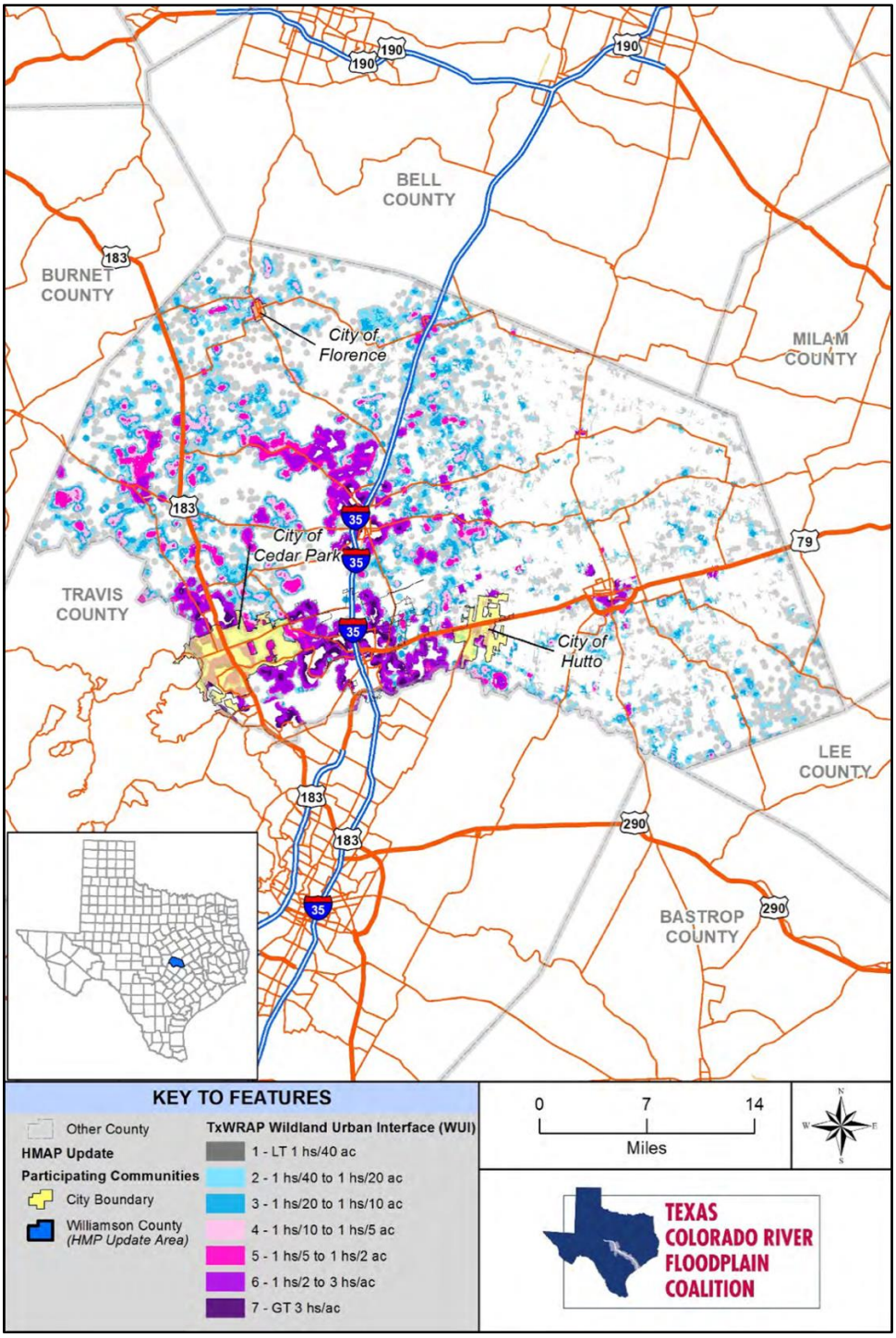
Many areas within and adjacent to the City are at risk for vegetation/wildfires. The threat to people and property from a wildfire event is greatest in Wildland Urban Interface/Intermix (WUI) areas where human population and development interfaces or is intermixed with natural wildland fuels. Vegetation/wildfire risk factors include vegetative fuel types and configuration, weather, topography, prior fire history, water supply, mitigation measures, and vegetation fire response capacity.

Wildfire Hazard Areas

According to the Texas Forest Service (TFS) Community Wildfire Protection Plan (CWPP), there are approximately 14,000 communities within the state identified as "at risk" for a potentially devastating wildfire, with much of the state's growth occurring in WUI areas. The Texas A&M Forest Service Wildfire Risk Assessment Portal (TxWRAP) estimates that 60 percent of the County's population lives within a WUI area, including areas within the City, as shown in the following figure.[20]

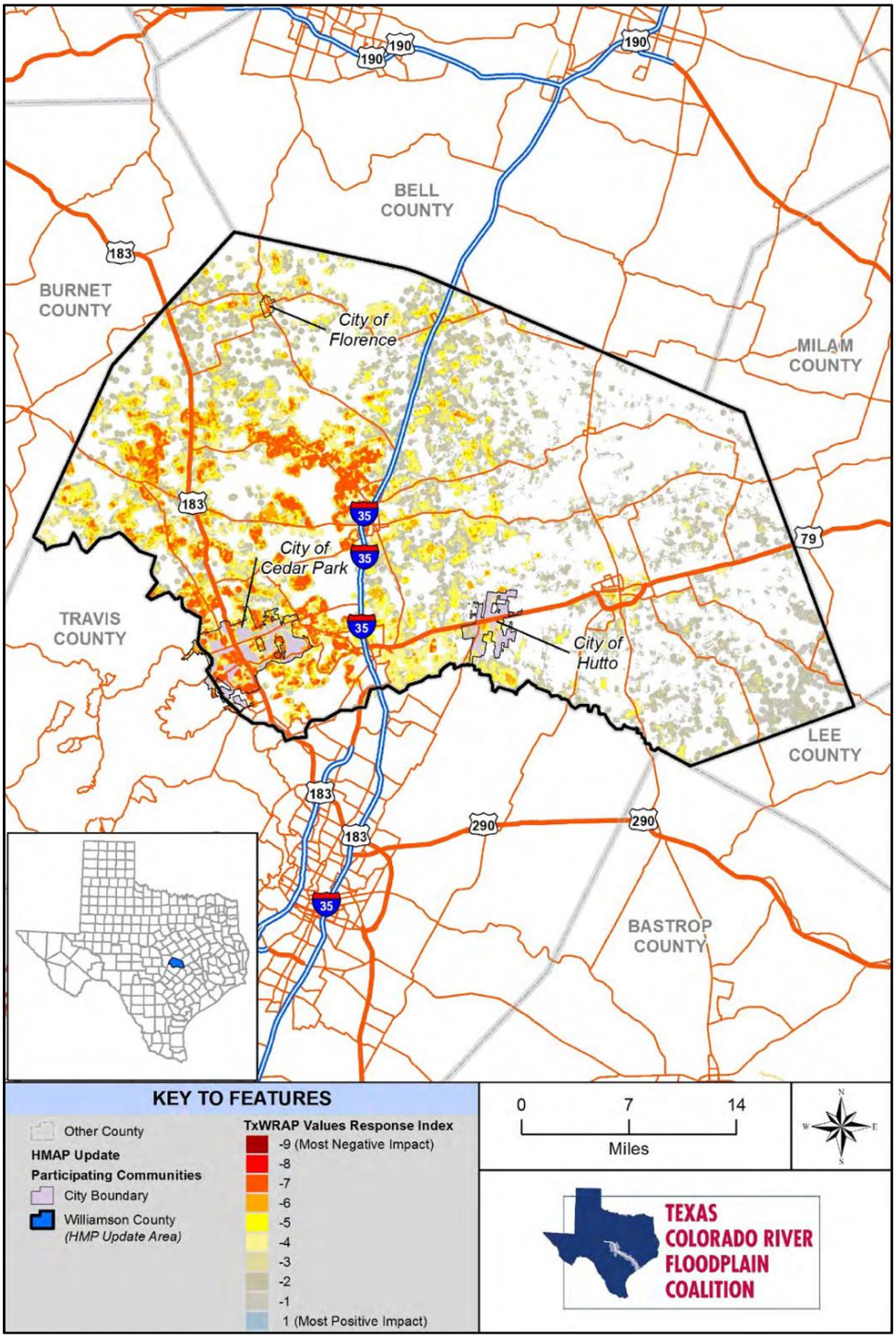
[20] Source: Chapter 16, Williamson County Hazard Mitigation Plan Update (January 2017).

Figure 21—Wildland Urban Interface Areas – Williamson County



The TxWRAP report for Williamson County also identifies the potential impact of a wildfire on values or assets with a Values Response Index (VRI) rating as shown in the following figure.

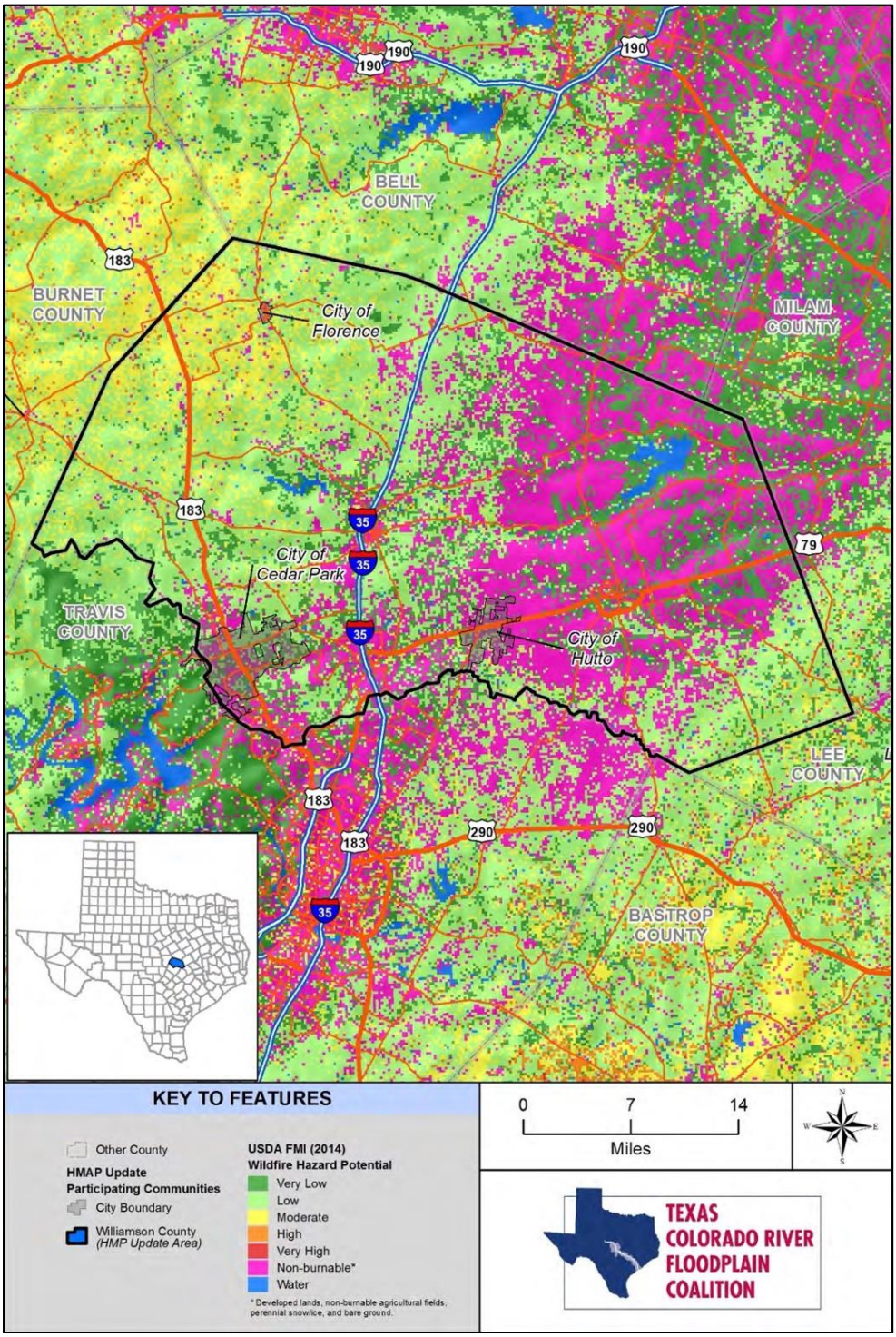
Figure 22—Wildfire Values Response Index – Williamson County



As the figure (and the interactive Texas Wildfire Risk Explorer) shows, the VRI index for the City is low to moderate.

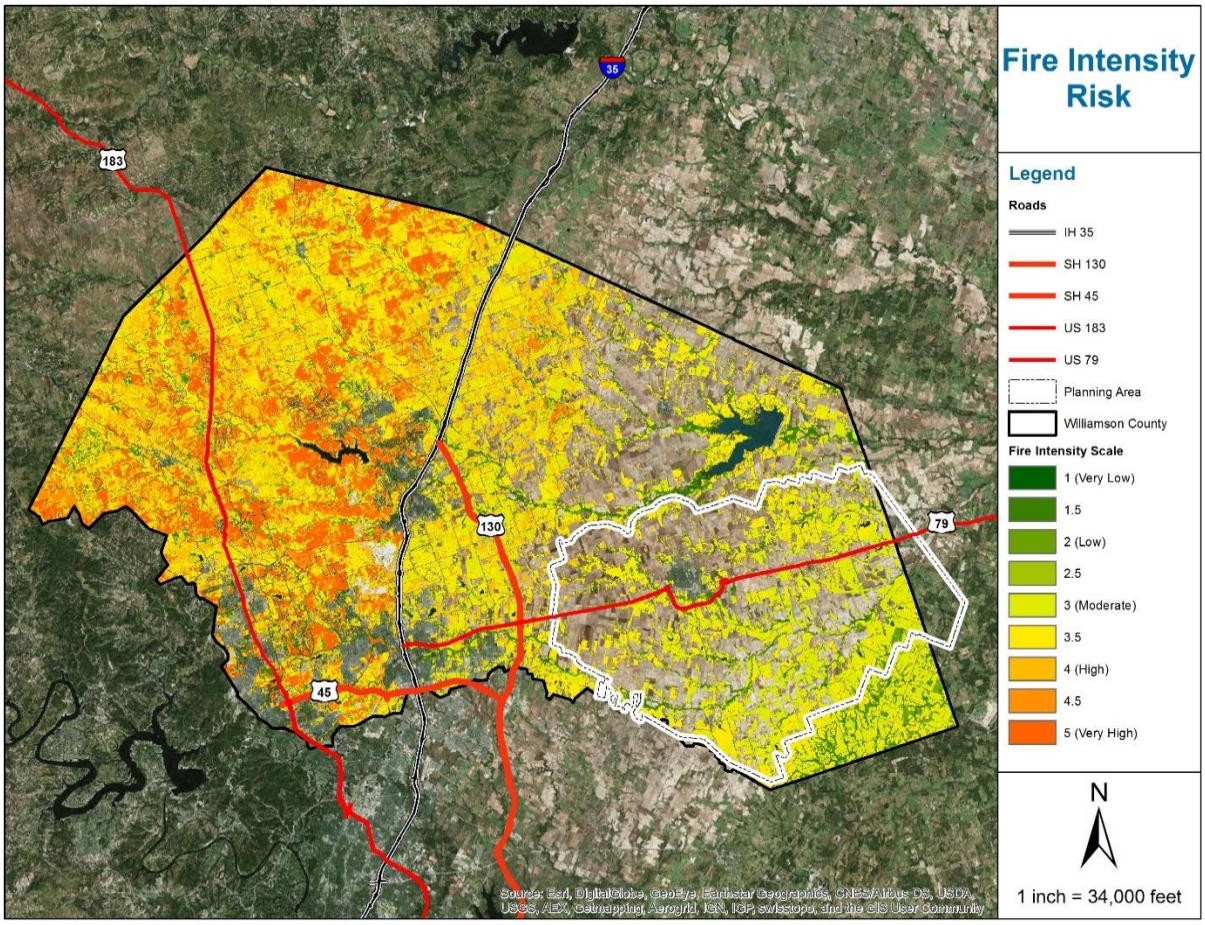
The following figure further identifies the Wildfire Hazard Potential (WHP) of those areas of Williamson County with the highest likelihood of a wildfire occurring or burning into. As the map illustrates, the City is at the lower end of the hazard scale.

Figure 23—Wildfire Hazard Potential – Williamson County



The following map further illustrates that the intensity of a wildfire within the City would most likely be low to moderate.[21]

Figure 24—Fire Intensity Ratings – Williamson County



Vegetative Fuels

Vegetative fuel factors influencing wildfire intensity and spread include fuel type (vegetation species), height, arrangement, density, and moisture. In addition to decorative landscape species and annual weeds, vegetative fuels within the City consist of a mix of native annual grasses including little bluestem, Indiangrass, switchgrass, Texas needlegrass, Virginia wild rye, big bluestem, Torrey silver bluestem, meadow dropseed, buffalo grass, and side-oats grama. Typical trees and shrubs include pecan, cedar, elm, ashe juniper, juniper, mesquite, hackberry, sugarberry,

[21] Source: Figure 26, 2018 City of Taylor Hazard Mitigation Plan.

and various oaks. Once ignited, vegetation fires can burn intensely and contribute to rapid fire spread under the right fuel, weather, and topographic conditions.

Weather

Weather elements, including temperature, relative humidity, wind, and lightning, also affect vegetation/wildland fire potential and behavior. High temperatures and low relative humidity dry out vegetative fuels, creating a situation where fuels will more readily ignite and burn more intensely. Wind is the most significant weather factor influencing vegetation/wildland fire behavior, with higher wind speeds increasing fire spread and intensity. The City has a humid, subtropical climate characterized by hot, humid summers and mild-to-cool winters with an annual average of 35 inches of rain and average summer high temperatures in the 90s. Fuel and weather conditions conducive to vegetation/wildfires occur from approximately April through October.

Topography

Vegetation/wildland fires tend to burn more intensely and spread faster when burning uphill and up-canyon, except for wind-driven downhill or down-canyon fires. The City's generally flat topography has minimal influence on vegetation/wildfire behavior and spread.

Water Supply

Another significant vegetation fire impact severity factor is the water supply immediately available for fire suppression. As stated, many areas of the City have undersized or dead-end water mains.

Vegetation/Wildfire Service Demand

The Department responded to 75 vegetation/wildfires over the four-year study, comprising 0.81 percent of total service demand over the same period, as summarized in the following table.

Table 36—Vegetation/Wildfire Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Vegetation / Wildfire	2018	9	9	0	18	0.85%
	2019	14	5	0	19	0.83%
	2020	9	7	10	26	1.13%
	2021	3	7	2	12	0.47%
	Total	**35**	**28**	**12**	**75**	**0.81%**
Percent Total Station Demand		0.72%	0.66%	6.32%		

As the table illustrates, vegetation/wildfire incident service demand is low.

Vegetation/Wildfire Risk Assessment

The following table summarizes Citygate's assessment of the City's vegetation/wildfire risk by planning zone.

Table 37—Vegetation/Wildfire Risk Assessment

Vegetation/Wildfire Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Possible*	*Possible*
Probable Impact Severity	*Minor*	*Minor*
Overall Risk	***Low***	***Low***

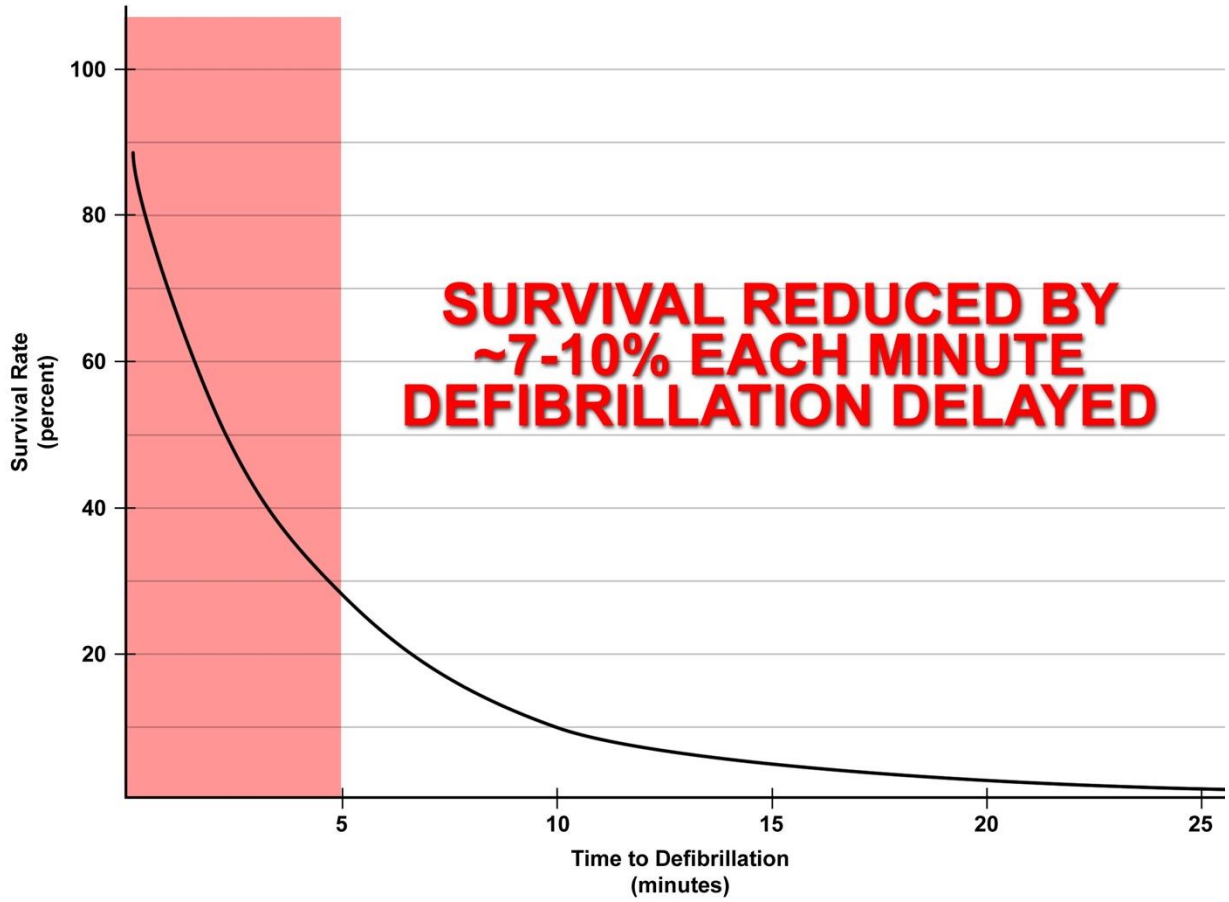
A.1.11 Medical Emergency Risk

Medical emergency risk in most communities is predominantly a function of population density, demographics, violence, health insurance coverage, and vehicle traffic.

Medical emergency risk can also be categorized as either a medical emergency resulting from a traumatic injury or from a health-related condition or event. Cardiac arrest is one serious medical emergency among many where there is an interruption or blockage of oxygen to the brain.

The following figure 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 25—Survival Rate Versus Time to Defibrillation



Population Density

The City's population density ranges from fewer than 75 to more than 3,000 people per square mile, as shown in Map #2a (**Volume 2—Map Atlas**). Risk analysis across a wide spectrum of other Citygate clients shows a direct correlation between population density and the *occurrence* of medical emergencies, particularly in high urban population density zones. *It should be noted that at the peak of construction, Samsung estimates upwards of 16,000 construction personnel on site daily*.[22]

Demographics

Medical emergency risk tends to be higher among older, poorer, less educated, and uninsured populations. As shown in Table 3, nearly 17 percent of the population is 65 and older, nearly 18 percent of the population over 24 years of age has less than a high school education or equivalent,

[22] Source: Videoconference meeting with Samsung executive project team on April 4, 2022.

11 percent of the population is below the poverty level, and 15 percent of the population does not have health insurance coverage.[23]

Vehicle Traffic

Medical emergency risk tends to be higher in areas of a community with high daily vehicle traffic volume, particularly areas with high traffic volume traveling at high speeds. The City's transportation network includes Highways 79 and 95 carrying an aggregate annual average daily traffic volume of nearly 35,000 vehicles.[24]

Medical Emergency Service Demand

Medical emergency service demand over the four-year study period includes slightly more than 6,000 calls for service, comprising nearly 66 percent of total service demand over the same period, as summarized in the following table.

Table 38—Medical Emergency Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Medical Emergency	**2018**	789	614	1	**1,404**	66.13%
	2019	792	676	11	**1,479**	64.78%
	2020	861	676	10	**1,547**	67.38%
	2021	872	774	13	**1,659**	64.83%
	Total	**3,314**	**2,740**	**35**	**6,089**	**65.75%**
Percent Total Station Demand		68.32%	64.93%	18.42%		

As the table shows, medical emergency service demand varies by planning zone and increased 18 percent over the four-year period. Demand should not be expected to increase dramatically during construction or operation of the Samsung semiconductor manufacturing facility, as the company plans to have on-site health care services to minimize impacts on local first responder capacity.

Medical Emergency Risk Assessment

The following table summarizes Citygate's assessment of the City's medical emergency risk by planning zone.

[23] Source: Esri Community Analyst Community Profile (2021) and U. S. Census Bureau.
[24] Source: Texas Department of Transportation (2021).

Table 39—Medical Emergency Risk Assessment

Medical Emergency Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Frequent*	*Frequent*
Probable Impact Severity	*Moderate*	*Moderate*
Overall Risk	***High***	***High***

A.1.12 Hazardous Material Risk

Hazardous material risk factors include fixed facilities that store, use, or produce hazardous chemicals or waste; underground pipelines conveying hazardous materials; aviation, railroad, maritime, and vehicle transportation of hazardous commodities into or through a jurisdiction; vulnerable populations; emergency evacuation planning and related training; and specialized hazardous material service capacity.

Fixed Hazardous Material Facilities

Department staff identified five current occupancies or facilities within the City requiring a state or County hazardous material operating permit or a Hazardous Materials Business Plan. In addition, Samsung Electronics is currently constructing a six million square foot semiconductor manufacturing facility on a 1,300-acre site in southcentral area of the City. In addition to the hazardous materials used during construction, large quantities of hazardous materials will be needed to support the facility's daily operational needs.[25] Samsung officials advised Citygate that high quantities of hazardous materials will be needed to meet operational needs.

Transportation-Related Hazardous Materials

The City also has transportation-related hazardous material risk due to its road transportation network, including Highways 79 and 95, with daily truck traffic, some of which are transporting hazardous commodities. There are also railway lines running both north to south and east to west through the City, with approximately 16 train movements daily;[26] however, a large railway hub—south of Highway 79, between Taylor and Hutto—is planned as a major industrial park to support Samsung and other future industrial facilities, with hazardous materials for the Samsung facility transported in by truck from this or more distant railway facilities.

[25] Source: Videoconference meeting with Samsung executive project team on April 4, 2022.
[26] Source: U.S. Department of Transportation, Federal Railroad Administration (2020 data).

Population Density

Because hazardous material emergencies have the potential to adversely impact human health, it is logical that the higher the population density, the greater the potential population exposed to a hazardous material release or spill. As shown in Map #2a Population Density by Block Group (**Volume 2—Map Atlas**), the population density within the City ranges from fewer than 75 to more than 3,000 people per square mile.

Vulnerable Populations

Persons vulnerable to a hazardous material release/spill include individuals or groups unable to self-evacuate, generally including children under the age of 10, the elderly, and persons confined to an institution or other setting where they are unable to leave voluntarily. As shown in Table 29, more than 30 percent of the population is under age 10 or is 65 years and older.

Emergency Evacuation Planning, Training, Implementation, and Effectiveness

Another significant hazardous material impact severity factor is a jurisdiction's shelter-in-place / emergency evacuation planning and training. In the event of a hazardous material release or spill, time can be a critical factor in notifying potentially affected persons—particularly at-risk populations—to either shelter-in-place or evacuate to a safe location. Essential to this process is an effective emergency plan that incorporates one or more mass emergency notification capabilities, as well as pre-established evacuation procedures. It is also essential to conduct regular, periodic exercises involving these two emergency plan elements to evaluate readiness and identify and remediate any planning or training gaps to ensure ongoing emergency incident readiness and effectiveness.

While the City does not have a formal emergency evacuation plan, the City utilizes Warn Central Texas and an internal City free subscription and reverse 9-1-1-based mass emergency notification system that can provide emergency alerts, notifications, and other emergency information to email accounts, cell phones, smartphones, tablets, and landline telephones.

Hazardous Material Response Capacity

As discussed in Section A.1.6, most Department personnel are trained to the Hazardous Materials Technician level. Additional, limited hazardous materials response capability is scattered throughout Williamson County among multiple agencies in addition to the County Special Operations Team with two hazardous materials technicians. The nearest full Hazardous Materials Response Team is in Austin, 34 miles southwest of the City.

Although the Samsung facility will have best practice safety controls and an on-site emergency response team with hazardous material capacity, the buildings will be too large for the on-site team and current six on-duty Department response personnel to enter, search, and resolve anything more extensive or severe than a minor emergency event. The City and Department will need to continue

to invest in ongoing hazardous material training and technical response capacity to ensure adequate capacity to mitigate a serious spill or release.

Hazardous Material Service Demand

The Department responded to 150 hazardous material incidents over the four-year study, comprising 1.62 percent of total service demand over the same period, as summarized in the following table.

Table 40—Hazardous Material Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Hazardous Material	**2018**	18	11	1	**30**	1.41%
	2019	24	23	2	**49**	2.15%
	2020	21	19	1	**41**	1.79%
	2021	20	10	0	**30**	1.17%
	Total	**83**	**63**	**4**	**150**	**1.62%**
Percent Total Station Demand		1.71%	1.49%	2.11%		

As the table shows, hazardous material service demand varies by planning zone and, as a percentage of total annual demand, was relatively consistent over the four years.

Hazardous Material Risk Assessment

The following table summarizes Citygate's assessment of the City's hazardous materials risk by planning zone.

Table 41—Hazardous Material Risk Assessment

Hazardous Material Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Probable*	*Probable*
Probable Impact Severity	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***

A.1.13 Technical Rescue Risk

Technical rescue risk factors include active construction projects; structural collapse potential; confined spaces such as tanks and underground vaults; bodies of water, including rivers and streams; industrial machinery use; transportation volume; and earthquake, flood, and landslide potential.

Construction Activity

There is ongoing residential, commercial, industrial, and infrastructure construction activity occurring within the City, including 24-hours a day / 7-days per week construction at the Samsung facility over the next few years. It should be noted that while Samsung typically relies on local first responder technical rescue capabilities and capacity, it has historically required its contractors to provide their own on-site technical rescue capability/capacity.[27]

Confined Spaces

There are some confined spaces within the City, including tanks, vaults, and open trenches.

Bodies of Water

There are numerous small bodies of water within the City.

Transportation Volume

Another technical rescue risk factor is transportation-related incidents requiring technical rescue. This risk factor is primarily a function of vehicle, railway, and aviation traffic. Vehicle traffic volume is the greatest of these factors within the service area, with Highways 79 and 95 carrying an aggregate annual average daily traffic volume of nearly 35,000 vehicles. The Taylor Municipal Airport is a general aviation airport with one 4,000-foot runway and no commercial airline services.

Earthquake Risk[28]

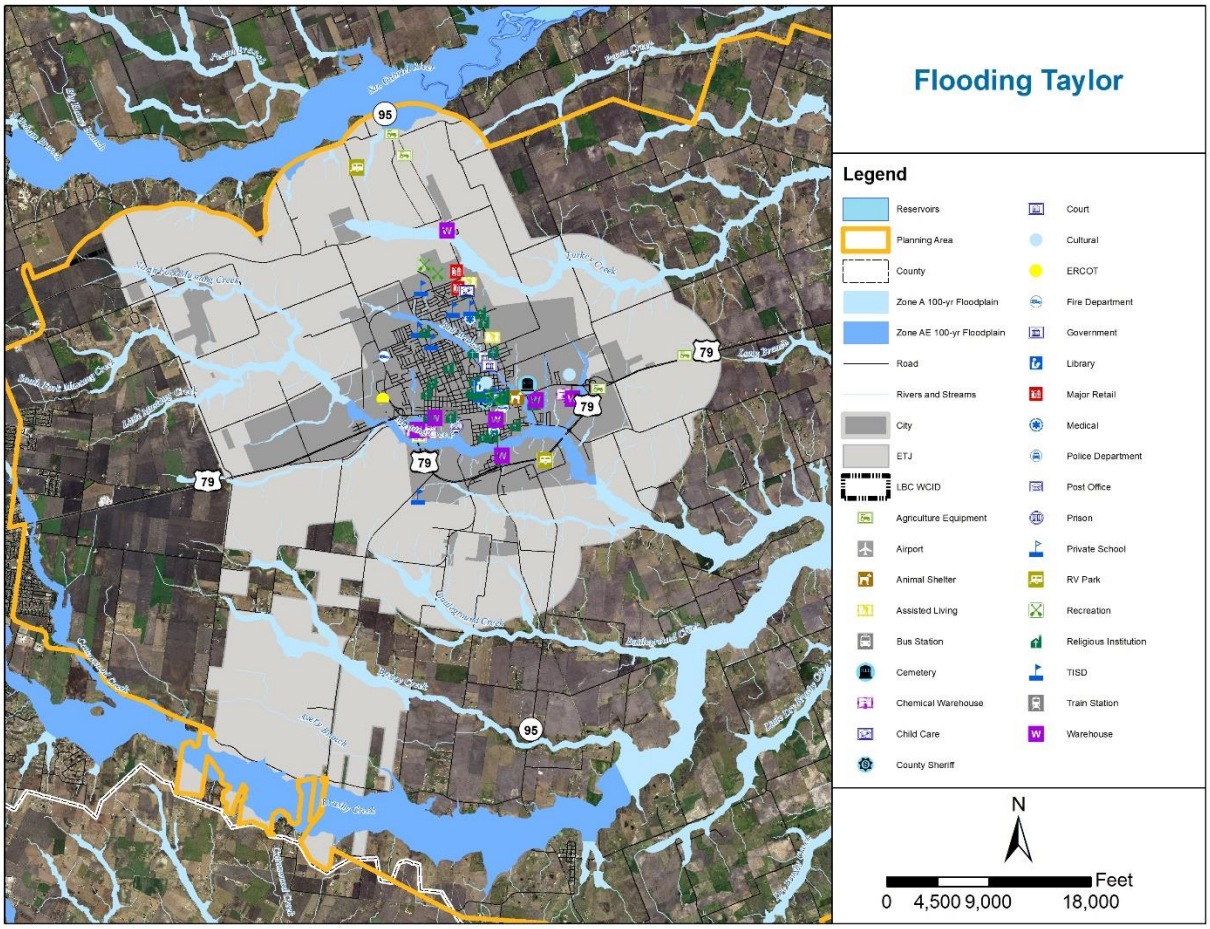
The earthquake hazard in central Texas is generally low; however, small earthquakes can occur, sometimes triggered by oil or gas production. The Williamson County Hazard Mitigation Plan ranks earthquakes as a low risk Countywide.

[27] Source: Videoconference meeting with Samsung executive project team on April 4, 2022.
[28] Source: Williamson County Hazard Mitigation Plan (January 2017), Chapter 11.

Flood Risk[29]

Historically, the City is susceptible to flooding from extreme rainfall events and inadequate drainage. The following map shows the areas of the City most susceptible to a 1 percent chance annual event, although some level of flooding is likely in any given year.

Figure 26—Flood Hazard Zones – City of Taylor



Tornado Risk[30]

Numerous tornado events have occurred in Williamson County since 1954 with most being weak to moderate in severity or extent. The City's Hazard Mitigation Plan projects the probability of a future tornado event as likely, with impact severity ranging from low to high.

[29] Source: City of Taylor Hazard Mitigation Plan, Section 2.6.
[30] Source: City of Taylor Hazard Mitigation Plan, Section 2.7.

Technical Rescue Service Demand

Over the four-year study, there were 20 technical rescue incidents in the City, comprising 0.22 percent of total service demand, as summarized in the following table.

Table 42—Technical Rescue Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Technical Rescue	2018	0	2	0	**2**	0.09%
	2019	1	5	0	**6**	0.26%
	2020	0	3	1	**4**	0.17%
	2021	2	5	1	**8**	0.31%
	Total	**3**	**15**	**2**	**20**	**0.22%**
Percent Total Station Demand		0.06%	0.36%	1.05%		

As the table illustrates, technical rescue incident service demand is low.

Technical Rescue Risk Assessment

The following table summarizes Citygate's assessment of the City's technical rescue risk by planning zone.

Table 43—Technical Rescue Risk Assessment

Technical Rescue Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Possible*	*Possible*
Probable Impact Severity	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***

A.1.14 Aviation Incident Risk

Aviation incident risk factors include commercial or general aviation activity into, from, and over a community or jurisdiction.

Taylor Municipal Airport, located west of downtown on the north side of Highway 79, is a general aviation business service facility with one 4,000-foot runway; 65 hangar spaces; 35 aircraft tie

downs; and one aviation inspection, maintenance, and repair facility. The airport also hosts several fly-in events each year.

Aviation Incident Service Demand

Over the four-year study period, there were seven aviation incidents comprising just 0.08 percent of total service demand for the same period, as summarized in the following table.

Table 44—Aviation Incident Service Demand

Hazard	Year	Planning Zone			Total	Percent Total Annual Demand
		Station 1	Station 2	Other		
Aviation Incident	2018	0	5	0	**5**	0.24%
	2019	0	0	0	**0**	0.00%
	2020	1	0	0	**1**	0.04%
	2021	1	0	0	**1**	0.04%
	Total	**2**	**5**	**0**	**7**	**0.08%**
Percent Total Station Demand		0.04%	0.12%	0.00%		

As the table illustrates, aviation incident service demand is extremely low.

Aviation Incident Risk Assessment

The following table summarizes Citygate's assessment of the City's aviation incident risk by planning zone.

Table 45—Aviation Incident Risk Assessment

Aviation Incident Risk	Planning Zone	
	Station 1	Station 2
Probability of Occurrence	*Unlikely*	*Unlikely*
Probable Impact Severity	*Moderate*	*Moderate*
Overall Risk	***Low***	***Low***