CITYGATE ASSOCIATES, LLC
PUBLIC SAFETY SERVICES

FIRE DEPARTMENT SERVICES EVALUATION

VOLUME 1 OF 2 – TECHNICAL REPORT

CITY OF LAKEVILLE, MN

MARCH 17, 2022

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Lakeville
MINNESOTA

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EXECUTIVE SUMMARY

The City of Lakeville, Minnesota (City) Fire Department (Department) retained Citygate Associates, LLC (Citygate) to conduct a comprehensive Fire Department Services Evaluation to establish recommended minimum requirements relative to the organization and deployment of fire suppression operations, emergency medical operations, and special operations for the Department to consider, and to create a template for future deployment and performance analysis.

This study is presented in several parts, including this Executive Summary which includes all findings and recommendations; the Standards of Cover supported by maps and response statistics; and an administrative support staffing capacity review. A separate Map Atlas **(Volume 2)** contains all the maps referenced throughout this report. Overall, there are 31 findings and 10 recommendations.

POLICY CHOICES FRAMEWORK

There are no mandatory federal or state regulations directing the level of fire service staffing, response times, or outcomes. However, if services are provided at all, local, state, and federal regulations must be followed for the safety of the public and for the personnel providing the services.

Thus, the level of fire protection services provided is a *local policy decision*. Communities have the level of fire services they can afford and choose to purchase, which may not always be the level desired.

OVERALL DEPLOYMENT SUMMARY

Fire service deployment, simply summarized, is about the *speed* and *weight* of response. *Speed* refers to initial response (first-due) resources, typically engines, ladder trucks, and ambulances, strategically deployed across a jurisdiction for response to emergencies within a specified time interval to control 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 a sufficient number of firefighters must be assembled within a reasonable time interval to safely control the emergency and prevent it from escalating into a more serious event. More importantly, within the SOC process, positive outcomes are the goal. From that, 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* density communities include preventing permanent impairment from medical emergencies where possible and confining building fires to the room or area of

origin. To achieve this, the initial (first-due) unit should arrive within 7:00 to 8:00 minutes, before brain death becomes permanent and an incipient building fire expands beyond the room of origin, and the full multiple-unit Effective Response Force (ERF) should arrive within 11:00 to 12:00 minutes with a sufficient number of personnel to safely perform all of the critical tasks necessary to mitigate the emergency.

For *suburban* density communities, desired outcomes typically include preventing death from a medical emergency where possible and confining building fires to the interior of the building of origin, which means that the first-due unit should arrive within 11:00 to 12:00 minutes and the full ERF should arrive within 15:00 to 16:00 minutes.

Overall service demand increased more than 33 percent over the three-year period, and another 39 percent in 2021 to nearly 2,800 calls for service annually, 65 percent of which were EMS-related. The Department's current deployment model provides two to four personnel on duty at Station 4 during daytime hours only, augmented by additional on-call personnel as available from home or work as needed. The following table summarizes the Department's response performance over the three-year study.

Table 1—Response Performance Summary

Response Component	Response Type	Best Practice		90th Percentile Performance	Performance versus Best Practice and Current Goal
		Time	Reference		
Call Processing / Dispatch	All	1:30	NFPA	**2:49**	**88%**
Crew Turnout	Overall	2:00	Citygate	**3:07**	**56%**
	Duty Crew			**2:16**	**13%**
First-Due Travel	Overall	4:00	NFPA Citygate	**7:27**	**86%**
	Duty Crew			**7:52**	**97%**
First Unit Call to Arrival	Overall	7:30	Citygate	**12:29**	**66%**
	Duty Crew			**11:22**	**52%**
ERF Travel	All	8:00	NFPA	**21:18**	**166%**
ERF Call to Arrival	All	11:30	Citygate	**26:32**	**131%**

As the table shows, the Department's current single duty crew deployment model cannot provide the "speed "and "weight" of response needed to facilitate desired outcomes in an urban/suburban population density community of 70,000 people. This model also leaves no on-duty staffing for the simultaneous incidents that are occurring 12 percent of the time and which increase in frequency annually.

Because this deployment model can only deliver a 4:00-minute first-unit travel time service level within 1.5 to 2 miles of Station 4, Citygate is concerned with the Department's ability to provide an equitable level of service to other areas of the City with similar risk and population density. While call processing and crew turnout performance may be improved with training and accountability, travel time, in Citygate's opinion, cannot be improved without (1) adding more response unit capacity in each of the other three station response areas, *and* (2) relocating existing stations and/or adding additional station(s) over time.

The Department is also increasingly unable to maintain its minimum daily duty crew shift staffing level with the current roster of approximately 85 part-time paid-on-call (POC) firefighters, approximately 19 percent of whom worked *less* than the required two shifts per month in 2021 and another 30 percent of whom only worked the minimum two shifts, leaving only about half of the remaining POC cadre to carry the rest of the 277 annual duty shifts. As a result, the Fire Chief and Assistant Fire Chief must fill those duty crew shift vacancies, taking away critical workload capacity to perform their primary responsibilities.

Citygate understands that a committed crew of part-time POC personnel provides great value to the City and Department, and a combination of full-time and part-time personnel will be needed over the foreseeable future to ensure an adequate first unit "speed of response" and ERF "weight of response." Citygate's assessment finds that the Department as currently deployed has significant challenges to address to serve its diverse urban/suburban/rural population over a large geographic area.

Administrative Support Staffing Capacity Summary

Citygate's review and evaluation of the Department's administrative support organization's workload capacity found that although the most important responsibilities and tasks are being completed, the Fire Chief and Assistant Fire Chief are regularly working 55 to 65 hours per week to complete that workload while other responsibilities are not completed at all. In addition, both the Fire Chief and Assistant Fire Chief are having to fill duty crew shift vacancies to maintain minimum operational response capacity on an increasing frequency, further impacting their administrative responsibilities and workload capacity.

Citygate's assessment identified the need for an additional 3.1–5.1 full-time equivalents (FTEs) at the appropriate skill level(s) to ensure sufficient fire administration workload capacity to complete all responsibilities and tasks within a normal 40-hour workweek as identified in detail in **Section 3.3**.

Findings and Recommendations

Following are Citygate's findings and recommendations as contained throughout this report.

Deployment Findings and Recommendations

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

Finding #2: The City and Department have *not* established response performance goals consistent with best practice recommendations as published by the Commission on Fire Accreditation International and the National Fire Protection Association. Doing so will guide future fire crew staffing, apparatus types, and deployment methods.

Finding #3: The Department's current deployment model provides only a single two- to four-person on-duty crew at Station 4 from 9:00 am to 10:00 pm on weekdays, and from 6:00 am to 10:00 pm on weekends. The remaining overnight hours and more serious emergency incidents rely on on-call personnel responding from home or work as available.

Finding #4: 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, trucks, specialty units, and command officers customarily needed to effectively control that type of incident based on Department experience.

Finding #5: The Department's current fire station locations can be expected to deliver 4:00-minute first-due travel time coverage to only 61 percent of the total service area road miles, which is only fair coverage to achieve desired outcomes.

Finding #6: The Department's current fire station locations can be expected to deliver 8:00-minute ERF travel time coverage to 89 percent of the service area's public road miles, which is very good coverage for more serious emergencies requiring multiple units from multiple stations assuming all units are available for immediate response.

Finding #7: The Department's aerial ladder truck resources are appropriately located at Stations 1 and 4 to serve the largest, most built-up sections of the service area within the desired 8:00-minute travel time goal.

Finding #8: Annual service demand increased 33 percent from January 2018 through December 2020, with a 39 percent increase in 2021 over the previous year.

Finding #9: One or more simultaneous calls for service occur 12 percent of the time.

Finding #10: Simultaneous incident activity doubled from 2018 to 2020.

Finding #11: Call processing performance is *88 percent slower* than the 1:30-minute best practice standard.

Finding #12: Duty crew turnout performance is only slightly slower than Citygate's recommended 2:00-minute best practice goal.

Finding #13: On-call POC turnout performance, while nearly 5:00 minutes, is good considering the personnel are responding to the station from home or work.

Finding #14: Duty crew travel time performance is *nearly double* the 4:00-minute best practice goal for urban response zones to facilitate desired outcomes.

Finding #15: Station response tier first-unit travel time performance is much better at slightly less than 5:00 minutes, however, it is still 22 percent slower than the 4:00-minute best practice goal for urban zones.

Finding #16: Duty crew call-to-arrival performance, which is the Department's true customer service measure, is *52 percent slower* than the 7:30-minute best practice goal to facilitate desired outcomes in urban areas due to slow call processing and long travel times.

Finding #17: Station response tier call-to-arrival performance is *nearly double* the 7:30-minute best practice goal due to slow call processing and crew turnout from home or work.

Finding #18: Department-wide ERF call-to arrival performance is *more than double* Citygate's recommended 11:30-minute best practice goal to facilitate desired outcomes in urban zones. It is also *71 percent slower* than Citygate's recommended 15:30-minute best practice goal for suburban zones, and *23 percent slower* than Citygate's recommended 21:30-minute best practice goal for rural zones.

Finding #19: Service demand increased more than 30 percent annually over the past three years. The Department responded to nearly 2,800 calls for service in 2021.

Finding #20: The part-time POC firefighter cadre provides great value to the City and Department.

Finding #21: The current duty crew model does not provide on-duty staffing 24-hours per day.

Finding #22: The current duty crew staffing level is insufficient to provide the number of personnel needed to safely resolve a single moderate-risk fire, multiple-patient EMS incident, or technical rescue.

Finding #23: With a 90th percentile ERF response time of more than 26:00 minutes, the time required to amass a sufficient number of on-call POC firefighters from home or work for more serious incidents is too long to facilitate desired outcomes.

Finding #24: The number of duty crew shifts with less than minimum POC staffing is increasing, and the resultant number of shifts the Fire Chief and Assistant Fire Chief must cover to maintain the established minimum response staffing level is increasing.

Finding #25: With the current duty crew staffing model only at Station 4 and a 90th percentile first unit travel time of nearly 8:00 minutes, *most* of the City receives a first unit travel time service level insufficient to facilitate typically desired outcomes in urban population density communities.

Finding #26: Overall response performance cannot be improved significantly without adding on-duty staffing at Stations 1, 2, and 3.

Finding #27: A combination of full-time and part-time personnel will be needed over the foreseeable future to ensure an adequate first unit "speed of response" and ERF "weight of response."

Recommendation #1: **Adopt Updated Deployment Policies:** The City Council should adopt updated, complete performance measures to aid deployment planning and to monitor performance. The measures of time should be designed to deliver outcomes that will save patients, when possible, upon arrival and to 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, 90 percent of the time from the receipt of the 9-1-1 call at the DCC to incidents within two miles of a staffed fire station. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and a 4:00-minute travel time. For those areas within the City beyond two miles of a staffed fire station, the first-due unit should arrive within 11:30 minutes from DCC notification at 90 percent or better reliability. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and an 8:00-minute travel time. For Eureka

Township, the first-due unit should arrive within 15:30 minutes from DCC notification at 80 percent or better reliability. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and a 12:00-minute travel time.

1.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine building fires near the room or rooms 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 **15** personnel, including at least one Chief Officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt at DCC 90 percent of the time within the urban population density areas of the City. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and an 8:00-minute travel time.

To confine building fires to the building of origin, keep vegetation fires under two acres 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 15:30 minutes from the time of 9-1-1 call receipt at DCC 90 percent of the time within the suburban population density areas of the City. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and a 12:00-minute travel time. For Eureka Township, a multiple-unit ERF of at least **six** personnel, including at least one Chief Officer, should arrive within 20:00 minutes from the time of 9-1-1 call receipt at DCC 80 percent of the time. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and 16:30-minute 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 in the urban population density areas of the City, 11:30 minutes or less in the suburban density areas of the City, and 15:30 minutes or less in Eureka Township to provide initial hazard evaluation and/or mitigation actions. 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, a first-due total response time of 7:30 minutes or less is required in the urban population density areas of the City; 11:30 minutes or less is required in the suburban density areas of the City; and 15:30 minutes or less is required in Eureka Township to evaluate the situation and initiate rescue actions. Additional resources should assemble as needed within a total response time of 11:30 minutes within the urban population density areas of the City, within 15:30 minutes in the suburban population density areas of the City, and within 21:30 minutes in Eureka Township to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #2: Add staffing at Station 4 to provide two-person duty crew staffing 24 hours per day, 7 days per week using a combination of paid full-time and part-time POC personnel as available.

Recommendation #3: At the earliest possible opportunity, fund a second two-person duty crew at Station 1, and relocate the Station 4 duty crew to Station 2 to improve Citywide first-unit response coverage and performance.

Recommendation #4: Continue to utilize active, committed part-time POC personnel to supplement full-time personnel and provide sufficient ERF staffing for more complex incidents.

Recommendation #5: Pursue authorization to provide EMS variance protocols to provide enhanced pre-hospital Emergency Medical Services.

Recommendation #6: Fund third and fourth two-person duty crews at Stations 3 and 4 to provide an equitable first-unit service level to most areas of the City.

Recommendation #7: As funding allows, increase minimum daily staffing at each station to three personnel.

Recommendation #8: As current stations become due for major remodel or replacement, consider relocating Station 1 southwest and Station 2 west to provide improved first unit and ERF travel time coverage.

Administrative Support Staffing Capacity Findings and Recommendations

Finding #28: The Lakeville Fire Department is understaffed to accomplish many of its administrative responsibilities and tasks.

Finding #29: The Fire Chief and Assistant Fire Chief are regularly working an average of 55 to 65 hours per week to ensure that the most important responsibilities and tasks are completed.

Finding #30: The Fire Chief and Assistant Fire Chief are having to fill duty crew shift vacancies with increasing frequency, impacting their available capacity to complete administrative responsibilities and tasks.

Finding #31: Citygate's evaluation of the Fire Department's administrative support organization yielded an estimated annual workload capacity gap of 6,124–9,960 hours which equates to 3.1–5.1 FTEs.

Recommendation #9: The City should consider funding an additional 0.5–1.0 FTE Administrative Assistant and 1.0 Training/Safety Chief Officer as soon as possible to resolve existing fire administrative workload capacity gaps, provide enhanced chief officer oversight and capacity, minimize or eliminate any potential single points of administrative support failure, and ensure sufficient fire administration workload capacity to complete all responsibilities and tasks within a normal 40-hour work week.

Recommendation #10: The City should consider funding an additional 2.0 FTE Fire Inspector capacity as soon as funding allows to provide the additional capacity needed to inspect all business occupancies on at least a triennial basis.

NEXT STEPS

Citygate offers the following suggested sequential next steps.

Near-Term

- Review and absorb the content, findings, and recommendations of this report.
- Adopt revised response performance goals as recommended.
- Evaluate fire stations for modifications needed to accommodate 24-hour duty crews.

- Increase staffing as necessary to provide a 24-hour two-person duty crew at Station 4.
- Develop a plan to provide additional administrative support capacity.
- Adopt a plan to staff Stations 1 and 2 with personnel 24 hours per day.

Longer-Term

- Develop a strategy to staff Stations 2 and 4 with 24-hour two-person duty crews.
- Develop a strategy to increase duty crew staffing to three personnel.
- Consider adding full-time Battalion Chiefs to supervise shift personnel and provide incident command.
- As fire stations need major repair or replacement, consider relocating Station 1 southwest and Station 2 west to improve first-due travel time coverage.
- Monitor response performance against adopted goals.

SECTION 1—INTRODUCTION AND BACKGROUND

The City of Lakeville, Minnesota (City) Fire Department (Department) retained Citygate Associates, LLC (Citygate) to conduct a comprehensive Fire Department Services Evaluation based on nationally recognized guidelines and best practices, federal and state mandates, and relevant local and regional operating procedures. The SOC assessment is intended to establish recommended minimum requirements relative to the organization and deployment of fire suppression operations, emergency medical operations, and special operations for the Department to consider, and will create a template for future deployment and performance analysis.

Citygate's Work Plan reflects Citygate's Project Team members' experience in fire administration and deployment. Citygate utilizes various National Fire Protection Association (NFPA) and Insurance Services Office (ISO) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI).

1.1 REPORT ORGANIZATION

This report is organized into the following sections. **Volume 2** (Map Atlas) is separately bound.

Executive Summary	A summary of current services and significant challenges, including key findings and recommendations.
Section 1	**Introduction and Background:** An introduction to the study and background information about the City and Department.
Section 2	**Standards of Cover Assessment:** An overview of the SOC process and detailed analysis of the Department's existing deployment model, risks to be protected, emergency outcome expectations, staffing needed at different emergencies (critical tasks), geographical distribution and concentration effectiveness of fire crew locations, reliability and historical response measures effectiveness, and a concluding overall deployment evaluation.
Section 3	**Administrative Support Staffing Capacity Review:** A high-level review and evaluation of the Department's administrative support staffing organization and workload capacity.
Appendix A	**Community Risk Assessment:** A comprehensive assessment of the values at risk to be protected within the community and evaluation of the fire and non-fire hazards likely to impact the service area as related to services provided by the Department.

1.1.1 Goals of the 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 is currently deployed and operating. This information is presented in the form of recommendations and policy choices for the City and Department to consider.

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 requiring a specific minimum level of fire services. Through the public policy process, each community is expected to understand the local fire and non-fire risks and its ability to pay 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 Scope of Work

1.2.1 Project Approach and Research Methods

Citygate utilized multiple sources to gather, understand, and model information about the City and Department. Citygate requested a large amount of relevant background data and information to better understand current costs, service levels, history of service level decisions, and other prior studies.

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

Once Citygate gained an understanding of the Department's service area 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-range needs. The result is a framework for enhancing Department services while meeting reasonable community expectations and fiscal realities.

1.2.2 Project Scope of Work

Citygate's approach to this assessment involved:

- Reviewing data and information provided by the Department and City and conducting stakeholder listening sessions with project stakeholders.
- Utilizing a Geographic Information System (GIS) software mapping program to model fire station travel time coverage.
- Using StatsFD™, an incident response time analysis program, to review the statistics of prior incident performance and plot the results on graphs and geographic mapping exhibits.
- Identifying and evaluating future City population and related development growth.
- Identifying and evaluating potential alternate service delivery models.
- Recommending appropriate risk-specific response performance goals.
- Utilizing the CFAI self-assessment criteria and *NFPA 1201 – Standard for Providing Emergency Services to the Public* as well as other NFPA standards as the basis for evaluating the Department's administrative support organization's workload capacity.

1.3 CITY OVERVIEW

Incorporated as a Plan 'A' Statutory city in 1967 under Chapter 412 of the Minnesota State Statutes, the City of Lakeville is located approximately 20 miles south of the downtowns of both St. Paul and Minneapolis. Bordered to the west by Credit River Township; to the north by the City of Burnsville, the City of Apple Valley and, tangentially, the City of Rosemount; to the east by the City of Farmington; and to the south by unincorporated Eureka Township, the City encompasses 38 square miles and is one of the fastest growing cities in the Twin Cities region.

Operating under a council and city administrator form of government, with a Mayor and four council members elected at large to staggered four-year terms, the City provides a full range of

urban community services including economic development, planning, engineering, building, police, fire, parks, recreation, streets, utilities, parking, library, recreation, and cultural services.

The City has a diversified economy led by service-related businesses, followed by retail trade and finance, insurance, and real estate industries. The Airlake Industrial Park is home to more than 200 companies and is one of the State's largest industrial parks. The City's adopted 2022 budget is $119.2 million.

1.3.1 Future Growth and Development

The City Council created a Strategic Growth Management Task Force in 1992 to develop strategies related to the rate, location, and types of development that would generate fiscal stability while preserving and enhancing the City's quality of life and services. The City's 2020–2023 Strategic Plan for Economic Development identifies the following strategic priorities:

- Business retention
- Expansion and diversification
- Maximize and market the City's competitive edge
- Housing to support economic goals
- Workforce availability and utilization

With coterminous City boundaries on the north and east sides, Lakeville can only expand geographically to the west or south. The City's Comprehensive Plan[1] projects the City population will increase to approximately 74,600 by 2030, and to 83,500 by 2040.

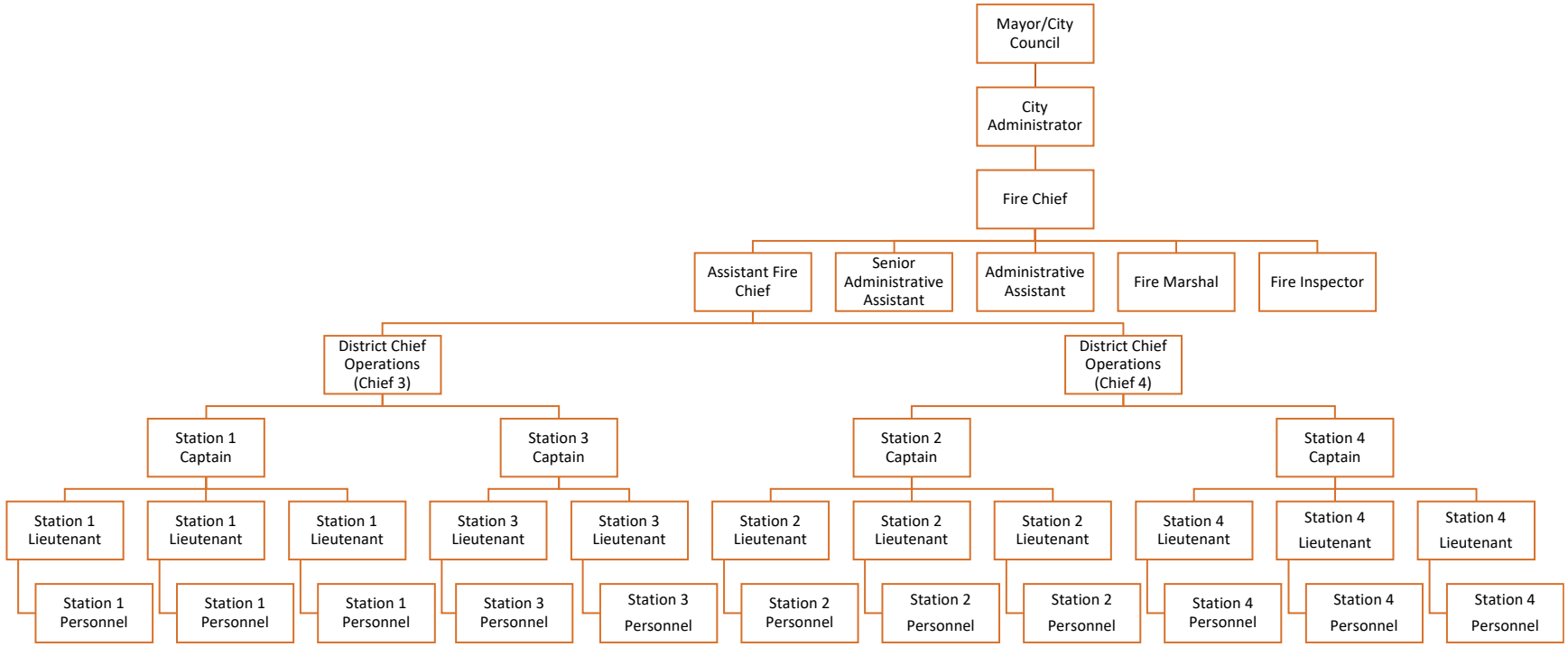
1.4 FIRE DEPARTMENT OVERVIEW

1.4.1 Organization

The Department, operating under authority of the City Council, provides fire suppression, technical rescue, Basic Life Support (BLS) pre-hospital emergency medical, initial hazardous materials response, community risk reduction, emergency management, and related fire and life safety services with a staff of 5.5 full-time personnel and up to 90 part-time firefighters organized as shown in the following figure.

[1] City of Lakeville 2040 Comprehensive Land Use Plan

Figure 1—Organizational Chart – City of Lakeville Fire Department



1.4.2 Facilities, Response Resources, and Staffing

The Department provides services from four fire stations with a combination of full-time and part-time paid-on-call (POC) personnel as summarized in the following table.

Table 2—Fire Department Facilities, Response Resources, and Daily Response Staffing

Station Number	Address	Year Built	Response Resources	Minimum On-Duty Staffing
1	20190 Holyoke Ave.	1985	Engine 100' Aerial Platform 3000-gallon Tender Grass Rig	POC[1]
2	16720 Dodd Blvd.	1976	2 Engines Grass Rig	POC[1]
3	17490 Kenrick Ave.	2087	Engine Rescue/Air Truck Grass Rig	POC[1]
4	9465 185th Street W.	2003	Engine 78' Ladder Truck Utility Truck Boat ATV	2–4[2]
			Total	**2–4**

[1] No on-duty staffing; POC personnel respond as available from home or work when paged for an incident response

[2] Minimum of two personnel on duty Monday through Friday from 9:00 am to 6:00 pm, and four personnel on duty from 6:00 pm to 10:00 pm; minimum of three personnel on duty from 6:00 am to 10:00 pm on weekends

1.4.3 Service Capacity

Service capacity refers to the Department's available response force; the size, type, 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 provides services with five engines, two aerial ladder trucks, one water tender, three grass rigs, one boat, and one ATV staffed by up to 90 part-time POC firefighters as discussed in **Section 2.2.1**.

All response personnel are trained to either the Emergency Medical Responder (EMR) or Emergency Medical Technician (EMT) level, capable of providing BLS pre-hospital emergency

medical care. The Department provides first responder emergency medical support to the private sector Advanced Life Support (ALS) ambulance service operating within the Department's service area under contract. When needed, air ambulance services are primarily provided by North Air Care based out of Faribault. Emergency Room services are available at M Health Fairview Ridges Hospital in Burnsville, M Health Fairview Southdale Hospital in Edina, Regions Hospital in St. Paul, Children's Minnesota Hospital in Minneapolis, and Hennepin Healthcare Medical Center in Minneapolis. Regions Hospital, Hennepin Healthcare Medical Center, and North Memorial Health Hospital in Robbinsdale are Level 1 Adult Trauma Centers, and Hennepin Healthcare Medical Center and Children's Minnesota Hospital are Level 1 Pediatric Trauma Centers.

Response personnel are also trained to the U.S. Department of Transportation Hazardous Material First Responder Operational (FRO) level to provide initial hazardous material incident assessment, hazard isolation, and support for a hazardous material response team. Hazardous material emergency response is provided by Dakota County Special Operations Team.

The Department provides water rescue capability with 10 POCs trained to the Rescue Swimmer level, and 10 additional POC personnel trained as drone pilots to support a variety of emergency incident types, including missing person searches and hazardous material incidents. All Department response personnel are trained in ice rescue skills. There is currently an initiative to partner with neighboring Burnsville Fire Department to enhance both rescue swimmer and ice rescue response capabilities.

The Department has mutual-aid agreements with its bordering city departments.

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

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SECTION 2—STANDARDS OF COVER ASSESSMENT

This section provides a detailed report of the Department's current ability to deploy and mitigate emergency hazards within its service area. The response analysis uses prior response statistics and geographic mapping to help the Department and the community visualize the capabilities and limitations of the current response system.

2.1 STANDARDS OF COVERAGE PROCESS OVERVIEW

The core methodology used by Citygate in the scope of its deployment analysis work is *Standards of Cover*, fifth and sixth editions, which is 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 SOC method evaluates deployment as part of a fire agency's self-assessment process. This approach uses risk and community expectations on outcomes to help elected officials make informed decisions on fire and emergency medical services 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.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire and emergency medical service levels the community needs and can afford.

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

The following table describes the eight elements of the SOC process.

Table 3—Standards of Coverage Process Elements

SOC Element		Description
1	Existing Deployment	Describing the current deployment model and response performance goals the agency has in place today.
2	Community Outcome Expectations	Reviewing the expectations of the community for responses to emergencies.
3	Community Risk Assessment	Identifying and quantifying the assets at risk to fire and non-fire hazards likely to impact the community. (For this report, see **Appendix A—Community Risk Assessment**.)
4	Critical Task Analysis	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation.
5	Distribution Analysis	Reviewing the spacing of first-due response resources (typically engines) to control routine emergencies.
6	Concentration Analysis	Reviewing the spacing of fire stations so that more complex emergencies can receive sufficient resources and personnel in a timely manner (First Alarm Assignment or ERF).
7	Reliability and Historical Response Effectiveness Analysis	Using prior response statistics to determine the percent of compliance the existing system delivers.
8	Overall Evaluation	Proposing Standard of Coverage statements by risk type, as necessary.

Source: CFAI, *Standards of Cover*, Fifth Edition

Simply summarized, fire service deployment is about the *speed* and *weight* of the response. *Speed* refers to initial response (first-due), all-risk intervention resources (engines, ladder trucks, and ambulances) strategically deployed across a jurisdiction for response to emergencies within a specified time interval to control routine to moderate emergencies, preventing the incident from escalating to greater size or severity. *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. In these situations, a sufficient number of firefighters must be assembled within a reasonable time interval to safely control the emergency and prevent it from escalating into a more serious event. The following table illustrates this deployment paradigm.

Table 4—Fire Service Deployment Paradigm

Element	Description	Purpose
Speed of Response	Travel time of initial response of 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-unit or two-unit response (*fully staffed* 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 the 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 suggest using several incremental measurements to define response time. Ideally, the clock starts when the Dakota County Communication Center (DCC) 9-1-1 dispatcher receives the emergency call. In Lakeville, the response time clock starts when the DCC receives the 9-1-1 call into its computer-aided dispatch (CAD) system. Response time increments include the DCC call processing, crew alerting and response unit boarding (commonly called turnout time), and actual driving (travel) time.

Best practice response time includes three distinct components of response: 9-1-1 call processing/dispatch, crew turnout, and travel, which combined equal *Total Response Time*. Goals should also address response performance to other risks within the City, such as hazardous materials and technical rescue, as recommended by the CFAI. While the Department has not adopted a response time goal, it has a service-level history that can be documented in response times, number of response companies, and minimum staffing, which will be analyzed in this study.

Currently NFPA Standard 1710, a recommended deployment standard for career fire departments in urban/suburban areas, recommends initial (first-due) intervention unit arrival within a 4:00-

minute travel time and recommends arrival of all the resources comprising the multiple-unit First Alarm within 8:00 minutes' travel at 90 percent or better reliability.[2]

NFPA Standard 1720, a recommended deployment standard for substantially volunteer-staffed fire departments, recommends initial (first-due) intervention units arrive within 14:00 minutes of receipt of the dispatch notification at 80 percent or better reliability. Although 9-1-1 dispatch center call processing time is *not* included in this deployment standard, the most recent published NFPA best practices have decreased the dispatch processing time to 1:00 minute for events with an imminent threat to life or significant 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.[3] In Citygate's experience, few dispatch centers meet this performance standard, thus we continue to recommend 1:30 minutes as a best-practice goal. Further, for crew turnout time, 1:00 minute to 1:20 minutes is recommended, depending on the type of protective clothing that must be donned. Citygate has long found that 1:20-minute turnout times are not achievable and thus recommends 2:00 minutes as an achievable goal for on-duty staffing, leaving 12:00 minutes for travel time to meet the 14:00-minute NFPA 1720 response goal, if dispatch processing time is not included.[4]

If the travel time measures recommended by the NFPA (and Citygate) are added to dispatch processing and crew turnout times recommended by Citygate and best practices, then a realistic 90 percent first-unit total response time goal for urban response zones is 7:30 minutes from DCC receiving the call. This includes 1:30 minutes for call processing/dispatch, 2:00 minutes for crew turnout, and 4:00 minutes for travel.

> **Finding #2:** The City and Department have *not* established response performance goals consistent with best practice recommendations as published by the Commission on Fire Accreditation International and the National Fire Protection Association. Doing so will guide future fire crew staffing, apparatus types, and deployment methods.

2.2.1 Current Deployment Model

The Department's current deployment model consists of a single two- to four-person POC *duty crew* at Station 4 from 9:00 am to 10:00 pm Monday through Friday, and from 6:00 am to 10:00

[2] 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).
[3] NFPA 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (2019 Edition).
[4] NFPA 1720 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments (2014 Edition).

pm on weekends, augmented by additional POC personnel as available from home or work as needed for more serious emergencies. Current Department policies require POC personnel to work a minimum of two four-hour duty shifts per month and attend one drill per month, which equates to an average of 277 available shift slots per month for the approximately 90 POC personnel. Incidents outside of duty crew hours rely solely on response of POC personnel from home or work, as available.

Finding #3:	The Department's current deployment model provides only a single two- to four-person on-duty crew at Station 4 from 9:00 am to 10:00 pm on weekdays, and from 6:00 am to 10:00 pm on weekends. The remaining overnight hours and more serious emergency incidents rely on on-call personnel responding from home or work as available.

Response Plan

The Department is an all-risk fire agency providing the people it protects with services that include fire suppression, pre-hospital BLS emergency medical, and initial hazardous material and technical rescue 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 DCC CAD system selects and dispatches the most appropriate resource types pursuant to the Department's response plan, as shown in the following table. Other than the duty crew personnel at Station 4, the number of POC personnel responding to any given call for service is unpredictable and variable depending on availability.

Table 5—Response Plan by Incident Type

Incident Type	Resources Dispatched	Total Personnel[1]
Single-Patient EMS	1 Engine	**2–4**
Vehicle Collision (Extrication)	2 Engines	**4–8**
Vehicle Fire	2 Engines	**4–8**
Building Fire	3 Engines, 1 Ladder Truck, 1 Chief Officer	**10–17**
Wildland Fire	1 Engine, Grass Rig, 1 Chief Officer	**4–7**
Water Rescue	2 Engines, 1 Utility Vehicle, 1 Boat, 1 Chief Officer	**7–12**
Hazardous Material Release	2 Engines, 1 Chief Officer	**4–9**

[1] Number of personnel above on-duty crew at Station 4 is variable and unpredictable

Finding #4: 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, trucks, specialty units, 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 sound data must be available to evaluate performance.

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.[5] Measuring the average only identifies the central or middle point of response time performance

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

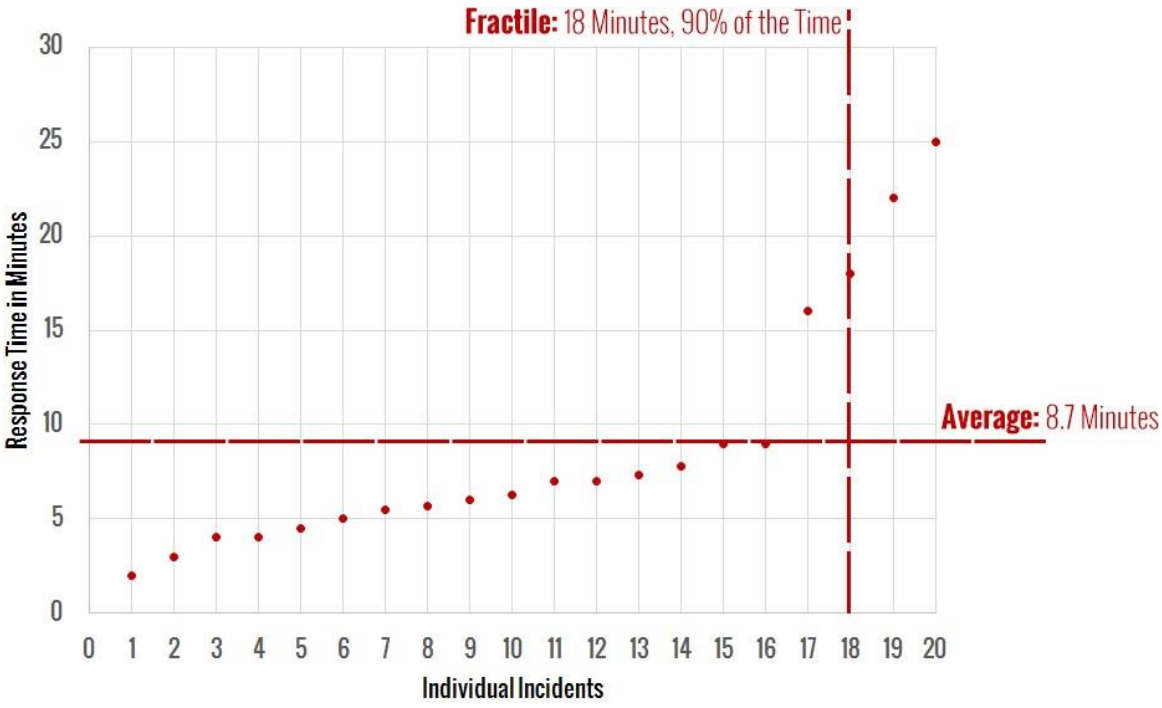
for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were far above or just above the average.

For example, the following figure shows response times for a fictitious fire department. This a small agency receives 20 calls for service each month, and each response time has been plotted on the following graph from shortest response time to longest response time.

The graph shows 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 that 20 percent of responses are far too slow and that this jurisdiction has a potential life-threatening service delivery problem. Average response time as a measurement tool for fire services 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 responses in mind, this small example jurisdiction has a response time of 18:00 minutes, 90 percent of the time. This fractile measurement is far more accurate at reflecting the service delivery situation of this small fictitious agency.

Figure 2—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 allow appropriate fire station spacing (distribution and concentration). 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. While cardiac arrests make up a small percentage, drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in a 6:00- to 8:00-minute time frame. If fire service response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, *all* responding crews must arrive, assess the situation, and deploy effective measures before brain death occurs or the fires spreads beyond the room of origin.

Thus, from the time the 9-1-1 call is received by the dispatch center, 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 the 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 a range to give hope for a positive outcome. It is important to note that the fire or medical emergency continues to deteriorate from the time of inception, not from the time the fire engine starts to drive the response route. Ideally, the emergency is noticed immediately and the 9-1-1 system is activated promptly. In the best of circumstances, this step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes 1:00 minute. Crew notification and travel time take additional minutes. Upon arrival, the crew must approach the injured party 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 apartments or office complexes, or 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 reverse; however, when an appropriate response time policy is combined with a well-designed deployment system, then only anomalies like bad weather, poor traffic conditions, or multiple emergencies slow down the response system. Consequently, a properly designed system will give the public hope of a positive outcome for their tax dollar expenditure.

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

2.4 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

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

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

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

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

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 planning zones) appropriate to the community or jurisdiction.
- Identification and quantification, to the extent data is available, of the 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 identified hazard.
- Determination of *probable* impact severity of a hazard occurrence by risk planning zone.
- Determination of overall risk by hazard and risk planning zone.

2.4.2 Values at Risk to Be Protected

Broadly defined, *values at risk* 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, critical facilities/infrastructure, buildings, and key economic, cultural, historic, and natural resources.

People

Residents, employees, visitors, and travelers through 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. Key demographic data for Lakeville includes:

- 24.5 percent of the population is under 10 or over 65 years of age.
- The service area population is predominantly Caucasian (84.3 percent) including Hispanic/Latino (5.0 percent, also counted as Caucasian), followed by Asian (5.3 percent), Black/African American (4.9 percent) and other (5.6 percent).
- Of the population over 24 years of age, 78.4 percent have completed high school or equivalency.
- Of the population over 24 years of age, 50.2 percent has an undergraduate degree while 14.7 percent has a graduate or professional degree.
- 97 percent of the population over 15 years of age is in the workforce; only 3 percent of that same population is unemployed.
- The median household income is $110,976.
- 3.9 percent of the service area population is below the federal poverty level.
- 1.6 percent of the service area population does not have health insurance coverage.

Critical Infrastructure / Key Resources

The U.S. Department of Homeland Security defines critical infrastructure and key resources (CIKR) 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 has identified 88 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.

Buildings

The Department response area includes just over 24,000 housing units, as well as more than 1,100 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**.

2.4.3 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.

Following an evaluation of the hazards identified in the 2016 Dakota County Hazard Mitigation Plan,[6] 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 five hazards for this risk assessment:

- Building fire
- Vegetation/wildland fire
- Medical emergency
- Hazardous material release/spill
- Technical rescue

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

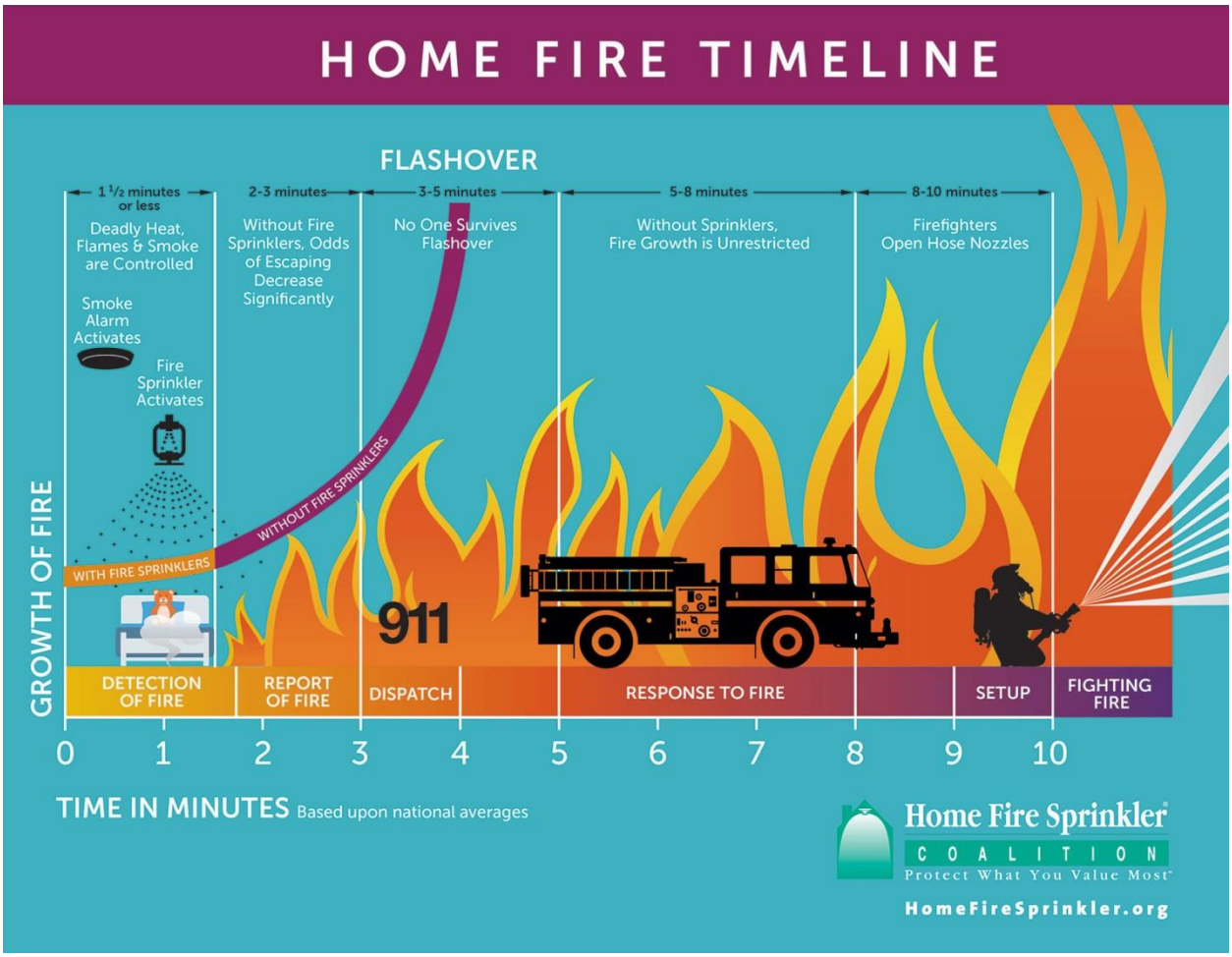
Building Fire Risk

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

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.

[6] Reference: Dakota County 2016 Hazard Mitigation Plan Table 4.1 Hazards Profiled.

Figure 3—Building Fire Progression Timeline

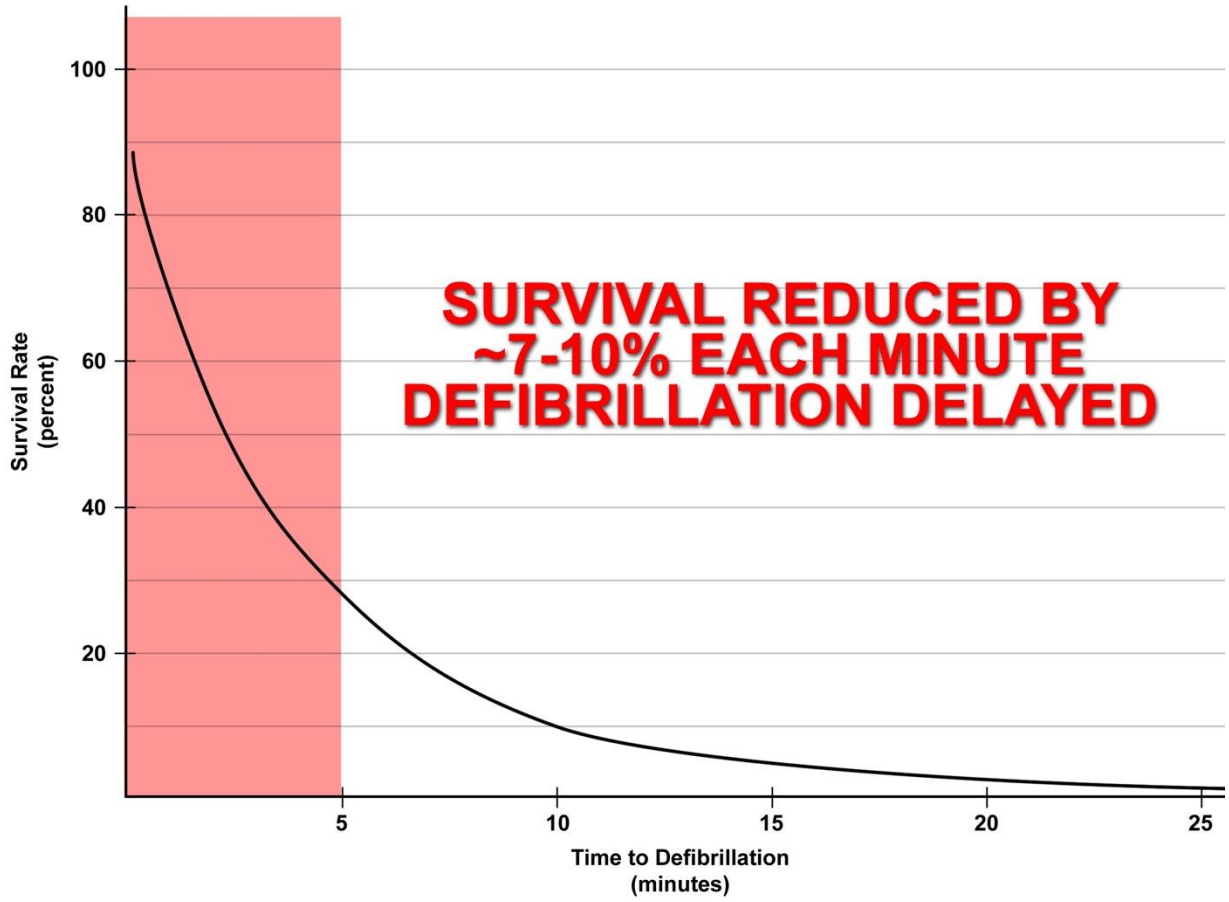


Source: http://www.firesprinklerassoc.org

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 4—Survival Rate versus Time of Defibrillation



Source: www.suddencardiacarrest.org

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

2.4.4 Risk Assessment Summary

The City's overall risk for five hazards related to emergency services provided by the Department range from **Low** to **High**, as summarized in the following table. See **Appendix A** for the full risk assessment.

Table 6—Overall Risk by Hazard

Hazard	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Building Fire	***Moderate***	***Moderate***	***Moderate***	***Moderate***
Vegetation/Wildland Fire	***Low***	***Low***	***Low***	***Low***
Medical Emergency	***High***	***High***	***High***	***High***
Hazardous Materials	***Moderate***	***Moderate***	***Moderate***	***Moderate***
Technical Rescue	***Moderate***	***Moderate***	***Moderate***	***Moderate***

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. Table 7 and Table 8 illustrate critical tasks typical of building fire and medical emergency incident, including the minimum number of personnel required to complete each task. These tables are composites from Citygate clients in urban/suburban departments like Lakeville, with units staffed with three or four personnel per engine or ladder truck. It is important to understand the following relative to these tables:

- It can take a considerable amount of 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

Table 7 illustrates the critical tasks required to control a typical single-family dwelling fire with five response units (three engines, one ladder truck, and one Chief Officer, all from Lakeville for a total ERF of 10–17 personnel). These tasks are taken from typical fire departments' 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 (OSHA) two-in/two-out safety policy, which requires that firefighters enter atmospheres such as building fires that are immediately dangerous to life and health 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, single-family 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 7—First Alarm Residential Fire Critical Tasks – 10–17 Personnel

Critical Task Description		Personnel Required
First-Due Engine (2–4 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	Establish incident command	1
6	Conduct primary search	2
Second-Due Engine (2–4 Personnel)		
1	If necessary, establish supply line to hydrant	1–2
2	Deploy a backup attack line	1–2
3	Establish Initial Rapid Intervention Crew	2
First-Due Ladder (3–4 Personnel)		
1	Conduct initial search and rescue, if not already completed	2
2	Deploy ground ladders to roof	1–2
3	Establish horizontal or vertical building ventilation	1–2
4	Open concealed spaces as required	2
Chief Officer		
1	Transfer of incident command	1
2	Establish exterior command and scene safety	1
Third-Due Engine (2–4 Personnel)		
1	Establish Initial Rapid Intervention Crew	3
2	Secure utilities	2
3	Deploy second attack line as needed	2
4	Conduct secondary search	2

Grouped together, the duties form an Effective Response Force (ERF), or First Alarm Assignment. These distinct tasks must be performed to effectively achieve the desired outcome; arriving on scene does not stop the emergency from escalating. While firefighters accomplish these tasks, the incident progression clock keeps running.

Many 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 fire (known as flashover), the fire will spread quickly both vertically and horizontally

throughout the structure. 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 and to rescue persons unable to self-evacuate. In addition, flashover presents a life-threatening situation to both firefighters and any occupants of the building. Fire fatalities typically include persons under 10 and over 65 years of age and unable to self-evacuate, and nearly 25 percent of the City's population falls within those age groups.

2.5.2 Critical Medical Emergency Tasks

The Department responds to more than 1,000 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 8—Cardiac Arrest Critical Tasks – One Engine (2–4 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

What does a deployment study derive from a critical task analysis? The time required to complete the critical tasks necessary to stop the escalation of an emergency (as shown in Table 7 and Table 8) must be compared to outcomes. As stated, after approximately 4:00 to 5:00 minutes of free burning a room, fire will escalate to the point of flashover. At this point, the entire room is engulfed

in fire, the entire building becomes threatened, 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 on-duty and on-call staffing is insufficient to *consistently* deliver a single ERF of 15 firefighters to a building fire, which the statistical analysis of this report will discuss in detail. 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 later or smaller.

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. Thus, achieving good performance requires *adequate staffing* (and training).

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 and the staffing model used*. When fire stations are spaced too far apart and one unit must cover another unit's area or multiple units are needed, the units may be too far away, and the emergency will escalate and result in a less-than-desirable outcome. When only one, or a subset of fire stations are staffed, response times are frequently inadequate to meet the speed or weight metrics outlined earlier.

Previous critical task studies conducted by Citygate and NFPA Standard 1710 identify that all units need to arrive at a building fire with 15–17 firefighters within 11:30 minutes (from the time of 9-1-1 call) to *simultaneously and effectively* perform the tasks of rescue, fire suppression, and ventilation.

If fewer firefighters arrive, all tasks may 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. Because rescue is conducted with at least two two-person teams, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Therefore, effective deployment is about the **speed** *(travel time)* and the **weight** *(number of firefighters)* of the response.

While three to five initial response personnel may begin to manage a moderate risk, confined residential fire, even a full ERF of 15 personnel 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.

The fact that it takes the Department more than 26:00 minutes[7] to deliver an ERF of 10–17 personnel to a moderate risk building fire reflects a real-world difficulty of confining serious building fires to or near the room of origin and preventing the spread of fire to adjoining buildings. This is a typical desired outcome in urban/suburban areas and requires more firefighters more quickly than the typical rural outcome of keeping the fire contained to the building, not room, of origin.

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 City is currently served by four fire stations, with Station 4 nearest the center of the City staffed most hours of the day with a two- to four-person on-duty crew staffing one engine. More serious incidents and incidents outside of the duty crew hours rely on response from *on-call* firefighters from their homes or work as available.

It is appropriate to understand, using geographic mapping tools, what the existing stations do and do not cover within travel time goals; if there are any coverage gaps needing one or more stations; and what, if anything, to do about them.

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

- **Distribution** – the spacing of first-due fire units to 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 used a geographic mapping tool that measures theoretical 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 these tools, Citygate ran several deployment tests and measured their impact on various parts of the City. A 4:00-minute first-due and 8:00-

[7] Reference: Table 18

minute ERF *travel* time were used, consistent with best practice response performance goals for positive outcomes in urban areas.

2.6.1 Deployment Baselines

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

Map #1 shows the Department's service area boundary and fire station locations. This is a reference map for other maps that follow. Station symbols denote the type of fire apparatus available at each station.

Map #2 – Risk Assessment: Planning Zones

Map #2 shows the four risk planning zones used for this study, as recommended by the CFAI, which are the same as each station's initial (first-due) response area.

Map #2a – Risk Assessment: Population Density

Map #2a shows the resident population density across the service area. People drive EMS incident demand, so the highest population density areas are typically the highest EMS demand locations. The highest density areas are in proximity to Stations 1 and 2 which are in the southern and northeastern sections of the City.

Map #2b – Risk: Critical Facilities

This map shows the locations of the 88 critical facilities identified by the Department for this study, which are located throughout all four station response zones.

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

Map #3 shows the 61 percent of the service area's total public road miles that a fire engine should be expected to reach within 4:00 minutes of *travel time* assuming the respective engine is in station and encounters no traffic congestion. As can be seen, there are very large areas throughout the City beyond 4:00 minutes of travel time from an existing station, making it less probable that desired outcomes can be achieved in those areas.

The purpose of response time modeling is to determine response time coverage across a jurisdiction's geography and station locations. This geo-mapping design is then validated against dispatch time data to reflect actual response times. Ideally, 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 #3a – Distribution: 4:00-Minute First-Due Travel Time Coverage (with Automatic Mutual Aid)

Map #3a shows the less than one percent increase in 4:00-minute travel time coverage with mutual aid, including only a few street segments in the northeastern section of the City.

Map #4 – Insurance Services Office (ISO) 1.5-Mile Coverage Areas

Map #4 displays the former ISO recommendation that urban stations cover a 1.5-mile *distance* response area. Depending on a jurisdiction's road network, the 1.5-mile measure usually 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. The 1.5-mile ISO coverage is somewhat similar to the 4:00-minute first-due coverage in Map #3a.

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

Map #5 shows the 89 percent of the service area's public street segments where the Department's current response plan should deliver the initial ERF of three engines, one ladder truck, and one chief officer within 8:00 minutes of travel time *without traffic congestion*. As can be seen, this is very good ERF coverage to facilitate desired outcomes for more serious incidents requiring multiple units.

Map #5a – 8:00-Minute ERF Travel Time for Lakeville Fire Stations 1 and 2 Only

Map#5a shows the 79 percent of the service area's public road miles that could be reached in 8:00 minutes of travel time from Stations 1 and 2 as recommended for initial staffed stations in Section 2.8.1.

Map #5b – 8:00-Minute ERF Travel Time Including Mutual-Aid Response

Map #5b shows the roughly one percent gain in 8:00-minute ERF travel time coverage with mutual aid, meaning that essentially all available mutual-aid resources are more than 8:00 minutes of travel time from the Lakeville City border.

Map #6 – 8:00-Minute Ladder Truck Travel Time Coverage

Map #6 shows, in green, 8:00-minute travel time coverage for a ladder truck from Stations 1 and 4. As can be seen, coverage includes most of the built-up areas of Lakeville and some limited areas of Eureka Township, indicating that these specialized resources are appropriately located to serve the largest, most built-up sections of the service area within the desired 8:00-minute travel time goal.

Map #8 – All Incident Locations

Map #8 shows the location of all incidents from January 2018 through December 2020. As can be seen, incidents occur throughout the entire service area.

Map #9 – Emergency Medical Services and Rescue Incident Locations

Map #9 shows the emergency medical and rescue incident locations over the three-year study. With 54.5 percent of all calls for service being EMS-related, this map illustrates the need for pre-hospital emergency medical services.

Map #10 – All Fire Locations

Map #10 shows the location of all fires within the service area over the three-year period. All fires include any type of fire call, from vehicle to dumpster to building. While there are obviously fewer fires than medical or rescue calls, this map illustrates that fires occur throughout the entire service area.

Map #11 – Building Fire Locations

Map #11 displays the location of all building fire incidents over the three-year study. While the number of building fires is a smaller subset of all fires, most building fires occurred in station areas other than the Station 4, where the duty crew is assigned. This means that many building fire responses are beyond the desired 4:00-minute first-unit travel time goal to facilitate a desired outcome of rescuing persons unable to self-evacuate and confining the fire to the room(s) of origin.

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

Map #12 shows, by mathematical density, where clusters of EMS and rescue incident activity occurred over the three data years. The darker density color plots the highest concentration of EMS/rescue incidents. This type of map makes the location of frequent workload more meaningful than simply mapping the locations of all EMS/rescue incidents, as was shown in Map #9.

This perspective is important because the 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.

Map #13 – All Fire Location Densities

Map #13 is similar to Map #12 but shows the hot spots of activity for all types of fires. The density of these incidents is greater in the higher building and population density areas of the City.

Map #14 – Structure Fire Location Densities

Map #14 is similar to Map #11 but shows the hot spot locations for structure fires only.

2.6.2 Travel Time Road Mile Coverage Measures

In addition to the visual displays of travel time coverage the maps provide, GIS software also calculates the miles of public streets covered at 4:00 and 8:00 minutes, as shown in the following table.

Table 9—Service Area Travel Time Coverage Summary

Map Number	Travel Time Measure	Total Public Road Miles	Miles Covered	Percent of Total Miles Covered
3	4:00-Minute First-Due	489.08	**298.29**	**61.0%**
3a	4:00-Minute First-Due with Mutual Aid	489.08	**301.71**	**61.7%**
4	ISO 1.5-Mile Station Spacing	489.08	**198.01**	**40.5%**
5	8:00-Minute ERF	489.08	**433.25**	**88.6%**
5a	8:00-Minute ERF from Stations 1 and 2 only	489.08	**385.46**	**78.8%**
5b	8:00-Minute ERF with Mutual Aid	489.08	**440.16**	**90.0%**
6	8:00-Minute Truck from Stations 1 and 4	489.08	**395.75**	**80.9%**

As the previous table shows, only 61 percent of the service area's public road network can be reached from the current fire station locations within 4:00 minutes of travel time, which makes achieving desired outcomes unlikely in the remaining 39 percent of road miles beyond the 4:00-minute travel time coverage.

The 89 percent 8:00-minute ERF travel time coverage is very good and *should* facilitate achieving desired outcomes for more serious incidents requiring a full ERF response *if* sufficient on-duty staffing is available at each station.

2.6.3 Mapping Coverage Findings

Finding #5: The Department's current fire station locations can be expected to deliver 4:00-minute first-due travel time coverage to only 61 percent of the total service area road miles, which is only fair coverage to achieve desired outcomes.

Finding #6: The Department's current fire station locations can be expected to deliver 8:00-minute ERF travel time coverage to 89 percent of the service area's public road miles, which is very good coverage for more serious emergencies requiring multiple units from multiple stations assuming all units are available for immediate response.

Finding #7: The Department's aerial ladder truck resources are appropriately located at Stations 1 and 4 to serve the largest, most built-up sections of the service area within the desired 8:00-minute travel time goal.

2.7 STATISTICAL ANALYSIS

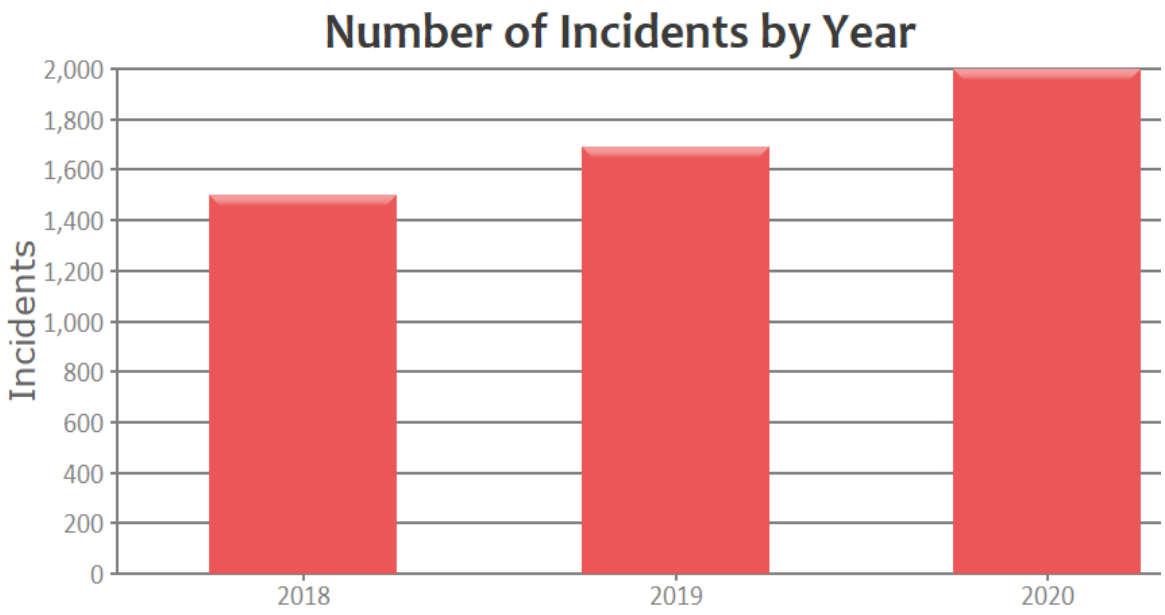
SOC ELEMENT 7 OF 8
RELIABILITY AND HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The maps described in **Section 2.6** and presented in **Volume 2** show the ideal situation for response times and the response effectiveness given perfect conditions with no competing calls, units out of place, or simultaneous calls for service. Examination of the actual 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 Demand for Service

Over the three-year period, the Department responded to 5,192 calls for service as summarized in the following figured. Overall service demand increased more than 33 percent over the three years. Subsequent to this analysis, the Department reported an additional 39 percent increase in service demand in 2021.

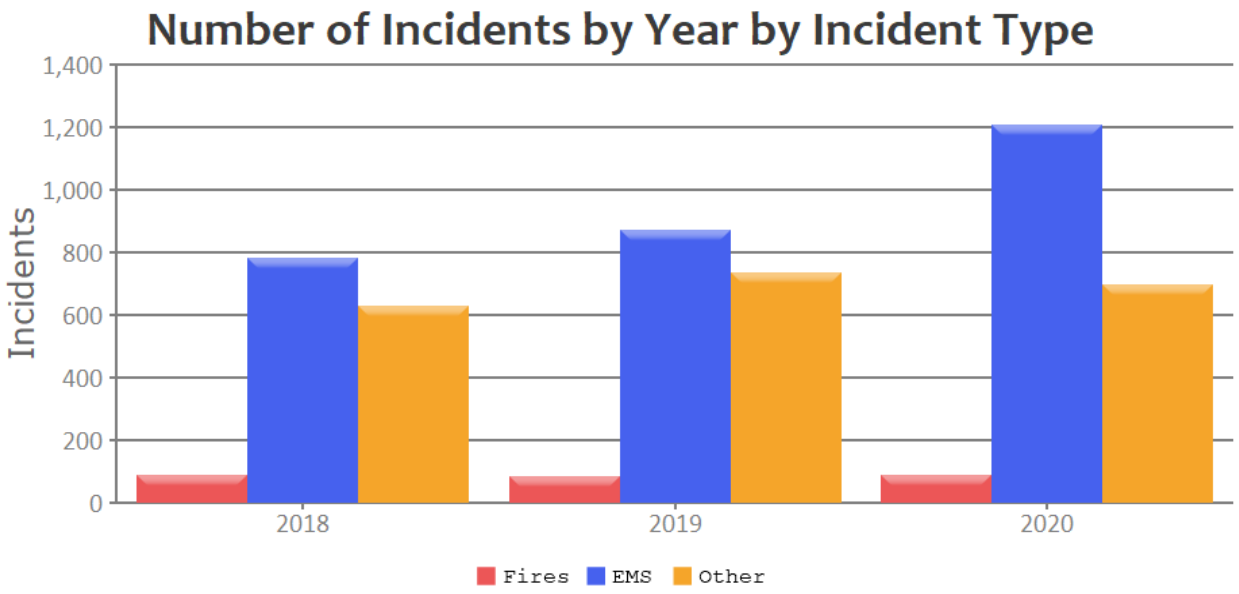
Figure 5—Annual Service Demand by Year



Finding #8: Annual service demand increased 33 percent from January 2018 through December 2020, with a 39 percent increase in 2021 over the previous year.

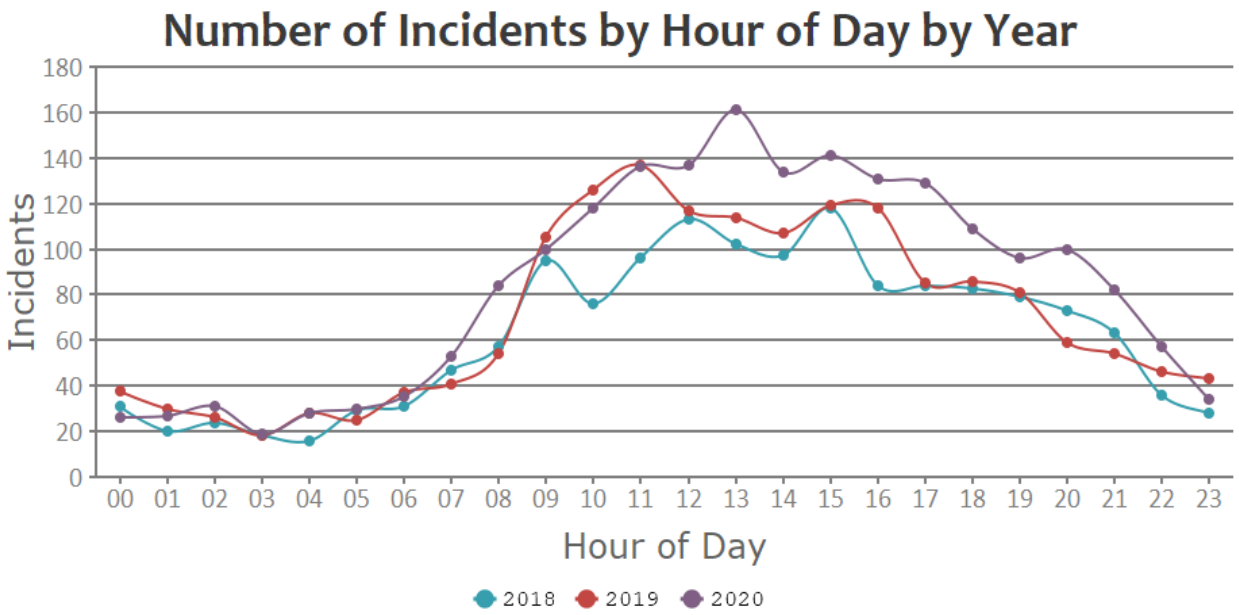
The following figure illustrates annual service demand by incident type and shows EMS incidents increasing steadily with fire and other incident types remaining fairly constant over the three-year period.

Figure 6—Annual Service Demand by Incident Type



The following figure shows service demand by hour of day, illustrating that calls for service occur at every hour of the day and night, with peak service demand occurring from approximately 8:00 am through 9:00 pm.

Figure 7—Service Demand by Hour of Day and Year



The following table ranks service demand by incident type for those with more than 25 occurrences over the three-year period. Note the high ranking of EMS-related incidents and incidents cancelled en route. Building fires rank eighth by volume.

Table 10—Service Demand by Incident Type

Incident Type	2018	2019	2020	Total
311 Medical assist, assist EMS crew	644	702	1,089	**2,435**
611 Dispatched & canceled en route	177	229	216	**622**
322 Vehicle accident with injuries	80	96	63	**239**
745 Alarm system sounded, no fire - unintentional	74	60	60	**194**
600 Good intent call, other	47	36	51	**134**
324 Motor vehicle accident no injuries	31	53	37	**121**
412 Gas leak (natural gas or LPG)	33	24	57	**114**
111 Building fire	**41**	**33**	**35**	**109**
671 Hazmat release investigation w/ no hazmat	28	51	27	**106**
735 Alarm system sounded due to malfunction	47	37	18	**102**
746 Carbon monoxide detector activation, no CO	33	37	29	**99**
733 Smoke detector activation due to malfunction	22	29	30	**81**
424 Carbon monoxide incident	13	28	25	**66**
743 Smoke detector activation, no fire - unintentional	15	21	16	**52**
622 No incident found on arrival of incident address	13	14	14	**41**
741 Sprinkler activation, no fire - unintentional	12	17	11	**40**
131 Passenger vehicle fire	14	15	10	**39**
113 Cooking fire, confined to container	14	10	15	**39**
740 Unintentional transmission of alarm, other	10	13	15	**38**
736 CO detector activation due to malfunction	7	14	15	**36**
731 Sprinkler activation due to malfunction	5	14	9	**28**

The following table ranks service demand by property use type for those with more than 25 occurrences over the three-year study. Note the high rankings of residential dwellings, streets, and highways.

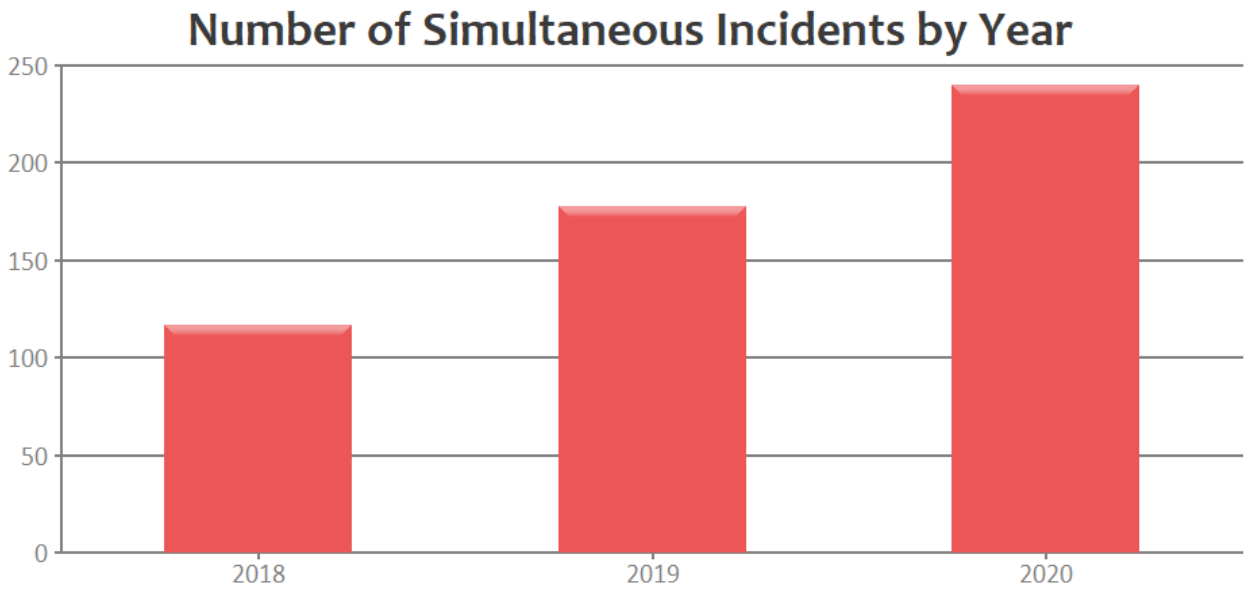
Table 11—Service Demand by Property Use

Incident Type	2018	2019	2020	Total
419 1 or 2 family dwelling	706	833	1,125	**2,664**
429 Multifamily dwellings	197	175	224	**596**
961 Highway or divided highway	176	171	125	**472**
962 Residential street, road or residential driveway	61	50	66	**177**
311 24-hour care Nursing homes, 4 or more persons	26	22	70	**118**
700 Manufacturing, processing	24	40	22	**86**
449 Hotel/motel, commercial	21	24	34	**79**
459 Residential board and care	14	34	21	**69**
213 Elementary school, including kindergarten	28	27	13	**68**
161 Restaurant or cafeteria	16	27	22	**65**
215 High school/junior high school/middle school	12	28	17	**57**
571 Service station, gas station	11	23	17	**51**
254 Day care, in commercial property	21	11	13	**45**
965 Vehicle parking area	12	11	21	**44**
519 Food and beverage sales, grocery store	19	12	7	**38**
599 Business office	14	11	9	**34**
131 Church, mosque, synagogue, temple, chapel	12	11	9	**32**
960 Street, other		10	20	**30**
963 Street or road in commercial area	7	9	13	**29**
931 Open land or field	14	9	5	**28**
581 Department or discount store	12	8	8	**28**

2.7.2 Simultaneous Incident Activity

Simultaneous incidents occur when other incidents are underway at the time a new incident begins. In 2020, simultaneous incidents occurred 12 percent of time. When simultaneous incidents occur, a significant response time delay can be expected for a second or subsequent simultaneous incident requiring response by on-call POC personnel responding from home or work. The following table shows that simultaneous calls for service doubled over the three-year study.

Figure 8—Simultaneous Incident Activity by Year



Finding #9: One or more simultaneous calls for service occur 12 percent of the time.

Finding #10: Simultaneous incident activity doubled from 2018 to 2020.

2.7.3 Station Workload Demand

The following table summarizes station response area workload by hour of day for 2020, with the busiest station areas listed first. The percentage shown is the percent probability of a station area having an active incident during that hour of day. The percentage considers both the number and the duration of incidents. Station 1's response area had the highest workload over most hours of the day.

Table 12—Station-Hour Demand (2020)

Hour of Day	Station Area			
	1	2	3	4
00:00	1.31%	0.72%	0.77%	0.35%
01:00	2.59%	1.30%	0.97%	0.49%
02:00	1.73%	1.13%	2.29%	0.37%
03:00	0.51%	1.01%	0.49%	0.26%
04:00	1.29%	0.29%	0.40%	0.91%
05:00	0.52%	0.78%	0.96%	1.14%
06:00	0.84%	0.40%	1.27%	0.62%
07:00	1.08%	2.60%	0.48%	1.23%
08:00	3.08%	2.84%	1.99%	0.31%
09:00	1.70%	0.25%	0.73%	0.38%
10:00	0.77%	1.06%	0.24%	0.20%
11:00	1.61%	0.57%	1.25%	4.76%
12:00	2.44%	1.40%	0.75%	0.00%
13:00	1.94%	1.22%	1.24%	0.78%
14:00	1.35%	0.82%	4.74%	0.42%
15:00	1.34%	2.07%	1.71%	0.44%
16:00	1.43%	1.40%	0.68%	0.31%
17:00	2.00%	3.98%	1.10%	0.37%
18:00	1.83%	0.66%	1.08%	0.58%
19:00	1.11%	1.32%	0.95%	0.36%
20:00	1.22%	1.31%	1.09%	0.42%
21:00	6.08%	0.24%	1.20%	0.59%
22:00	1.48%	1.33%	2.39%	0.41%
23:00	0.51%	1.19%	0.68%	0.70%
Overall	**1.66%**	**1.25%**	**1.23%**	**0.68%**

2.7.4 Operational Performance

The following tables measure the performance for the first apparatus to arrive on the scene for NFIRS-coded fire and EMS emergency incidents only. These measures are the number of minutes and seconds necessary for 90 percent completion of the following components:

- Call processing/dispatch
- Crew turnout
- Travel
- Dispatch to arrival
- Call to arrival

For this analysis, operational performance components were evaluated using one or more response tiers as summarized in the following table.

Table 13—Response Tiers

Response Tier	Calls Included
Department-Wide	All calls for service
Duty Crew	Only duty crew from Station 4
Station Response	Only calls where on-call POC personnel responded from home or work

Call Processing/Dispatch

Call processing measures the time from the first incident time stamp in the DCC until apparatus are notified of the request for assistance. The following table summarizes 90th percentile call processing performance. DCC call processing performance is *88 percent slower* (1:19 minutes) than the 1:30-minute best practice standard.

Table 14—90th Percentile Call Processing Performance

Call Processing/Dispatch	Overall	2018	2019	2020
Department-Wide	**2:49**	2:39	2:48	2:54

Finding #11: Call processing performance is *88 percent slower* than the 1:30-minute best practice standard.

Crew Turnout

Crew turnout measures the time interval from completion of the dispatch notification until the start of vehicle movement to the emergency incident. While NFPA recommends 1:00 to 1:20 minutes for turnout depending on the type of protective clothing that must be donned, Citygate has found that few if any agencies can meet that performance standard and has thus long recommended 2:00

minutes as an achievable goal for on-duty station personnel. The following table summarizes crew turnout performance by response tier.

Table 15—90th Percentile Crew Turnout by Response Tier by Year

Crew Turnout	Overall	2018	2019	2020
Department-Wide	**3:07**	2:23	3:18	4:03
Duty Crew	**2:16**	2:13	2:17	2:19
Station Response	**4:43**	3:41	4:53	4:44

While duty crew turnout performance is only slightly slower than the 2:00-minute best practice goal, on-call POC station personnel turnout performance is more than double the recommended goal at almost 5:00 minutes, which is good considering those personnel are responding to the station from home or work.

Finding #12: Duty crew turnout performance is only slightly slower than Citygate's recommended 2:00-minute best practice goal.

Finding #13: On-call POC turnout performance, while nearly 5:00 minutes, is good considering the personnel are responding to the station from home or work.

First-Unit Travel

First-unit travel measures the time interval from the start of apparatus travel until arrival at the emergency incident. In most urban/suburban jurisdictions, a 90th percentile first-unit travel time of 4:00 minutes or less would be considered highly desirable to achieve desired outcomes. As the following table shows, duty crew travel performance is *nearly double* the recommended 4:00-minute goal for urban response zones due to the 57-square mile service area. While station response tier performance is much better, it is still *22 percent slower* than the 4:00-minute best practice goal for urban zones.

Table 16—90th Percentile First-Unit Travel by Response Tier by Year

Crew Turnout	Overall	2018	2019	2020
Department-Wide	**7:27**	7:42	7:38	6:56
Duty Crew	**7:52**	8:01	7:55	7:37
Station Response	**4:53**	5:50	4:50	4:23

Finding #14: Duty crew travel time performance is *nearly double* the 4:00-minute best practice goal for urban response zones to facilitate desired outcomes.

Finding #15: Station response tier first-unit travel time performance is much better at slightly less than 5:00 minutes, however, it is still 22 percent slower than the 4:00-minute best practice goal for urban zones.

Call to Arrival

Call to arrival measures the time interval from receipt of the 9-1-1 request for assistance until the first responding apparatus arrives at the emergency. This is the Department's true customer service performance measure. Citygate recommends a 7:30-minute call-to-arrival performance goal at 90 percent reliability to facilitate desired outcomes in urban zones, 11:30 minutes in suburban zones, and 15:30 minutes in rural zones. This includes 1:30 minutes for call processing/dispatch, 2:00 minutes for crew turnout, and 4:00, 8:00, or 12:00 minutes respectively for travel. The following table shows duty crew call-to-arrival performance is *52 percent slower* than the 7:30-minute goal for urban zones due to the slow call processing and long travel times associated with the large response area, and station response tier performance is nearly double the 7:30-minute best practice goal due to slow call processing and crew turnout times.

Table 17—90th Percentile Call to First-Unit Arrival by Response Tier by Year

Crew Turnout	Overall	2018	2019	2020
Department-Wide	**12:29**	12:13	12:33	12:54
Duty Crew	**11:22**	11:03	11:32	11:53
Station Response	**14:13**	14:28	14:11	14:10

Finding #16: Duty crew call-to-arrival performance, which is the Department's true customer service measure, is *52 percent slower* than the 7:30-minute best practice goal to facilitate desired outcomes in urban areas due to slow call processing and long travel times.

Finding #17: Station response tier call-to-arrival performance is *nearly double* the 7:30-minute best practice goal due to slow call processing and crew turnout from home or work.

2.7.5 Effective Response Force (ERF) Concentration Measurements

The Department's ERF for building fires is three engines, one ladder truck, and one Battalion Chief, for a total of 10–17 personnel. Over the three-year study, there were only 15 building fires where the entire ERF arrived at the incident. The following table shows that Department-wide 90th percentile ERF call-to-arrival performance at 26:32 minutes is *more than double* Citygate's recommended 11:30-minute best practice goal to facilitate desired outcomes in urban zones. It is also *71 percent slower* than Citygate's recommended 15:30-minute best practice goal for suburban zones, and *23 percent slower* than Citygate's recommended 21:30-minute best practice goal for rural zones.

Table 18—90th Percentile ERF Call to Arrival Performance

Crew Turnout	Overall	2018	2019	2020
Department-Wide	**26:32**	25:02	21:21	23:58
Station 1	**27:38**	25:02	n/a	27:38
Station 2	**23:27**	16:22	13:15	23:27
Station 3	**26:32**	26:32	21:21	23:58
Station 4	**17:22**	17:22	n/a	13:32

Finding #18: Department-wide ERF call-to-arrival performance is *more than double* Citygate's recommended 11:30-minute best practice goal to facilitate desired outcomes in urban zones. It is also *71 percent slower* than Citygate's recommended 15:30-minute best practice goal for suburban zones, and *23 percent slower* than Citygate's recommended 21:30-minute best practice goal for rural zones.

2.8 Overall Evaluation

SOC Element 8 of 8
Overall Evaluation

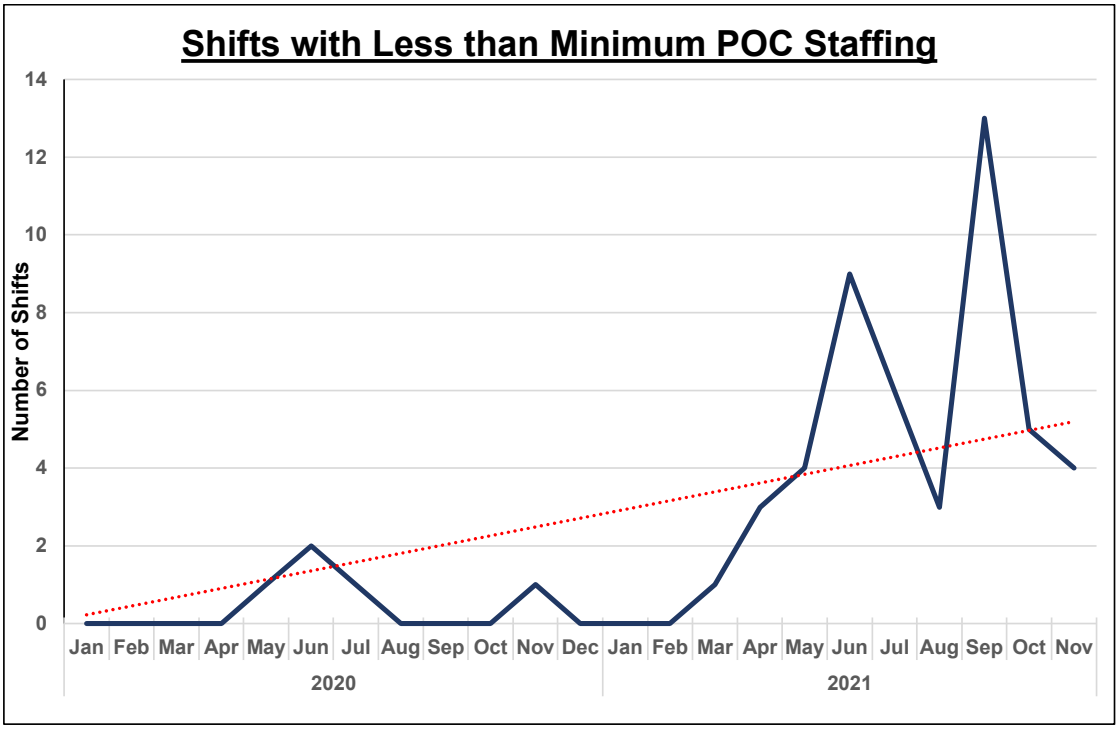
The Department serves an urban/suburban/rural population with a mixed residential and non-residential land-use pattern typical of other Twin City area cities of similar size and demographics.

Overall service demand increased more than 33 percent over the three-year study, and another 39 percent in 2021 to nearly 2,800 calls for service annually. The current deployment model of two to four personnel on duty at Station 4 during daytime hours only is *insufficient* to control even one moderately complex incident, leaving no on-duty staffing for the simultaneous incidents that occur 12 percent of the time and increase in frequency annually. Because this model can only deliver a

4:00-minute first-unit travel time service level within 1.5 to 2 miles of Station 4, *and* given the increasing annual service demand, simultaneous incident activity, and extremely sluggish first-due travel-time performance, Citygate is concerned with the Department's ability to provide equitable "speed of response" to large sections of the City as well as to provide sufficient "weight of response" capacity for more serious emergencies *and* concurrent incident responses to achieve commonly expected outcomes in urban/suburban communities like Lakeville that have more than 70,000 residents.

The Department's current duty crew staffing model includes an average of 277 four-hour shifts each month. With the current roster of approximately 85 active part-time POC firefighters, each firefighter would have to work 3.25 shifts per month to fill all shifts to maintain established minimum shift staffing levels. Not only is this more than the two shifts per month currently required, but 30 percent of the POC personnel worked only the minimum number of shifts in 2021 and an additional 19 percent worked *less* than the required number of shifts in the same year, leaving only about half of the 85 POC personnel to carry the rest of the staffing load. In those instances where fewer than the minimum number of POC firefighters show up for a shift, the Fire Chief and/or Assistant Fire Chief must fill that slot to maintain minimum staffing, taking away critical workload capacity to perform their primary responsibilities. As the following figure illustrates, this is occurring on an increasingly frequent basis.

Figure 9—Shifts with Less than Minimum POC Staffing



Citygate understands that a committed cadre of part-time POC personnel provides great value to the City and Department, and a combination of full-time and part-time personnel will be needed over the foreseeable future to ensure an adequate first unit "speed of response" and ERF "weight of response."

DCC's call processing performance and first-unit travel time are significantly slower than best practice recommendations, resulting in first-unit call-to-arrival performance 66 percent (4:30 minutes) *slower* than Citygate's 7:30-minute recommended best practice to facilitate desired outcomes in urban zones. The current fire station locations can only deliver 4:00-minute travel time coverage to 61 percent of the service area's public road miles, and as Map #3 (**Volume 2–Map Atlas**) illustrates, only about 12 percent of the entire Lakeville service area can be covered within 4:00 minutes of travel time from Station 4 where the duty crew is located. This means that the remaining approximately 88 percent of the service area is receiving a lower level of service than those located within Station 4's first-due response area. Best practice is to provide an equitable level of service to all areas of a jurisdiction with similar risk and population density.

While call processing and crew turnout performance may be improved with training and accountability, travel time, in Citygate's opinion, cannot be improved without (1) adding more response unit capacity in each of the other three station response areas, *and* (2) relocating existing stations and/or adding additional station(s) over time.

If desired outcomes include limiting building fire damage to only part of the inside of an affected building and/or minimizing permanent impairment resulting from a medical emergency, the urban population density areas of the City will need both first-due unit and multiple-unit ERF coverage in all four station response areas consistent with Citygate's recommended *urban area* response performance goal of first-unit arrival within 7:30 minutes from the DCC receiving the 9-1-1 call, and multiple unit ERF arrival within 11:30 minutes, all at 90 percent or better reliability.

If desired outcomes include limiting building fire damage to the inside of an affected building and/or minimizing death resulting from a medical emergency, the City will need both first-due unit and multiple-unit ERF coverage beyond a 4:00-minute travel time from the current four stations consistent with Citygate's recommended *suburban area* response performance goal of first-unit arrival within 11:30 minutes from DCC receiving the 9-1-1 call, and multiple unit ERF arrival within 15:30 minutes, all at 90 percent or better reliability.

For the rural zones of the Department's service area beyond 8:00 minutes of travel time from an existing station, Citygate recommends a *rural area* response performance goal of first-unit arrival within 15:30 minutes from DCC receiving the 9-1-1 call, and multiple unit ERF arrival within 21:30 minutes, all at 80 percent or better reliability.

Finding #19: Service demand increased more than 30 percent annually over the past three years. The Department responded to nearly 2,800 calls for service in 2021.

Finding #20: The part-time POC firefighter cadre provides great value to the City and Department.

Finding #21: The current duty crew model does not provide on-duty staffing 24-hours per day.

Finding #22: The current duty crew staffing level is insufficient to provide the number of personnel needed to safely resolve a single moderate-risk fire, multiple-patient EMS incident, or technical rescue.

Finding #23: With a 90th percentile ERF response time of more than 26:00 minutes, the time required to amass a sufficient number of on-call POC firefighters from home or work for more serious incidents is too long to facilitate desired outcomes.

Finding #24: The number of duty crew shifts with less than minimum POC staffing is increasing, and the resultant number of shifts the Fire Chief and Assistant Fire Chief must cover to maintain the established minimum response staffing level is increasing.

Finding #25: With the current duty crew staffing model only at Station 4 and a 90th percentile first unit travel time of nearly 8:00 minutes, *most* of the City receives a first-unit travel time service level insufficient to facilitate typically desired outcomes in urban population density communities.

Finding #26: Overall response performance cannot be improved significantly without adding on-duty staffing at Stations 1, 2, and 3.

Finding #27: A combination of full-time and part-time personnel will be needed over the foreseeable future to ensure an adequate first unit "speed of response" and ERF "weight of response."

2.8.1 Deployment Recommendations

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

Near-Term

Recommendation #1: **Adopt Updated Deployment Policies:** The City Council should adopt *updated*, complete performance measures to aid deployment planning and to monitor performance. The measures of time should be designed to deliver outcomes that will save patients, when possible, upon arrival 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, 90 percent of the time from the receipt of the 9-1-1 call at the DCC to incidents within two miles of a staffed fire station. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and a 4:00-minute travel time. For those areas within the City beyond two miles of a staffed fire station, the first-due unit should arrive within 11:30 minutes from DCC notification at 90 percent or better reliability. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and an 8:00-minute travel time. For Eureka Township, the first-due unit should arrive within 15:30 minutes from DCC notification at 80 percent or better reliability. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and a 12:00-minute travel time.

1.2 **Multiple-Unit Effective Response Force for Serious Emergencies:** To confine building fires near the room or rooms 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 **15** personnel, including at least one Chief Officer, should arrive within 11:30 minutes from the time of 9-1-1 call receipt at DCC 90 percent of the time within the urban population density areas of the City. This equates to a 1:30-minute dispatch time, 2:00-minute crew turnout time, and an 8:00-minute travel time.

To confine building fires to the building of origin, keep vegetation fires under two acres 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 15:30 minutes from the time of 9-1-1 call receipt at DCC 90 percent of the time within the suburban population density areas of the City. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and a 12:00-minute travel time. For Eureka Township, a multiple-unit ERF of at least **six** personnel, including at least one Chief Officer, should arrive within 20:00 minutes from the time of 9-1-1 call receipt at DCC 80 percent of the time. This equates to a 1:30-minute dispatch time, a 2:00-minute crew turnout time, and 16:30-minute 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 in the urban population density areas of the City, 11:30 minutes or less in the suburban density areas of the City, and 15:30 minutes or less in Eureka Township to provide initial hazard evaluation and/or mitigation actions. 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, a first-due total response time of 7:30 minutes or less is required in the urban population density areas of the City; 11:30 minutes or less is required in the suburban density areas of the City; and 15:30 minutes or less is required in Eureka Township to evaluate the situation and initiate rescue actions. Additional resources should assemble as needed within a total response time of 11:30 minutes within the urban population density areas of the City, within 15:30 minutes in the suburban population density areas of the City, and within 21:30 minutes in Eureka Township to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #2: Add staffing at Station 4 to provide two-person duty crew staffing 24 hours per day, 7 days per week using a combination of paid full-time and part-time POC personnel as available.

Recommendation #3:	At the earliest possible opportunity, fund a second two-person duty crew at Station 1, and relocate the Station 4 duty crew to Station 2 to improve Citywide first-unit response coverage and performance.
Recommendation #4:	Continue to utilize active, committed part-time POC personnel to supplement full-time personnel and provide sufficient ERF staffing for more complex incidents.
Recommendation #5:	Pursue authorization to provide EMS variance protocols to provide enhanced pre-hospital Emergency Medical Services.

Longer-Term

Recommendation #6:	Fund third and fourth two-person duty crews at Stations 3 and 4 to provide an equitable first-unit service level to most areas of the City.
Recommendation #7:	As funding allows, increase minimum daily staffing at each station to three personnel.
Recommendation #8:	As current stations become due for major remodel or replacement, consider relocating Station 1 southwest and Station 2 west to provide improved first-unit and ERF travel time coverage.

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SECTION 3—ADMINISTRATIVE SUPPORT STAFFING CAPACITY REVIEW

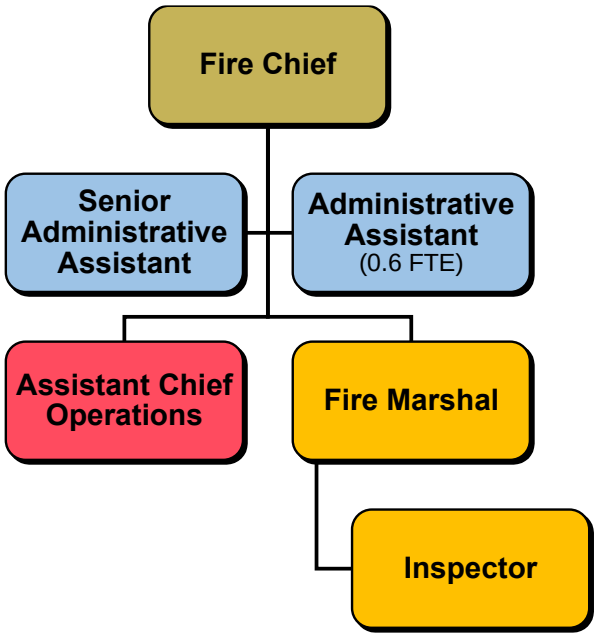
As an element of this SOC Assessment, The City requested a high-level review and evaluation of the Department's administrative support staffing organization and workload capacity.

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]."[8] 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 require a significant leadership and general management commitment.

3.1 ADMINISTRATIVE SUPPORT ORGANIZATION OVERVIEW

The City's Adopted 2021 Budget authorizes 5.6 full-time equivalent (FTE) Fire Department administrative support positions organized as shown in the following figure. This staff is responsible for the overall administration and management of all Department programs and services, and administrative support for the approximately 90 POC operational response personnel.

Figure 10—Fire Department Administrative Support Organization



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

3.2 KEY ADMINISTRATIVE SUPPORT RESPONSIBILITIES

3.2.1 Fire Chief Responsibilities

- Overall administration of Department programs and functions
- Administrative systems and procedures
- Labor/management issues
- Strategic planning
- Risk management
- Ensuring Department goals and objectives are met
- EMS program quality assurance / quality improvement
- Standard operating procedures
- Department health and wellness program
- Fire Dispatch Center coordination
- Employee vaccination program
- Infection control program
- Implementation of best practices
- Hazardous materials and rescue programs
- OSHA respirator fit testing
- Emergency Manager
- Management of Department budget
- Department technical support
- Emergency incident response

3.2.2 Assistant Fire Chief Responsibilities

- Fleet services coordination
- Hose testing and repair
- Ladder testing and maintenance
- Pump testing

- Self-contained breathing apparatus program
- EMS supplies
- Equipment/Tools research and purchasing
- Department training, development, planning, and scheduling
- Technical Rescue Training
- Target Solutions Online training
- Duty Crew Training
- Recruit Academy Training
- Department technical support
- Emergency incident response

3.2.3 Fire Marshal and Fire Inspector Responsibilities

- Adoption and enforcement of the Fire Code
- Target hazards / pre-incident planning
- 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

3.2.4 Senior Administrative Assistant / Administrative Assistant Responsibilities

- Public fire and life safety education scheduling
- Duty crew scheduling
- Labor/management issues
- POC firefighter payroll
- Quality assurance of NFIRS reporting
- Business contact information
- Plan review administration
- Permits administration

3.3 Administrative Support Organization Workload Capacity Review Summary

Citygate's review and evaluation of the Department's administrative support organization's workload capacity found that although the most important responsibilities and tasks are being completed, the Fire Chief and Assistant Fire Chief are regularly working 55 to 65 hours per week to complete that workload while other responsibilities are not completed at all. In addition, both the Fire Chief and Assistant Fire Chief are having to fill duty crew shift vacancies to maintain minimum operational response capacity on an increasing frequency, further impacting their administrative responsibilities and workload capacity.

The following table summarizes Citygate's estimated administrative support workload capacity gaps that include responsibilities/expectations not being completed at all as well as those tasks and responsibilities that currently cannot be completed within a normal 40-hour work week.

Table 19—Administrative Support Organization Workload Capacity Gap Summary

Workload	Estimated Hours	Frequency	Estimated Total Annual Capacity Gap (Hours)	Equivalent FTE Capacity Needed to Close Gap[1]
POC Recruitment	40–80	Annually	40–80	.02–.04
Training program management/oversight/certifications	10–20	Weekly	500–1,000	.25–.51
Department/Academy Training	20	Weekly	1,000	.51
Duty crew staffing/scheduling	6–10	Weekly	300–500	.15–.25
Fire grant research/writing	4–6	Monthly	48–60	.02–.03
Fire Investigations	3–5	Monthly	36–60	.02–.03
Inspections/Re-Inspections – 337 Existing High Hazard Occupancies	350–660	Annually	350–660	.18–.34
Inspections/Re-Inspections – 1,078 Other Existing Business Occupancies	800–1450	Annually	800–1,450	.41–.74
Fire Alarm/Automatic Fire Sprinkler Systems Follow-Up	3–5	Weekly	150–250	.08–.13
Fire Safety / Public Education	5–10	Weekly	250–500	.13–.25
Emergency Management Administration	50	Monthly	400–800	.20–.41
Equipment maintenance/repair/replacement/Building	6–12	Weekly	300–600	.15–.31
IT Support	3–5	Weekly	150–250	.08–.13
NFIRS Quality Control	6–10	Weekly	300–500	.15–.25
Administrative/Record retention/Fire Relief/Data research	20–25	Weekly	1,000–1,250	.51–.64
Pre-Plans/Key Lock Box Maintenance	10–20	Weekly	500–1,000	.25–.51
		Total	**6,124–9,960**	**3.1–5.1**

[1] FTE = full-time equivalent capacity assuming 1 FTE = 1,960 annual hours

Based on this assessment, Citygate recommends that the City consider adding the following additional administrative support capacity as soon as possible to resolve existing fire administrative workload capacity gaps, provide enhanced chief officer oversight and capacity, minimize or eliminate any potential single points of administrative support failure, and ensure sufficient fire administration workload capacity to complete all responsibilities and tasks within a normal 40-hour workweek.

- 0.5–1.0 FTE Administrative Assistant
- 1.0 FTE Training/Safety Chief Officer

In addition, Citygate recommends adding 2.0 FTE Fire Inspectors as soon as funding allows to provide the capacity needed to inspect all business occupancies on at least a triennial basis.

Finding #28: The Lakeville Fire Department is understaffed to accomplish many of its administrative responsibilities and tasks.

Finding #29: The Fire Chief and Assistant Fire Chief are regularly working an average of 55 to 65 hours per week to ensure that the most important responsibilities and tasks are completed.

Finding #30: The Fire Chief and Assistant Fire Chief are having to fill duty crew shift vacancies with increasing frequency, impacting their available capacity to complete administrative responsibilities and tasks.

Finding #31: Citygate's evaluation of the Fire Department's administrative support organization yielded an estimated annual workload capacity gap of 6,124–9,960 hours which equates to 3.1–5.1 FTEs.

Recommendation #9:	The City should consider funding an additional 0.5–1.0 FTE Administrative Assistant and 1.0 Training/Safety Chief Officer as soon as possible to resolve existing fire administrative workload capacity gaps, provide enhanced chief officer oversight and capacity, minimize or eliminate any potential single points of administrative support failure, and ensure sufficient fire administration workload capacity to complete all responsibilities and tasks within a normal 40-hour work week.
Recommendation #10:	The City should consider funding an additional 2.0 FTE Fire Inspector capacity as soon as funding allows to provide the additional capacity needed to inspect all business occupancies on at least a triennial basis.

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APPENDIX A—COMMUNITY 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:

- 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 community as a whole.

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 identified hazard.
- Determination of *probable* impact severity of a hazard occurrence by planning zone.
- Determination of overall risk by hazard as described in the following table.

Table A20—Overall Risk

Probability	Impact				
	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*

Citygate used the following data sources for this study to understand the hazards and values to be protected in the Department:

- U. S. Census Bureau population and demographic data
- City and County General Plan and zoning information
- City and County Geographical Information Systems (GIS) data
- Dakota County Hazard Mitigation Plan
- City and County Comprehensive Emergency Management Plans
- 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 Department's service area yields the following:

1. The Department serves a diverse urban/suburban/rural population with densities ranging from fewer than 300 to over 4,000 people per square mile, over a widely varied land use pattern.[9]
2. The Department's service area population is projected to increase to about 74,600 by 2030 and 83,500 by 2040.[10]
3. The Department's service area includes a large inventory of residential and non-residential buildings to protect, as well as the Airlake Airport, an intermediate-size

[9] Dakota County Survey and Land Information Department
[10] City of Lakeville 2040 Comprehensive Land Use Plan

facility serving primarily personal, recreational, and business aviation in the southern portion of the Twin Cities Metropolitan Area.

4. The Department's service area has economic and other resource values to be protected as identified in this assessment.

5. Dakota County has a County-wide warning system to alert the public of disaster or emergency information in a timely manner.

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

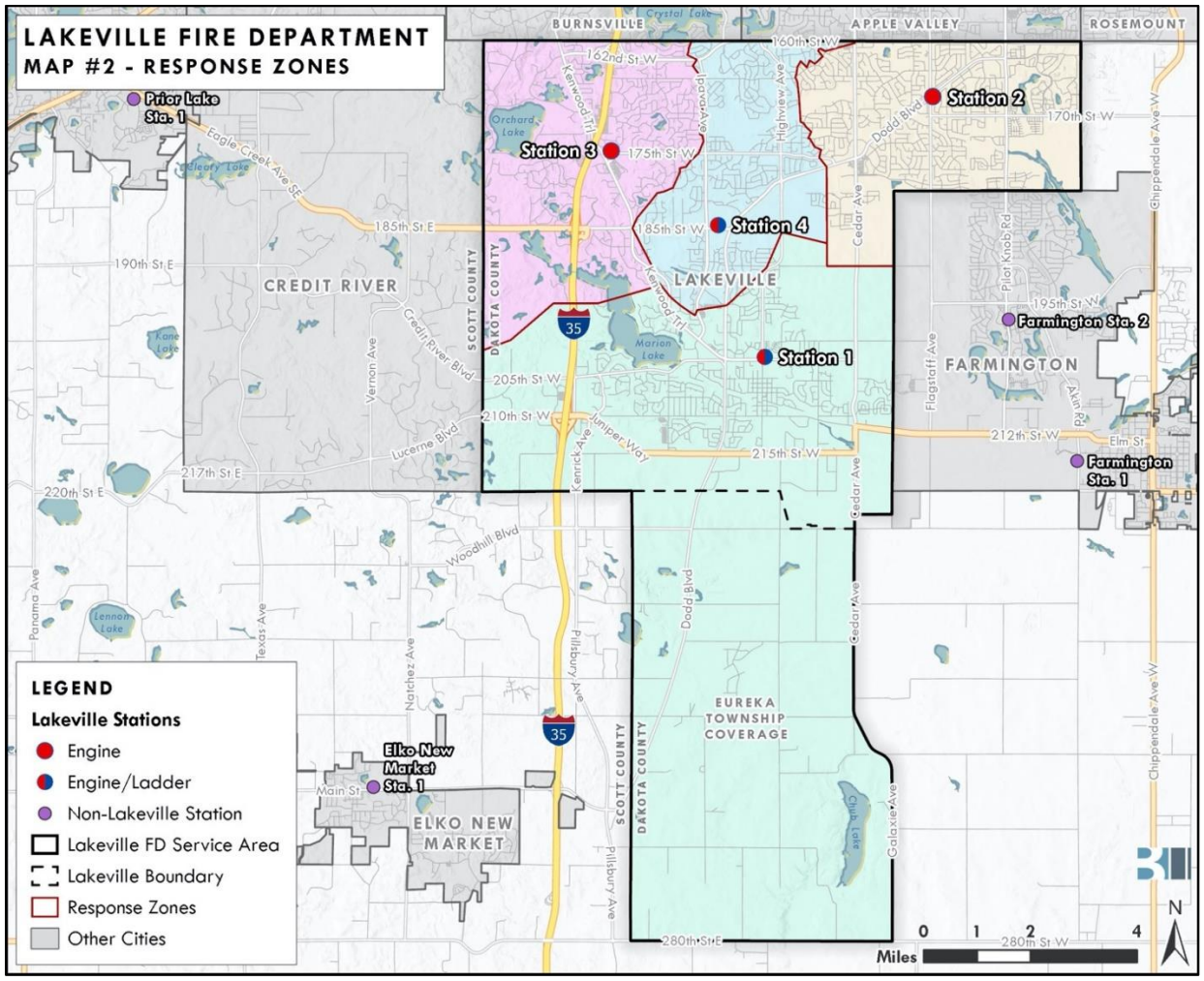
Table A21—Overall Risk by Hazard

Hazard	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Building Fire	***Moderate***	***Moderate***	***Moderate***	***Moderate***
Vegetation/Wildland Fire	***Low***	***Low***	***Low***	***Low***
Medical Emergency	***High***	***High***	***High***	***High***
Hazardous Materials	***Moderate***	***Moderate***	***Moderate***	***Moderate***
Technical Rescue	***Moderate***	***Moderate***	***Moderate***	***Moderate***

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 contain high- or maximum-risk occupancies, such as commercial and industrial buildings with a high hazard fire load. If risk were to be evaluated on a jurisdiction-wide basis, the predominant moderate risk could outweigh the high or maximum risk and may not be a significant factor in an overall assessment of risk. If, however, those high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then it becomes a more significant risk factor. Another consideration in establishing planning zones is that the jurisdiction's record management system must also track the specific zone for each incident to be able to appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized four planning zones corresponding with each fire station's first-due response area, as shown in the following map.

Figure A11—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 younger than 10 years of age, the elderly, and people housed in institutional settings. The following table summarizes key demographic data for the Department's service area.

Table A22—Key Demographic Data – Lakeville Fire Department

Demographic	2021
Population	**70,555**
Under 10 years	14.50%
10–14 years	8.20%
15–64 years	67.40%
65–74 years	7.00%
75 years and older	3.00%
Median age	36.3
Daytime population	61,978
Housing Units	**24,191**
Owner-Occupied	88.20%
Renter-Occupied	10.20%
Vacant	1.60%
Average Household Size	3.31
Median Home Value	$344,799
Ethnicity	
White	84.30%
Hispanic/Latino (counted as White)	5.00%
Asian	5.30%
Black/African American	4.90%
Other	5.60%
Education (population over 24 yrs. of age)	**45,861**
High School Graduate or Equivalent	78.4%
Undergraduate Degree	50.20%
Graduate/Professional Degree	14.70%
Employment (population over 15 yrs. of age)	**54,539**
In Labor Force	97.00%
Unemployed	3.00%
Median Household Income	$110,976
Population Below Poverty Level	3.90%
Population without Health Insurance Coverage	1.60%

Source: ESRI U.S. Census Bureau

The previous table shows:

- 24.5 percent of the population is under 10 or over 65 years of age.
- The service area population is predominantly Caucasian (84.3 percent) including Hispanic/Latino (5.0 percent, also counted as Caucasian), followed by Asian (5.3 percent), Black/African American (4.9 percent) and other (5.6 percent).
- Of the population over 24 years of age, 78.4 percent have completed high school or equivalency.
- Of the population over 24 years of age, 50.2 percent has an undergraduate degree while 14.7 percent has a graduate or professional degree.
- 97 percent of the population over 15 years of age is in the workforce; only 3 percent of that same population is unemployed.
- The median household income is $110,976.
- 3.9 percent of the service area population is below the federal poverty level.
- 1.6 percent of the service area population does not have health insurance coverage.

The City of Lakeville's Comprehensive Plan[11] projects the City population will increase to approximately 74,600 by 2030, and to 83,500 by 2040.

Buildings

The Department's service area includes just over 24,000 households,[12] as well as more than 1,100 businesses[13] including offices, professional services, retail sales, restaurants/bars, motels, churches, schools, government facilities, healthcare facilities, and other business types.

Building Occupancy Risk Categories

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

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 smaller than 10,000 square feet without a high hazard fire

[11] City of Lakeville 2040 Comprehensive Land Use Plan
[12] City of Lakeville 2040 Comprehensive Land Use Plan
[13] City of Lakeville 2040 Comprehensive Land Use Plan

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 larger 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.

The Department identified 60 high/maximum-risk building uses as they relate to the CFAI building fire risk categories as summarized in the following table.

Table A23—Building Occupancy Inventory by Risk Category

Building Occupancy Classification		Number	Risk Category[1]
A-1	Assembly	2	***High***
H	Hazardous	14	***Maximum***
I	Institutional	18	***High***
R-1	Hotel/Motel	6	***High***
R-2	Multi-Family Residential	20	***High***
	Total	**60**	

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

Critical Facilities

The U.S. Department of Homeland Security defines critical infrastructure and key resources (CIKR) 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 has identified 88 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 A24—Critical Facilities

Critical Facility Category	Number of Facilities
Community Services	6
Education	20
Government Services	16
Public Safety	5
Transportation	4
Utility	37
Total	**88**

Source: Lakeville Fire Department

Key Employers

The following table lists key City businesses by sector.

Table A25—Key Businesses

Business Name	Business Sector
Independent School District #194	Government/Education
Hearthside Food Solutions	Food Manufacturing
Treehouse Private Brands	Food Manufacturing
Schmitty & Sons	Transportation
Post Consumer Brands	Headquarters
BTD Manufacturing	Fabricated Metal
Menasha Corporation	Packaging Materials
FedEx Freight	Distribution
City of Lakeville	Government
Image Trend	Software
Lifetime Fitness	General Service
Old Downtown Area	Retail

Natural Resources

Natural resources within the Department's service area include:[14]

- Lake Kingsley
- Valley Lake
- East Lake
- Horseshoe Lake
- Lake Marion
- Orchard Lake
- Crystal Lake
- Lee Lake
- Six tributaries are also within the Department's response area
- Ritter Farm Park
- Legacy Park
- Kachina Court Conservation Area
- Michaud Park/Conservation Area

Cultural/Historic Resources

Cultural and historical resources within the Department's response area include:

- Heritage Center
- Hale Household
- Lakeville Area Arts Center
- Fairfield District of Downtown Lakeville

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

[14] City of Lakeville 2040 Comprehensive Land Use Plan page 52

for this study. The Dakota County 2016 Hazard Mitigation Plan[15] (HMP) identifies and addresses the following 16 hazards:

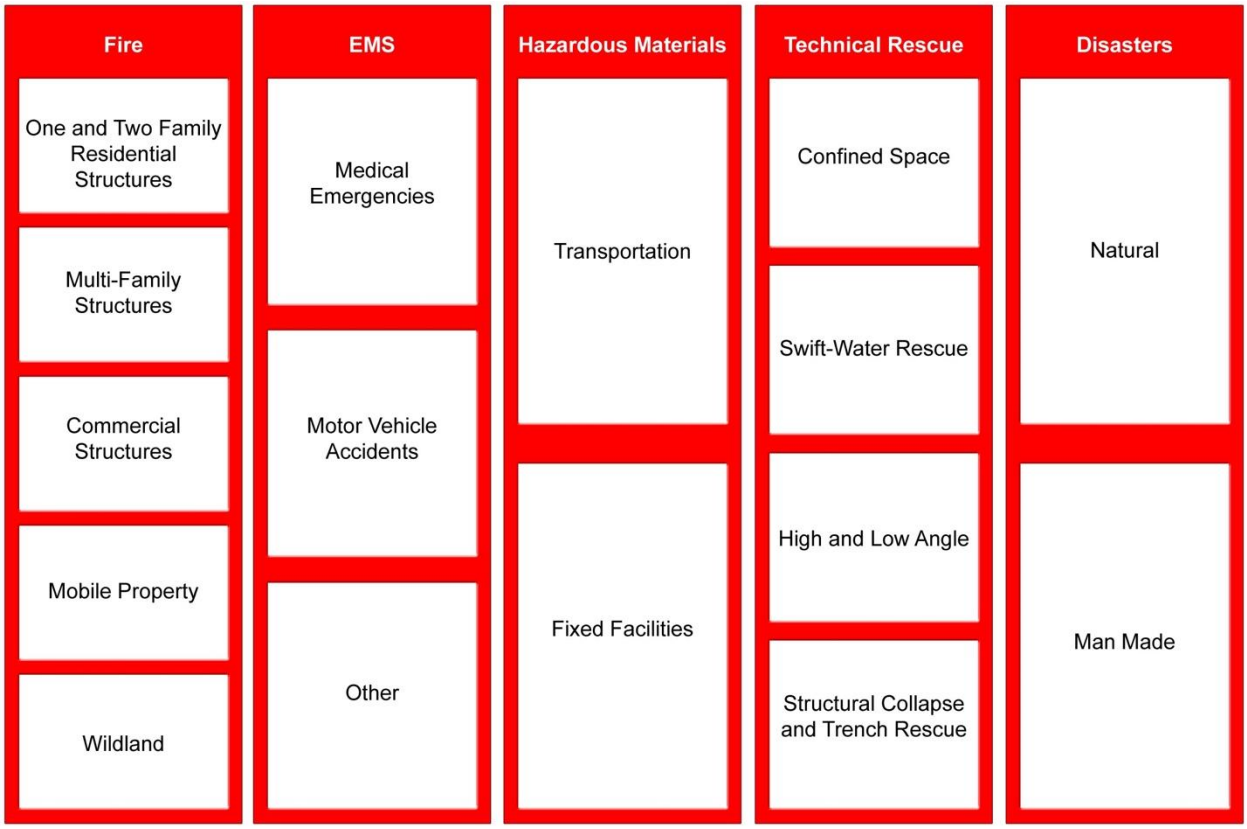
1. Cyber Attack
2. Dam Failure
3. Hazardous Material Incident
4. Drought
5. Extreme Temperatures
6. Flooding
7. Infectious Disease
8. Landslide
9. Structural Fire
10. Terrorism
11. Tornado
12. Violent Summer Storms
13. Violent Winter Storms
14. Wastewater Treatment Plant Failure
15. Water Supply Contamination
16. Wildfire

Although the Department has no legal authority or responsibility to mitigate any of these hazards other than for structure fire and wildfire, it does provide services related to each hazard, 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 may be deployed to mitigate those risks.

[15] Reference: Dakota County 2016 Hazard Mitigation Plan Table 4.1 Hazards Profiled.

Figure A12—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 Dakota County 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 five hazards for this risk assessment:

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

A.1.6 Service Capacity

Service capacity refers to the Department's available response force; the size, type, 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 risk consists of two personnel on duty Monday through Friday from 9:00 am to 6:00 pm, this staff is augmented by the four full-time sworn administrative staff that may be available on any given day. This staffing provides one engine, and one District Chief or the Fire Chief, all operating from Station 4. For the remainder of the day, Monday through Friday, four *duty crew* firefighters staff one engine out of Station 4 from 6:00 pm to 10:00 pm. This response is supplemented by a District Chief responding separately in a chief's vehicle. Monday through Friday overnight hours, 10:00 pm to 9:00 am, are staffed exclusively by *on-call* firefighters and a District Chief, all of whom primarily respond from home or work. Weekend overnight hours, 10:00 pm to 6:00 am, are staffed exclusively by *on-call* firefighters and a District Chief, all of whom primarily respond from home or work. Emergency calls requiring more than a single apparatus response result in additional stations being summoned and staffed by *on-call* firefighters, typically responding from home or work.

The Department also has five engines, two ladder trucks, one water tender, three brush trucks, one rescue truck (being sold and replaced by an engine in 2022), one boat and one ATV. All these resources are staff by *on-call* firefighters.

All response personnel are trained to either the Emergency Medical Responder (EMR) or Emergency Medical Technician (EMT) level, capable of providing Basic Life Support (BLS) pre-hospital emergency medical care. The Department provides first responder support to the privately contracted Advanced Life Support (ALS) ambulance service operating within the Department service area. When needed, air ambulance services are primarily provided by North Air Care based out of Faribault, MN. Emergency Room services are available at Fairview Ridges (Burnsville), Fairview Southdale (Edina), Regions (St. Paul), Children's Minnesota (Minneapolis), and Hennepin Healthcare (Minneapolis). Level 1 Adult Trauma Centers include Regions (St. Paul), Hennepin Healthcare (Minneapolis), and North Memorial (New Hope). Level 1 Pediatric Trauma Centers include Hennepin Healthcare (Minneapolis), and Children's Minnesota (Minneapolis). Burn Centers include Hennepin Healthcare (Minneapolis) and Regions (St. Paul).

Response personnel are also trained to the U.S. Department of Transportation Hazardous Material First Responder Operational (FRO) level to provide initial hazardous material incident assessment, hazard isolation, and support for a hazardous material response team. Hazardous material emergency response is provided by Dakota County Special Operations Team (Apple Valley hosts the equipment cache).

The Department provides water rescue capabilities. Ten firefighters are trained as *rescue swimmers* and there are an additional 10 firefighters trained as drone pilots to support a variety of call types including missing person searches and hazardous material incidents, to name a few. All Lakeville

Fire Department firefighters are trained in ice rescue skills. There is currently an initiative to partner with neighboring Burnsville Fire Department to enhance both response capabilities.

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 the 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 A26—Probability of Occurrence

Probability	General Characteristics	Expected Frequency of Occurrence
Rare	• Hazard ***may occur*** under exceptional circumstances.	25+ years
Unlikely	• Hazard ***could occur*** at some time. • No recorded or anecdotal evidence of occurrence. • Little opportunity, reason, or means for hazard to occur.	5–24 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.	1–4 years
Probable	• Hazard will ***probably occur*** occasionally. • Regular recorded or strong anecdotal evidence of occurrence. • Considerable opportunity, reason, or means for hazard to occur.	1–12 months
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.	1–4 weeks

Citygate's SOC assessments use 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 extent a hazard occurrence impacts people, buildings, lifeline services, the environment, and the community as a whole. The following table describes the five impact severity categories and related general criteria used for this analysis.

Table A27—Impact Severity

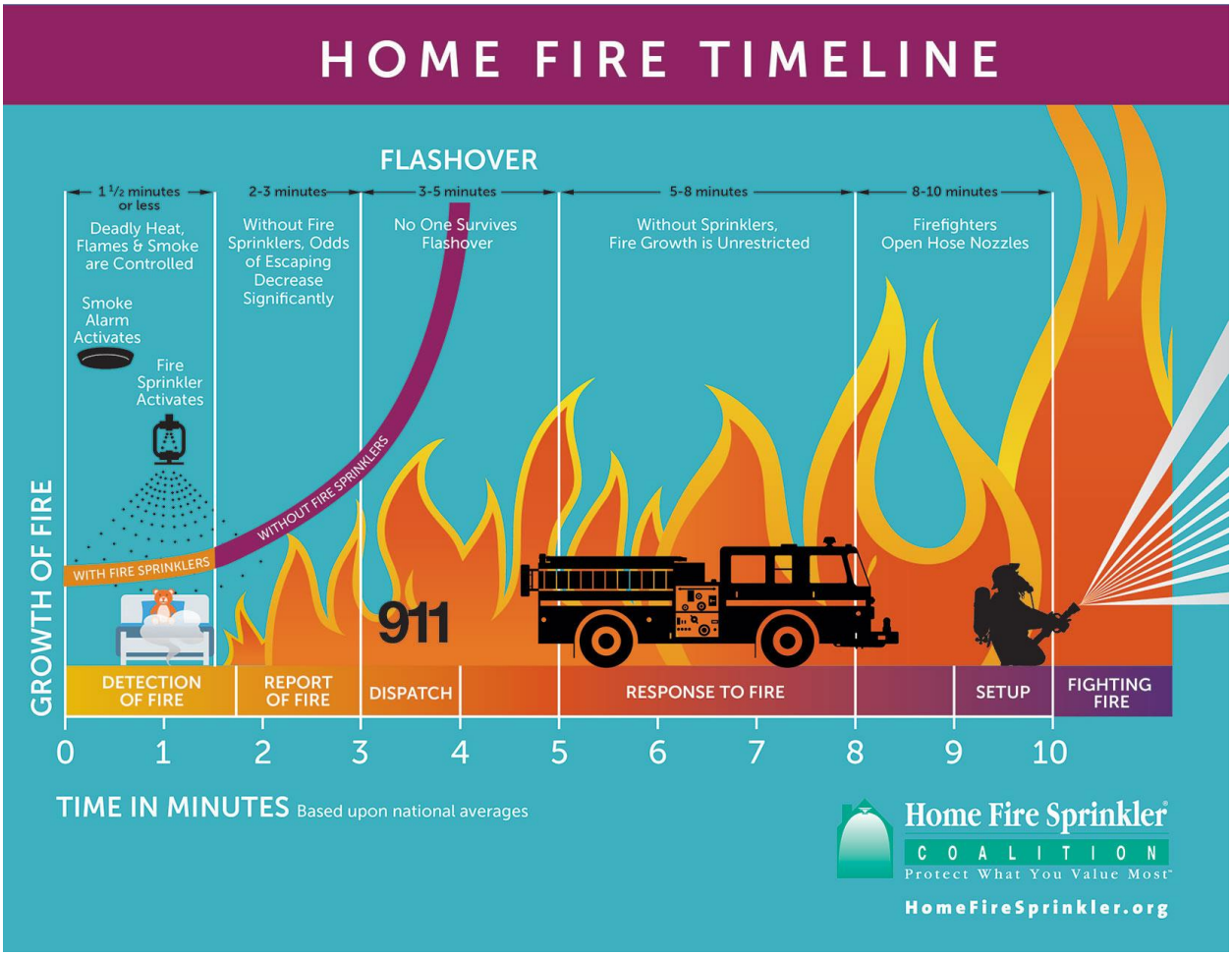
Impact Category	Characteristics
Insignificant	• No injuries or fatalities • None to few persons displaced for short duration • Little or no personal support required • None to inconsequential damage • None to minimal community disruption • No measurable environmental impacts • None to minimal financial loss • No wildland Fire Hazard Severity Zones
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 Fire Hazard Severity Zones
Moderate	• Medical treatment required; some hospitalizations; few fatalities • Localized displaced of persons for less 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 FHSZ
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 FHSZ; less than 25% in *Very High* wildland FHSZ
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 FHSZ; more than 25% of area in *Very High* wildland FHSZ

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 in determining 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 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 A13—Building Fire Progression Timeline



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

Population Density

Population density within the service area ranges from fewer than 300 (Eureka Township) to over 4,000 (City of Lakeville) people per square mile. 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 within the Department's service area is provided by the following water purveyors:

- City of Lakeville
- Eureka Township does not have a municipal water system. All fire flows are provided by Department tenders and pumpers

According to Department staff, available fire flow and pressure is adequate throughout the City limits of Lakeville. Eureka Township is without fire hydrants.

Building Fire Service Demand

Over the three-year study from January 1, 2018, through December 31, 2020, the Department responded to 157 building fire incidents, comprising slightly more than three percent of total service demand over the same period as summarized in the following table.

Table A28—Building Fire Service Demand

Risk	Year	Planning Zone						Total	Percent Total Annual Demand
		Station 1	Station 2	Station 3	Station 4	Duty Crew	Officer Only		
Building Fire	2018	15	23	6	11	0	1	**56**	3.73%
	2019	13	9	13	2	0	12	**49**	2.89%
	2020	17	12	6	5	3	9	**52**	2.60%
Total		**45**	**44**	**25**	**18**	**3**	**22**	**157**	3.02%
Percent Total Station Demand		5.07%	5.92%	3.86%	4.84%	0.15%	9.32%		

As the previous table illustrates, annual overall building fire service demand was fairly consistent over the three-year study.

Building Fire Risk Assessment

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

Table A29—Building Fire Risk Assessment

Building Fire Risk	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Probability of Occurrence	*Probable*	*Probable*	*Probable*	*Probable*
Probable Impact Severity	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***	***Moderate***	***Moderate***

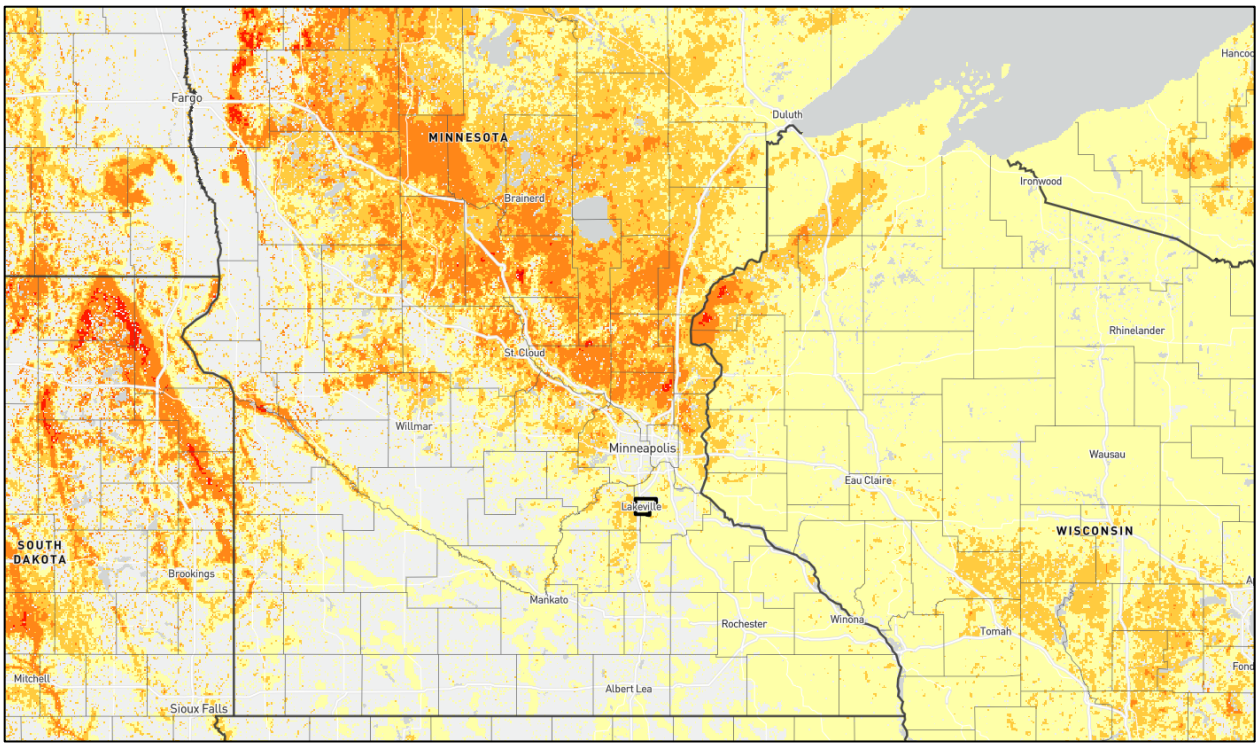
A.1.10 Vegetation/Wildfire Risk

Some portions of the response area are susceptible to a vegetation/wildland fire. Vegetation/wildland fire risk factors include vegetative fuel types and configuration, weather, topography, prior service demand, water supply, mitigation measures, and vegetation fire service capacity.

Wildfire Risk–Minnesota

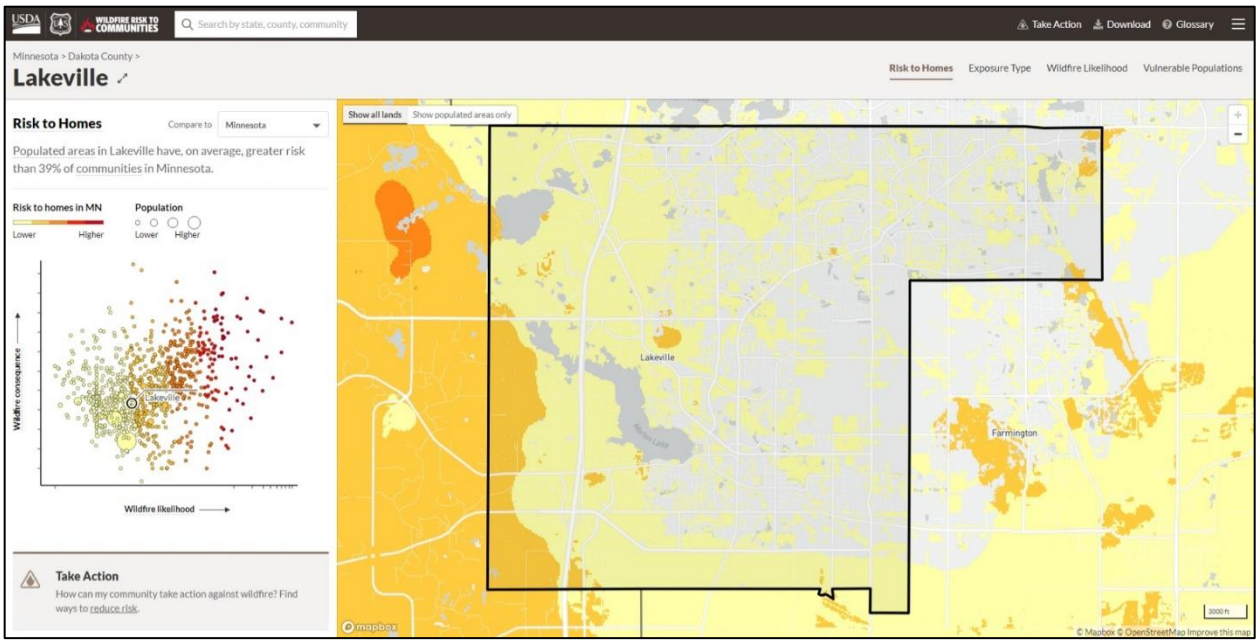
The Minnesota Department of Natural Resources (DNR) identifies wildfire risk throughout the state.

Figure A14—Wildfire Hazard Risk Zones



The DNR also designates Wildland Urban Interface (WUI) areas of the state where urban or suburban development exists within a wildland vegetation environment prone to fire. These are areas with at least 20 people per square mile with the most potential for significant damage to life and property. The following map is a more regional look as it relates to the Department's area. The Department coverage area is located in a ***lower*** wildfire risk zone.

Figure A15—Dakota County Wildland Urban Interface (WUI) Areas



Vegetative Fuels

Vegetative fuel factors influencing fire intensity and spread include fuel type (vegetation species), height, arrangement, density, and moisture. Vegetative fuels within the Department, in addition to decorative landscape species, include both native and non-native annual and perennial plant species including grasses, weeds, brush, and mostly deciduous and mixed hardwood and conifer tree species. 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. Wildland fire season, when vegetation fires are most likely to occur due to fuel and weather conditions, occurs from approximately April through September/October in Dakota County. Summer weather within the Department service area typically includes cooler mornings and warm afternoons and evenings. Occasional summer gradients produce higher daytime temperatures, lower relative humidity, and higher winds. While these conditions elevate the wildfire potential, typical Department service area weather is not conducive to a significant vegetation/wildland fire.

Topography

Vegetation/wildland fires tend to burn more intensely and spread faster when burning uphill and up-canyon, except for a wind-driven downhill or down-canyon fire. The Department's service area has generally flat topography which minimally influences vegetation fire behavior and spread.

Water Supply

Another significant vegetation fire impact severity factor is water supply immediately available for fire suppression. As discussed in **Section A.1.9**, while available fire flow and pressure is adequate in the City, it is less than adequate in other areas including Eureka Township, which is without fire hydrants.

Wildfire History

Since 2004, DNR has recorded 184 wildland fires in the Department's response area. The vast majority of these wildland fires have burned less than one acre.[16]

Vegetation/Wildfire Fire Service Capacity

The Department's wildland fire service capacity consists of the same daily staffing model used for all other types of responses.

Vegetation/Wildfire Fire Service Demand

Over the three-year study, the Department responded to 14 vegetation/wildland fires, comprising only 0.27 percent of total service demand over the same period as summarized in the following table.

Table A30—Vegetation/Wildfire Fire Service Demand

Risk	Year	Planning Zone						Total	Percent Total Annual Demand
		Station 1	Station 2	Station 3	Station 4	Duty Crew	Officer Only		
Vegetation / Wildland	2018	0	2	1	1	0	0	4	0.27%
	2019	0	1	2	0	0	1	4	0.24%
	2020	0	1	4	0	1	0	6	0.30%
Total		0	4	7	1	1	1	14	0.27%
Percent Total Station Demand		0.00%	0.54%	1.08%	0.27%	0.05%	0.42%		

[16] MNDNR Report

The previous table shows annual vegetation/wildland fire service demand consistent over the three-year study with very low overall demand.

Vegetation/Wildland Fire Risk Assessment

The following table summarizes Citygate's assessment of vegetation/wildland fire risk by planning zone.

Table A31—Vegetation/Wildfire Risk Assessment

Vegetation/Wildfire Risk	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Probability of Occurrence	*Unlikely*	*Probable*	*Probable*	*Probable*
Probable Impact Severity	*Minor*	*Minor*	*Minor*	*Minor*
Overall Risk	***Low***	***Low***	***Low***	***Low***

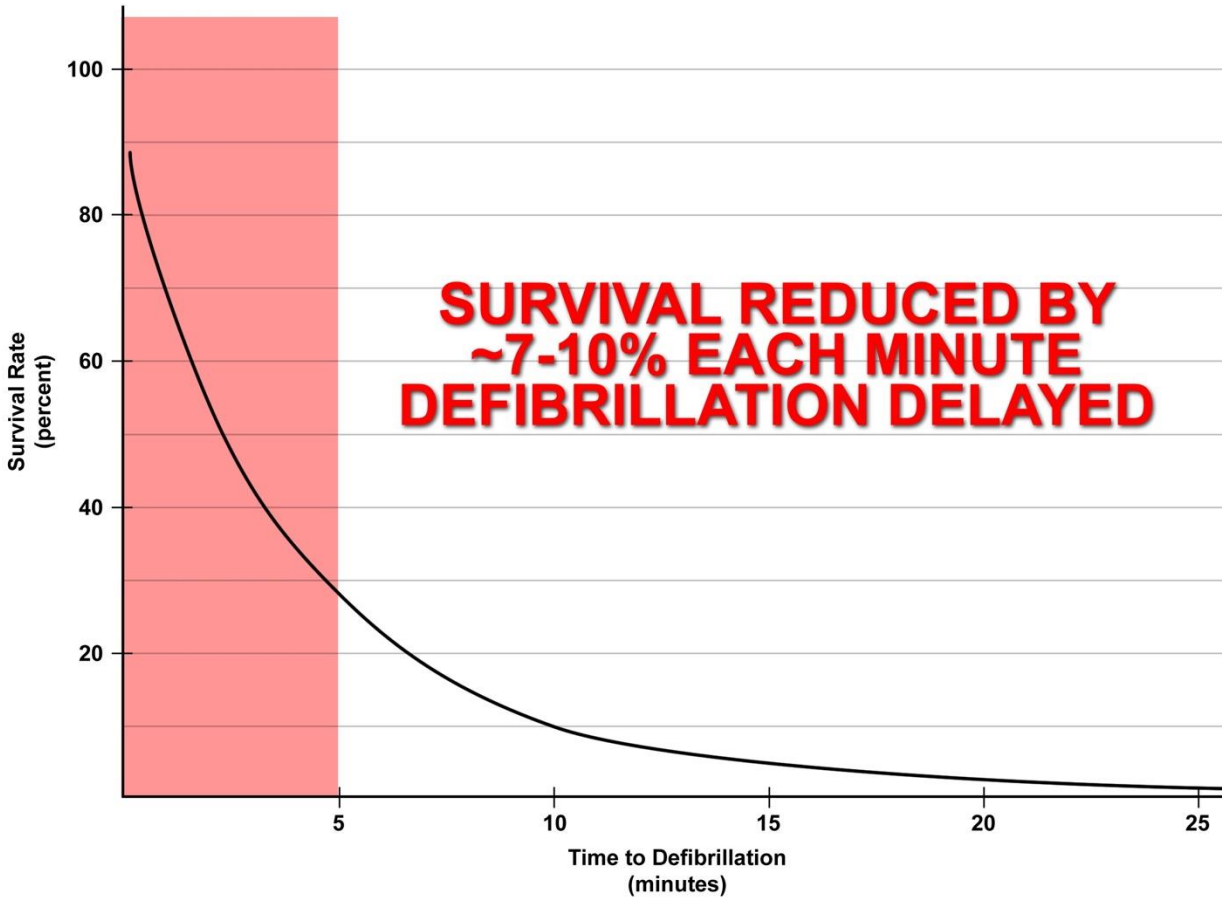
A.1.11 Medical Emergency Risk

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 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 ALS interventions.

Figure A16—Survival Rate versus Time to Defibrillation



Source: www.suddencardiacarrest.org.

Population Density

Population density within the Department's service area ranges from fewer than 300 to over 4,000 people per square mile. 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.

Demographics

Medical emergency risk tends to be higher among older, poorer, less educated, and uninsured populations. As shown in Table A22 10 percent of the Department's population is 65 and older, 21.6 percent of the population over 24 years of age has less than a high school education or

equivalent, 3.9 percent of the population is below the poverty level, and 1.6 percent of the population does not have health insurance coverage.[17]

Vehicle Traffic

Medical emergency risk tends to be higher in those areas of a community with high daily vehicle traffic volume, particularly those areas with high traffic volume traveling at high speeds. Interstate Highway 35, County Road 5/Kenwood Trail, 162nd Street W, 165th Street, 175th Street and 185th Street carrying an aggregate annual average daily traffic volume of 144,400 vehicles. There is also one railroad operating within the coverage area, Progressive Rail.

Medical Emergency Service Demand

Medical emergency service demand over the three-year period includes 2,829 calls for service, comprising more than 54 percent of total service demand over the same period as summarized in the following table.

Table A32—Medical Emergency Service Demand

Risk	Year	Planning Zone						Total	Percent Total Annual Demand
		Station 1	Station 2	Station 3	Station 4	Duty Crew	Officer Only		
Medical Emergency	**2018**	133	111	99	58	357	6	**764**	50.93%
	2019	143	99	103	65	328	126	**864**	51.00%
	2020	113	102	94	51	835	6	**1,201**	60.14%
Total		**389**	**312**	**296**	**174**	**1,520**	**138**	**2,829**	54.50%
Percent Total Station Demand		43.86%	41.99%	45.68%	46.77%	73.64%	58.47%		

As the previous table shows, medical emergency service demand *increased more than 57 percent* over the study period, with a 39 percent increase in 2020 over the prior year, most likely due to COVID-19 related calls for service. Overall, the Department's medical emergency service demand is typical of other jurisdictions with similar demographics.

Medical Emergency Risk Assessment

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

[17] Source: Esri Community Analyst and U. S. Census Bureau.

Table A33—Medical Emergency Risk Assessment

Medical Emergency Risk	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Probability of Occurrence	*Frequent*	*Frequent*	*Frequent*	*Frequent*
Probable Impact Severity	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Overall Risk	***High***	***High***	***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 Materials Facilities

Department staff identified 14 hazardous occupancies within the service area.

Transportation-Related Hazardous Materials

The Department has transportation-related hazardous material risks. The risk factor is primarily a function of vehicle, railway, maritime, and aviation traffic. Vehicle traffic volume is the greatest of these factors within the coverage area, with Interstate Highway 35, County Road 5/Kenwood Trail, 162nd Street W, 165th Street, 175th Street, and 185th Street carrying an aggregate annual average daily traffic volume of 144,400 vehicles. There is also one railroad operating within the coverage area, Progressive Rail. Progressive Rail carries a wide variety of cargo.

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. Population density within the Department ranges from fewer than 300 to over 4,000 people per square mile.

Vulnerable Populations

Persons vulnerable to a hazardous material release/spill include those 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 A22, 24.5 percent of the Department's coverage area population is under age 10 or is 65 years of age 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 to identify and remediate any planning or training gaps to ensure ongoing emergency incident readiness and effectiveness.

A County-wide system alerts the public of disaster or emergency situations. In addition, the City utilizes local media and the internet to disseminate emergency information to the public in a timely manner. The Dakota Communications Center (DCC) controls the activation of a Mass Telephone Notification System (MTNS) or "reverse-9-1-1" system. The system is used at the direction of local fire, police, and government officials to notify the public of situations requiring protective action, such as a hazardous material spill, or requiring the public's assistance, such as a missing child or vulnerable adult.[18]

Hazardous Material Service Demand

The Department responded to 204 hazardous material incidents over the three-year study, comprising nearly four percent of total service demand over the same period as summarized in the following table.

Table A34—Hazardous Material Service Demand

Risk	Year	Planning Zone						Total	Percent Total Annual Demand
		Station 1	Station 2	Station 3	Station 4	Duty Crew	Officer Only		
Hazardous Materials	2018	9	7	4	10	13	8	**51**	3.40%
	2019	4	10	8	2	13	26	**63**	3.72%
	2020	6	11	6	3	51	13	**90**	4.51%
Total		**19**	**28**	**18**	**15**	**77**	**47**	**204**	3.93%
Percent Total Station Demand		2.14%	3.77%	2.78%	4.03%	3.73%	19.92%		

[18] Dakota County All Hazard Plan pg. 62

As the previous table shows, hazardous material service demand increased more than 76 percent over the three-year study, with a nearly 43 percent increase from 2019 to 2020.

Hazardous Material Risk Assessment

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

Table A35—Hazardous Material Risk Assessment

Hazardous Material Risk	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Probability of Occurrence	*Possible*	*Possible*	*Possible*	*Possible*
Probable Impact Severity	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***	***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; floods, and landslide potential.

Construction Activity

There is ongoing residential, commercial, and infrastructure construction activity occurring within the Department's coverage area.

Confined Spaces

There are multiple tanks, vaults, and temporary open trenches within the service area.

Bodies of Water

Bodies of water within the service area include Lake Kingsley, Valley Lake, East Lake, Horseshoe Lake, Lake Marion, Orchard Lake, Crystal Lake, and Lee Lake. There are six tributaries within the Department's response area.

Transportation Volume[19]

Another technical rescue risk factor is transportation-related incidents requiring technical rescue. This risk factor is primarily a function of vehicle, railway, maritime, and aviation traffic. Vehicle traffic volume is the greatest of these factors within the coverage area, with Interstate Highway 35,

[19] MnDOT Traffic Analysis website

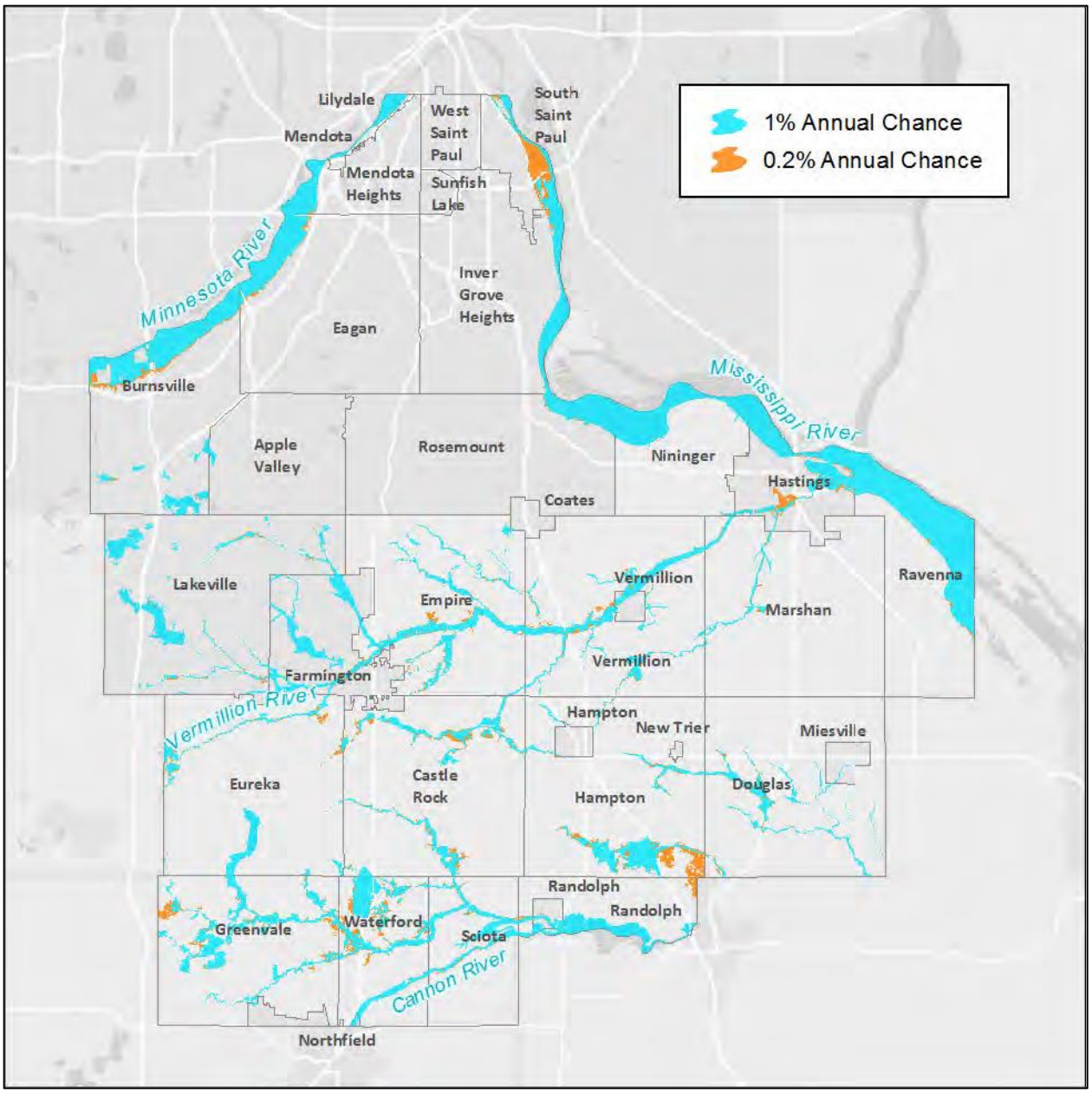
County Road 5/Kenwood Trail, 162nd Street W, 165th Street, 175th Street and 185th Street carrying an aggregate annual average daily traffic volume of 144,400 vehicles. There is also one railroad operating within the coverage area, Progressive Rail, which carries a wide variety of cargo.

Flood Risk[20]

Flooding can occur almost anywhere within Dakota County, including the Department coverage area. One method for identifying geographic locations of flood prone areas is the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). The following map shows the Special Flood Hazard Areas (SFHA) within Dakota County as determined by FEMA.

[20] Dakota County MN All Hazard Mitigation Plan pg. 79

Figure A17—Special Flood Hazard Zones – Dakota County



Technical Rescue Service Demand

Over the three-year study, there were 33 technical rescue incidents comprising less than 1 percent of total service demand for the same period as summarized in the following table.

Table A36—Technical Rescue Service Demand

Risk	Year	Planning Zone						Total	Percent Total Annual Demand
		Station 1	Station 2	Station 3	Station 4	Duty Crew	Officer Only		
Technical Rescue	2018	7	3	2	5	0	0	**17**	1.13%
	2019	0	2	2	0	2	1	**7**	0.41%
	2020	1	2	2	2	2	0	**9**	0.45%
Total		**8**	**7**	**6**	**7**	**4**	**1**	**33**	0.64%
Percent Total Station Demand		0.90%	0.94%	0.93%	1.88%	0.19%	0.42%		

As the previous table shows, overall annual technical rescue service demand is very low.

Technical Rescue Risk Assessment

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

Table A37—Technical Rescue Risk Assessment

Technical Rescue Risk	Planning Zone			
	Station 1	Station 2	Station 3	Station 4
Probability of Occurrence	*Possible*	*Possible*	*Possible*	*Possible*
Probable Impact Severity	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Overall Risk	***Moderate***	***Moderate***	***Moderate***	***Moderate***