

Grapevine Fire Department  
*Texas*

Fire Department Service Delivery Analysis

*August 2014*



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## Fire Department Service Delivery Analysis

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## Table of Contents

<b>Acknowledgments</b> .....	<b>iii</b>
<b>Executive Summary</b> .....	<b>1</b>
<b>Evaluation of Current Conditions</b> .....	<b>9</b>
Organizational Overview .....	9
Governance and Lines of Authority .....	11
Organizational Design .....	13
Organizational Chart .....	15
Service Area and Infrastructure .....	16
Budgets and Finance .....	18
Emergency Response Type and Frequency .....	21
Management Components .....	24
Mission, Vision, Strategic Planning, Goals, and Objectives .....	24
Strategic Planning .....	25
Management Documents and Processes .....	26
Staffing .....	33
Administrative and Support Staffing .....	33
Emergency Response Staffing .....	36
Service Delivery and Performance .....	40
Demand .....	40
Distribution .....	47
Concentration .....	59
Reliability .....	67
Response Performance .....	70
Capital Assets and Capital Improvement Programs .....	75
Facilities .....	77
Apparatus .....	82
Capital Replacement Planning .....	84
<b>Future System Demand Projections</b> .....	<b>91</b>
Population Growth Projections .....	91
Population History .....	91
Population Projection .....	92
Service demand Projection .....	92
Community Risk Analysis .....	94
<b>Future Delivery System Recommendations</b> .....	<b>97</b>
Development of Response Standards and Targets .....	97
Critical Tasks, Risk, and Staffing Performance .....	97
Response Time Performance Objectives .....	102
Short and Mid-Term Strategies .....	105
Response Deployment .....	105
Emergency Medical Services (EMS) .....	107
Organizational Development .....	109

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Training .....	110
Recommended Long-Term Strategy .....	111
Fire Station Upgrades and Replacement .....	111
Training Facility Development .....	115
Industry Best Practices and Standards .....	116
<b>Conclusion.....</b>	<b>119</b>
<b>Appendix.....</b>	<b>121</b>
Table of Figures.....	121

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### **Grapevine Fire Department**

Steve Bass, Fire Chief

Darrell Brown, Deputy Fire Chief, Operations

Mark Ashmead, Deputy Chief, Fire Administration

Randie Frisinger, Deputy Chief, Fire Marshal

Jimmy Cox, Grapevine Professional Firefighters, President

Kenneth Hesch, Grapevine Professional Firefighters, Vice President



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## Executive Summary

Emergency Services Consulting International (ESCI) was engaged by the City of Grapevine to provide a service delivery analysis and recommendations for the delivery of emergency services within the Grapevine Fire Department (GFD) service area. This service delivery analysis will assist the department in future planning and provision of comprehensive emergency services to the citizens of Grapevine. This report is organized as a service delivery analysis and overview that evaluates current conditions; projects future growth, development, and service demand; and provides recommendations to enhance current services, or to provide an equal level of service, over the next five to 15 years.

ESCI thanks the City of Grapevine, and the staff of the GFD, for their cooperation in the preparation of this report. All involved were candid in their comments and provided a tremendous amount of essential information. Special appreciation is offered to Fire Chief Steve Bass, Deputy Chief Darrel Brown, and Deputy Chief Mark Ashmead in acknowledgement of the time, effort, and resources they provided for this report.

The service delivery analysis plan begins with a review of the current service delivery provided by GFD including its programs, administration, management, service delivery performance, and financial benchmarks. All areas are evaluated and discussed in detail and specific recommendations are provided, where applicable.

### Report Section I: Evaluation of Current Conditions

An analysis of current conditions is documented in eight survey sections, reviewing the GFD administration, governance, staffing, personnel management, service delivery, planning, operations/administrative support, and capital assets. Each component of the evaluation includes an introductory explanation of the subject area and discussion of desirable outcomes and identified best practices.

Criterion used to evaluate the fire department has been developed over many years. These gauges include relevant guidelines from national accreditation criteria, the National Fire Protection Association (NFPA) standards, federal and state mandates for fire and EMS systems, recommendations by various organizations such as the Center for Public Safety Excellence (CPSE), and generally accepted best practices within the fire and EMS industry.

The evaluation of current conditions offers the City a detailed assessment of existing fire department operations and also provides the ESCI project team with a snapshot in time; the basis from which the balance of the Fire Department program and service audit is developed. The following discusses some of the key findings:

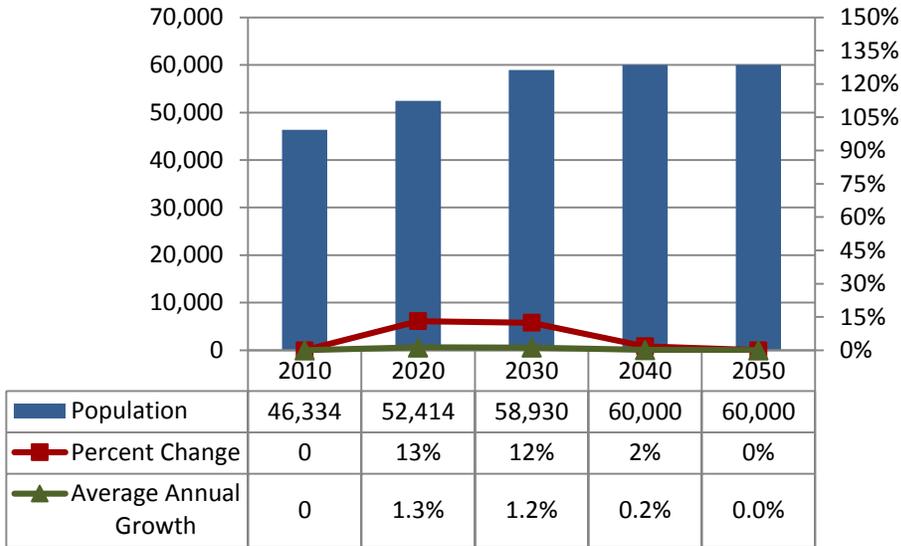
### *Current and Future Service Demand*

GFD is a municipal subdivision of the City of Grapevine, Texas. Grapevine is located in the north Texas Metroplex region, immediately adjacent to the City of Dallas. The fire department's service area encompasses approximately 27.2 square miles that fall within the city. The service area population consists of 48,447 residents with a combined resident, conference, and resort population of up to 110,000.

The City of Grapevine and adjacent areas are experiencing consistent and significant daytime recreational/conference and business population growth, which has a strong potential to continue into the future. With community population and business growth comes increasing service demand and workload on the fire department, challenging the agency to keep pace with growing needs.

Over the years, the department has evolved into the agency it is today providing fire prevention and suppression, technical rescue, hazardous materials and advanced life support (ALS), medical first response, and transportation services. The department operates from five strategically placed facilities using a fleet of three engines, three aerial ladders (two quints and one ladder truck) with ALS capabilities, a heavy rescue response unit, three MICU ambulances, and a number of ancillary and support vehicles. The department staffs entirely career personnel that include an administrative complement of 11 and an operations complement of 90 personnel.

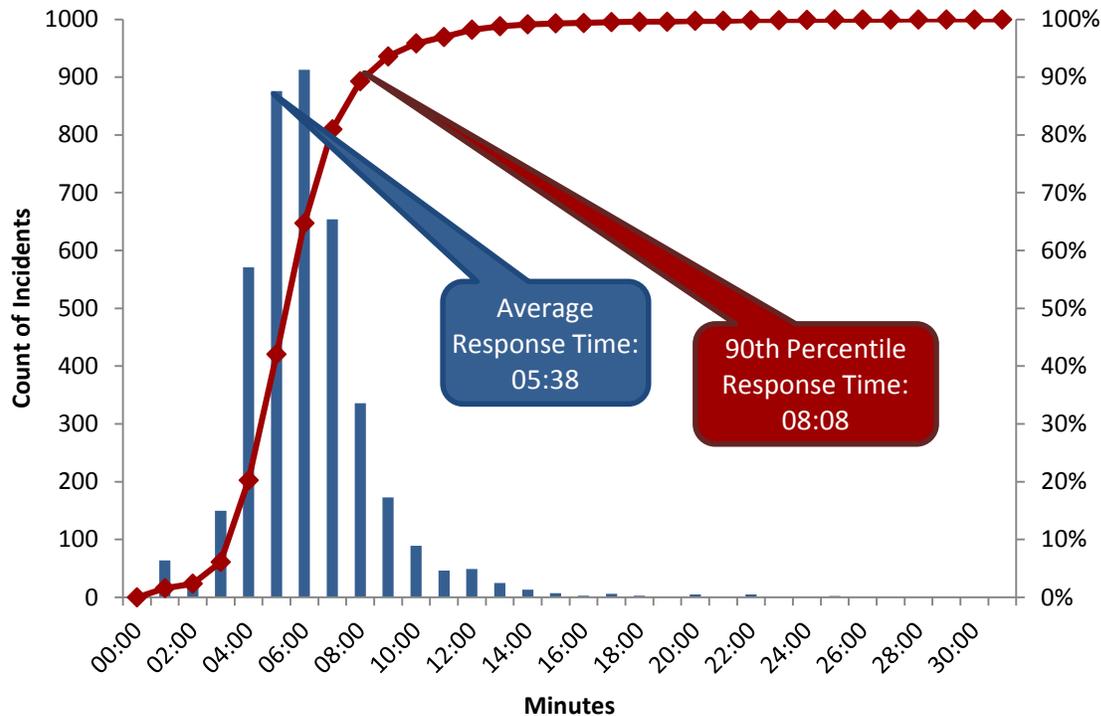
The Texas Water Development Board (TWDB) prepares population projections for communities and regions throughout Texas to predict future water use and needs. This population projection shows the population of Grapevine increasing approximately twenty four percent through 2040, to a population of 60,000. The resident population remains flat at 60,000 through 2050 and beyond, according to the TWDB projection. This is the result of the city reaching build-out, the point at which there is little remaining land available for residential development within the current boundaries of Grapevine.



Service Delivery and Response Performance

Response performance criteria and actual service delivery performance is analyzed in detail, providing information with which the Department can develop future deployment methodologies and identify desired levels of response performance and staffing.

Response times in 2013 were found to average 5 minutes 38 seconds. Of all of the incidents to which the Department responded in the study year, 90 percent were answered in 8 minutes 8 seconds or less.



Fire stations are generally well located to provide reasonable response time intervals. However, to appropriately upgrade two existing stations they will need to be relocated to a suitable site with adequate land and access elements. GIS analysis indicates that over 90 percent of incidents occurring within the City are within 5 minutes 35 second “travel” time from an existing fire station with an overall 90<sup>th</sup> percentile of response elements (dispatch, turn out, and travel time) of eight minutes and eight seconds. This overall 90<sup>th</sup> percentile of eight minutes eight second coverage is considered acceptable. However, absent defined response performance goals it is unknown if it meets community expectations. It is explained further in the report that some aspects of response performance are best developed locally based on identified risk, community expectations, and desired service levels. It is important that Grapevine develop and adopt response, performance, and staffing standards that best meet the city’s risk profile and needs of the community served. To meet the identified standards and/or improve upon current response times with anticipated future growth, additional personnel and upgraded/relocated fire stations will be needed in the future.

Staffing

The staffing section of the report reviews both operational and administrative and support personnel deployment. In general terms, operational (emergency response) staffing of fire apparatus is found to

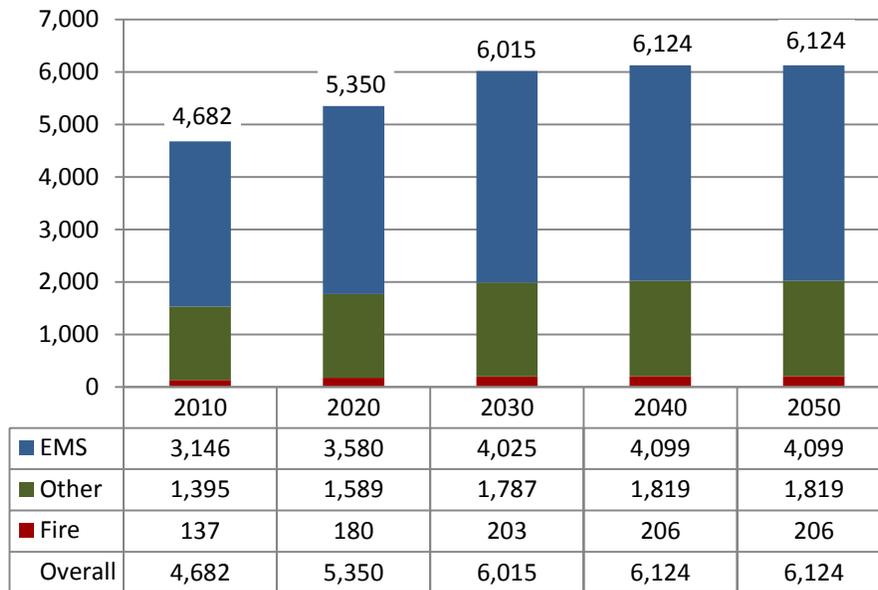
be within regional norms. However, given Grapevine’s unique risk profile based on recreational and resort/conference facilities, there is a demonstrated challenge in assembling an effective firefighting force in accordance with national standards. In addition, anticipated population growth and service demand increases will further impact the ability to assemble an effective firefighting force for high risk responses.

In review of administrative and support staffing levels, some shortcomings are revealed. The ratio of administrative staffing to departmental operational personnel is lower than what ESCI’s experience finds to be optimum. Additionally, it is found that the Emergency Medical Services and Training Division administration are under-staffed in consideration of the anticipated service level demands and addition of new personnel, which directly impact training, certification, and quality management workload. Several opportunities to address inadequate administrative staffing can be addressed through additional personnel and enhanced regional partnerships with neighboring jurisdictions. Additional assessment and recommendations are provided in the report.

#### Report Section II: Future System Demand Projections

Following the evaluation of current conditions, the report continues to analyze the service delivery demands that can be expected to confront the GFD in the future. Existing demographics are identified and compared to U.S. Census Bureau, Texas State Data Center, as well as local and regional planning resources for development of projected future needs.

In evaluating the deployment of facilities, resources, and staffing, it is imperative consideration be given to potential changes, such as population growth, that can directly affect emergency workload. Changes in service demand may require adjustments in the deployment of staffing and capital assets in order to maintain acceptable levels of performance. For the purposes of this study, ESCI uses the TWDB population projection for Grapevine and multiplies this number by a per capita incident rate derived from historical service demand. This analysis provides a picture of potential service demand through 2040, based on population growth in Grapevine. The results are shown in the following figure.



In this analysis, fires (includes all types of fires) demonstrate the lowest rate of increase. This reflects a national trend and can be attributed to improvements in building codes and fire prevention over the last several decades. EMS is expected to continue to be the predominant factor affecting service demand. Other emergency service calls not involving actual fires are predicted to increase in part due to the use of automatic alarm systems that decrease the number of actual fires, but increase service demand.

Report Section III: Future Delivery System Models

The current conditions analysis and system demand projections form the foundation from which ESCI has developed strategies for the delivery of services in Grapevine for the future.

This section cites multiple future system model modifications, included both short-term and long-term initiatives that are identified in the interest of improving and maintaining future system integrity. Each initiative is discussed in detail and guidance is provided.

The discussion of future delivery systems begins with an explanation of the importance of developing response time standards and targets, viewed by ESCI as a critical step that is needed if GFD is to appropriately plan for the future. Guidance is offered regarding how the agency can assess critical tasking, risk analysis, and staffing performance from which response time performance objectives can be established.

Short- and mid-term strategies and models are discussed next. The initiatives identified and explained include:

- Future resource deployment needs and staffing levels
- Emergency Medical Services system administration participation/engagement and future considerations
- Administrative and Support program needs
- Training Program direction and ability to meet increasing training needs
- Regional cooperative expansion opportunities and benefits

The report continues by discussing long-term strategies and needs, including:

- Future fire station construction considerations
- EMS service delivery challenges and future considerations
- Future regional fire training facility development and construction
- Accreditation and industry best practices for dispatch, EMS, and fire service delivery

The strategies needed to meet future service demand do not come without cost. In the final discussion section of the report, ESCI provides information on the financial considerations that come with system expansion and modified delivery models. Financial projections are offered with regard to fire station construction costs as well as fire apparatus expenses.



## Evaluation of Current Conditions

Emergency Services Consulting International (ESCI) was engaged by the City of Grapevine to provide a long-range analysis and recommendations for the delivery of emergency services within the Grapevine Fire Department (GFD) that will assist the department in future efforts and long-range planning. This report serves as the culmination of the project and is configured as an organizational service delivery analysis that evaluates current conditions: projects future growth, development, service demands, and provides recommendations to enhance current services or provide an equal level of service over the next 10 to 20 years.

Using organizational, operational, staffing, and Geographic Information System (GIS) models, this phase of the study provides recommendations for improvement in current services delivered to the community. The evaluation and analysis of data and other information is based on Texas State laws and regulations, National Fire Protection Association (NFPA) standards, Commission on Fire Accreditation International (CFAI)<sup>1</sup> self-assessment criteria, health and safety requirements, federal and state mandates relative to emergency services, and generally accepted best practices within the emergency services community.

Each section in the following report provides the reader with general information about that specific element, as well as observations and analysis of any significant issues or conditions that are pertinent. Observations are supported by data provided by Grapevine Fire Department (GFD) and collected as part of the review and interview process. Finally, specific recommendations are included to address identified issues or to take advantage of opportunities that may exist.

### ORGANIZATIONAL OVERVIEW

The Organizational Overview component provides a review of the organization, discussing the agency's configuration and the services that it provides. Data provided by Grapevine Fire Department was combined with information collected in the course of ESCI's fieldwork to develop the following overview.

The purpose of this section is two-fold. First, it verifies the accuracy of baseline information along with ESCI's understanding of the agency's composition. This provides the foundation from which the Service

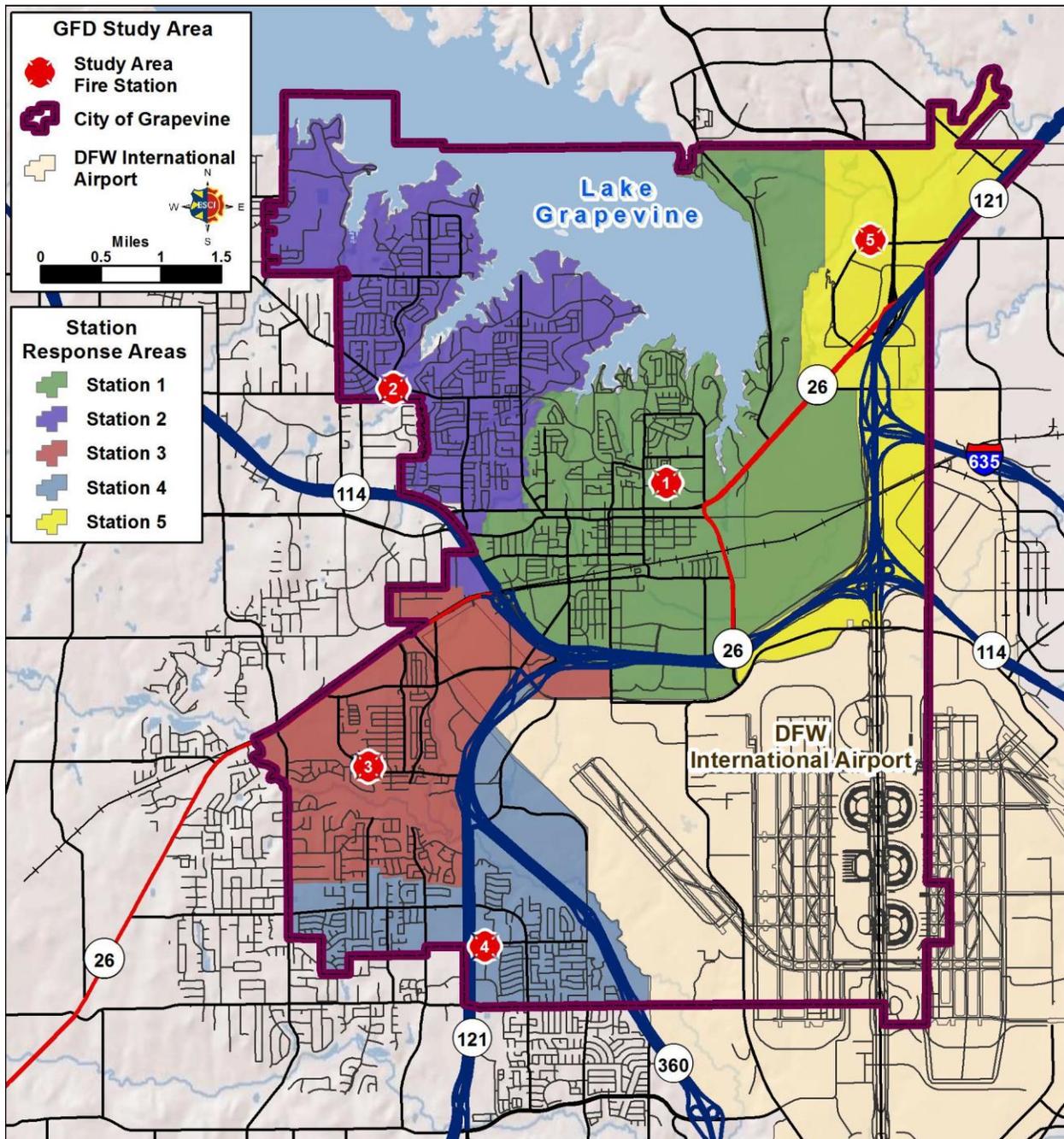
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<sup>1</sup> The CFAI organization is now a subsection of the Center for Public Safety Excellence (CPSE) but maintains its prime function of accrediting fire agencies.

Delivery Analysis is developed. Secondly, the overview serves as a reference for the reader who may not be fully familiar with the details of the agency's operations. Where appropriate, ESCI includes recommended modifications to current observations based on industry standards and best practices.

GFD is a municipal subdivision of the City of Grapevine, Texas. Grapevine is located in the north Texas Metroplex region, immediately adjacent to the City of Dallas. The fire department's service area encompasses approximately 27.2 square miles that fall within the city. The service area population consists of 48,447 residents with a consistent resident, conference, and resort population of up to 110,000. The following map reflects the Grapevine Fire Department service area.

Figure 1: Service Area Map



### *Governance and Lines of Authority*

The very basis of any service provided by governmental or quasi-governmental agencies lies within the policies that give that agency the responsibility and authority upon which to act. In most governmental agencies, including GFD, those policies lie within the charters, ordinances, and other governing

documents adopted by the individual municipalities. The following table provides an overview of the agency’s governance and lines of authority elements.

**Figure 2: Survey Table – Governance**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Governance and Lines of Authority</b>		
Governing body	City Manager/Council form of government	
i) Head of governing body	Mayor	
ii) Key employee of governing body	City Manager	
iii) Meetings	First and third Tuesdays	
Fire Chief position	At will employee	
i) Hired by contract	No	
ii) Term of contract	N/A	
iii) Periodic performance evaluation	Annual	
Fire Chief/authority defined	City Charter	
Policy and administrative roles defined	City Charter	
<b>Attributes of Successful Organizations</b>		
Policy, rules, guiding documents	City Administrative Policies plus Department policies; SOPs and internal policies are currently under revision	Separate department policy documents from operating guidelines.
i) Process for revision provided	Currently under revision	Establish a defined process for regular review and revision of rules, policies, and procedures. Include labor input.
Legal counsel maintained		
i) Consultation available	Via City Attorney	
ii) Labor counsel	Via City Attorney	
Financial controls		
i) Financial control system	Requisition and purchase order process with spending thresholds, administered via City finance	
ii) Financial review	Monthly finance report to council by finance department	
iii) Auditor	Third party audit	
iv) Frequency of review	Annual	
Governing body minutes maintained	Yes	
i) Availability of minutes	Posted on City website	

**Discussion:**

Governance in the Grapevine Fire Department is much like what is found in other cities in Texas. The fire chief reports to a city manager who, in turn, reports to a city council consisting of six members along with an elected mayor. As a municipal subdivision, GFD is a standing department within the organizational structure of the City of Grapevine.

GFD operates under the guidance of several foundational documents, including city administrative polices and internal, department policies, which include Standard Operating Guidelines (SOPs). At the time of ESCI’s fieldwork, the SOPs and internal policies were reported to be under revision.

Because policies and procedures establish the foundation upon which an organization operates, it is essential that they be current and comprehensive in content. ESCI recommends that the process of reviewing and updating the department’s internal policies and operating procedures be completed and, further, that a regular schedule of future review and revision be established.

**Key Recommendations:**

- Complete the process of updating departmental policies and procedures.
- Establish a regularly scheduled process for annual review and revision of policies and procedures.

***Organizational Design***

The organizational design of an emergency services agency is vitally important to the agency’s ability to deliver service in an efficient and timely manner while providing the necessary level of safety and security to the members of the organization. During an emergency, an individual’s ability to supervise multiple personnel is diminished; thus, industry standards recommend a span of control of four to six personnel under stressed situations. This is a recommendation carried forward from military history and has shown to be effective in emergency service situations.

In addition, employees tend to be more efficient when they know to whom they report and have a single point of contact for supervision and direction. A recent research project conducted by the Columbia University, Northwestern University, and University of Queensland, Australia, found that,

*...when there are tasks that require teamwork, people get more done when there are leaders and followers. Without a clear chain of command, members often become sidetracked with grabbing power and lose track of the task at hand. <sup>2</sup>*

The following table summarizes the organizational design components of the Grapevine Fire Department:

**Figure 3: Survey Table – Organizational Design**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Organizational Structure</b>		
Structure type	Traditional top-down hierarchy	
Descriptions of all jobs maintained	Yes, for all positions	
i) Job descriptions updated	As needed only	Establish regular review process every 2-5 years for all job descriptions.
Employment agreements	No	
<b>Chain of Command</b>		
Defined Chain of command	Defined via organizational chart	
Span of control	3-to-1 ratio	
Hiring/Firing authority	Fire chief, advises human resources and city manager but authority is with the fire chief	
<b>Formation and History</b>		
Organization formed	1907	
History maintained	Have a written document	
i) Individual or group responsible	Not assigned	

**Discussion:**

GFD’s organizational design provides a logical hierarchical flow of information and definition of responsibilities that is understandable to the organization’s personnel. Job descriptions are in place for all positions, appropriately defining roles and responsibilities at various levels within the organization. However, the job descriptions are updated only an as-needed basis, leading to ESCI’s recommendation that they be scheduled for annual review.

**Key Recommendations:**

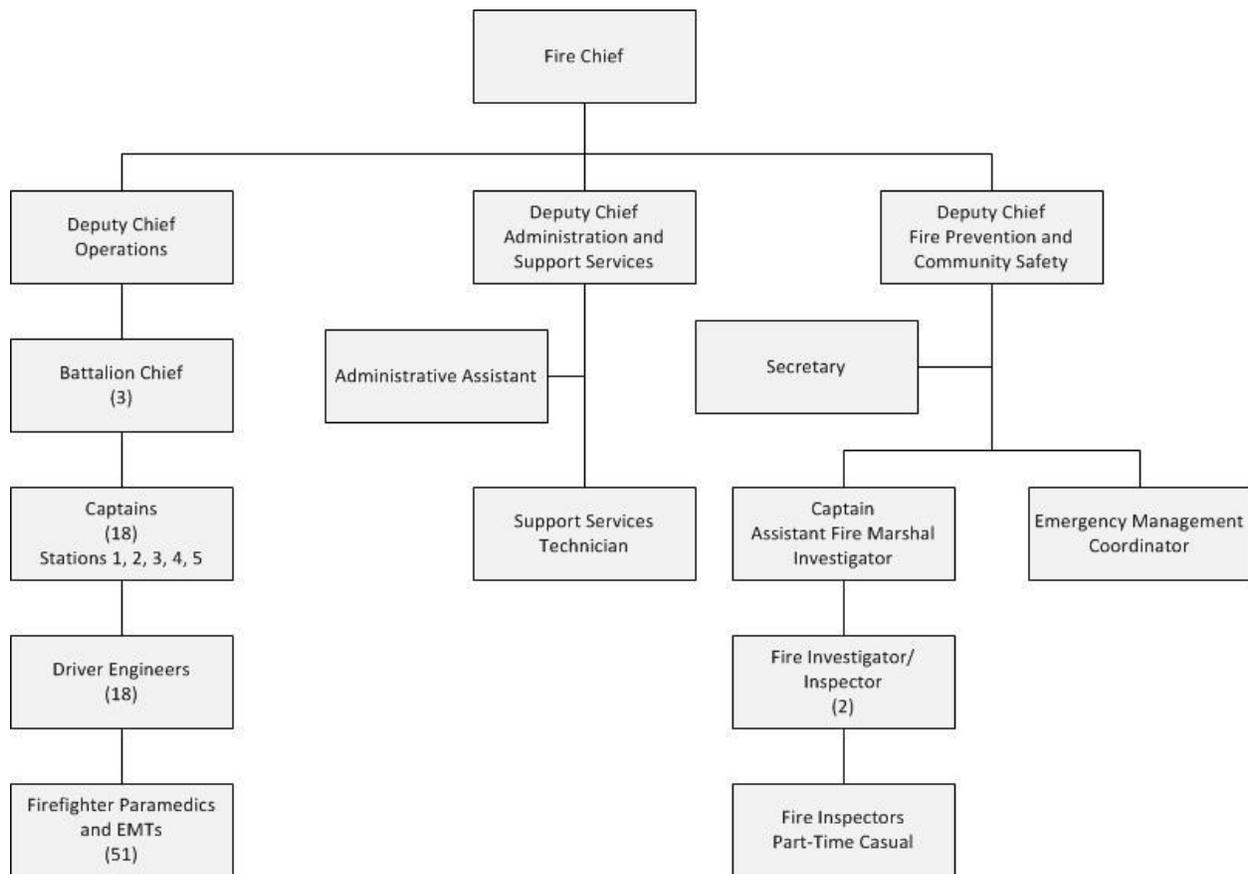
- Establish a process of regularly scheduled review of all job descriptions.

<sup>2</sup> Inc. September 2012. “Why Hierarchies are Good for Productivity”, p 26.

**Organizational Chart**

To operate effectively the structure of a fire department needs to be clearly defined in the form of an organizational chart. The chart institutionalizes the agency’s hierarchy, identifies roles and, most importantly, reporting authority. A well-developed chart helps to assure that communication flows appropriately and limits opportunities to circumvent the reporting structure. GFD’s organizational chart is shown in the following figure. <sup>3</sup>

**Figure 4: Grapevine Fire Department Organizational Chart**



The department is organized in a top-down hierarchy, typical of most fire departments. The fire chief has three direct reports, all of whom are deputy chief positions including an Operations Division, Administrative and Support Services Division, and a Fire Prevention and Community Safety Division. Each division has additional support positions as identified in the organizational chart.

<sup>3</sup> Provided by client.

### Service Area and Infrastructure

The size and composition of a fire department’s service area affects the type and number of personnel, fire stations, and vehicles that are needed to provide services efficiently. Sometimes complex decisions need to be made regarding the deployment strategies employed to properly position resources based on land area, geography, risk, and similar factors. Following is a summary of the GFD’s service area and service infrastructure resources.

**Figure 5: Survey Table – Service Area and Infrastructure**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>General Description of Agency</b>		
Agency type	Municipal subdivision	
Area, square miles	27.2	
Headquarters	Station 1	
Fire stations	5	
Other facilities	None	
Population served	48,447 residents and 110,000 used for benchmarking comparisons due to sustained transient conference/recreation visitors	
<b>Service Delivery Infrastructure</b>		
Emergency vehicles		
i) Engines	3	
ii) Engine, reserve	2	
iii) Ladder truck	3 (2 quint, 1 aerial) 1 quint, reserve	
iv) Ambulance	3	
v) Ambulance, reserve	2	
vi) Heavy rescue	1	
vii) Brush	1	
viii) Water rescue	2 (1 vehicle, 1 boat, 1 reserve boat)	
ISO rating	Protection Class 2	
Total fire department personnel, uniformed and civilian		
i) Administrative and support personnel, full-time	11	
ii) Administrative and support personnel, volunteer	5-10 office and field volunteers	
iii) Operational personnel, full-time	90	
iv) Operational personnel, volunteer	None	
v) Part time personnel	4 inspectors, part time, casual	

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
vi) Contract personnel	1 contract training coordinator 1 contract EMS coordinator	Explore full time training and EMS coordination and oversight. Supplement with contract positions as needed. Explore regional cooperation with local agencies.
vii) Other	1 emergency management intern (intermittently)	

**Discussion:**

GFD provides its service delivery to the public from five fire stations, strategically located throughout the city. The department has made a substantial investment in fire apparatus (vehicles) including three fire engines and two “quint” apparatus, which are fire engines also equipped with aerial ladder devices. There is also a standard ladder truck, three ambulances, and a number of other specialized and reserve units.

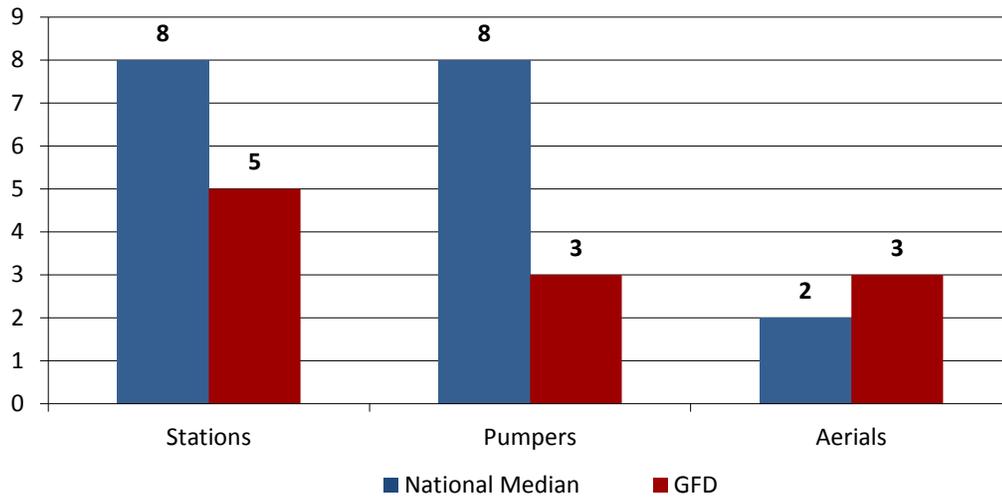
A cadre of 90 full-time, career response personnel provides fire and emergency services for the City of Grapevine. The responders operate under the supervision of the fire chief and ten other full-time administrative and support personnel.

The department’s continuing test will be that of making the most prudent staffing and facility placement decisions based on weighing multiple considerations including risk exposure, response times, access challenges, deployment, community expectations, and fire department capacity. Those decisions are difficult given the financial considerations that must be taken into account. Placement of fire stations and deployment of vehicles and personnel is analyzed in detail in the Service Delivery and Performance section of this report.

- *In consultation with the GFD, ESCI is using a sustained population number of 110,000 as a conservative and accurate population base that is served by the GFD. This population number was agreed to be a conservative estimate of the population served that is a combination of residents and visitors to the city for travel, conference, and recreational purpose. This population number serves as a data element for comparison benchmarking at the regional and national level for spending, personnel, and capital resources.*

In the following chart, a comparison of fire stations, pumpers (engines), and aerial trucks is provided, mirrored against national and regional data.

**Figure 6: Comparison of Capital Resources per 1,000 Population**



When compared to available national median data from the National Fire Protection Association, GFD operates from a smaller number of fire stations and fire apparatus. This apparatus and station resource allocation is consistent with the number of permanent residents and the need to serve a large transient population based on the cities conference, hotel, and recreational risk profile. What is not reflected in the table above is reserve apparatus. The department has a somewhat high amount of apparatus in total, if the reserve units are added to the comparison.

**Key Recommendations:**

- Explore full time training and EMS coordination and oversight. Supplement with contract positions as needed. Explore regional cooperation with local agencies. ( This is discussed in more detail in the recommendation portion of the report)

***Budgets and Finance***

No emergency services agency, municipal or Emergency Service District can survive without adequate funding. This funding, which may come from a variety of sources such as ad valorem taxes, fundraisers, donations, etc., forms the basis from which the agency is able to purchase the necessary equipment to fulfill its mission. Without adequate funding that is also sustainable, an organization is destined for failure. In the current economy, most communities are searching for ways in which to reduce expenditures while maintaining levels of service. Simultaneously, emergency services organization are finding it increasingly difficult to deliver the services that the community desires and are often asking for more funding to adequately supply the expected levels of services.

Listed below is a summary of GFD’s revenues, operating budget, and debt. The representations presented here illustrate total departmental budget including personnel, supplies/materials, and capital expenditures, information that will be used in future analyses in this report.

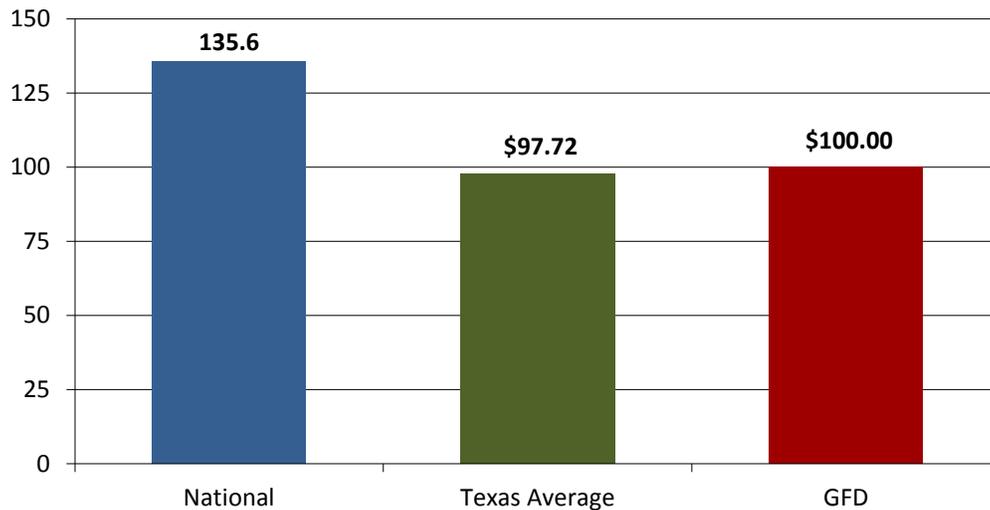
**Figure 7: Survey Table – Operating Budget and Financial Resources**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Finance Overview</b>		
Designated fiscal year	October to October	
Assessed property value, FY 2012/13		
Revised current year general operating fund budget, fire department	11 million	
General fund property tax, city levy – current budget year	.34 per 100	
i) Levy rate (FY 2010 through 2013)		
ii) General fund levy collection rate – prior year		
Bonds, fire department	Public Safety building and ladder truck	
i) Levy rate		
Other tax levy, public safety	None	
i) Levy rate	None	

**Discussion:**

The cost of providing fire and EMS services is highly variable in every community, based on the level of services provided, deployment practices, and community service level expectations. While there is no established standard in terms of how much services should cost, one comparison of interest is the cost per capita that is found relative to national and state averages.

**Figure 8: Cost per Capita**



The above chart indicates that GFD costs per capita are consistent with the Texas average and below the national average. It is noted that the total used includes the Department’s annual operating budget and includes capital budget expenditures, which are not routinely included in all operation budgets. If capital were not included, the cost per capita would become even closer or lower than the Texas average. In addition, the transient population and high utilization of resources by visiting and recreating populations require an increased cost per capita to adequately protect the risk profile seen in the city of Grapevine.

The cost per capita comparison is based on US Census Bureau data relative to all fire department types in the state (career and volunteer) and should be viewed only as a broadly generalized point of reference. The actual cost of service delivery results from a local community decision that identifies the level of emergency response that is desired. GFD has unique challenges, as previously mentioned, with a significant transient population based on a large conference and resort and recreational population and facilities within the city that drive the need for resource deployment, along with a community desire and expectation for a high level of services.

**Emergency Response Type and Frequency**

GFD responded to 5,097 requests for assistance from the citizens of the city in the 2013 reporting year. As is typically found, the vast majority of incidents are of an emergency medical nature. The department’s emergency calls for 2013 are listed in the following table.

**Figure 9: Survey Table – Emergency Response Type and Frequency**

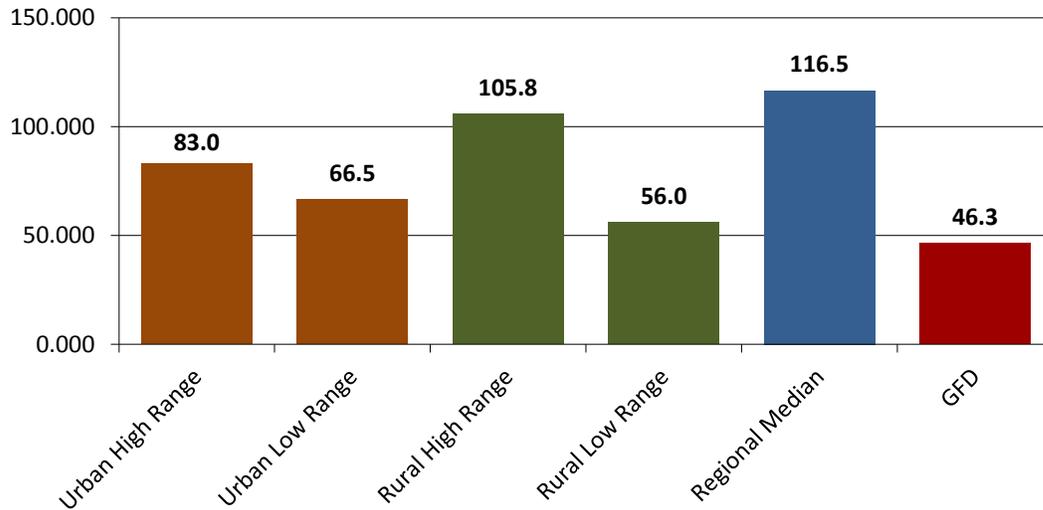
Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Incidents</b>		
Fire	168	
i) Value of property exposed to fire, 2013	\$19,514,252	
2012	\$48,497,359	
2011	\$53,420,688	
2010	\$132,673,922	
ii) Value of property lost to fire, 2013	\$4,405,918	
2012	\$2,164,507	
2011	\$2,584,140	
2010	\$1,155,221	
Rupture or explosion	3	
EMS/rescue	3,498	
Hazardous condition	137	
Service call	422	
Good intent call	451	
False call	409	
Severe weather	3	
Other	6	
<b>Total</b>	<b>5,097</b>	

**Discussion**

68.7 percent of GFD’s 2013 incidents involved response to medical emergencies. The percentage is similar to what is found in similar fire departments today. 168 incidents were reported as structural fires in the reporting year, which is consistent with that found in similar-sized agencies. Additional detail on emergency response, service delivery effectiveness, and response performance is provided in the Service Delivery and Performance section of this report.

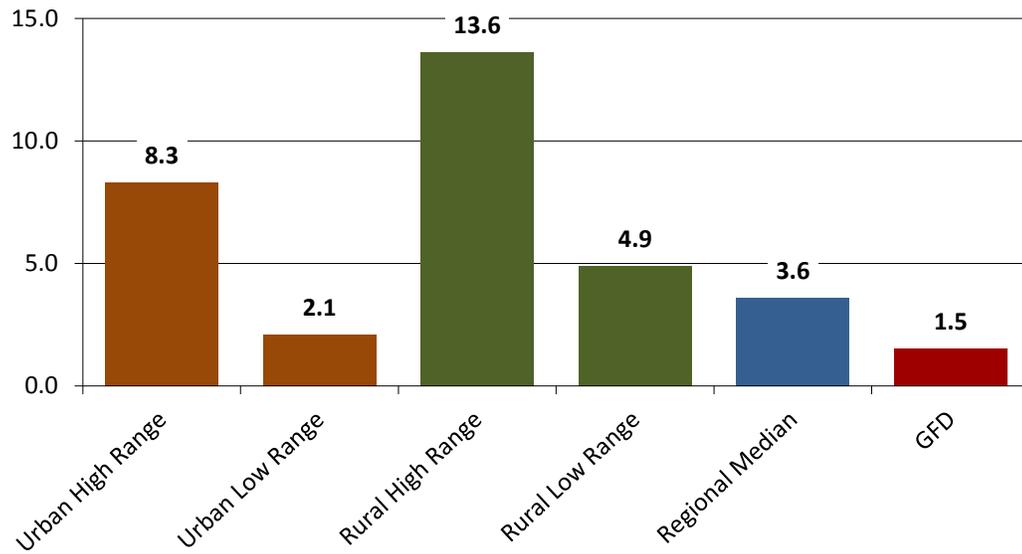
ESCI compared the number of total emergency incidents to which GFD responded in calendar year 2013 to regional comparators based on data provided by the National Fire Protection Association, detailed in the following graph.

**Figure 10: Incidents per 1,000 Population**



In total emergency incidents, Grapevine is below the regional median. This is due in part because utilization trends of cities with residential populations similar to the combined Grapevine residential and transient population frequently have higher resource utilization and call volume. A similar comparison is offered in the following figure, referencing only fires that occurred on a per 1,000 population basis.

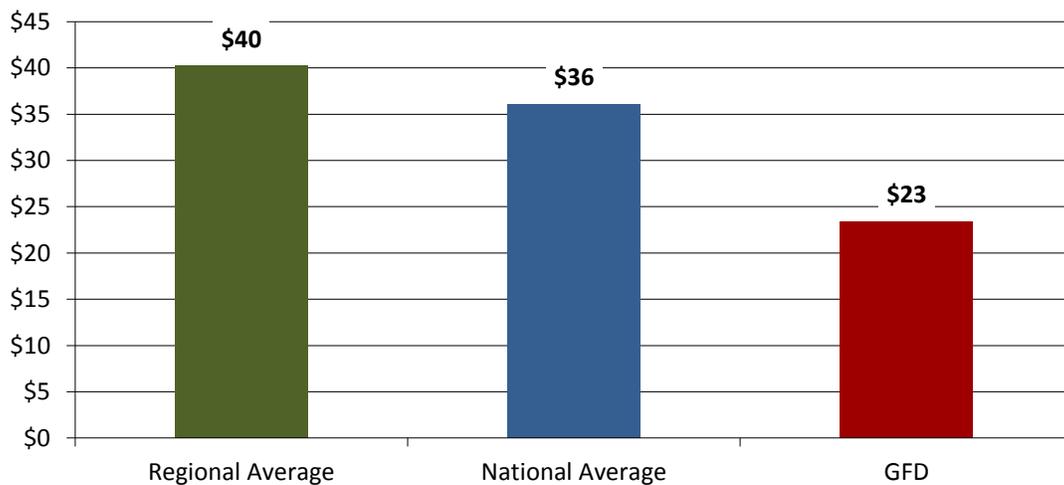
**Figure 11: Fires per 1,000 Population**



The occurrence of fires in Grapevine is slightly below the urban low range category and below the regional median. A lower experience frequency is likely a result of a combination of a higher number of newer structures, effective new construction permitting practices, and effective fire prevention efforts that have been in place in past years.

The following provides a comparison of dollar losses to fires on a per-capita basis, compared to regional and national averages:

**Figure 12: Comparison of Fire Loss Per Capita**



The prior figure is based on 2010 thru 2013 data, indicating that GFD fire losses are well below the national and regional averages. The number of fires per capita is low compared to the national and regional average combined with lower fire loss, which is indicative of strong prevention, short response times, and significant suppression capabilities. While the amount of resources and stations is below the regional and national averages, the GFD is very proficient at the prevention and suppression of fires with the existing resources.

### MANAGEMENT COMPONENTS

As a service provider to a thriving and active community, GFD faces challenges to increased organizational demands and management. Although community growth has slowed in recent years, it can be expected that the city of Grapevine will see increased activity and visitors as a major transportation and business hub for the north Texas Metroplex region. To meet the expanding demand the organization must assure that it is adequately prepared in terms of the fundamental components of its management configuration to keep pace with future needs.

In addition to the operational challenges of emergency response, the management of the business of a fire department always presents unique issues involving the administration of financial resources, the setting of goals and objectives, internal and external communications, information management, and security. This section of the report examines the department’s efforts in this area and preparation for the future health of the organization.

#### *Mission, Vision, Strategic Planning, Goals, and Objectives*

The process of strategic planning involves clarifying an organization’s mission, articulating its vision for the future, and specifying the values within which it will conduct itself.

**Figure 13: Survey Table – Mission, Vision, Strategic Planning, Goals and Objectives**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Mission, Vision, Strategic Planning, Goals, and Objectives</b>		
Mission statement adopted	Yes	Complete Mission Statement within a Strategic Plan process; then post and widely disseminate.
i) Displayed	No	
ii) Periodic review	Yes	Review Mission Statement every five years.
Vision established and communicated	In progress, draft in place	Compile Vision Statement within a Strategic Planning process; then post and widely disseminate.

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
Values of staff established	In progress, draft in place	Compile Values Statement(s) within a Strategic Planning process; then post and widely disseminate.
Strategic or master plan	No	Complete a 3-5 year strategic planning process. Develop goals, objectives and performance measures within Strategic Planning process; ensure consistency with City 5-year and long term plans.
Agency goals and objectives established	No	Establish performance objectives for all ranks and positions that tie into the established strategic plan and position requirements.
Performance objectives established	Budget performance objectives	
Code of ethics established	In SOPs	

**Discussion:**

The current planning efforts for Grapevine Fire Department (GFD) are derivatives of the City’s short and long term planning. While they provide a high level of direction, the GFD-specific content is limited and not sufficient to meet the needs of contemporary municipal fire departments.

**Strategic Planning**

ESCI recommends GFD complete a structured strategic planning process, which involves diverse internal and external teams in addition to the typical plan foundational components – Mission, Vision, and Values. It should be consistent with the City’s strategic planning initiatives but with content that addresses planning elements relevant to the fire department.

GFD goals, objectives, and critical tasks should be a key deliverable of this strategic planning process. The plan essentials will serve to guide decisions and resource allocation for the department over the next three to five years.

**Key Recommendations:**

- Complete Mission Statement within a Strategic Plan process; then post and widely disseminate.
- Compile Vision Statement within a Strategic Planning process; then post and widely disseminate.
- Compile Values Statement(s) within a Strategic Planning process; then post and widely disseminate
- Complete a three - five year strategic planning process.

*Management Documents and Processes*

**Figure 14: Survey Table – Foundational Documents and Processes**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Availability of SOP's, Rules and Regulations, Policies</b>		
Copies of rules provided	Electronically and hard copy available	
i) Last date reviewed	Under review currently	Advocate for a formal review process to ensure all rules and regulations are assessed every 3 – 5 years.
Copies of SOG's or guidelines available		Ensure wide distribution of SOGs and guidelines
i) Regular update	As needed	Establish a formal review process to ensure all SOPs are assessed every 3 – 5 years.
ii) Process for development of new SOG's	Chain of Command, developed by project manager or BC	Establish a structured process for development of new SOG/SOPs include line personnel and labor input.
iii) SOG's used in training evolutions	Yes, structure fire protocol, used as reference documents	
Policy manual available		Separate GFD policy documents from SOPs and publish in a Policy Manual (preferred digital).
i) Reviewed for consistency		Establish a periodic review schedule to ensure consistency among policy statements.
ii) Reviewed for legal mandates	No	Establish a periodic review schedule to ensure consistency among policy statements.
iii) Training on policies provided	No	Provide policy training as part of employee orientation; also, systematically incorporate policy review and training so that all policies are reviewed by employees at least every three years.

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Critical Issues</b>		
Critical issues are identified		
i) First critical issue	EMS administrative support	Establish concurrent EMS oversight utilizing Shift Medical Supervisors that report to the established EMS Chief Officer.  Need staffing to provide a Field Management Officer on significant incidents, need depth for leave, To ensure 4-0 minimum staffing, the GFD needs to assign 5 with 4 minimum per apparatus. Currently average 2 OT per day with 6 down per day due to leave.
ii) Second critical issue	Line staffing	Establish and fund a capital improvement program to ensure stations meet current fire facility best practices.
iii) Third critical issue	Station location /facilities in need of upgrades	
iv) Internal evaluation of critical issues	Executive staff level with recommendations	
<b>Challenges of the Future</b>		
Challenges are identified		
i) First challenge	New staffing positions	Explore ambulance transportation rate study to adjust rates to cover costs of EMS oversight and supervision.
ii) Second challenge	Future of EMS system and service delivery model	Conduct a community and regional needs assessment to identify integrated health care services and funding for the GFD and surrounding region.
iii) Third challenge	Funding for facility and infrastructure needs	Explore general fund and capital bonds and funding to upgrade existing essential facilities. Facilities study for upgrades ADA and best practices
<b>Internal Communications</b>		
Regularly scheduled staff meetings (fire department)	Yes, weekly exec, BC semi monthly, three times annually shift meetings	
Written staff meeting minutes	At executive and BC meetings	Establish effective meeting guidelines that provide standardized agendas, minutes and meeting conduct for all GFD meetings.
Memos	Memo	
Member newsletter	No	Explore member interest in a regular newsletter; perhaps electronically, including preferred frequency.
Member forums	Three times a year	

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
Open door policy	Yes, use chain of command for official communications, all staff available but will not take formal actions	
Bulletin board	Electronic and each station has a bulletin board	
Vertical communication path clearly identified	Yes	Identify needs and establish advisory committees for training, health & fitness, apparatus & equipment, and agency SOPs.
E-mail	No policy	Establish accepted e-mail practices and use guidelines.
Employee mail boxes	Yes	
Voicemail	All Admin/support staff personnel, BC Office	
Issues taskforce	No, ad-hoc as needed	Explore further use of GFD member committees, work groups and task force groups to assist with planning and organizational development.
<b>External Communications</b>		
Community newsletter	Participate in City's letters as needed	
Website	Page on the City Website	
Advisory committee(s)	No	Identify and pursue opportunities to create and/or tag on to citizen input initiatives.
Complaint process	Yes. Through City website	
Social media (Facebook/twitter)	Facebook and Twitter accounts	Explore opportunities for enhanced use of social media.
Community survey	Not as a department, EMS transports all Grapevine residents transported are surveyed	
Local community planning organizations	Tarrant County LAPC	

**Discussion:**

The Grapevine Fire Department (GFD) is a paramilitary organization for which policies, rules, and regulations are critical to the delivery of consistent service delivery, guiding appropriate behavior and personnel accountability. These guiding documents are vital for success in training at all levels and meeting the expectations of the citizens of Grapevine.

### *Policies and Procedures*

The GFD's departmental policies are contained with the department's Standard Operating Guidelines (SOGs). ESCI recommends that GFD take action to segregate its policies and procedures into two distinct locations to reinforce the distinctions between the two. Policies guide decision-making and typically leave some room for managerial discretion. Procedures drive actions of the members and typically are more detailed and rigid.

Policies should be formally reviewed and brought current at least every three years. This review and currency process should involve a broad and diverse constituency of GFD members to ensure its thorough and complete result. Additionally, there is no structured, formal process established to develop new policies; such a process should be researched, developed, and implemented as soon as practical.

A key component to policy development and review is the utilization of subject matter committees. These committees are vital to the development of adequate and appropriate policies as well as ensuring a voice in the organization's operations and future. ESCI recommends that the GFD establish a number of core committees with labor management and organizational subject matter expertise represented on each committee. At a minimum, it is recommended the GFD establish and utilize a Training Advisory Committee, EMS Oversight Committee, Safety Committee, Apparatus and Equipment Committee, and an Operations/Special Operations Committee. Committees should meet on a regular basis, utilize agendas and minutes in accordance with adopted meeting guidelines, and be integrated into the department's participation and decision making process.

### *Critical Issues*

Public service agencies, including Fire and EMS agencies, routinely face a somewhat complex array of current critical issues and challenges emerging on the horizon. Some public safety leaders unwisely choose to face these issues and challenges alone and forego the benefits of involving numerous talented and capable members of their team at all levels. Chief Bass and Deputy Chief Brown have made their intentions clear that they prefer to engage all appropriate and available organizational resources (people) to resolve issues and meet challenges. ESCI recommends patient and consistent messages and methods to draw GFD members into these important processes.

Chief Bass and Assistant Chief Brown have outlined the following:

<u>CRITICAL ISSUES</u>	<u>CHALLENGES</u>
<ul style="list-style-type: none"><li>• EMS administrative support</li><li>• Line staffing</li><li>• Station location /facilities in need of upgrades</li></ul>	<ul style="list-style-type: none"><li>• New staffing positions</li><li>• Future of EMS system and service delivery model</li><li>• Funding for facility and infrastructure needs</li></ul>

Included in the tables above are numerous recommendations developed by ESCI to address the identified Critical Issues and Challenges. The following discussion is intended to provide additional clarity for the identified critical issues.

#### EMS Administrative Support

Currently, a single contracted staff member predominantly oversees the department's advanced life support and EMS program. This presents challenges as it relates to all aspects of supervision of an advanced life support responder program. Issues such as required on-going continuing medical education, quality improvement, equipment, and clinical research and development, infectious disease management, and on-scene supervision all compete for the limited availability of contract services. In addition, little capacity is available to research and pursue future EMS initiatives that will best serve the citizens and visitors of the city of Grapevine in a dramatically changing EMS industry.

#### Line Staffing

As demonstrated in the Service Delivery and Performance section of this report, the GFD provides a high level of service and capabilities within the constraints of the limited resources compared to similar-sized jurisdictions. The GFD desires to meet or exceed the NFPA 1710 industry standard for response times and effective firefighting force standards. Given the unique nature of population clustering in resort and recreational areas with high-rise and conference center and commercial risk elements, it is reasonable to meet or exceed these established national best practices.

### Station Location and Facilities in Need of Upgrade

The GFD appears to have the appropriate number of fire stations that are properly located to meet the emergency response needs of the city. However, two of the five fire stations (Station two and three) were built in 1981 and 1982 and are representative of the construction, layout, and community and department demographics three decades ago. Both facilities lack appropriate room, gender facilities, essential facility capabilities, and ADA requirements in accordance with current industry best practices.

#### **Key Recommendations:**

- Advocate for a formal review process to ensure all rules and regulations are assessed every 3 – 5 years.
- Establish a structured process for development of new SOG/SOPs to include line personnel and labor input.
- Provide policy training as part of employee orientation; also, systematically incorporate policy review and training so that employees review all policies at least every three years.
- Explore ambulance transportation rate study to adjust rates to cover costs of EMS oversight and supervision.
- Explore general fund and capital bond measures to upgrade existing essential facilities. Conduct a facilities study for GFD operational needs, essential facility upgrades, and ADA best practices.
- Conduct a community and regional needs assessment to identify integrated health care services and funding for the GFD and surrounding region.
- Explore further use of GFD member committees, work groups, and task force groups to assist with planning and organizational development.

**Figure 15: Survey Table – Record Keeping and Documentation**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Document Control</b>		
Process for public access established	Department form used	
Hard copy files protected	Locked file cabinets	
Computer files backed up	Yes	
<b>Security</b>		
Building security	Combination locks on stations	
Office security	Offices locked after hours	
Computer security	Password protected	
Capital inventory maintained		
i) Asset security system used	Inventory performed	
ii) Inventory interval	Annual	Explore best inventory management practices and adopt appropriate systems.
Monetary controls used		
i) Cash access controls	None	Establish petty cash and account receivable policies in accordance with City and GASB accounting standards.
ii) Credit card controls	Accountability practices in place	
iii) Purchasing controls	Monthly reconciliation of expenditures	
<b>Reporting and Records</b>		
Records kept by computer		
i) Type of platform	PC	
ii) Operating system	Windows	
Periodic report to elected officials		
i) Financial report	Quarterly performance measure reporting includes financial reporting	
ii) Management report	Quarterly performance measure reporting	
iii) Operational report	Informal only	Develop a template for a quarterly operational report; populate and publish regularly.
iv) Distributed to others	Provided to the City Manager	
Annual report produced		
i) Distributed to others	City budget report only	
Required records maintained		
i) Incident reports	Yes	
ii) Patient care reports	Yes	
iii) Exposure records	Yes	
iv) SCBA testing	Annual	
v) Hose	Annual	
vi) Ladder	Annual	

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
vii) Pump	Annual	
viii) Breathing air	Quarterly	
<b>Information Technology</b>		
Computer platform	PC based	
Maintenance/IT support provided by	City IT Department	

**Discussion:**

GFD’s reports and records practices are generally appropriate, with a few recommendations noted above. The importance of effective record keeping cannot be overstated and it was apparent from the data provided to ESCI in the course of this project that the agency has effective records management practices in place.

Two areas identified for consideration for enhancement by the GFD were in the areas of inventory control and management. A detailed and up to date inventory system will assist with managing goods and services and reduces the possibility of lost or missing equipment and assets. The second area for consideration is a standardized quarterly operational report. The GFD provides an excellent and high level of service. A standardized quarterly report with standardized data points and benchmarking will assist the GFD in monitoring and adjusting service levels and operational performance measures.

**Key Recommendations:**

- Explore best inventory management practices and adopt appropriate systems.
- Develop a template for a quarterly operational report; populate and publish regularly.

STAFFING

*Administrative and Support Staffing*

One of the primary responsibilities of a fire organization’s administration and support staff is to ensure that the operational entities of the organization have the ability and means to accomplish their responsibilities on an emergency incident. Efficient and effective administration and support are critical to the success of a fire agency.

Like any other part of a fire department, administration and support require appropriate resources to function properly. Analyzing the administrative and support positions of a fire department facilitates an understanding of the relative number of resources committed to this important function. The appropriate balance of the administration and support components to the operational component is critical to the success of the department’s mission and responsibilities.

This section reviews the staffing within GFD and provides an evaluation of the historical staffing performance.

**Figure 16: Survey Table – Administrative and Support Staffing**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Administration and Other Support Staff</b>		
Fire Chief	1	
Deputy Fire Chief	3	
Training	1 contract	Explore full time Training Officer/coordination.
EMS Coordinator	1 contract	Establish full time shift or administrative EMS oversight.
Emergency Management Coordinator	1	
Fire Inspector	3, also Arson Investigators	
Administrative Secretary/Secretary	2 (1 each)	
Fire Support Technician	1	
<b>Total administrative &amp; support staff</b>	<b>11</b>	
<b>Percent administrative &amp; support total</b>	<b>10 percent</b>	

**Discussion:**

ESCI notes that currently the level of administrative and support staffing represents 10 percent of GFD total membership. In addition, a number of the administrative positions are contract employees and do not serve in full-time equivalent positions. It is our experience that typically effective administrative staffing totals range from 12 percent to 15 percent of agency totals. After reviewing the functions and responsibilities assigned to the work group, ESCI concludes that the number of FTEs assigned is below what is needed to appropriately accomplish the responsibilities of this division.<sup>4</sup>

<sup>4</sup> ESCI recognizes organizational goals, regulatory environment, and workload are the actual drivers that determine the number of administrative personnel required to deliver support services. The 12 to 15 percent ratio is the range ESCI typically sees in fire service organizations and is used for comparison purposes.

### *Training*

GFD assigns a contract employee to the function of fire training. This places the functions of program needs assessment, design, coordination, and evaluation with the same single personnel resource that is also responsible for program delivery as well as shift operational and personnel responsibilities. ESCI encourages the GFD to reevaluate the resources and assign a dedicated Grapevine position to this function.

We also note that this is a very appropriate function wherein GFD should consider an enhanced and formalized regional cooperative training strategy within their existing partnering agencies. All fire departments, nationally as well as within the north Texas area, share essentially the same needs with regard to training their personnel. Further, the regional agencies respond to emergencies together via mutual aid and automatic aid procedures and, in the interest of safety of firefighters and effectiveness of response, should be trained to common standards and practices. Finally, a regionalized, collaborative approach to training delivery, in addition to the benefits noted, can substantially reduce costs and increase efficiency of educational efforts.

### *Emergency Medical Services*

Currently, a single contracted staff member predominantly oversees the department's advanced life support and EMS program. This presents challenges as it relates to all aspects of supervision of an advanced life support responder program. Issues such as required on-going continuing medical education, quality improvement, equipment and clinical research and development, infectious disease management, and on-scene supervision all compete for the limited availability of contract services. In addition, little capacity is available to research and pursue future EMS initiatives that will best serve the citizens and visitors of the City of Grapevine in a dramatically changing EMS industry.

The department should consider exploring on-shift EMS supervision, given that EMS represents a significant amount of the call volume. ESCI recommends the development of shift EMS Supervisors. These supervisors will address span of control issues, shift ALS supervision, and assist with program management, Infectious control, Safety Officer function and EMS system support.

This model combined with Grapevine's current EMS capabilities will allow for prospective, concurrent-real time and retrospective oversight and intervention that will significantly impact EMS functions and patient outcomes.

**Key Recommendations:**

- Explore full-time Training Officer/Coordination.
- Establish full-time Shift or Administrative EMS oversight.

***Emergency Response Staffing***

It takes an adequate and properly trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved.

Tasks that must be performed at a fire can be broken down into two key components – life safety and fire flow. Life safety tasks are based on the number of building occupants, their location, status, and ability to take self-preservation action. Life safety related tasks involve search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention

The first 15 minutes is the most crucial period in the suppression of a fire. How effectively and efficiently firefighters perform during this period has a significant impact on the overall outcome of the event. This general concept is applicable to fire, rescue, and medical situations. Critical tasks must be conducted in a timely manner in order to control a fire or to treat a patient. GFD is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner. The following table lists GFD’s emergency response staffing configuration.

**Figure 17: Survey Table – Emergency Response Staffing**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Emergency Service Staff – Fire</b>		
Battalion Chief	3	
Captain	18	
Driver Engineer	18	
Firefighters	51	
<b>Emergency Service Staff – EMS</b>		
Shift Paramedic	48	
EMT-B	3	
EMT-I	N/A	
EMT-P	N/A	
<b>Total operational staff</b>	<b>90</b>	
<b>Fire department total</b>	<b>101</b>	
Percent of operational officers to firefighters/Engineers	26 percent	

**Figure 18: Survey Table – Staffing**

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
<b>Use of Career and Volunteer Personnel</b>		
Career scheduling methodology	24/48	
i) Length of normal duty period	24	
ii) FLSA period	27 day cycle	
iii) Residency requirements	No	
Operational career services		
i) Fire suppression	Yes	
ii) EMS/rescue, first response	Yes	
iii) EMS, advanced life support	Yes	
iv) Specialized rescue	Yes	
v) Fire prevention inspections	Yes	
vi) Emergency management	Yes	
vii) Public education	Yes	
viii) Hazardous materials response (level)	FRO with some Technicians, 14 city special ops North East Fire Department Association (NEFDA)	
Volunteer services		
i) Chaplain	Yes	
ii) Civilian administrative volunteer	Citizen Fire Academy rehab unit and services	
<b>Responsibilities and Activity Levels of Personnel</b>		
Assignment of routine duties:		
i) By position		
ii) By areas of personal interest	Yes, SCBA, divers, rescue technicians	
Special duties assigned by:	Expertise and interest	

Survey Components	Grapevine Fire Department Observations	Comments and Recommendations
i) Duty assignment		
Work groups/Committees		
i) EMS quality management	Yes, field training preceptors	Explore cooperative/shared QA/QI process with appropriate partner jurisdictions.
ii) Chaplain	No	Explore cooperative/shared training automatic aid and planning for delivery with appropriate partner jurisdictions with non-NEFDA partners.
iii) Training	No	Explore forming a Training Advisory Committee.
iv) Safety	No	
v) Building development	No	
vi) Standards/SOGs	No, ad-hoc as needed, apparatus	

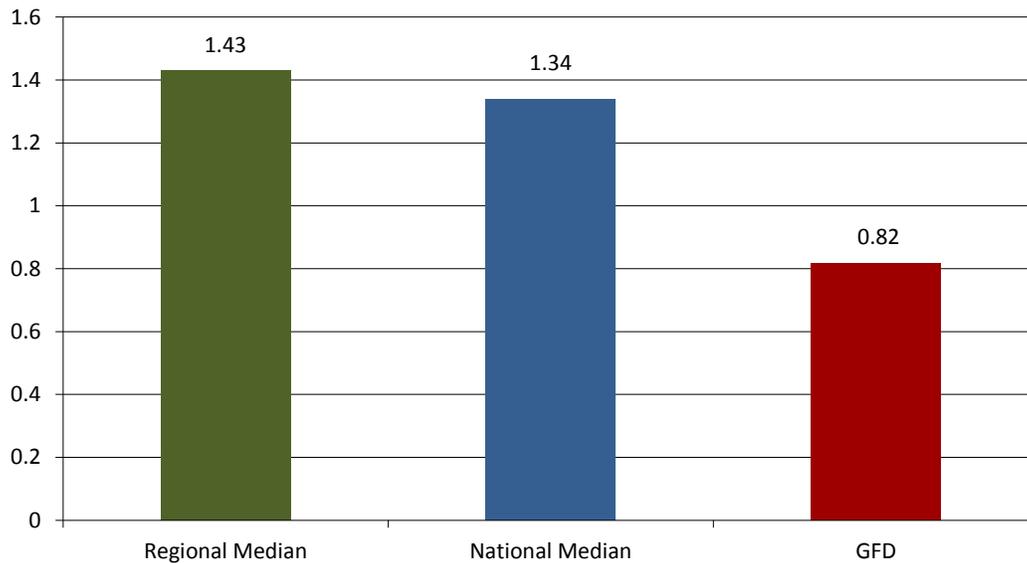
**Discussion:**

Considerable ongoing local, regional, and national discussion and debate draws a strong focus and attention to the matter of firefighter staffing. Frequently, this discussion is set in the context of firefighter safety. While there are published national standards regarding firefighter staffing, they generally speak in terms of the number of firefighters assigned to a particular response apparatus, often characterized as a “minimum of four personnel per engine company.” ESCI notes that the more critical issue is the number of firefighters that are assembled at the scene of an incident in conjunction with the scope and magnitude of the job tasks expected of them, regardless of the type or number of vehicles upon which they arrive.

It is important to understand that the assembly of firefighters on an incident, also called an “Effective Firefighting Force” or “Effective Response Force,” is a determination that is made at the community level based on risk, capability, and citizen expectations. There is not mandated requirement, though there are standards that are discussed in detail in this report. In the Service Delivery section, resource concentration is evaluated in detail, finding that GFD is capable of establishing an effective response in a timely manner in many areas of the response area, but also challenged to do so in other areas.

Another means of comparison, also used on a national basis, is that of measuring the number of firefighters on staff per 1,000 population of the service area. The following figure illustrates the current comparison of GFD staffing with both national and regional norms.<sup>5</sup>

**Figure 19: Career Staffing per 1,000 Population**



At minimum daily staffing levels, GFD has 26 emergency personnel available to respond to all emergencies. GFD has the capability to respond to one house fire or reasonably confined commercial fire at a time. This is successfully demonstrated the majority of the time, as the likelihood of simultaneous structures fires is low. As will be seen later in this report, a majority of the department’s workload is medical in nature and, given the current resources, the department is situated to handle existing workload.

Using this comparison, GFD has a lower staffing per 1000 than the national and regional comparisons of its engine and quint companies. ESCI notes that, given the unique demographic of high density convention, hotel, and recreational areas with high value property and significant life risk, GFD should begin an incremental approach to increasing response staffing in the context of achieving adopted standards for an effective firefighting force and utilization of the deployment analysis. ESCI recommends that the increase in assembling an adequate firefighting force be accomplished through a combination

<sup>5</sup> Data drawn from NFPA reports "U.S. Fire Department Profile- 2011" and "U.S. Fire Loss- 2011" (most recent available).

of incremental staffing increases and enhanced automatic aid agreement utilization and development with adjacent jurisdictions.

**Key Recommendations:**

- Explore cooperative/shared training and planning and automatic aid for service delivery with appropriate partner jurisdictions with non-NEFDA partners.
- Explore forming a Training Advisory Committee

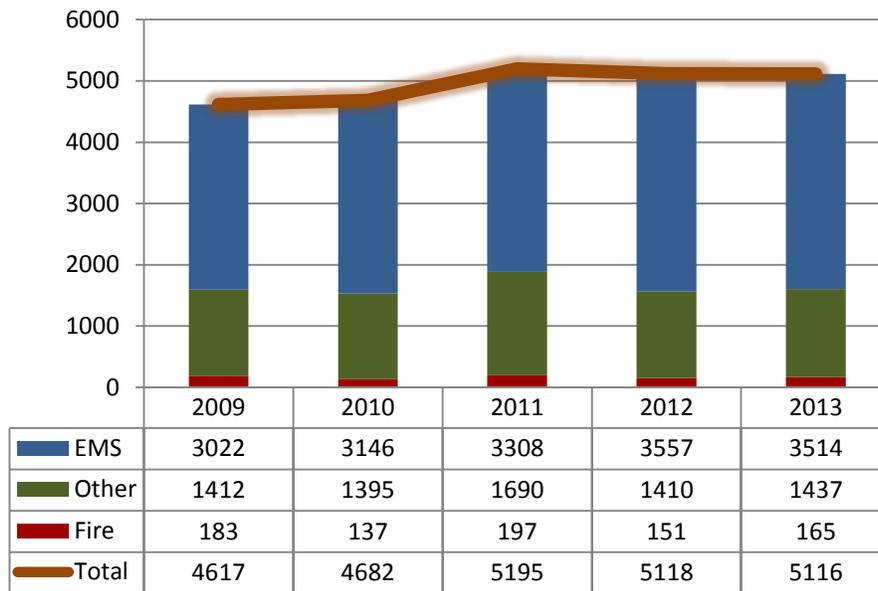
## SERVICE DELIVERY AND PERFORMANCE

The delivery of fire suppression, rescue, and emergency medical services is no more effective than the sum of its parts. It requires efficient notification of an emergency and rapid response from well-located facilities in appropriate apparatus with a sufficient number of well-trained personnel following a well-practiced plan of action. This section of the report provides an analysis of the current service delivery components of GFD.

### *Demand*

In the demand analysis, ESCI reviews current and historical service demand by incident type and temporal variation for the GFD. GIS software is used to provide a geographic display of demand within the study area. National Fire Incident Records System (NFIRS) data, incident response data, and apparatus response data collected by the department is used in this section of the report. The following figures demonstrate historical service demand for the last five full calendar years.

**Figure 20: GFD Historical Service Demand, 2009 through 2013**



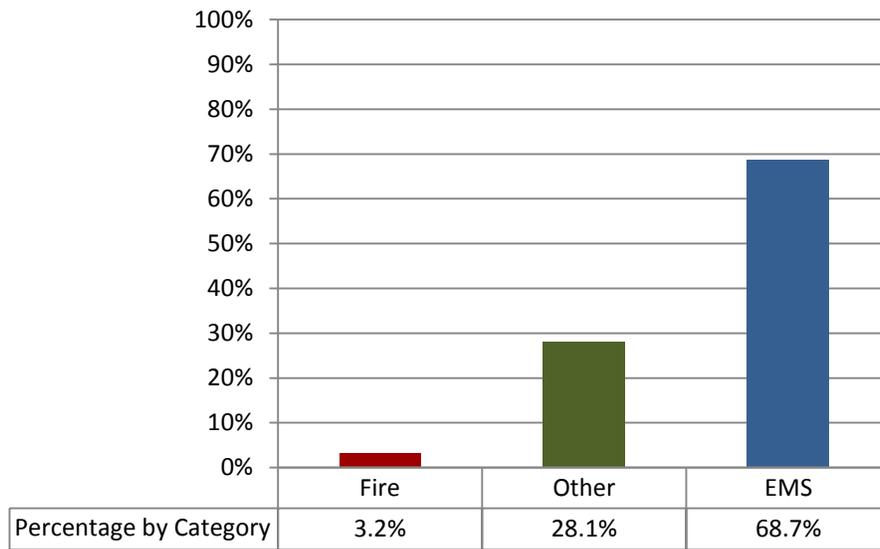
The previous figure demonstrates that GFD service demand was flat in 2009 and 2010 then increased ten percent in 2011. It then stabilized and remained relatively flat from 2011 through 2013. Using the NFIRS incident type definitions, ESCI categorizes incidents as “Fires” (structures, vehicle, brush, any 100 series incident in NFIRS), “EMS” (all calls for medical service including MVA’s and rescues, any 300 series incident in NFIRS), and “Other” (false alarms, hazmat incidents, service calls, all other NFIRS incident series). The next figure demonstrates the percent change in service demand from 2009 through 2013, summarized by fire, EMS, and other incident categories.

**Figure 21: GFD Percent Change by Incident Category, 2009 through 2013**

Total Percent Change- 2009 Through 2013	
Incident Category	Percent Change
Fire	-9.8%
Other	1.8%
EMS	16.3%
Total Demand	9.7%

Overall demand increased by nearly 10 percent from 2009 through 2013. The number of actual fire incidents decreased by nearly 10 percent in the same time period. EMS service demand increased by 16.3 percent between 2009 and 2013.

**Figure 22: GFD Service Demand by Incident Category**

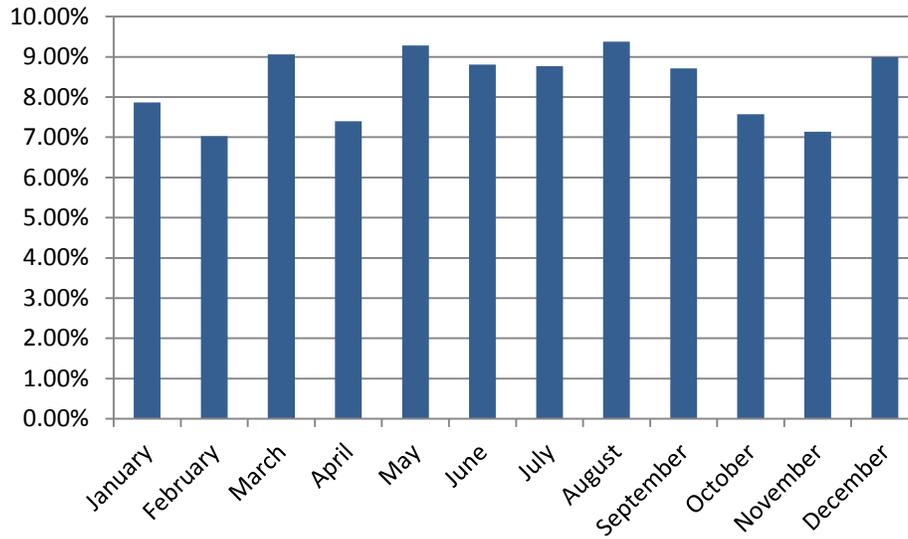


The above chart displays the nature of service demand in the GFD study area in 2013. EMS incidents represent the largest portion (68.7 percent) of 2013 service demand. Only slightly over 3 percent of GFD 2013 incidents were fires. The data displayed in the previous figures reflect a nationwide trend of call type distribution for all hazard fire jurisdictions, especially jurisdictions such as GFD that provide EMS transport services.

*Temporal Variation*

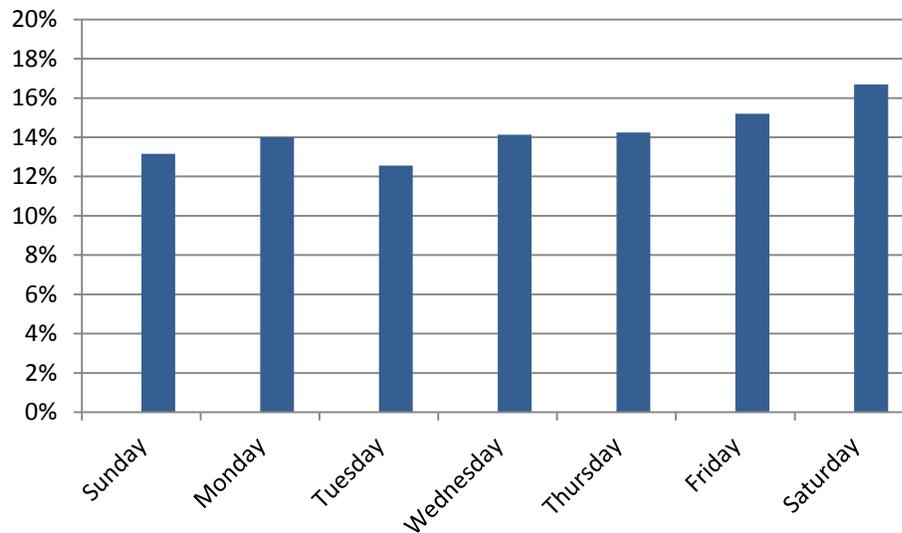
It is also useful to evaluate service demand temporally in order to determine if there are specific trends during certain periods where staffing can be modified to better fit the demand. The following figures display 2013 service demand within the GFD study area; summarized by call volume by month, day, and time of day.

**Figure 23: GFD Service Demand by Month, 2013**



Overall service demand varies throughout the year, with the lowest demand in February (6.9 percent) and the highest number of calls for service in August (9.3 percent). The differential range by month is slightly over 2 percent for the study area. This demand trend is consistent with spring and summer festivals, activities, and events in the City of Grapevine. The next figure looks at service demand by day of the week.

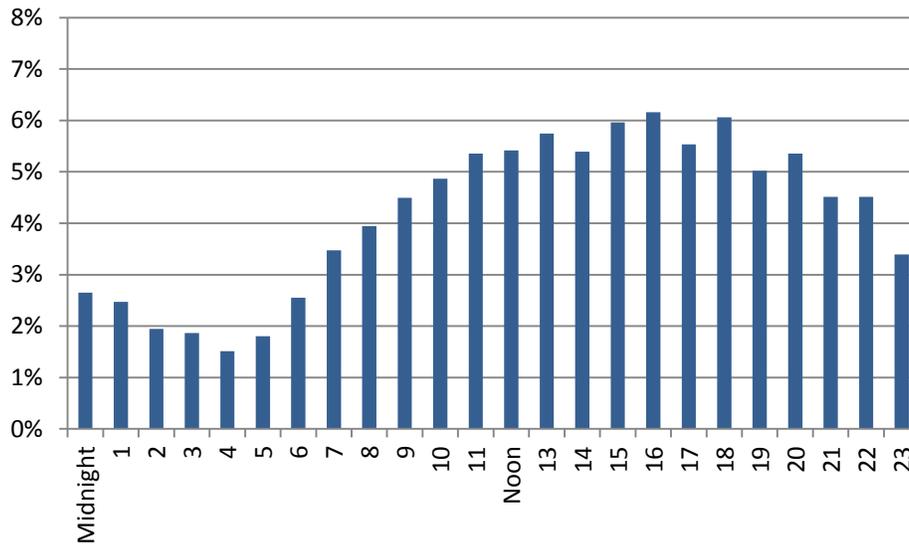
**Figure 24: GFD Service Demand by Day of the Week, 2013**



As with monthly service demand, service demand varies throughout the week. Again the range is relatively narrow (approximately 4 percent) with lowest demand seen on Tuesdays and highest demand

Saturdays. This call demand trend is consistent with the large influx of visitors for weekend resort, conference, festival, and recreational activities. The last analysis of temporal variation demonstrates workload by hour of the day.

**Figure 25: GFD Service Demand by Hour of the Day, 2013**

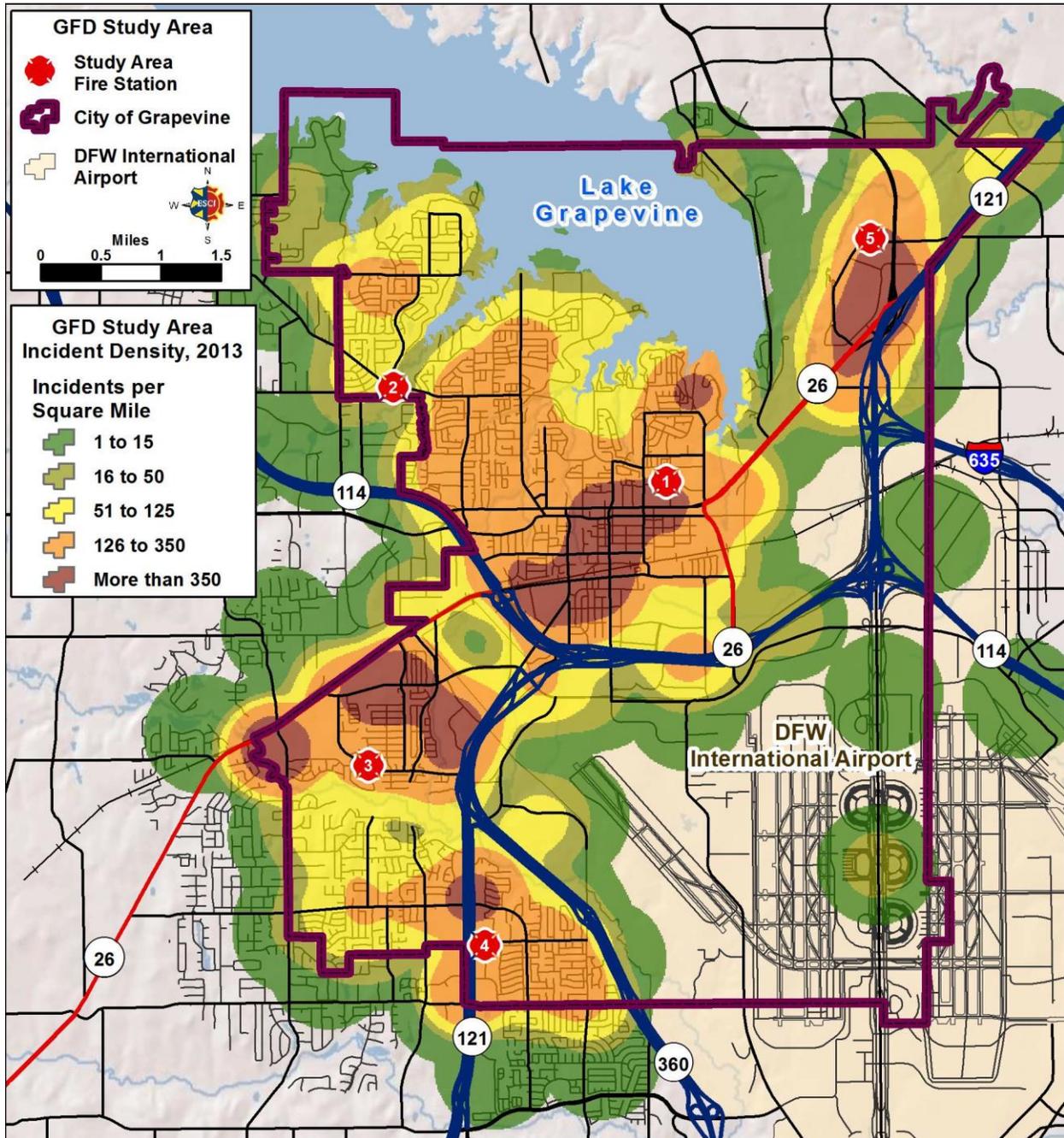


Service demand directly correlates with the activity of people, with workload increasing during daytime hours and decreasing during nighttime hours as shown in the following figure. Incident activity is at its highest between 10:00 AM and 6:00 PM; and over 64 percent of calls for service occurred between 08:00 AM and 08:00 PM. There is a significant and predictable increase in service demand during the day. This provides an opportunity for GFD to anticipate increased workload and improve response performance by deploying apparatus to address periods of peak activity.

*Geographic Service Demand*

In addition to the temporal analysis of service demand, it is useful to examine the geographic distribution of service demand. Using dispatch center incident location data provided by GFD, ESCI plots incident locations and calculates the mathematical density of 2013 service demand in the GFD service area.

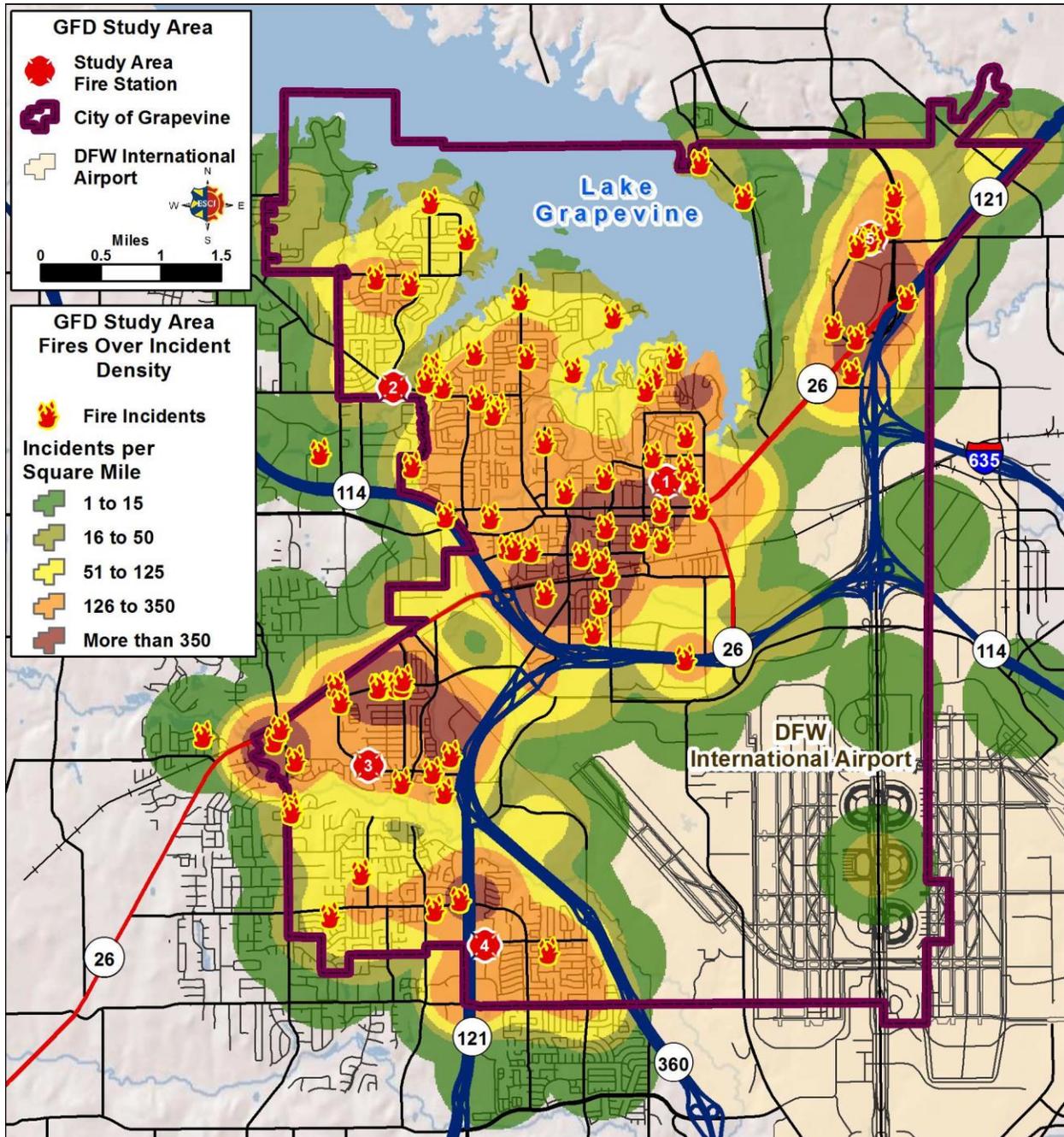
Figure 26: GFD Incident Density, 2013



The above figure demonstrates the areas of highest incident density are located in the core area of Grapevine between Stations 1, 3, and 5. Note the area (Station 5) to the north in the Grapevine Mills shopping district. This area is indicative of a significant service demand based on shopping and local commerce by visitors and citizens from surrounding communities occurring in the north end of the city.

As discussed earlier, EMS incidents represent the majority of GFD service demand. The next figure pinpoints “Fire” incidents in the 2013 GFD data set.

Figure 27: GFD Fire Incidents, 2013



Fire incidents are the least frequent incident type in the data set. However, “Fire” service demand is distributed throughout the study area in a pattern that is similar to the overall incident data.

Fire incidents do appear in greater frequency in the downtown’s Station 1 area, which is consistent with older construction and number of older single-family dwellings.

### *Distribution*

The analysis of distribution of resources presents an overview of the current deployment of fire department facilities, equipment, and personnel within the GFD service area. It evaluates current system deployment as it relates to response times to emergencies.

Figure 28: GFD Service Area and Station Response Districts

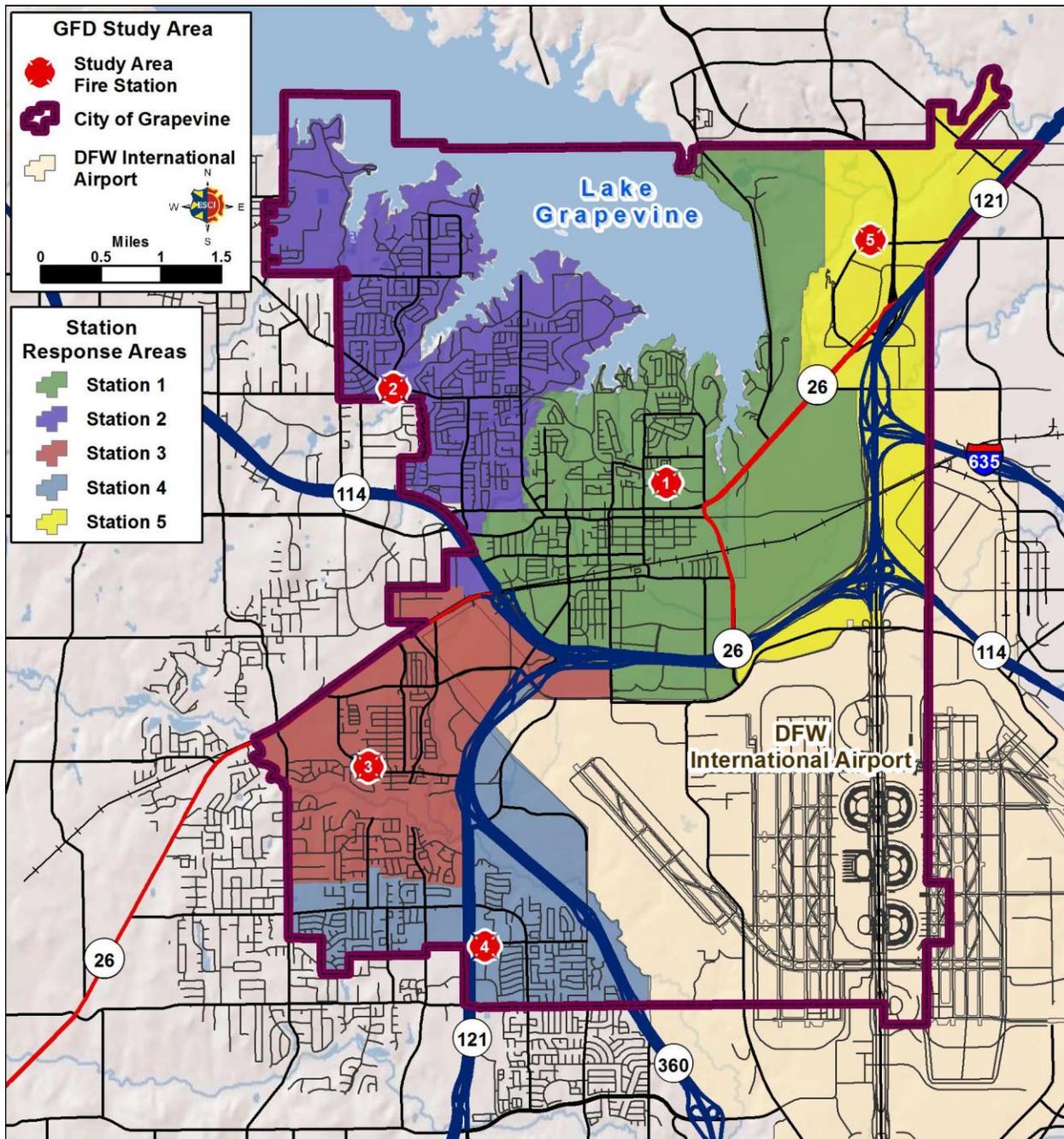
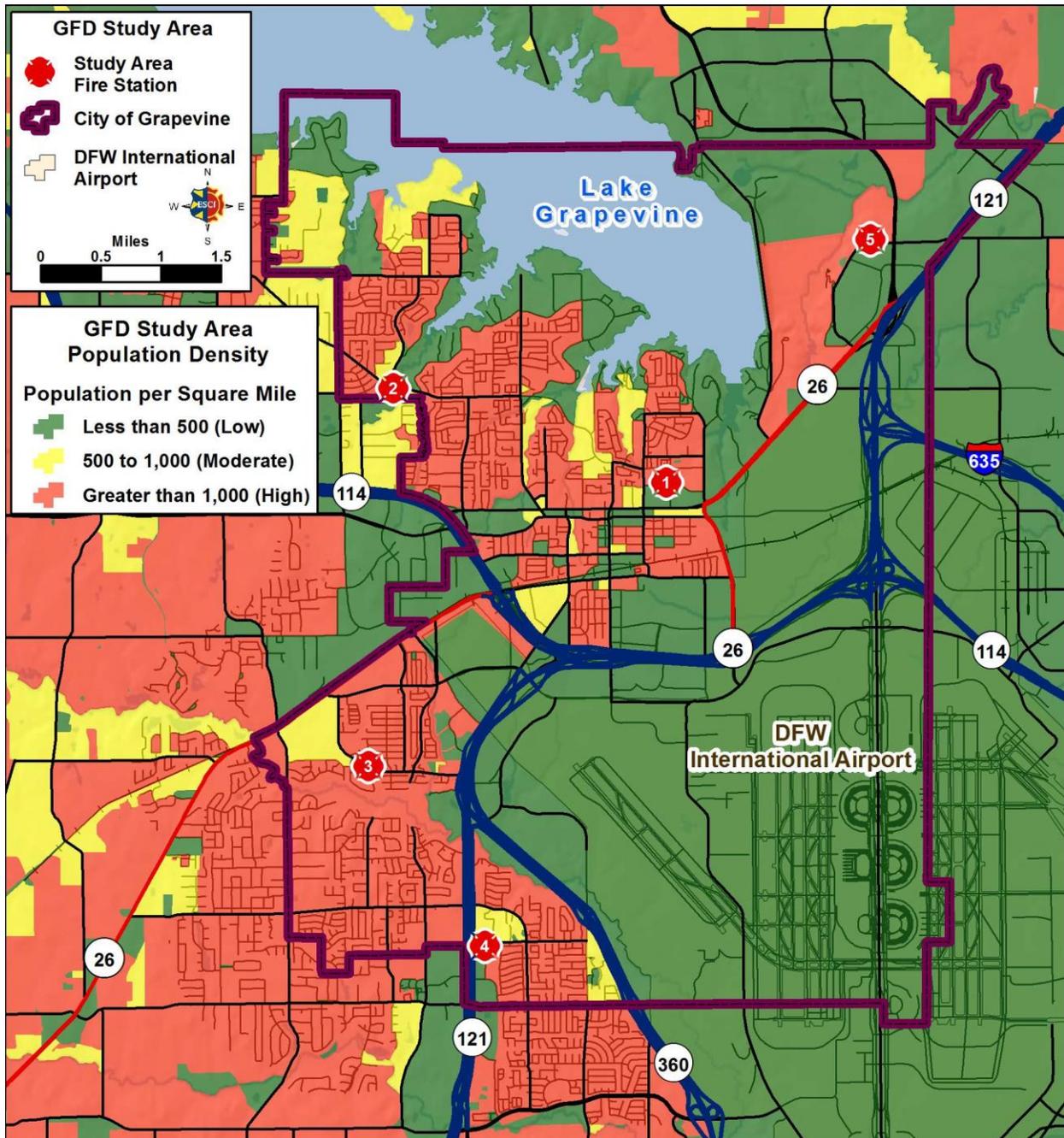


Figure 29 depicts the GFD study area. The city encompasses an area of nearly 35.9 square miles, including approximately 8.2 square miles protected by the DFW Airport Fire Department, the remaining 27.2 miles is protected by the GFD. The GFD currently provides fire protection, emergency medical aid and transport, and rescue services from five stations located throughout the city.

Three major limited access highways (Highways 121, 114, and 360) transect the city of Grapevine. The street network within Grapevine in some areas lacks direct routes and interconnectivity. This can negatively impact emergency response vehicles. Modern technology, such as the use of mobile data computers (MDC's), GPS units, and automatic vehicle location (AVL) technology; allows fire jurisdictions to dispatch the closest available apparatus to emergency incidents regardless of first due areas. This technology can provide a means to overcome shortcomings in the transportation network, and improve response performance. The current fire stations are located in a manner that provides good access to the majority of the GFD service area.

The following figure uses 2010 Census Block data to display population density throughout Grapevine.

Figure 29: GFD Population Density, 2010 Census Data

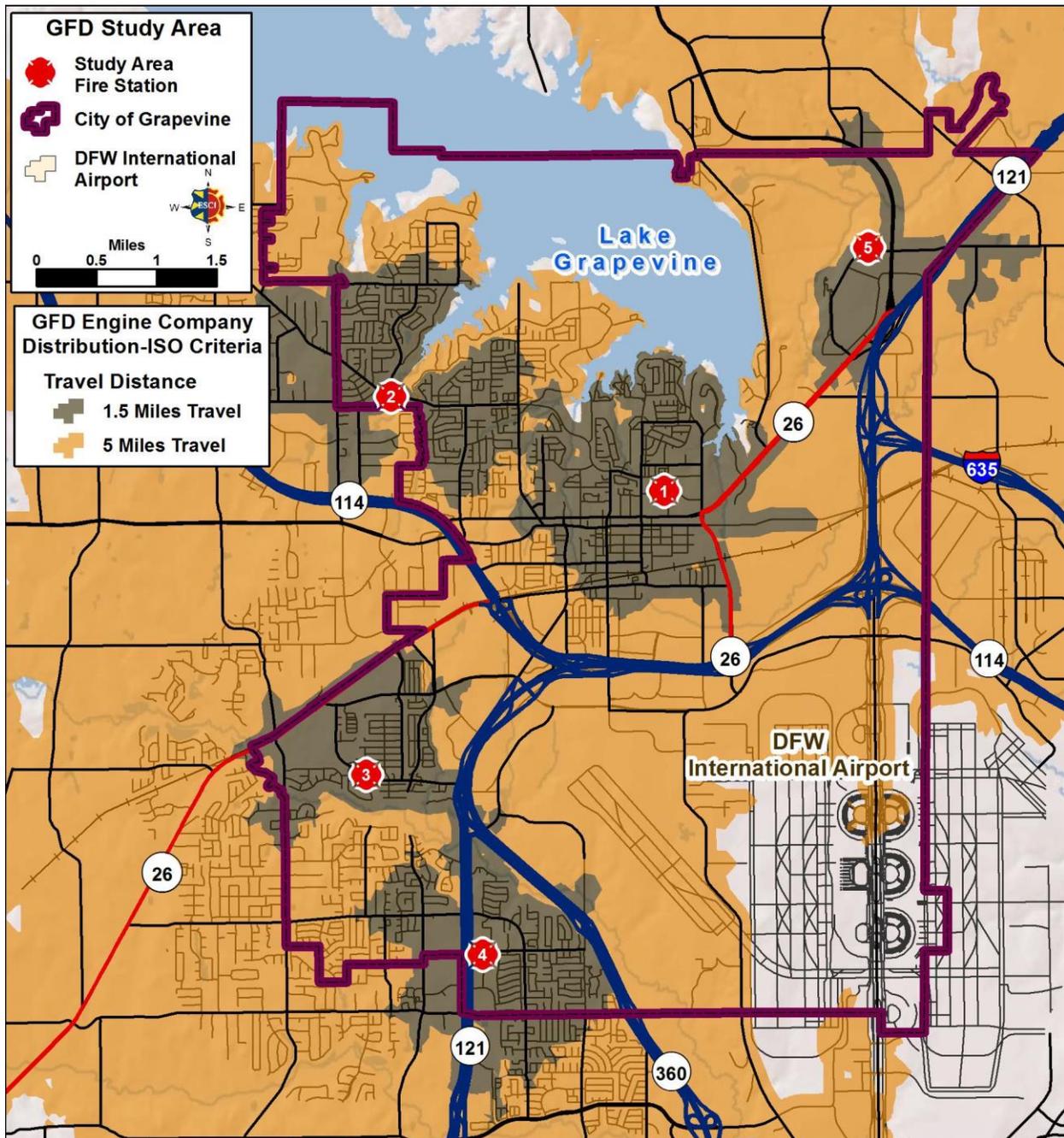


According to the Texas State Data Center, the estimated population of Grapevine in 2013 (the most current estimate available) was 48,477. The population density in the majority of the city, other than DFW International Airport, is greater than 1,000 per square mile; which classifies Grapevine as an urban

community. The overall population density of Grapevine is approximately 1,349 per square mile with small areas of suburban population densities.

The Insurance Services Organization (ISO) is a national insurance industry organization that evaluates fire protection for communities across the country. A jurisdiction's ISO rating is an important factor when considering fire station and apparatus distribution since it can affect the cost of fire insurance for individuals and businesses. For ISO purposes, response areas are measured at 1.5 miles of travel distance for each engine company and 2.5 miles for a ladder company (aerial apparatus) on existing roadways. For a structure to be in a protected rating for insurance purposes, it must be within five miles of a fire station. The next two figures examine current station and apparatus distribution based on credentialing criteria for the Insurance Services Organization (ISO).

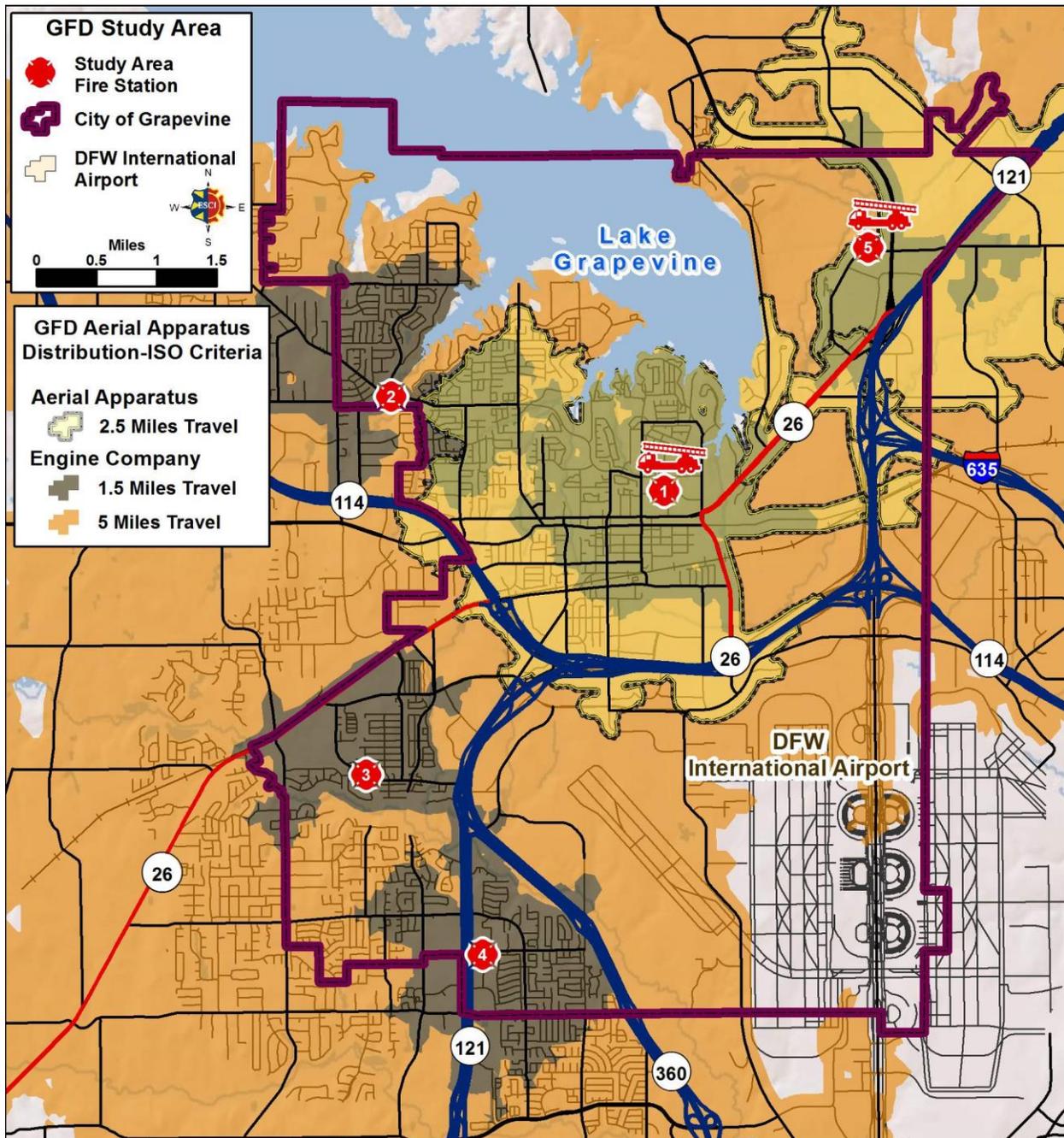
Figure 30: GFD Engine Company Distribution-ISO Criteria



Nearly 47.3 percent (47.3) of the Grapevine road network is within 1.5 miles of a GFD station. All of the currently developed portions of Grapevine are five miles or less from a fire station. GFD staffs combination aerial/pumpers (quint) apparatus at Stations 4 and 5.

The following figure demonstrates the 2.5-mile service areas for these apparatus.

Figure 31: GFD Aerial Company Distribution-ISO Criteria



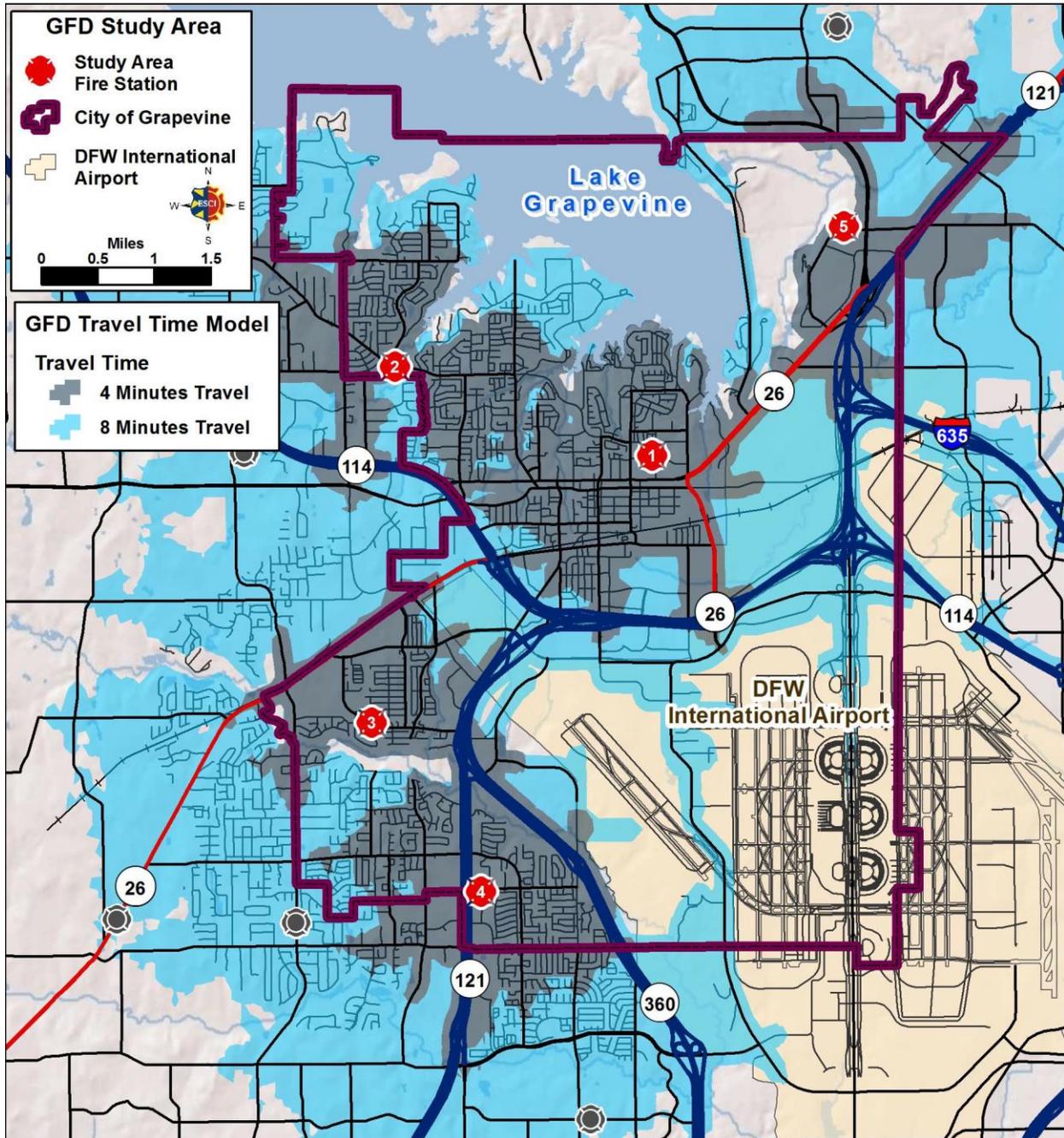
The ISO criteria for aerial apparatus distribution is based on the presence and number of buildings over three stories. ESCI believes a ladder company at Station 1 and aerial/engines (quint) at Station 5 provide adequate aerial apparatus coverage. GFD is classified as a Class 2 fire department by the ISO. ESCI believes there is an opportunity to reduce apparatus maintenance and replacement costs by removing one quint from service at Station 4. Properly equipping an engine to meet the requirements of a ladder service company should maintain the excellent GFD ISO classification and reduce the high cost of

maintaining and replacing a third aerial apparatus. This option is discussed in the Recommendations portion of this report.

The ISO assigned Grapevine a Public Protection Classification (PPC) of Class 2 (Class 1 represents exemplary fire protection) in 2010. The current distribution of stations and apparatus in the GFD service area provides sufficient coverage to satisfy ISO criteria. Note that the ISO only addresses fire suppression activities and is primarily concerned with the geographic coverage of property.

Of equal importance is the travel time required to respond from a fire station to a call for service. The analysis in the following figure is travel time over the current road network. Travel time is calculated using the posted speed limit and adjusted for negotiating turns, non-connected travel routes, and intersections.

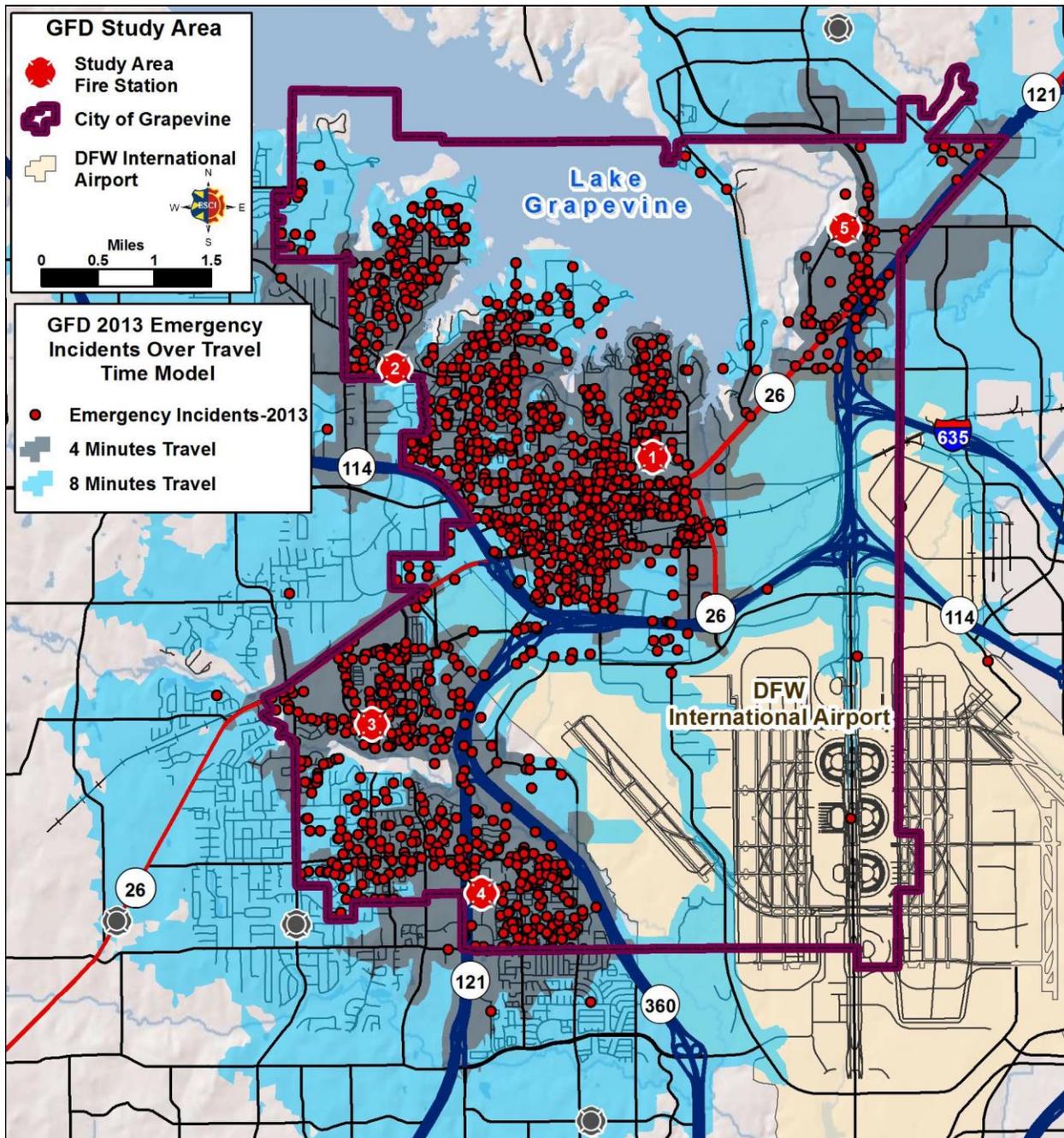
Figure 32: GFD Travel Time Model, Current Station Locations



The previous figure demonstrates travel time capabilities from the current GFD station locations. The vast majority of high call volume and high population density areas is within a four-minute travel time. All portions of the GFD service area are within an eight-minute travel time.

The next figure displays 2013 emergency incidents and the travel time model to compare travel time capability to service demand.

Figure 33: GFD Travel Time Capability and Emergency Service Demand, 2013



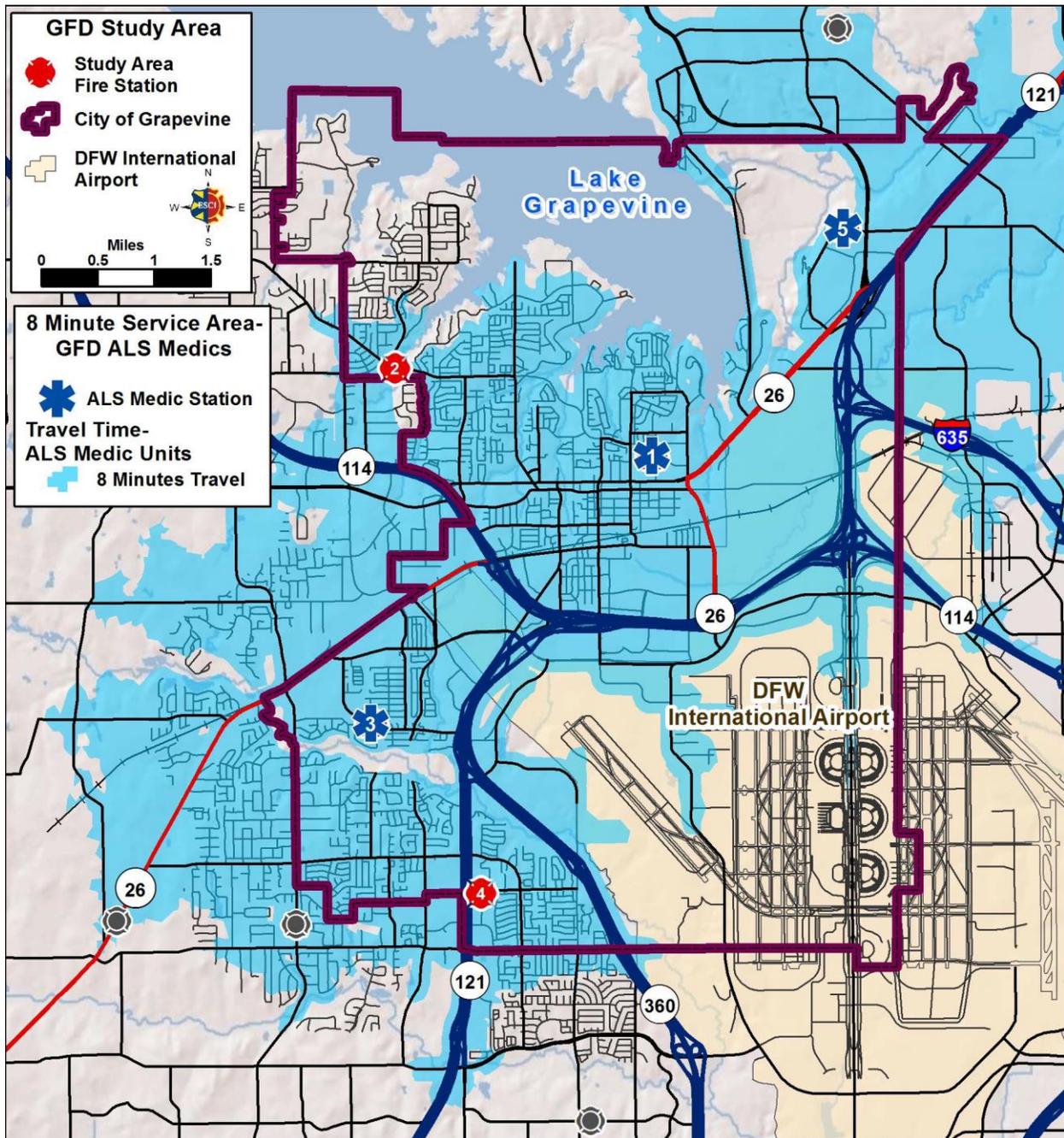
National standards, such as the *NFPA 1710*,<sup>6</sup> specify that career staffed, urban fire departments should deploy resources such that 90 percent of emergency service demand can be reached in 4 minutes travel or less. Over 82 percent of travel time is potentially the longest component of a number of elements,

<sup>6</sup> *NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (National Fire Protection Association 2010).

which create the response continuum that starts when a call for help is received at the 911 center and ends when emergency responders arrive on scene. ESCI has examined and feels that GFD stations are generally located in the optimized location. Two Stations (Stations 2 and 3) are recommended to be relocated in the general half-mile radius from the existing stations to accommodate necessary station upgrades and optimized station functionality based on current best practices.

Over 82 percent of 2013 emergency responses are within 4 minutes travel of a GFD station. Over 98 percent of emergency incidents were within eight minutes of a GFD fire station. Given the current number and location of fire stations, GFD does not appear able to meet the *NFPA 1710* standard four-minute travel time requirement at the 90<sup>th</sup> percentile. As demonstrated in the previous figure, the majority of calls not compliant with the 4-minute travel time are in the less dense residential and recreational areas near the lakefront. As discussed in the Response Time Development and Performance section of the report, *NFPA 1710* response time standards can be met in the vast majority of the city by creating an alternative suburban response zone and standard for the outlying and lakefront areas that represent a small percentage of the total service area and call volume.

Figure 34: GFD ALS Transport Medic Units



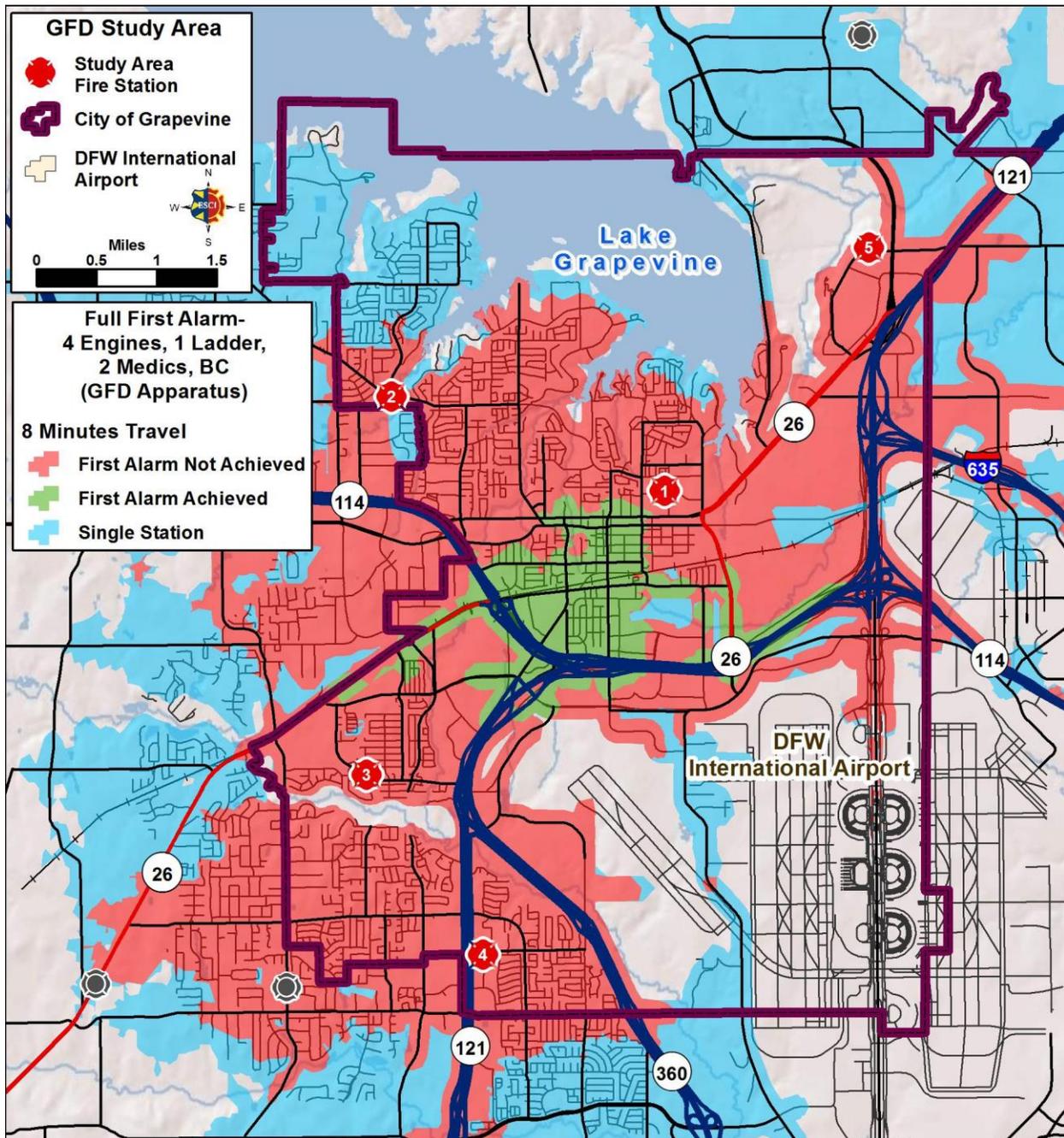
NFPA 1710 states that in jurisdictions where the fire department provides Advanced Life Support (ALS) service, ALS resources should be capable of responding to an ALS emergency in 8 minutes travel or less 90 percent of the time. With the exception of a small area north of Station 2, all of the GFD service area is within 8 minutes travel of a GFD ALS unit. Based on the relatively small call volume in the area outside the 8 minute response time, the GFD exceeds the 8 minute NFPA 1710 ALS response time standard 90 percent of the time.

### *Concentration*

Accepted firefighting procedures call for the arrival of the entire initial assignment or effective firefighting force (sufficient apparatus and personnel to effectively deal with an emergency based on its level of risk) within a reasonable amount of time. This is to ensure that enough people and equipment arrive soon enough to safely control a fire or mitigate any emergency before there is substantial damage or injury. In this analysis, ESCI examines the ability of GFD to assemble multiple resources across the study area. The following figure shows some configuration options that contribute to an increased convergence of personnel to accommodate an effective firefighting force in accordance with industry best practices.

The figure also displays the GFD ability to converge an existing first alarm assignment to emergencies within eight minutes.

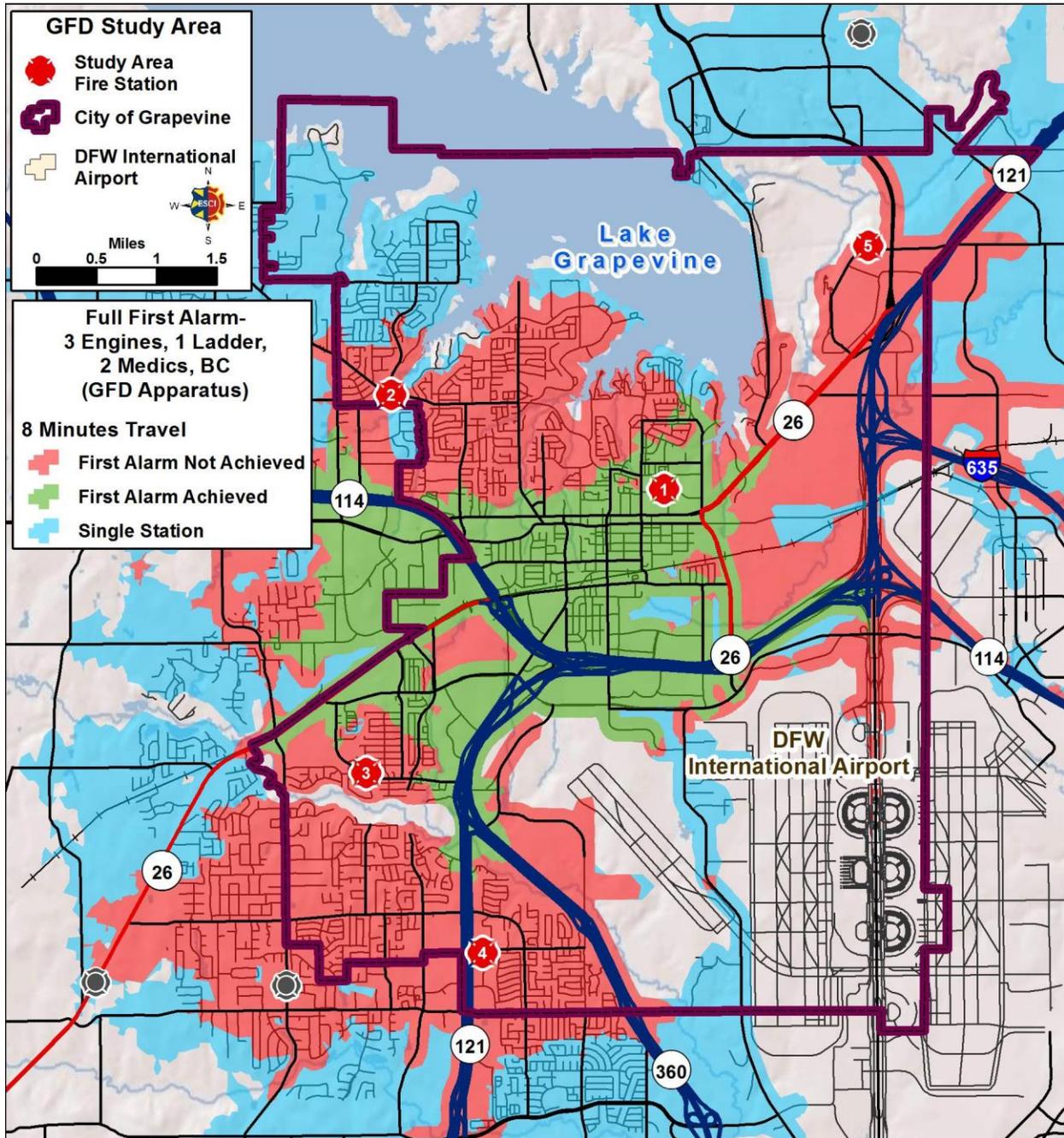
Figure 35: GFD Full First Alarm Capability, 8 Minutes Travel



The current GFD first alarm assignment for a structure fire consists of four engines, one aerial apparatus, one medic unit, and one battalion chief (19 personnel). Only a small portion of the GFD service area is within 8 minutes travel of a GFD full first alarm assignment.

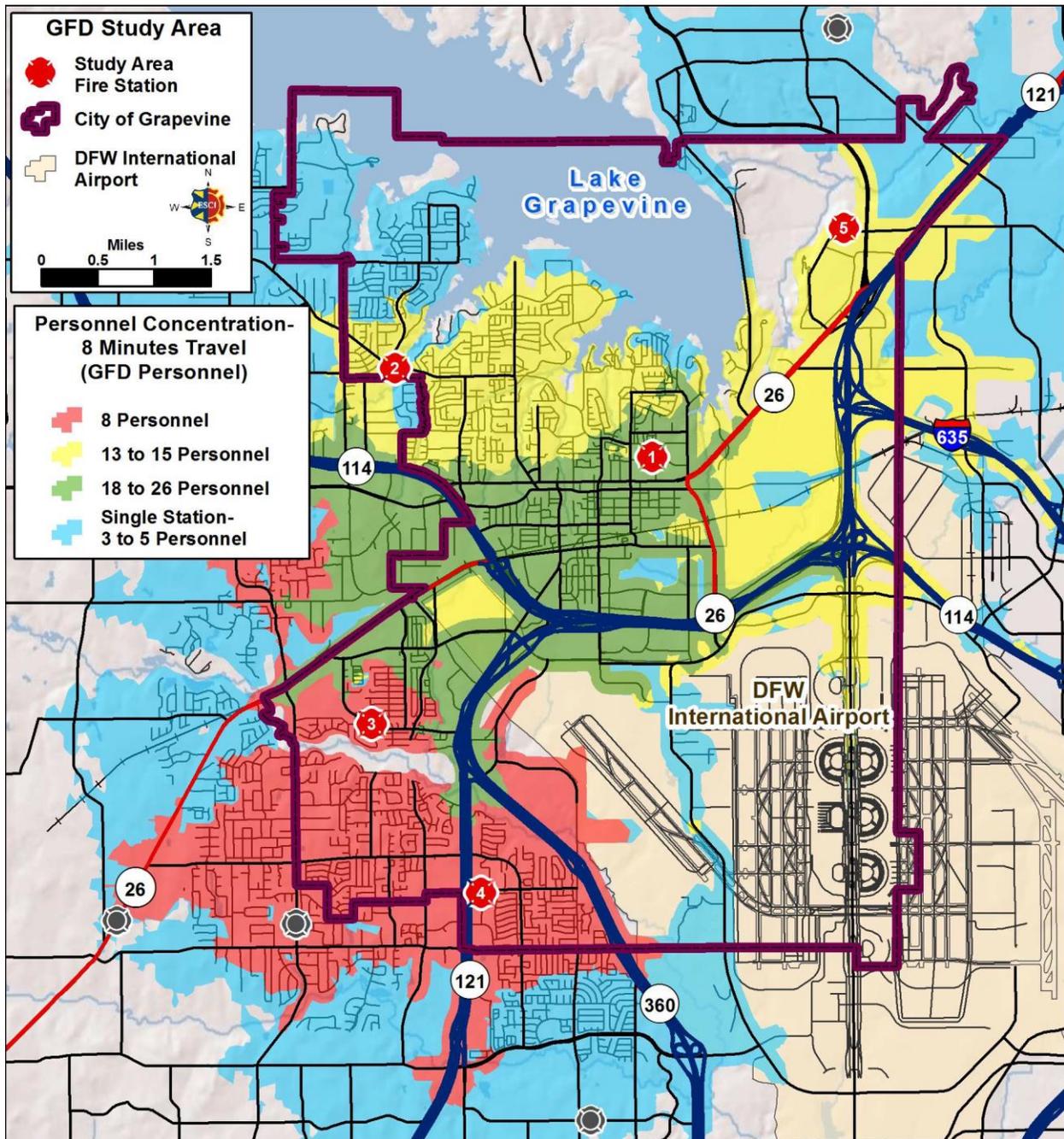
The following figure provides an alternative response matrix that will meet Commission for Public Safety Excellence (CPSE) firefighting force standards.

Figure 36: NFPA 1710 Full First Alarm Capability, 8 Minutes Travel



As a point of comparison by utilizing a modified first alarm assignment of three engines, one truck, one medic and a battalion chief, a significantly larger area is able to assemble a first alarm assignment. This configuration leaves two stations available instead of one available for additional resources or concurrent incident.

Figure 37: GFD Personnel Concentration, Current Three/Four 26 Minimum Staffing



The Center for Public Safety Excellence (CPSE) *Standards of Cover*, 5<sup>th</sup> Edition (an industry best practices publication) suggests that 14 to 16 personnel are required to safely and effectively mitigate a moderate risk fire suppression incident. NFPA 1710 another industry best practice standard, calls for 17 personnel

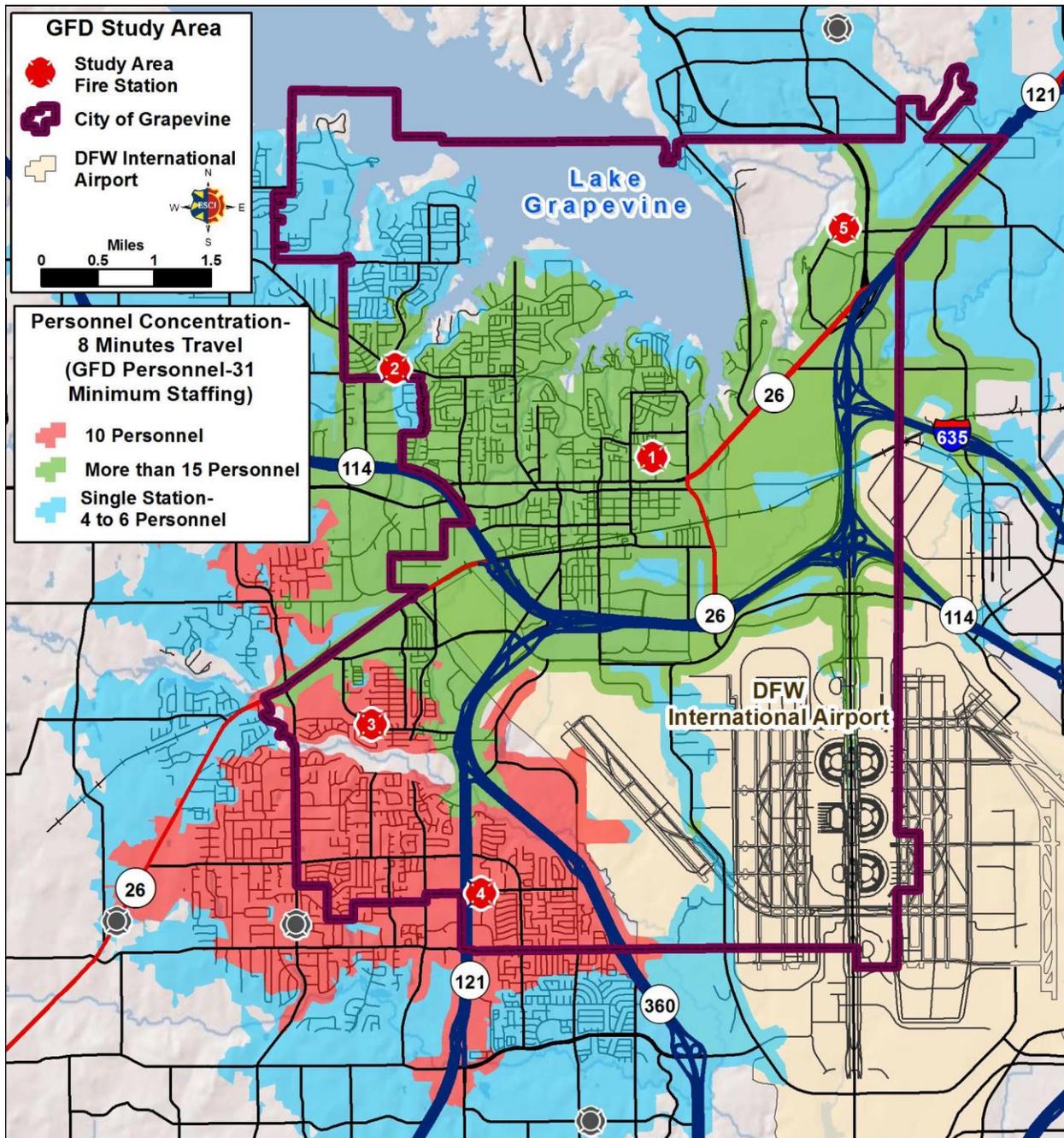
to provide adequate firefighting capabilities on fire incidents. The current deployment of GFD personnel is capable of providing 14 to 16 personnel to a large portion of the service area.<sup>7</sup>

The following display shows an alternative staffing level of four personnel per apparatus and how that staffing level will impact an eight minute personnel concentration response levels.

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<sup>7</sup> See: National Fire Protection Association, *Standard for Organization and Deployment of Fire Suppression Operations, EMS Operations, and Special Operations (NFPA 1710 and NFPA 1720)*; and the Commission on Fire Accreditation (CFAI) *Standards of Cover, 5<sup>th</sup> Edition*.

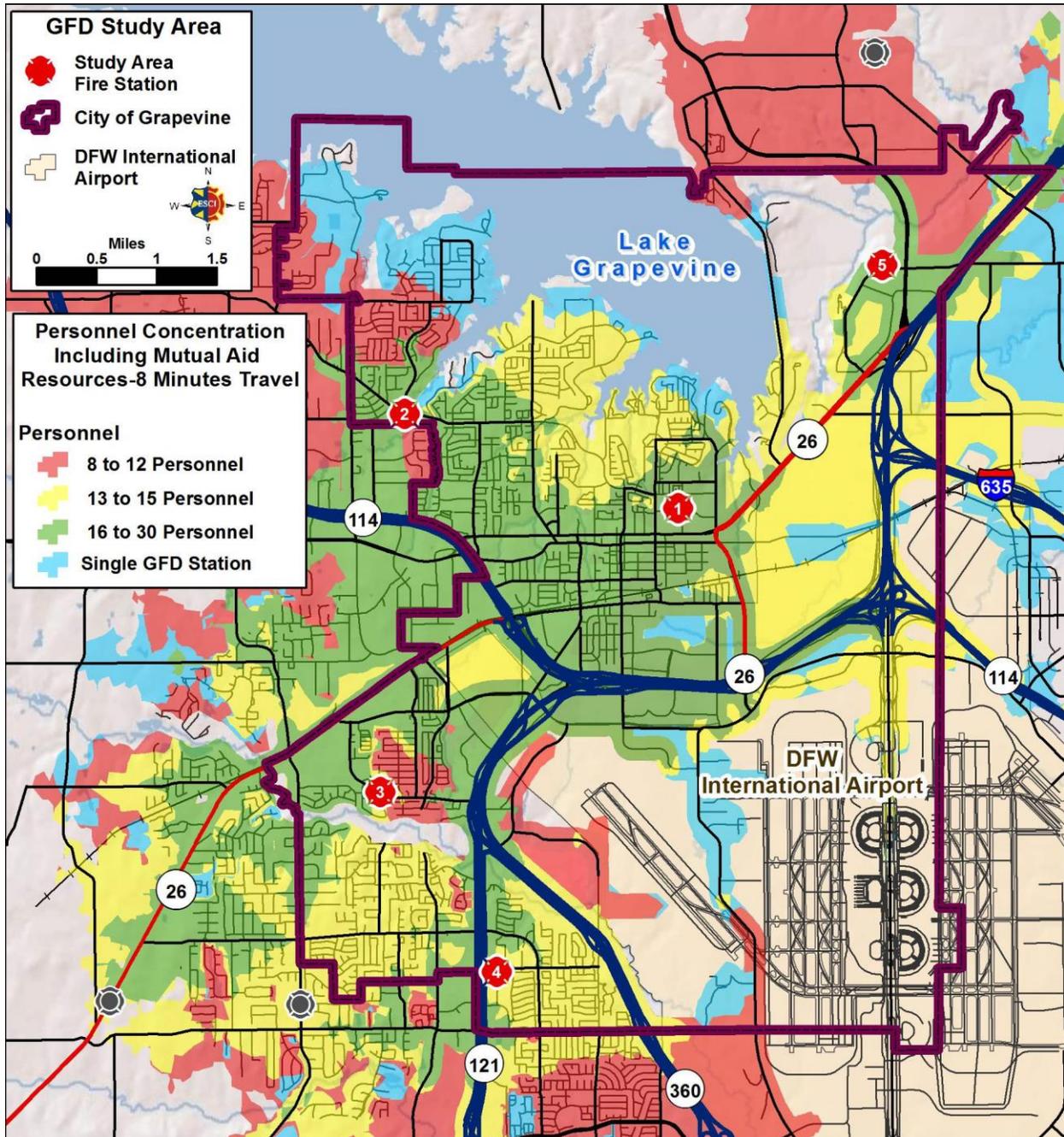
Figure 38: GFD Personnel Concentration, Four Person 31 Daily Minimum Staffing



As an alternative point of comparison, if GFD were to have four person staffing on all apparatus, 17 to 20 personnel could be assembled in eight minutes in the majority of the city. Areas in district three and four that do not meet industry best practices for personnel concentration can meet established standards with the enhanced automatic aid agreements and responses for adjacent fire jurisdictions.

The following figure demonstrates how assistance from adjacent fire jurisdictions can assist the GFD in assembling an effective firefighting force.

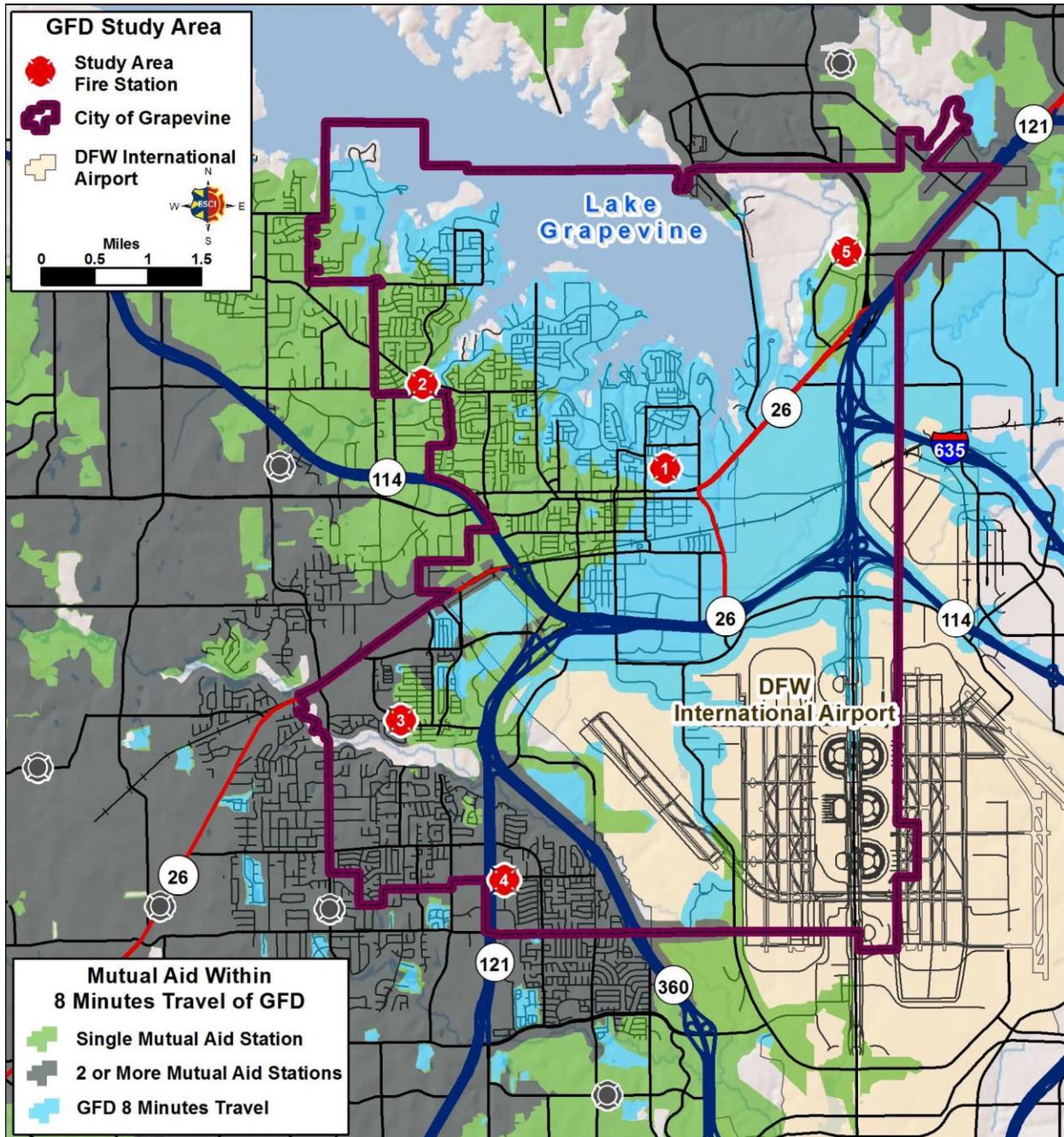
Figure 39: GFD Personnel Concentration, Mutual Aid 8 Minute Response



The above figure displays personnel concentration that includes existing current GFD minimum staffing and fire adjacent fire agencies within an 8 minute response time responding into the city. The figure demonstrates a significant increase in personnel concentration in high utilization and risk areas by

utilizing enhanced automatic aid from surrounding agencies. ESCI observes that once response and performance standards are established and adopted, the GFD can meet or exceed personnel concentration industry adopted standards and best practices through a combination of enhanced automatic aid utilization and increased minimum staffing.

Figure 40: Mutual/Automatic Aid Resources within 8 Minutes Travel of GFD



As discussed in the Distribution and Concentration Analysis, the current travel time capabilities of GFD resources provide a high level of coverage at 8 minutes travel. However, there are portions of the service area where GFD is challenged to assemble adequate resources to mitigate complex, high-risk incidents safely. The prior figure demonstrates the portions of the GFD service area within 8 minutes travel of mutual aid resources. Examination of the GFD incident data reveals that GFD received mutual or automatic aid 80 times in 2013. The GFD provided mutual or automatic aid to surrounding fire jurisdictions 226 times. ESCI recommends increased automatic and mutual resources be utilized to optimize response time and personnel concentration within the city.

**Reliability**

A review of workload by station and response unit can reveal much about response performance and a department’s ability to assemble adequate resources to mitigate simultaneous incidents. Although fire stations and response units may be distributed in a manner to provide quick response, that level of performance can only be obtained when the response unit is available in its primary service area.

Unit Hour Utilization (UHU) analyzes the amount of time that a unit is *not* available for response because it is already committed to another incident. The larger the number, the greater its utilization and the less available it is for assignment to subsequent calls for service. The following figure displays the average time GFD’s primary response apparatus (staff and utility vehicles are not included) were committed to an incident in 2013, and expresses this as a percentage of the total year.

**Figure 41: GFD Unit Hour Utilization (UHU), 2013**

Unit	Average Time Committed	Total Time Committed	UHU Rate
<b>Station 1</b>			
BC 56	47:24	139:01:33	1.59 %
E1	27:41	665:21:03	7.60 %
M1	42:31	1110:12:19	12.67 %
T1	28:23	228:02:41	2.60 %
<b>Station 2</b>			
E2	35:35	408:01:51	4.66 %
<b>Station 3</b>			
E3	26:32	527:10:21	6.02 %
M3	48:59	1023:48:45	11.69 %
<b>Station 4</b>			
Q4	29:26	324:55:40	3.70 %
<b>Station 5</b>			
Q5	31:10	323:56:13	4.10 %

Unit	Average Time Committed	Total Time Committed	UHU Rate
M5	47:35	549:31:48	6.27 %

Not surprisingly, the GFD transport medics display the highest UHU rates. These units respond to approximately 69 percent of the current GFD service demand. Transport time to the hospital, patient handoff, and report writing increases the time medic units are unavailable. The previous figure also displays the average time committed to an incident per apparatus during 2013. In general, fire apparatus (engines and quints) are committed 25 to 30 minutes per incident. The average time committed for EMS units (medics) is approximately 46 minutes.

Simultaneous or concurrent incidents can affect a fire department’s ability to muster sufficient resources to respond to additional emergencies. The following figure demonstrates the percentage of the time that GFD resources were committed to more than one incident at the same time in 2013.

**Figure 42: GFD Concurrent Incidents, 2013**

Concurrent Incidents	Percentage
Single Incident	64.1%
2	27.4%
3	6.9%
4	1.4%
5 or More	0.3%

Nearly 64 percent of GFD service demand occurred as a single incident in 2013. Approximately 27 percent of incidents occur concurrently. The percentage of concurrent incidents is comparable to other fire jurisdictions with similar service demand and EMS transport responsibility.

The following figure details the instances of multiple apparatus being committed to a single incident. Apparatus cancelled prior to arrival and mutual aid apparatus are not included in the analysis.

**Figure 43: GFD Apparatus Drawdown, 2013**

Single Apparatus	Apparatus per Response				
	2	3	4	5	6 or More
16.3%	73.4%	7.0%	1.2%	0.5%	1.7%

The prior figure refers to incidents where two or more apparatus respond to incidents. Two apparatus responded to over 73 percent of the total incidents. The vast majority of these two unit responses are EMS incidents. Implementation of criteria-based dispatch protocols for EMS incidents (dispatch of a single unit to non-emergency calls for medical assistance) provides an opportunity to reduce resource drawdown and improve response performance.

The ability of a fire station’s first-due unit(s) to respond to an incident within its assigned response area is known as unit or station reliability. The following figure demonstrates the percentage of incidents that a first-due apparatus for each of the GFD station areas was the first apparatus on scene in their particular station area.

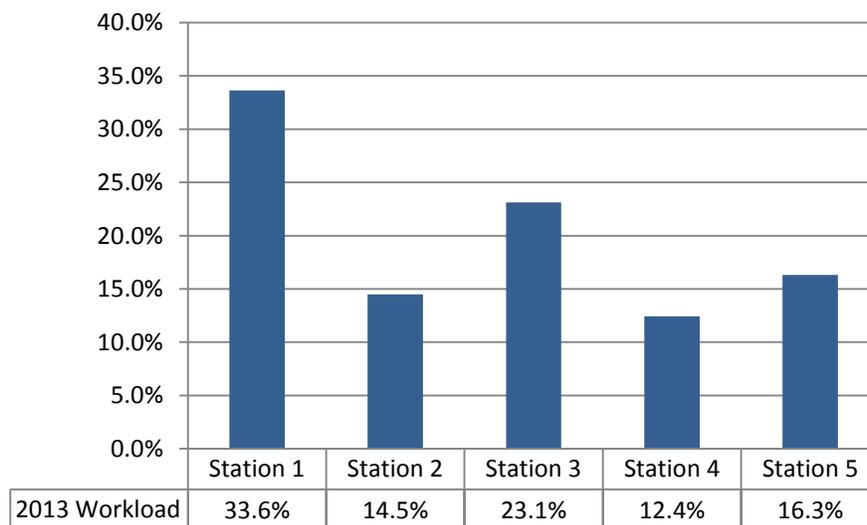
**Figure 44: GFD Station Reliability, 2013**

Station 1	Station 2	Station 3	Station 4	Station 5
88.0%	97.2%	92.6%	90.1%	94.9

In ESCI’s experience, station reliability rates below 85 percent can lead to worsening response performance because back up apparatus must respond from outside the primary station area. This is affirmed in industry best practices publications such as the Commission on Fire Accreditation (CFAI) *Standards of Cover, 5<sup>th</sup> Edition*. The reliability rate for GFD stations is well above 85 percent.

The next figure in the reliability study displays the workload of each of the four GFD stations.

**Figure 45: GFD Workload by Station Area**



As seen in the previous figure, Station 1 handles nearly 34 percent of GFD service demand, while slightly over ten percent of 2013 service demand occurred in the Station 4 area. Service demand is fairly evenly distributed between the district one/two and three/four/five first due areas.

### *Response Performance*

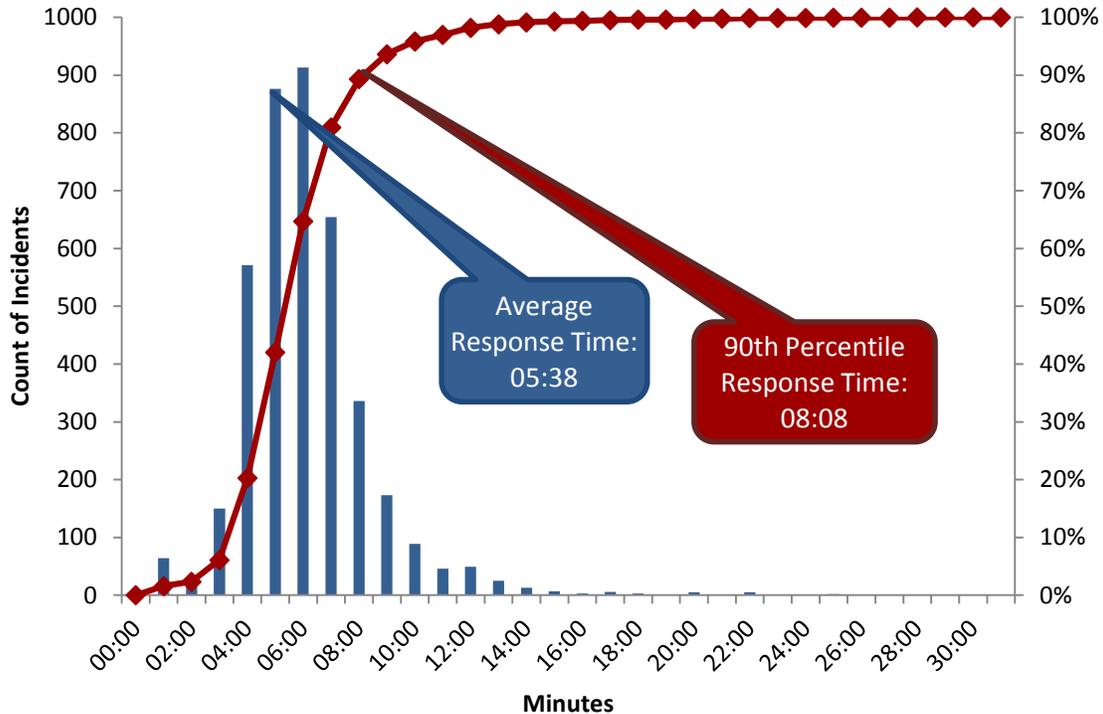
Perhaps the most publicly visible component of an emergency services delivery system is that of response performance. Most citizens and policymakers alike want to know how quickly they can expect to receive services. In the Performance Summary, ESCI examines emergency response performance for the GFD service area using incident data from the Grapevine Communications Center provided by GFD. Non-emergency incidents, mutual or auto aid incidents outside the GFD service area, data outliers, and invalid data are removed from the data set whenever possible.

ESCI measured total response time from the time of the receipt of the alarm at the 911 center to when the first apparatus arrived on the scene of the emergency. ESCI calculated both average and 90<sup>th</sup> percentile data for these emergency incidents. The use of percentile measurement of total response time performance follows the recommendations of the NFPA standards and the Center for Public Safety Excellence (CPSE/CFAI) Standards of Cover document.

Fire department leaders and policy makers often use “average” response performance measures since the term is commonly used and widely understood. The most important reason for not using average for performance standards is that it may not accurately reflect the performance for the entire data set, and can be easily skewed by data outliers. Percentile measurements are a better measure of performance since they show that the large majority of the data set has achieved a particular level of performance.

The first figure in this section of the report displays overall emergency response time frequency throughout the GFD study area.

**Figure 46: GFD Response Frequency, 2013 Priority Incidents**



The most frequently recorded response time for emergency calls is within the sixth minute. Specifically, the average is 5 minutes 38 seconds, with 90 percent (90<sup>th</sup> percentile) of all emergency incidents answered in 8 minutes 8 seconds or less. The previous figure measures total response time. Total response time is comprised of several different components:

- Call Processing Time – The amount of time between when a dispatcher answers the 911 call and resources are dispatched.
- Turnout Time – The time interval between when units are notified of the incident and when the apparatus are en route.
- Travel Time – The amount of time the responding unit actually spends travelling to the incident.
- Total Response Time – Total Response Time equals the combination of “Processing Time,” “Turnout Time,” and “Travel Time.”

The following figure examines GFD 2013 performance for the various components of total response time.

**Figure 47: GFD Overall Response Performance, 2013 Priority Incidents**

Total Response Time Continuum				
	Call Processing	Turnout Time	Travel Time	Total Response Time
Average	00:49	01:19	03:31	05:38
90th Percentile	01:31	02:09	05:35	08:08

Tracking the individual pieces of total response time facilitates identifying deficiencies and areas for improvement. The *NFPA 1710* standard specifies that call-processing time should not exceed 60 seconds (measured at the 90<sup>th</sup> percentile).

The previous figure demonstrates that call-processing time exceeds the 60-second goal by 30 seconds at the 90<sup>th</sup> percentile. Most modern dispatch centers are regional multiagency, multidisciplinary (law enforcement, Fire, EMS) agencies, and call-processing time is generally not under the direct control of the fire department. Fire department leaders need to be aware of call processing time and work cooperatively with the dispatch agency to meet standards.

The second component of the response continuum is turnout time. The following figure displays GFD 90<sup>th</sup> percentile turnout time performance in 2013, summarized for fire and EMS responses.

**Figure 48: GFD 90<sup>th</sup> Percentile Turnout Time, 2013 Priority Incidents**

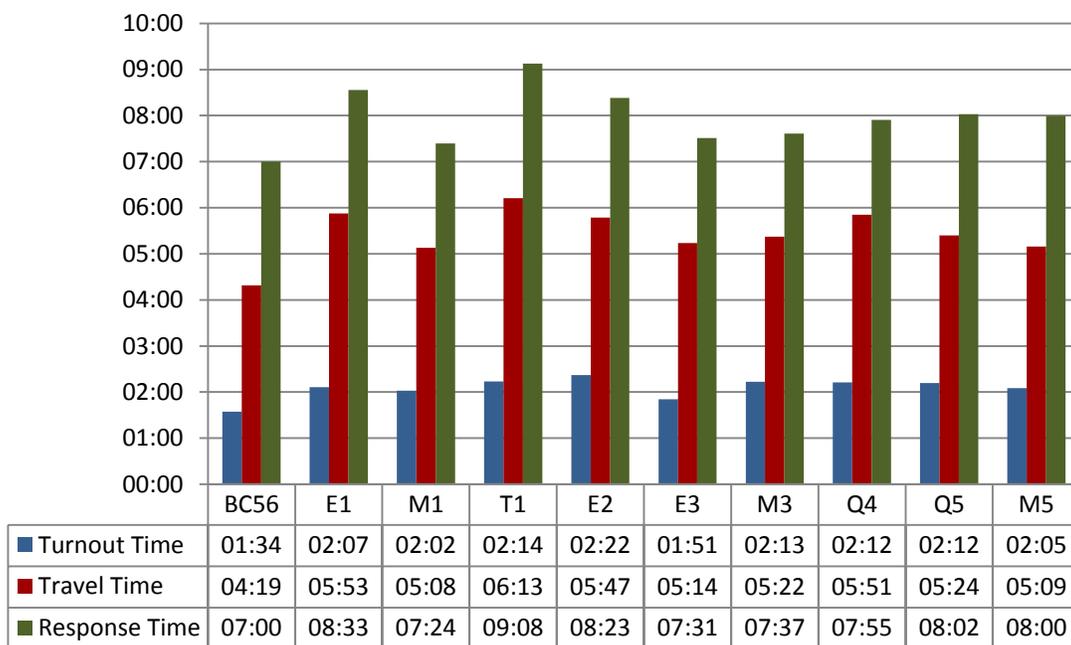
Turnout Time Performance		
	Fire	EMS
90th Percentile	02:13	02:07

GFD turnout time performance ranges from 1 minute 26 seconds for EMS calls to 1 minute 44 seconds for fire apparatus. Recommended turnout time for all emergency incidents is less than 90 seconds, 90 percent of the time. Turnout time performance is significantly longer than current NFPA recommendations. Good training and properly designed facilities can minimize the time required to don appropriate equipment, assemble at the response vehicle, and begin travel to the incident. ESCI

recommends consistent monitoring and reporting to the organization regarding turnout time, established standards and methods for improving this metric performance.

As discussed in the Distribution Analysis, travel time is potentially the longest component of total response time. The distance between the fire station and the location of the emergency influences total response time the most. The quality and connectivity of streets, traffic, and geography are also factors. In the following figure, ESCI examines travel time and total response time for each of the GFD station areas, measured at the 90<sup>th</sup> percentile.

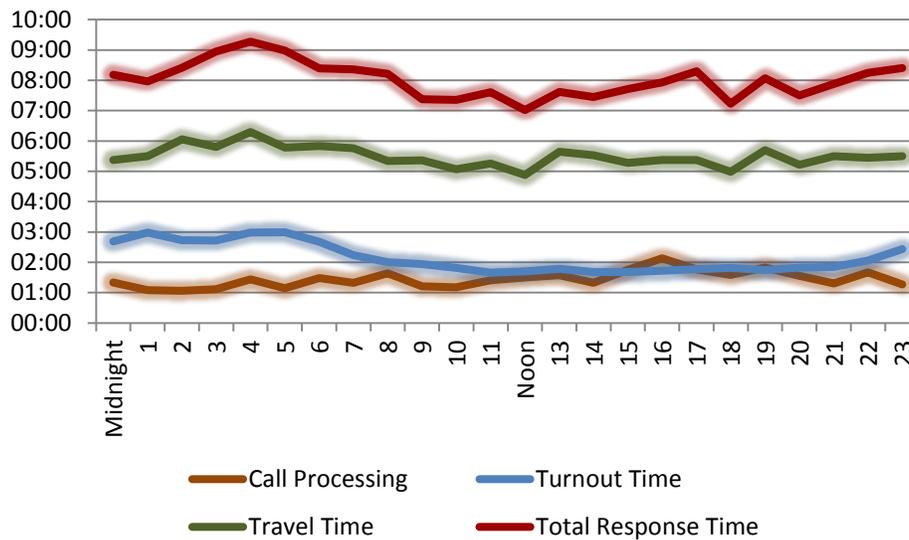
**Figure 49: GFD Response Performance by Apparatus, 2013 Priority Incidents**



In the above chart, ESCI displays travel time performance and total response time performance together to demonstrate the direct correlation between travel time and total response time. As travel time increases by station area, there is a corresponding increase in total response time. Total response time ranges from a low in the Station 3 (E563) area of 7 minutes 31 seconds to a high in the Station 1 (T561) area of 9 minutes 8 seconds.

The last figure in the Response Performance Analysis combines all four components of the overall total response continuum and tracks performance throughout 24 hours in 2013.

Figure 50: GFD Call Processing and Response Time Elements



Calculating and tracking the components of total response time allows fire department leaders to identify trends and correct specific deficiencies. Note that total response time increases during the late night and early morning hours. This reflects the increased turnout time during these hours. Travel time ranges from 5 minutes to slightly at, or over, 6 minutes throughout the day. Call processing time fluctuates from 1 minute to 2 minutes 18 seconds. The longest call processing times occur in the late afternoon through early evening hours when service demand for the fire department and the 911 center is the highest.

In general, GFD service delivery and response performance compares well to fire departments with similar service demand, area served, stations, apparatus, and personnel.

Throughout the Service Delivery and Performance Analysis, ESCI has referred to the *NFPA 1710* standards. Note that the NFPA standards are simply a point of reference against which performance can be measured. The standards are not mandates or requirements. However, they do represent industry best practices and can be viewed as desirable goals. The *CFAI Standards of Cover, 5<sup>th</sup> Edition* is also regarded as an industry best practice. This document recommends adopting response goals and standards that are based on community risk and expectations, current response capabilities, and standards to maximize response effectiveness throughout the service area.

CAPITAL ASSETS AND CAPITAL IMPROVEMENT PROGRAMS

Aside from personnel, capital assets can be a department’s most critical expense. Without proper upkeep and replacement planning, facilities and apparatus can fall into disrepair and fail at a critical time. This section evaluates the capital assets of GFD and provides recommendations for replacement as necessary.

**Figure 51: Survey Table – Capital Assets and Capital Improvement Planning**

Survey Components	Grapevine Fire Department Observations	Recommendations
<b>Fire Stations/Structures</b>		
Replacement Plan maintained	None	Complete a master facility plan to determine facility upgrades, replacement options, funding, and timing
i) Period of plan (from – to)	N/A	
ii) Funding mechanism	N/A	
Construction or improvement plans	No planned construction	
i) 2014	N/A	
ii) 2015	N/A	
iii) 2016	N/A	
iv) 2017	N/A	
<b>Apparatus</b>		
Replacement Plan maintained	In fleet services, fire department has some input	Establish approved replacement schedule for all apparatus types and capital equipment.
i) Period of plan (from – to)	Use benchmarks on an assessment matrix and scale	
ii) Funding mechanism	CIP fund, part of general fund city budget not a FD fund	Establish and fund a comprehensive Capital Replacement Program.
Purchase or refurbishment schedule	Normally one piece a year, evaluated each year	
i) 2014		
ii) 2015		
iii) 2016		
iv) 2017		
<b>Support Equipment</b>		
Replacement Plan maintained	Not scheduled; block amount of money within operational budget	
i) Period of plan (from – to)	Annual budget	
ii) Funding mechanism	General fund allocation	
<b>Methods of Financing</b>		
General revenue	Yes	
Reserve fund(s)	Capital Replacement Fund in the City budget	

Survey Components	Grapevine Fire Department Observations	Recommendations
Revenue fund(s)	Ambulance Transport Fees (Goes to General Fund)	
General obligation bond	Public safety administration building	Consider bond measure for essential facility upgrades and construction.
Lease-Purchase (none)	Ladder Truck—Certificate of Obligation	
Grants or gifting	Good success on UASI and AFG grants	
Special fees	None	

**Facilities**

**Figure 52: Grapevine Fire Department Station 1 601 Boyd Drive**



Constructed in 1991, Fire Station 1 is a 13,000 square foot facility. The station houses an engine, truck and medic apparatus, along with a command vehicle, brush truck and dive rescue unit. The facility consists of four double-depth apparatus bays in a drive through configuration.

Accommodations are present in the station for up to ten shift personnel. However, the dorm and restrooms are not dual gender appropriate.

The station currently houses the administrative functions of the department. A recent bond election is funding the construction of a new public safety building. Nearly 12,000 square feet will be allocated to Fire Administration and EOC functions. With the administration relocation, a remodel of this station is expected to address the tight living quarters and gender specific concerns. Currently this facility does not meet Americans with Disabilities Act (ADA) standards.

<b>1. Structure</b>	
A. Construction type	Masonry construction in the apparatus room. Wood frame with brick veneer construction in the administration and quarters areas. The building is on a concrete slab.
B. Date Built	1991
C. Seismic protection/energy audits	None
D. Auxiliary power	Diesel generator fueled by day tank, automatic transfer switch equipped.
E. Condition	Fair
F. Special considerations (American with Disabilities Act of 1990 (ADA), mixed gender appropriate, storage, etc.)	Facility is not ADA compliant, nor is it appropriately configured for dual gender use.
<b>2. Square Footage</b>	13,000
<b>3. Facilities Available</b>	
A. Exercise/workout	Small area off bay.
B. Kitchen/dormitory	Adequate kitchen area, no suppression system in hood. Houses ten shift personnel tightly – originally designed for seven.
C. Lockers/showers	Lockers provided – Shower facilities not dual gender appropriate.
D. Training/meetings	Training room located in administrative area.
E. Washer/dryer	Residential heavy-duty washer and dryer are provided.
<b>4. Protection Systems</b>	
A. Sprinkler system	None
B. Smoke detection	System installed. Local notification only.
C. Security	Cypher lock, bay doors on remote in apparatus cab.
D. Apparatus exhaust system	Point source capture system in place.

**Figure 53: Grapevine Fire Department Station 2 - 2801 Panhandle**



Constructed in 1981, This 3,281 square foot facility shows its age. The 2-bay, back-in configuration houses a single engine and a reserve medic unit. The south bay wall and concrete floor have cracks which could indicate potential foundation problems. The living quarters are very tight and cramped.

The location of the bay entry and egress in the rear of the building requires operators to negotiate a long lane and narrow radius to maneuver apparatus. Several point turns are necessary to back into the bay. This configuration is not ideal.

While this station may be in a suitable geographic location, the lot is very small and could not support a new facility that would address today's needs.

The condition of this facility presents both short and long-term maintenance issues. This facility is not ADA compliant, nor is it appropriately configured for dual gender use.

<b>Structure</b>	
A. Construction type	Wood frame, brick veneer on concrete slab.
B. Date Built	1981
C. Seismic protection/energy audits	N/A
D. Auxiliary power	Diesel Generator fueled by undersized day tank, automatic transfer switch equipped.
E. Condition	Poor
F. Special considerations (American with Disabilities Act of 1990 (ADA), mixed gender appropriate, storage, etc.)	Facility is not ADA compliant, nor is it appropriately configured for dual gender use.
<b>2. Square Footage</b>	<b>3,281</b>
<b>3. Facilities Available</b>	
A. Exercise/workout	A small area is provided in apparatus bay.
B. Kitchen/dormitory	A small galley kitchen is present. The dorm is small and cramped.
C. Lockers/showers	Lockers are provided. The restroom and shower facility is dated. This area is not configured appropriately for dual gender use.
D. Training/meetings	Dayroom is used for meetings and classroom space.
E. Washer/dryer	Residential heavy-duty washer and dryer are provided.
<b>4. Protection Systems</b>	
A. Sprinkler system	None
B. Smoke detection	Single station 110v A/C powered detectors
C. Security	Cypher lock, bay doors on remote in apparatus cabs.
D. Apparatus exhaust system	Point source capture system is in place.

**Figure 54: Grapevine Fire Department Station 3 - 2627 Briarwood**



Constructed in 1982, this 3,281 square foot facility also shows its age. Station 2 and this station are of the same design, with very small modifications. The 2-bay, back in configuration houses a single engine and a medic unit. This facility is not dual-gender appropriate. Originally designed to accommodate 3-shift personnel, it now houses 5. The living quarters are very small.

The location of the bay entry and egress in the rear of the building requires operators to negotiate a tight radius to maneuver apparatus. Several point turns are often necessary to back into the bay. This configuration is not ideal.

This station may be in a suitable geographic location, but the lot is very small and could not support a new facility that would address today's needs. The condition of this facility presents both short and long-term maintenance issues. This facility is not ADA compliant, nor is it appropriately configured for dual gender use.

<b>1. Structure</b>	
A. Construction type	Wood frame, brick veneer, on concrete slab.
B. Date Built	1982
C. Seismic protection/energy audits	N/A
D. Auxiliary power	Diesel generator fueled by day tank, automatic transfer switch equipped. The original generator appears to have been replaced.
E. Condition	
F. Special considerations (American with Disabilities Act of 1990 (ADA), mixed gender appropriate, storage, etc.)	Facility is not ADA compliant, nor is it appropriately configured for dual gender use.
<b>2. Square Footage</b>	3,281
<b>3. Facilities Available</b>	
A. Exercise/workout	A small area is provided in bay.
B. Kitchen/dormitory	A small galley kitchen is present. The dorm is very small and cramped. The area was originally built to accommodate three personnel, but now serves five.
C. Lockers/showers	Lockers are provided; The restroom and shower facility is dated. This area is not appropriately configured for dual gender use.
D. Training/meetings	The dayroom is used for meetings and classroom space.
E. Washer/dryer	Residential heavy-duty washer and dryer are provided.
<b>4. Protection Systems</b>	
A. Sprinkler system	None
B. Smoke detection	Single station 110v A/C powered detectors
C. Security	Cypher lock, bay doors on remote in apparatus cabs
D. Apparatus exhaust system	Point source capture system is in place

**Figure 55: Grapevine Fire Department Station 4 - 4500 Merlot**



Constructed in 1994, this facility is 5,281 square feet in area and houses an engine and heavy rescue. The apparatus room is of 2-bay, back in configuration. The crew quarters are cramped. The apparatus area is adequate.

One restroom facility serves the entire crew. The exercise and workout equipment is located in a utility room, which houses electrical panels and a gas fueled water heater. The watch room serves as the only office. The captain does not have a private location to work. Counseling or disciplinary sessions must be done in the watch office that is enclosed by glass which affords no privacy.

This facility is not ADA compliant, nor is it appropriately configured for dual gender use.

<b>1. Structure</b>	
A. Construction type	Masonry and steel, on concrete slab
B. Date Built	1994
C. Seismic protection/energy audits	None
D. Auxiliary power	Natural gas generator and automatic transfer switch equipped
E. Condition	Average. Missing officer's quarters and private office.
F. Special considerations (American with Disabilities Act of 1990 (ADA), mixed gender appropriate, storage, etc.)	Facility is not ADA compliant, nor is it appropriately configured for dual gender use.
<b>2. Square Footage</b>	5,281
<b>3. Facilities Available</b>	
A. Exercise/workout	Provided, but poorly located in converted utility room which also houses the main electrical panels and natural gas fueled water heater.
B. Kitchen/dormitory	An adequate kitchen is in place. Dormitory space is very limited.
C. Lockers/showers	Lockers are provided. This area is not appropriately configured for dual gender use.
D. Training/meetings	The department has access to a community room attached to the building.
E. Washer/dryer	Residential heavy-duty washer and dryer are provided. A commercial washer/extractor and gear dryer is also provided.
<b>4. Protection Systems</b>	
A. Sprinkler system	None
B. Smoke detection	System is installed. Local notification only.
C. Security	Cypher lock, bay doors on remote in apparatus cabs.
D. Apparatus exhaust system	Point source capture.

**Figure 56: Grapevine Fire Station 5 - 2801 Grapevine Mills Blvd N.**



Constructed in 2000, this 6,792 square foot station is the newest of all of the department's facilities. This is the only station where gender appropriate restroom and shower facilities are in place for the crew. This station houses a quint and medic unit. A reserve engine is housed here as well.

A large crack in the masonry wall and bay floor were observed indicating that there may be a foundation and/or structural issues that must be addressed. The condition of this facility presents both short and long-term maintenance issues.

<b>1. Structure</b>	
A. Construction type	Masonry and Steel frame
B. Date Built	2000
C. Seismic protection/energy audits	N/A
D. Auxiliary power	Diesel Generator fueled by day tank and automatic transfer switch equipped.
E. Condition	Average, with foundation issues.
F. Special considerations (American with Disabilities Act of 1990 (ADA), mixed gender appropriate, storage, etc.)	Facility is not ADA compliant.
<b>2. Square Footage</b>	6,792
<b>3. Facilities Available</b>	
A. Exercise/workout	Area off bay
B. Kitchen/dormitory	An adequate kitchen is in place. Dormitory space is very limited.
C. Lockers/showers	Lockers are provided and the shower and restroom facilities are gender appropriate.
D. Training/meetings	The dayroom is used for meetings and classroom space.
E. Washer/dryer	A residential heavy-duty washer and dryer are provided. A commercial washer/extractor and gear dryer is also provided.
<b>4. Protection Systems</b>	
A. Sprinkler system	None
B. Smoke detection	System installed. Local notification only.
C. Security	Cypher locks, bay doors on remote in apparatus cabs.
D. Apparatus exhaust system	Point source capture system is in place.

**Discussion:**

All five of the Grapevine Fire stations were toured. The condition and suitability of Station 2 and Station 3 are currently an issue. These two small stations were constructed in 1981 and 1982 to accommodate a very different organization than what currently exists. The department has had to adapt and to crowd additional personnel into a space that it was not originally designed to quarter. At Station 2 there is evidence of potential foundation issues as demonstrated by cracked concrete bay floors. The cracks also

extend to the exterior wall. Expansion on either the Station 2 or 3 site does not appear to be a viable option due to the small lot on which they are situated.

While these stations are located in a good geographic location to provide optimized response times, ESCI's believes the current lot/parcel configuration of Station 2 and 3 will not allow for appropriate modification or construction of a compliant and functional fire station that will meet the future emergency service needs for the city of Grapevine. This is addressed in the recommendation section of this report.

The administrative functions at Station 1 are to be relocated to the new public safety building. The current crew and operational areas are to be configured into the vacated space. During the remodel, concerns such as American's with Disabilities Act (ADA) and dual-gender appropriate accommodations are expected to be addressed.

The two newest fire Stations, 4 and 5, are nearing 20 years old. The buildings are beginning to show signs of age and a need for greater maintenance. Some updating is also necessary in both stations to fully address the dual-gender and ADA issues. Station 5 appears to have signs of foundation issues that, if left unaddressed, may shorten the overall life cycle of the facility.

It is important to plan for the repair and/or replacement of all stations based upon conditions and future needs. A full evaluation of the current conditions and the associated costs must be completed. A master facility plan is suggested to determine future options, funding, and timing.

### ***Apparatus***

Along with fixed facilities, the city of Grapevine has made substantial investments in fire engines, ladder trucks, medic units, brush vehicles, and other rolling stock commonly referred to as "apparatus". Other than the emergency responders, response vehicles are the next most important tools in the emergency response system. If emergency personnel cannot arrive quickly due to unreliable transportation, or if the equipment does not function properly, then the delivery of emergency service is likely compromised.

Fire apparatus are unique and specialized pieces of equipment, customized to operate efficiently for a narrowly defined mission. For this reason, fire apparatus are very expensive and offer little flexibility in use and reassignment. As a result, communities seek to achieve the longest life span possible for these vehicles. The following figures provide an overview of GFD's apparatus fleet.

**Figure 57: GFD Station 1 Major Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 1	Engine	2009	Pierce/Velocity	Very Good	5	2000	500
Truck 1	Truck	2013	Pierce/100'	Very Good	5	500	300
Medic 1	Medic	2009	Horton/GMC	Good	2	N/A	N/A
Battalion 1	SUV	2006	Chevrolet/ Suburban	Good	3	N/A	N/A
Dive 1(Cross Staffed)	Dive Unit	2009	SVI/Freightliner	Good	6	N/A	N/A

**Figure 58: GFD Station 2 Major Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 2	Engine	2007	Rosenbauer/ Spartan	Fair	4	2000	500
Mustang (Cross Staffed)	Boat	2011	Sea Ark/28'	Very Good	8	500	N/A

**Figure 59: GFD Station 3 Major Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine 3	Engine	2012	Pierce/Velocity	Very Good	5	1500	500
Medic 3	Medic	2012	Horton/Ford	Very Good	2	N/A	N/A

**Figure 60: GFD Station 4 Major Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Quint 4	Quint	2006	Rosenbauer/75'	Fair to Poor	6	2000	400
Rescue 56 (Cross Staffed)	Heavy Rescue	2005	SVI/Spartan	Good	6	N/A	N/A

**Figure 61: GFD Station 5 Major Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Quint 5	Quint	2009	Pierce/75'	Good	5	2000	500
Medic 5	Medic	2013	Horton/Ford	Very Good	2	N/A	N/A
Brush 56	Brush	2002	Ford F450	Good	3	150	320

**Figure 62: GFD Reserve Apparatus**

Apparatus Designation	Type	Year	Make / Model	Condition	Seating Capacity	Pump Capacity	Tank Capacity
Engine (10100)	Engine	2000	E-One	Fair	6	2000	500
Engine (10101)	Engine	2001	E-One	Fair	6	2000	500
Quint (10309)	Quint	1999	E-One	Fair	6	1500	500
Medic (10425)	Medic	2005	Wheeled Coach/Chev	Fair	2	N/A	N/A
Medic (10145)	Medic	2005	Wheeled Coach/Chev	Poor	2	N/A	N/A
Battalion Chief	SUV	2007	Chev/Suburban	Fair	3	N/A	N/A
Boat 56	Boat	1990	Sea Ark/19'	Fair	6	N/A	N/A

### *Capital Replacement Planning*

Unfortunately, no piece of mechanical equipment can be expected to last forever. As a vehicle ages, repairs tend to become more frequent, parts are more difficult to obtain, and downtime for repair increases. Given the emergency mission that is so critical to the community, downtime is one of the most frequently identified reasons for apparatus replacement.

Because of the expense of fire apparatus, most communities develop replacement plans. To enable such planning, communities often turn to the accepted practice of establishing a life cycle for the apparatus that results in an anticipated replacement date for each vehicle. The communities then set aside incremental funds during the life of the vehicle so cash is available when needed. This decision is influenced by many factors:

- Actual hours of use of any specific piece of equipment can vary significantly in comparison to other similar apparatus, even within the same fire department. Attempts to shuffle like-apparatus among busy and slower fire stations to distribute hours of use more evenly have proven difficult. Frequent changes in apparatus create familiarity and training challenges. In addition, certain response areas may have equipment and tool requirements that are not common to others.
- Actual hours of use, even if evenly distributed, do not necessarily equate to intensity of use. For example, a pumper making mostly emergency medical responses will not age as rapidly as a pumper with a high volume of working fire incidents that require intense use of the pump or hydraulics. However, for every hour you idle an engine it is equivalent to driving 33 to 35 miles of wear and tear. Likewise, road mileage can also be a poor indicator of deterioration and wear.

- Technology, which is increasingly a factor in fire equipment design, becomes outdated even if the apparatus wear is not as significant. In some departments, crews at different fire stations deal with widely different technology on pumpers simply because of the age of the equipment. These differences can be significant, affecting everything from safety and lighting systems to automated digital pump pressure controls and injection foam generation.

*NFPA 1901: Standard for Automotive Fire Apparatus* is a nationally recognized standard for the design, maintenance, and operation of fire suppression apparatus.<sup>8</sup> The issue of replacement cycles for various types of apparatus has been discussed in the committee that develops the standard for many years. In developing its latest edition, the NFPA Fire Department Apparatus Committee called for a life cycle of 15 years for front-line service and 5 years in reserve status for engines, 20 years in front-line service and 5 years in reserve status for ladder trucks.

Does this mean that a fire engine cannot be effective as a front-line pumper beyond 15 years? A visit to many departments in the United States might prove otherwise. Small, volunteer fire departments with only a hundred or so calls per year often get up to 25 years from a pumper, though the technology is admittedly not up-to-date. Likewise, busy downtown fire stations in some urban communities move their engines out of front-line status in as little as 8 years.

The reality is that it may be best to establish a life cycle for use in the development of replacement funding for various types of apparatus; yet, apply a different method (such as a maintenance and performance review) for actually determining the replacement date in real life, thereby achieving greater cost efficiency when possible. GFD has generally adhered to commonly accepted industry standards for vehicle replacement scheduling. First, service lives have been recognized as follows:

- Engines 15 years
- Ladders/Quints 20
- Ambulances 10 years
- Type VI (brush) engines 15 years
- Staff vehicles 8 years

Further, the department has recognized that service time is not the only factor that should be considered in deciding when a vehicle needs to be replaced. Planning should also be based on an annual

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<sup>8</sup> *NFPA 1901: Standard for Automotive Fire Apparatus*, 2009 edition.

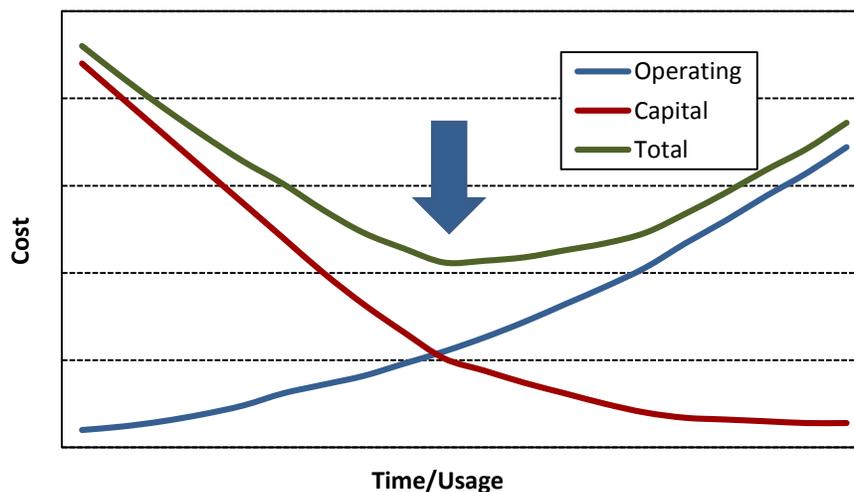
evaluation system; assigning points relative to observations that are revisited annually as a part of the budget process. The criteria evaluated are:

- Reliability
- Maintenance Cost
- Condition

ESCI reviewed the vehicle replacement planning documentation provided and finds that GFD has not established a fully adequate and well developed strategy. We offer the following as a general discussion to provide some input and recommendations on vehicle replacement approaches.

A conceptual model that may be used when a replacement cycle is considered is the *Economic Theory of Vehicle Replacement*. The theory states that, as a vehicle ages, the cost of capital diminishes and its operating cost increases. The combination of these two costs produces a total cost curve. The model suggests the optimal time to replace any piece of apparatus is when the operating cost begins to exceed the capital costs. This optimal time may not be a fixed point, but rather a range of time. The flat spot at the bottom of the total curve in the following figure represents the replacement window.

**Figure 63: Economic Theory of Vehicle Replacement**



Shortening the replacement cycle to this window allows an apparatus to be replaced at optimal savings to the department. If an agency does not routinely replace equipment in a timely manner, the overall reduction in replacement spending can result in a quick increase of maintenance and repair

expenditures. Officials who assume that deferring replacement purchases is a good tactic for balancing the budget need to understand two possible outcomes that may happen because of that decision:

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

Regardless of its net affect on current apparatus costs, the deferral of replacement purchases unquestionably increases future replacement spending need.

As stated above, GFD has recognized and practiced vehicle replacement schedule on an as-needed basis and is considered and funded in a part of the annual fiscal year budget process. As a point of comparison to this approach, the following replacement schedule was developed for reference.

The schedule is based on the following service life estimates:

**Figure 64: Apparatus Life Expectancies**

Vehicle Type	Life Expectancy	Replacement Cost
Ambulance	10	\$155,000
Light Rescue Truck	10	\$140,000
Med Rescue Truck	15	\$350,000
Custom Pumper	15	\$550,000
Ladder	20	\$1,200,000
Wildland	15	\$140,000

Using the above, the following replacement schedule was developed.

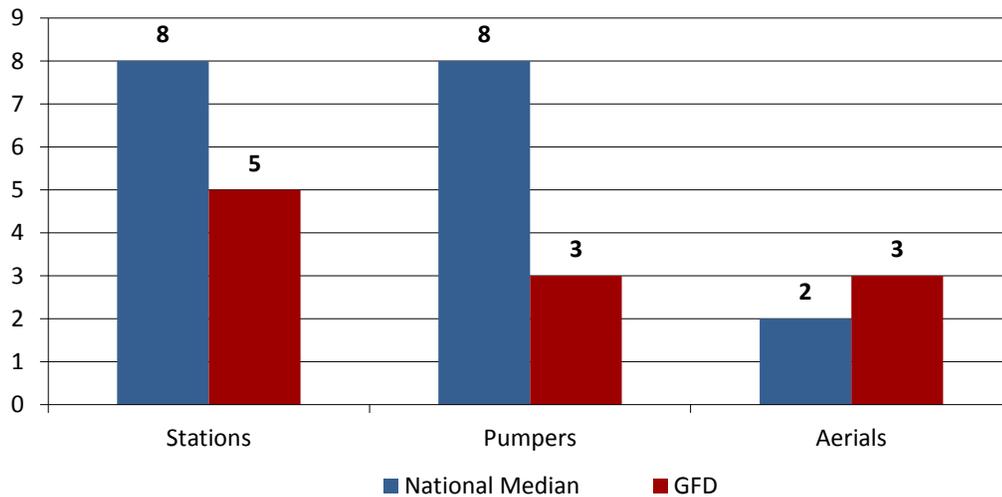
**Figure 65: Apparatus Life Expectancies**

Unit	Year	Replacement Cost	Annual Fund Contributions	Current Cash Requirements	Current Age	Life Expectancy	Replacement Year
Engine 1	2009	\$550,000	\$36,667	\$183,333	5	15	2024
Engine 1	2009	\$550,000	\$36,667	\$183,333	5	15	2024
Truck 1	2013	\$900,000	\$45,000	\$45,000	1	20	2033
Medic 1	2009	\$155,000	\$15,500	\$77,500	5	10	2019
Engine 2	2007	\$550,000	\$36,667	\$256,667	7	15	2022
Engine 3	2012	\$550,000	\$36,667	\$73,333	2	15	2027
Medic 3	2012	\$155,000	\$15,500	\$31,000	2	10	2022
Quint 4	2006	\$900,000	\$45,000	\$360,000	8	20	2026
Rescue 56	2005	\$350,000	\$23,333	\$210,000	9	15	2020
Quint 5	2009	\$900,000	\$45,000	\$225,000	5	20	2029
Medic 5	2009	\$155,000	\$15,500	\$77,500	5	10	2019
Brush 56	2002	\$140,000	\$9,333	\$112,000	12	15	2017
<b>TOTALS</b>			<b>\$324,167</b>	<b>\$1,651,333</b>			

A fully funded capital replacement program will ensure apparatus is replaced in an appropriate time frame that ensures a productive and dependable life cycle. In addition, this type of funding and replacement program will reduce erratic and significant repair costs based on fleet aging and minimize fluctuation in the vehicle maintenance operational and capital replacement budget.

In comparison to other departments serving similar populations across the country, the department is lower in all 3 categories, regarding the numbers of stations, engines and aerial apparatus as shown in the figure below. These fluctuations and deviations are consistent with the unique and local risks faced by the GFD. Specifically, the city of Grapevine has a fairly small geographic footprint with high-density populations and resort communities. It does not require as many fire station and resource distribution locations as seen in jurisdictions serving similar populations over a larger geographic area.

**Figure 66: Benchmark Comparison of Capital Assets**



Based on the available benchmark data, GFD is lower in apparatus count to the national median for stations and engines/pumps. However, the department maintains a higher number of reserve apparatus than is typically found and, were those units to be added to the above chart, the department would be much closer to the medians.

To put the chart in perspective, the disclaimer for this benchmark comparison is simple. The data to create this benchmark is published by the NFPA based on peer surveys sent to each fire department identified within the NFPA database. The data is not validated in any way and is only presented here as a means to benchmark GFD based on the available data. The comparison is based purely on population and does not consider geography or type of department (career versus volunteer/paid-on-call) or whether or not the department provides transport EMS. Further discussion related to distribution of physical resources will be provided in a later section of this report.

**Key Recommendations:**

- Complete a master facility plan to determine facility upgrades, replacement options, funding and timing.
- Consider bond measure for essential facility upgrades and construction.
- Establish approved replacement schedule for all apparatus types and capital equipment.
- Establish and fund a comprehensive capital replacement program.



## Future System Demand Projections

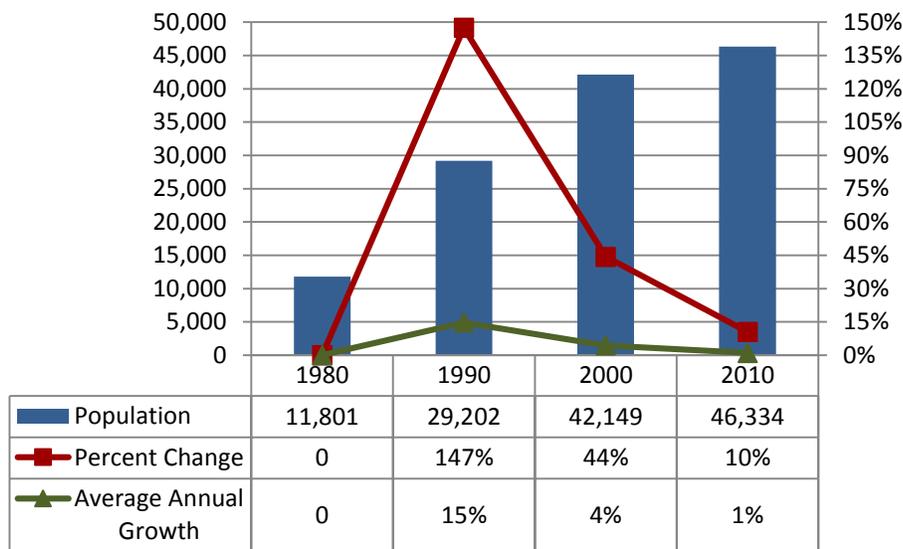
### POPULATION GROWTH PROJECTIONS

In this section, ESCI projects and analyzes future system demand in the GFD service area. Future demand is largely dependent on changes over time to population, demographics, economics, and the local infrastructure. This analysis utilizes data from the US Census Bureau, the Texas State Data Center, the Texas Water Development Board, and local demographic data.

#### Population History

The US Census Bureau estimates the population of Grapevine in 2013 as 48,447 (the latest estimate available). The figure below illustrates historical population change from 1980 to 2010.

**Figure 67: GFD Historical Service Demand, 2009 through 2013**

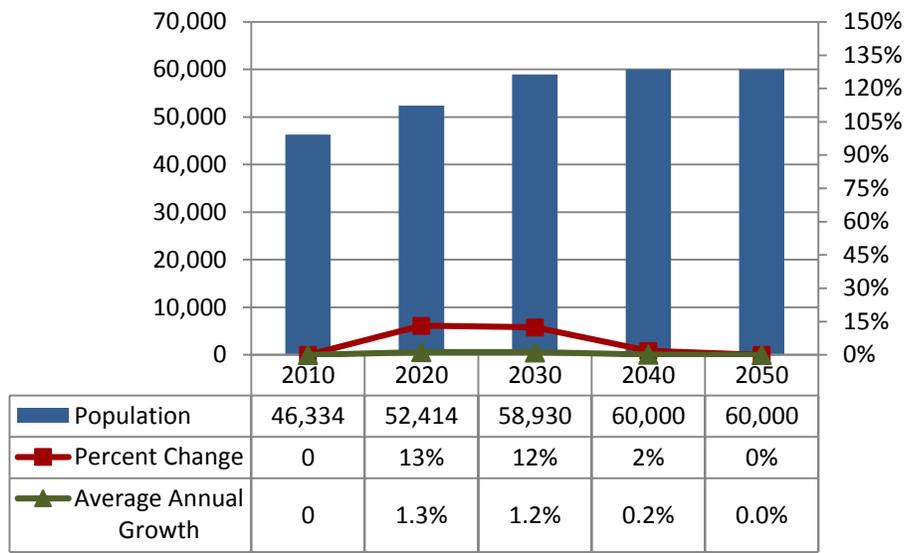


The previous figure demonstrates the rapid growth in Grapevine from 1980 to 2010. The population of Grapevine has more than quadrupled since 1980. Grapevine continued to see a significant increase in population between 1990 and 2010. Although the rate of growth has slowed, a review of census data reveals that the average annual growth rate (AAG) between 2010 and 2013 was approximately 2 percent.

**Population Projection**

In the following figure, ESCI presents a projection of population growth in Grapevine through 2050. The projection was prepared by the Texas Water Development Board (TWDB), and uses historical data, the latest Texas State Data Center population projection, and local development data.

**Figure 68: TWDB Population Projection for Grapevine, 2010-2050**

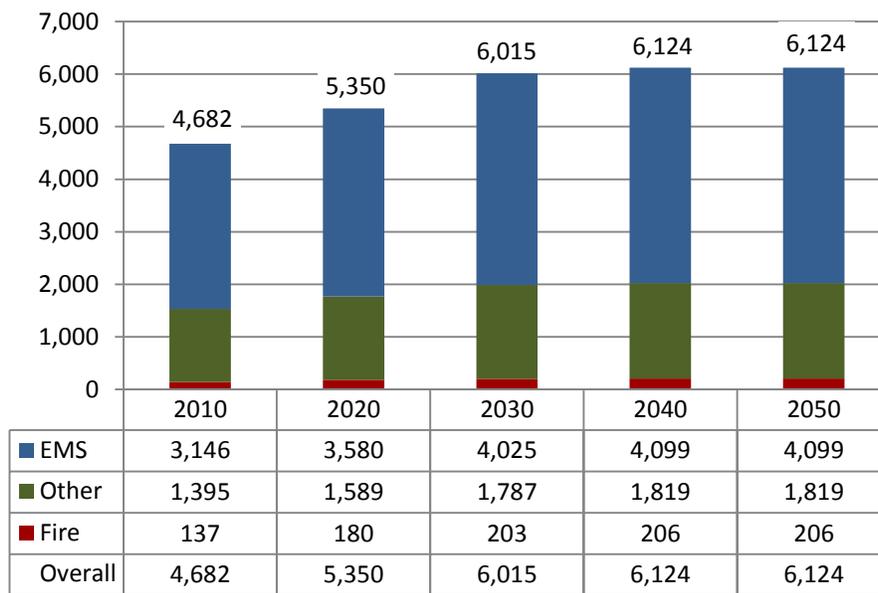


The TWDB prepares population projections for communities and regions throughout Texas to predict future water use and needs. This population projection shows the population of Grapevine increasing through 2040, to a population of 60,000. The resident population remains flat at 60,000 through 2050 and beyond, according to the TWDB projection. This is the result of the city reaching build-out, the point at which there is no remaining land available for residential development within the boundaries of Grapevine.

**SERVICE DEMAND PROJECTION**

In evaluating the deployment of facilities, resources, and staffing, it is imperative that consideration be given to potential changes such as population growth that can directly affect emergency workload. Changes in service demand may require changes and adjustments in the deployment of staffing and capital assets in order to maintain acceptable levels of performance. For the purposes of this study, ESCI uses the TWDB population projection for Grapevine and multiplies this by a per capita incident rate derived from historical service demand. This analysis provides a picture of potential service demand through 2050 based on population growth in Grapevine. The results are shown in the following figure.

**Figure 69: GFD Projected Service Demand by Incident Category, 2010-2050**



The projected population growth is applied to the historical service demand data (summarized as Fire, EMS, and Other incident categories) to calculate projected service demand for 2010 through 2050. Fires (includes all types of fires) demonstrate the lowest rate of increase. This reflects a national trend and can be attributed to improvements in building codes and fire prevention over the last several decades. EMS is expected to continue to be the predominant factor affecting service demand. Other emergency service calls not involving actual fires are predicted to increase in part due to the use of automatic alarm systems that decrease the number of actual fires, but increase service demand.

It is not the intent of this study to be a definitive authority for the projection of future population in the service area, but rather to base recommendations for future fire protection needs on a reasonable association with projected service demand. Since human activity is a primary driver of emergency service demand, it is important to have a population-based projection of the future size of the community.

ESCI regards the projection presented above as a conservative estimate of future service demand in the Grapevine area. Fire department EMS providers across the nation continue to see increased demand for EMS services. Local demographic and economic data indicates that although Grapevine will reach a maximum resident population of 60,000 as soon as 2040, commercial development and employment opportunities will continue to increase the daytime population in the city. These factors are difficult to quantify and beyond the scope of this project. However, it is clear that the Grapevine Fire Department

will continue to provide emergency services to a growing service population. Planning should begin now to maintain the resources needed to meet the continuing demand for services.

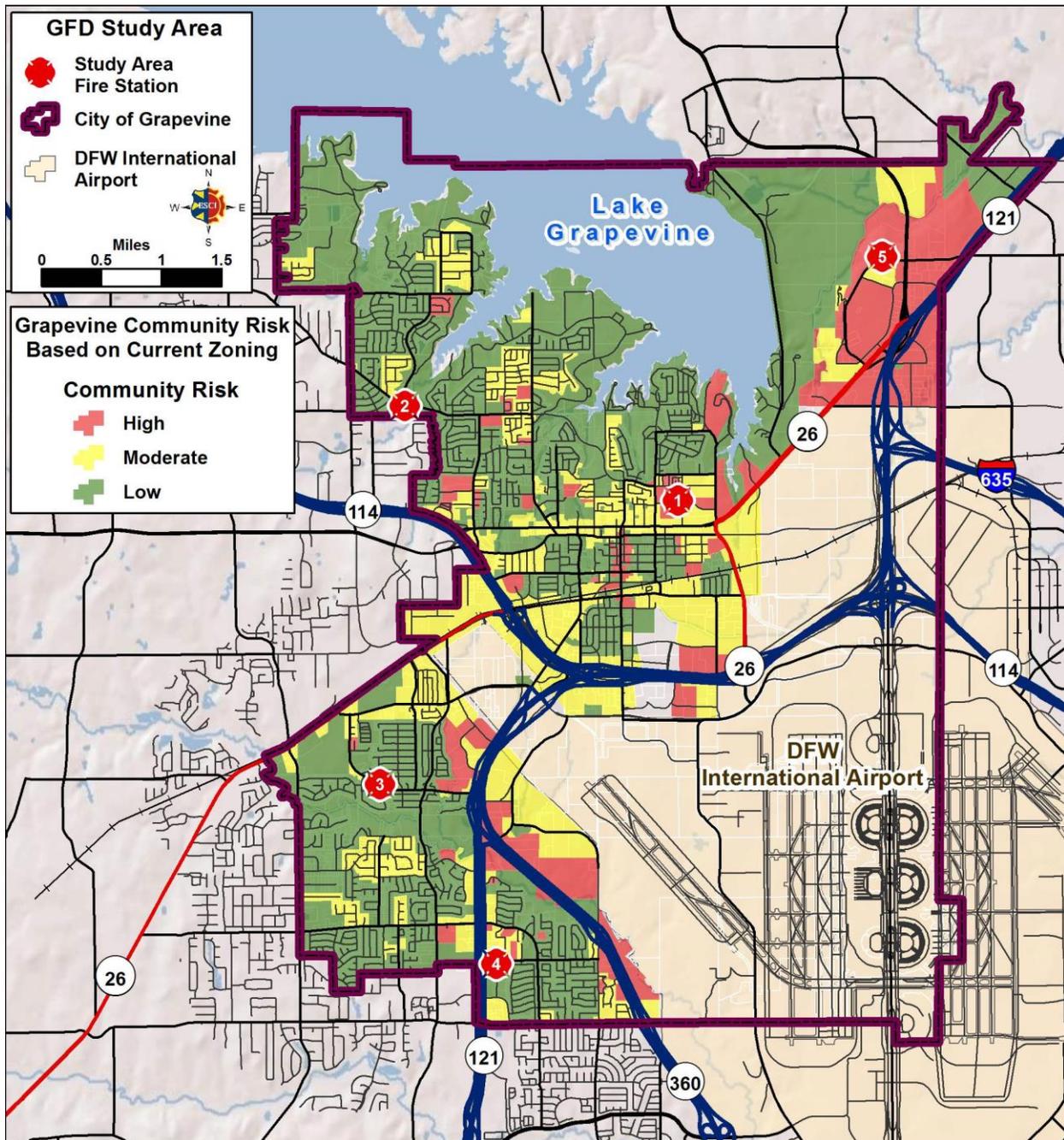
#### COMMUNITY RISK ANALYSIS

ESCI uses GIS software and current zoning classifications in the city of Grapevine to examine current land use. Risk is assigned to the zoning classifications to present a view of relative community fire and life risk.

- Low Risk – Areas zoned and used for agricultural purposes, open space, low-density residential and other low intensity uses.
- Moderate Risk – Areas zoned for medium-density single-family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High Risk – Higher-intensity business districts, resort and conference centers, mixed-use areas, high-density residential, industrial, warehousing, and large mercantile centers.

The following map displays community risk within Grapevine using the criteria listed above.

Figure 70: Community Risk



Risk based on land use and zoning classifications within Grapevine is diverse. Low risk areas composed of mainly single-family dwellings are mixed with areas categorized as moderate risk; composed of commercial and higher density multifamily dwellings. The business areas in the older core area of Grapevine: large commercial development such as the Grapevine Mills area, high-density multifamily dwellings, mixed-used areas, and most industrial developments are classified as high risk.



## Future Delivery System Recommendations

Although the foregoing sections of this report focused primarily on the conditions that currently exist within the GFD, the intent of this study is to combine that evaluation with a look into the future and provide policy makers with information necessary to carry the system forward over the next 10 to 20 years. This portion of the report provides recommendations related to the deployment of facilities, apparatus, and personnel with a focus on future service delivery and an improvement in overall efficiency within the system.

### DEVELOPMENT OF RESPONSE STANDARDS AND TARGETS

Throughout this report, ESCI has emphasized the importance of the establishment of response performance metrics by the GFD. Once established, these standards establish measurable goals for service delivery, which then form the baseline upon which planning for deployment of resources is based. Absent these processes, the organization is not able to determine where it needs to go, nor is it able to know when it is achieving its goals and meeting its community's expectations.

Response standards must be developed by the individual community based on the expectations of elected officials and citizens, then balanced against the financial aspect of what a community is able and willing to afford. For this reason, ESCI cannot establish these standards for GFD, but rather will provide guidance and examples of what we consider to be acceptable metrics.

### *Critical Tasks, Risk, and Staffing Performance*

As explained earlier, tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants, and their location, status, and ability to take self-preservation actions. Life safety-related tasks involve search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent actions, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently.

These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention

The fire service assesses the relative risk of properties and occurrences based on a number of factors. Properties with high fire risk often require greater numbers of personnel and apparatus to effectively mitigate the fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk involved. The level of risk categories used by Commission for Public Safety Excellence (CPSE) relate as follows (See Figure 71: Grapevine Relative Community Risk Map):

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

The CPSE has a sample critical tasking analysis for the number of personnel required on scene for various levels of risk. This information is illustrated in the following figure as an example of critical tasking only and is not intended to conclusively define the actual personnel necessary based on risk.<sup>9</sup>

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<sup>9</sup> Note: Based on examples provided in the publication Commission on Fire Accreditation International, Inc. (now Center for Public Safety Excellence), *Creating and Evaluating Standards of Response Coverage for Fire Departments*, 4th edition.

**Figure 71: Sample of Critical Task Staffing by Risk**

Sample Critical Tasking Analysis Firefighter Personnel Needed Based On Level of Risk				
	Structural Maximum Risk	Structure Significant Risk	Structure Moderate Risk	Non- Structure Low Risk
Attack line	4	4	2	2
Back-up line	4	2	2	(2)
Support for hose lines	4	3	2	
Search and rescue	4	4	2	
Ventilation	4	2	2	
Rapid intervention team	4	4	2	
Pump Operator	2	1	1	1
2nd apparatus/ladder operator	1	1	(1)	
Command	2	1	1	1#
Safety	2	1	1#	
Salvage	4			
Rehabilitation	2			
Division/group supervisors	(2)			
<b>Total</b>	<b>37-39</b>	<b>23</b>	<b>14-16</b>	<b>3-6</b>

*() Indicates tasks may not be required at all such incidents.*

*# Indicates task may, at times, be completed concurrently with other position.*

The first 15 minutes is the most crucial period in the suppression of a fire. How effectively and efficiently firefighters perform during this period has a significant impact on the overall outcome of the event. This general concept is applicable to fire, rescue, and medical situations.

Critical tasks must be conducted in a timely manner to control a fire or to treat a patient. Three scenarios of commonly encountered emergencies are routinely utilized by fire departments when conducting field validation and critical tasking: a moderate risk structure fire, a traffic collision with a trapped victim, and a cardiac arrest. Each scenario is conducted using standard operating procedures and realistic response times based on actual system performance. Each scenario is normally run multiple times with a variety of fire companies to validate and verify observations and times.

To further validate the analysis process, results are compared with records from actual working fires and similar incidents from previous years. Overall results are reviewed to determine if the actions taken within the early minutes of an incident resulted in a stop loss or not, and if additional resources were

required. The critical task analysis process demonstrates the rate in which the current deployment plan results in stopping loss a high percentage of time within initial critical time goals.

Again, critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation, stop loss, and to perform necessary tasks required for a medical emergency. GFD is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner.

*All Risk Critical Resource Tasking*

Fire departments respond to many incidents other than structure fires, including hazardous materials (dangerous goods) releases, motor vehicle collisions, basic and advanced life support medical emergencies, and non-structural fires. Personnel responding to these types of incidents should be assigned tasks similar to structure fires.

The following figures are provided as an example for these types of incidents, although ESCI recommends GFD conduct field validation exercises with its crews to verify the critical tasking analysis provided. After field validation is complete, the department may find that the critical tasking can be adjusted appropriately upward or downward for each incident type.

**Figure 72: Non-Structure Fire Critical Tasking**

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
<b>Total</b>	<b>4</b>

**Figure 73: Hazardous Materials Incident Critical Tasking**

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

**Figure 74: Motor Vehicle Collision with Entrapment Critical Tasking**

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

**Figure 75: Emergency Medical Incident Critical Tasking**

Task	Personnel
Ambulance Transport	2
First Responder	4
<b>Total</b>	<b>6</b>

The aforementioned minimum staffing criteria should be used in setting specific service level objectives for each of the incident types.

### *Response Time Performance Objectives*

The process of setting response time performance objectives will include two sets of questions:

- What are the expectations of the community and elected officials in regard to initial response times of the fire department to an emergency incident? What is the public’s perception of quality emergency services where response time is concerned?
- What response time performance would be reasonable and effective in containing fire, stopping the loss, and saving lives when considering the common types of incidents and fire risks faced by GFD?

To initiate the process of considering the expectations of the customer, the historical travel time and loss history needs to be examined from the data that was submitted by GFD. Then, historical service levels are compared to known and anticipated service demand and community growth projections. Considering these projections, suggested response time standards are created to ensure GFD is meeting local service demand expectations in accordance with relevant industry standards and best practices.

Grapevine is a full career department and therefore references the industry standard for the Center of Public Safety Excellence (CPSE) and the *NFPA 1710* performance measures. These response time measures are displayed in the following table:

**Figure 76: NFPA 1710 Performance Measurement Recommendations**

Response Element	NFPA Recommendation
Call Processing <sup>10</sup>	0:60 @ 95 <sup>th</sup> %
Turnout	0:60 @ 90 <sup>th</sup> % for Medical 1:20 @ 90 <sup>th</sup> % for Fire
Response	4:00 @ 90 <sup>th</sup> %
Effective Response Force	8:00 @ 90 <sup>th</sup> %

*NFPA 1720* provides direction for variable density response performance measures that are intended for volunteer or combination fire departments, but can be used as guidelines for career departments that provide services to a wide range of population densities and geographic areas.

<sup>10</sup>*NFPA 1221: Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.*



**Figure 77: Additional NFPA Response Performance Objectives by Population Density Categories**

Response Element	Response Performance Objective
Call Processing	0:60 @ 95 <sup>th</sup> %
Turnout	0:60 @ 90 <sup>th</sup> % for Medical 1:20 @ 90 <sup>th</sup> % for Fire
Urban Zone	4:00 @ 90 <sup>th</sup> Percentile
Suburban Zone	8:00 @ 80 <sup>th</sup> Percentile
Rural Zone	14:00 @ 80 <sup>th</sup> Percentile

Although NFPA performance recommendations are considered an industry standard, departments working with their governing bodies have the authority to implement performance measures that are better suited to their communities. This is known as the Authority Having Jurisdiction (AHJ). The GFD 90<sup>th</sup> percentile for call processing is 1 minute 30 seconds, turnout time is 2 minutes 9 seconds and travel time is 5 minutes 31 seconds resulting in a 8 minute and 8 second overall response time. Given the current response time performance, ESCI recommends that Grapevine adopt performance measures that, for the most part, adhere to *NFPA 1710/1720* standards methodology although some of the adopted measures deviate from those standards as illustrated below.

To most accurately reflect system performance in accordance with identified risk, ESCI recommends tiered response performance objectives for the city based on population density. This methodology will effectively segregate the service area into three distinct response zones: urban, suburban, and rural (Figure 84: GFD 2010 Census Data Population Density Map).

The first “example” is the “first due” response of a single incident utilizing standard reflex time from dispatch to arrival 90 percent of the time:

**Figure 78: First Due Response Standard Example**

First Due, Single Unit Response	
Urban (> 1000 per square mile)	7 minutes to 90 percent of incidents
Suburban (500-1000 per square mile)	11 minutes to 90 percent of incidents
Rural (<500 per square mile)	15 minutes to 90 percent of incidents

The next example represents a first alarm response to a moderate risk structure fire, utilizing standard reflex time from dispatch to arrival 90 percent of the time:

**Figure 79: First Alarm Response Standard Example**

First Alarm, Response of Four Engines, One Truck and One Battalion Chief	
Urban (> 1000 per square mile)	11 minutes to 90 percent of incidents
Suburban (500-1000 per square mile)	19 minutes to 90 percent of incidents
Rural (<500 per square mile)	23 minutes to 90 percent of incidents

The above discussion is intended to provide the GFD with the information necessary to begin the process of establishing response standards and targets. The department is encouraged to begin the process as soon as possible, especially in light of the potential for a steady increase in population density in demand and services provided.

## SHORT AND MID-TERM STRATEGIES

The previous sections of this report detail a considerable volume of observations and recommendations relating to GFD current conditions relating to management and operations. The process of understanding, prioritizing and implementing the recommended enhancements can be daunting simply due to the amount of work that may be involved. To help the organization navigate through the process, the following discussion further defines the short and mid-term priorities that ESCI has identified.

### *Response Deployment*

Growth and increased city activity projections for Grapevine continue to be strong and current activity supports that picture. ESCI concludes that while the projected growth and expected service demand will likely justify an increase in response resources in the future, there is not an urgent need for new engine or truck company resources or an additional fire station today. Response times are tracking within acceptable ranges and incident outcomes are generally acceptable. However, there is an identified deficiency in the GFD's ability to provide an effective firefighting force at times. The following are recommendations that will enhance current response and service delivery levels and efficiencies until additional resources are deemed necessary by increased risk and service demand.

- The GFD should conduct a process as recommended in the *“development of response standards and targets”* portions of this report to develop and adopt response time standards that address community risk and service expectations. The adopted standards should clearly define risk (urban, suburban, rural), response times (concentration), distribution (effective firefighting force), measurable performance metrics (90 percentile) and outcomes (e.g. cardiac arrest survival, fire loss per \$100 assessed value, property value saved, annual fire loss, etc.). The GFD should also consider completing a Standard of Cover study to build off this organizational analysis that can further define fire and EMS deployment models, surge capacity, and service delivery options.
- If the GFD chooses to adopt NFPA 1710 standards, the GFD will need to address the assembling of an effective firefighting force to meet this standards (see figures 38 and 39). Enhanced automatic aid and cooperative service agreements in conjunction with 4-person staffing should be considered as equally important elements of assembling an effective firefighting force in accordance with the community risk and adopted GFD standards. It is recommended that a staffing plan be developed that incrementally addresses staffing deficiencies that are identified and validated through 90 percentile compliance with adopted NFPA 1710 effective firefighting

force and response time standards. It is further recommended that enhanced cooperative service and automatic aid agreements be developed, implemented, and measured before development of the recommended staffing plan. The following elements of current and future automatic aid and cooperative service agreements should be addressed as soon as possible:

- In the existing mutual aid response agreements utilized by the GFD and surrounding fire jurisdictions, the first GFD company is arriving in a timely manner. However, the challenge can be traced to travel times for next due non-GFD companies. Specifically, delays in notification and dispatching of resources are present based on extended call processing time, separate dispatch centers, and separate computer aided CAD systems that are not integrated. Information exchanges between the centers are being relayed by phone. It is recommended that a CAD interface with agencies routinely responding into Grapevine be pursued to eliminate delays and duplication of information flow to and from responding units.
- There is opportunity to enhance automatic aid by implementing a comprehensive cooperative service agreement with boundary drops between fire agencies such as Flower Mound, Lewisville, DFW, Irving, and other adjacent agencies to provide increased unit concentration and reliability in outlying portions of the city. This can also assist with the assembling of an effective firefighting force for resort, conference, and downtown regions that have high levels of service demand. Currently, unit requests for existing mutual aid agreements are based on CAD recommendation utilizing geographic coordinates/recommendations and run cards with a notification/request for response by phone. The technology does exist to utilize GIS-based CAD recommendations for the closest unit to respond. This technology should be accessed and boundary drops implemented where practical. These response assignments can be further improved through expanded use of a traffic signal preemption system that will work for all responding units regardless of the jurisdiction. This is especially important for companies that must travel congested arterials and significant traffic volume.
- The GFD currently runs two quint apparatus (apparatus with a pump, aerial ladder, hose, and tank), which have extensive equipment, training, and maintenance needs as well as a ladder truck. ESCI has concluded maintaining one quint and the existing “truck company” at the centrally located station (Station 1) and enhanced aerial apparatus automatic aid capabilities will result in adequate aerial apparatus and truck company coverage, optimum performance,

and significant cost savings. It is recommended the second quint at Station 2 be replaced with an “engine” equipped to meet ISO criteria in conjunction with the rescue unit as a ladder support unit. This configuration will allow for more effective vehicle utilization, reduced purchase and maintenance costs, and maintain the current excellent GFD ISO rating of two. This will also assist the department in the operation and utilization of the regional heavy rescue unit.

- Current dispatch call-processing time exceeds the 60-second industry standard goal by 30 seconds at the 90<sup>th</sup> percentile. Most modern dispatch centers are regional multi-agency, multi-disciplinary (law enforcement, Fire, EMS) agencies; and call-processing time is generally not under the direct control of the fire department. Fire department leaders need to be aware of call processing time and work cooperatively with the dispatch agency to reduce call processing times so they meet adopted GFD standards.
- Turn out times exceed the 90-second industry standard by 30 to 45 seconds at the 90<sup>th</sup> percentile. An important aspect of optimizing resource utilization and enhanced service levels is the pursuit and maintenance of short turn out times. ESCI recommends turn out times for all apparatus be posted monthly for department members to review. The GFD should conduct monthly review and feedback forums regarding turn out times with suggestions and policy adjustments on how to reduce turn out times until the GFD feels they have optimized this response component.

### *Emergency Medical Services (EMS)*

Advanced Life Support (ALS) emergency medical transportation is provided by GFD. The Grapevine system includes three ALS ambulances staffed by two credentialed paramedics under medical supervision strategically stationed throughout the city. In addition to the ALS ambulances, there are six first responder ALS engine/truck companies that respond within their service areas to provide rescue and clinical care.

GFD is the primary provider of EMS within its service area, and there is one contract employ dedicated to the planning, delivery, evaluation, and overall effectiveness of GFD resources. The EMS delivery system overall within the city is very well integrated and provides a high level of EMS. GFD has not established identified outcome-based EMS system performance benchmarks, which could serve as a measure of efficiency and effectiveness.

EMS response constitutes a very significant portion of GFD's response activity and is also a critically important service. It is evident that the GFD would benefit from an increased level of oversight, supervision, and management by full time GFD employees. It is recommended that the GFD pursue an "EMS Shift Supervisor" position to provide prospective, concurrent, and retrospective medical control. ESCI recommends GFD enhance the current EMS program to have adequate oversight and initiate a planning process that will:

- Identify and assess system performance benchmarks, training requirements, equipment requirements, and skills gaps.
- Incorporate a blended strategy of system integration, outcome based performance measures, training, and skills development and assessment.
- Prioritize implementation of a Medical Priority Dispatch System (MPDS) and an appropriate tiered response to medical calls for service (right resource, right patient, right time).
- Incorporate first responder Peak Activity Units (PAUs) to include BLS or ALS Quick Response Units to maintain adopted response time standards.
- In coordination with local health care providers and related stakeholders, conduct a community needs assessment to identify future community paramedicine and health care services that can and should be provided by the GFD.
- Conduct a transportation billing "rate study" to increase revenue and pursue a cost neutral ambulance transportation service. GFD should ensure the rate study is in compliance with Texas Medicaid Provider Procedures Manual (TMPPM) that utilizes the Texas Medicaid Healthcare Partnership (TMHP) claim system. This rate study should be conducted in accordance with the Federal Register, 2 CFR 200 cost determination, billing rates, and billing requirements.
- Work with the local cooperative partners to fully integrate, training, equipment/supplies, quality assurance, and EMS administrative functions.
- Provide strong direction for the program; and
- Appropriately staff the program with the establishment of shift EMS supervisors or lead personnel to ensure adequate oversight and supervision are present for current and future EMS delivery needs.
- Train and equip EMS Shift Supervisors to serve as a first responder ALS unit, shift safety officer, infectious control officer and or IC Aid as needed

### *Organizational Development*

GFD is in a state-of-transition, in part due to the progressive vision and leadership of the current executive team but also because they are preparing to transition to a new leadership team in the near future. As a result, the membership is in the process of navigating its way through a set of new priorities and paradigms, which is often a difficult process.

To assist in the transition, ESCI recommends internal communications be enhanced in an effort to increase ownership in decisions and appreciation for organizational changes. The establishment of internal advisory committees is recommended in areas such as:

- Safety Committee
- Training Advisory Committee
- Operations/Special Operations Committee
- Apparatus Committee
- EMS Committee

Committees should include the participation and oversight of a departmental chief officer as well as labor group representation.

ESCI recommends the new executive team initiate a strategic planning process. This process should be community and organizationally-based and build off of the 100-day observations and identified issue and opportunities. The process should include at a minimum:

- Community, City, and Organization input town hall meetings
- Joint labor management key stakeholder strategic planning team
- Mission statement development or refinement
- Vision statements
- Values
- Identified department initiatives
  - Goals
  - Objectives
  - Critical Tasks
- Strategic Plan roll out strategy and operational plan and visible progress tracking mechanisms

### *Training*

GFD has devoted significant focus and attention to the enhancement of training programs and standards within the organization. The program contract staffing, however, lacks the depth necessary to handle the significant training standards and mandates that meet current industry standards and complex service delivery models such as the GFD. ESCI believes the existing training staff model will rapidly exceed its capabilities based on anticipated service demand growth over the next 10 years combined with the need to handle the ongoing training, skills maintenance and recertification, and the expectations for professional development within a dynamic professional fire service organization.

Successful fire and EMS training programs typically incorporate full time staff that provides a leadership/managerial component and a delivery and evaluation program. ESCI recommends GFD work to ensure effective incorporation of a full time training position and both components within their training program.

ESCI recommends that GFD undertake a comprehensive planning process that will:

- Identify and assess training requirements, developmental needs, and skills gaps.
- Establish, implement, and manage a comprehensive training and professional development program for all GFD employees.
- Incorporate a blended strategy of education, training, and practical skills development and assessment.
- Provide strong leadership for the program.
- Provide effective training delivery and skills assessment; and
- Appropriately staff the program with the addition of at least one FTE training position.

Within the training program, ESCI recommends GFD specifically explore additional cooperative services initiatives with surrounding departments in the areas of recruit training, Multi-Company Tactical Operations (MCTO), technical rescue programs, incident command system (NIMS) training, and special operations training e.g. hazardous materials, technical rescue, etc.

## RECOMMENDED LONG-TERM STRATEGY

The following long-term recommendations are complex and significant in nature. They will require significant policy direction, elected official involvement, and financial commitment. As this report is intended to serve the city of Grapevine in its long-range fire service planning for 10-15 years, it is not anticipated these recommendations will be completed quickly. While study and data to address these recommendations may be initiated quickly, it is anticipated these recommendation will most likely be considered and acted upon over the next 3 to 10 years.

### *Fire Station Upgrades and Replacement*

ESCI toured all 5 of the Grapevine Fire stations. The fire station tours nor this report is intended to be a comprehensive facility evaluation or master planning document, it is intended to provide general observations and recommendation for consideration and planning over the next 10 to 15 years.

The most significant observation was the condition and suitability of Station 2 and Station 3. These two small stations were constructed in 1981 and 1982 to accommodate a very different organization than what currently exists. The department has had to adapt and to crowd additional personnel into a space that it was not originally designed to quarter. At fire Station 2 there is evidence of potential foundation issues as demonstrated by cracked concrete bay floors. The cracks also extend to the exterior wall. Expansion on either the Station 2 or 3 site does not appear to be a viable option due to the small lot on which they are situated (ESCI's observation is modern fire station site requirements for dual apparatus stations have a minimum range of 1 to 2 acres).

The administrative functions at Station 1 are to be relocated to the new Public Safety Building. The current crew and operational areas are to be configured into the vacated space. During the remodel there is an opportunity to address concerns and identified issues such as essential facility requirements, Americans with Disabilities Act (ADA), and dual-gender appropriate accommodations are expected to be addressed.

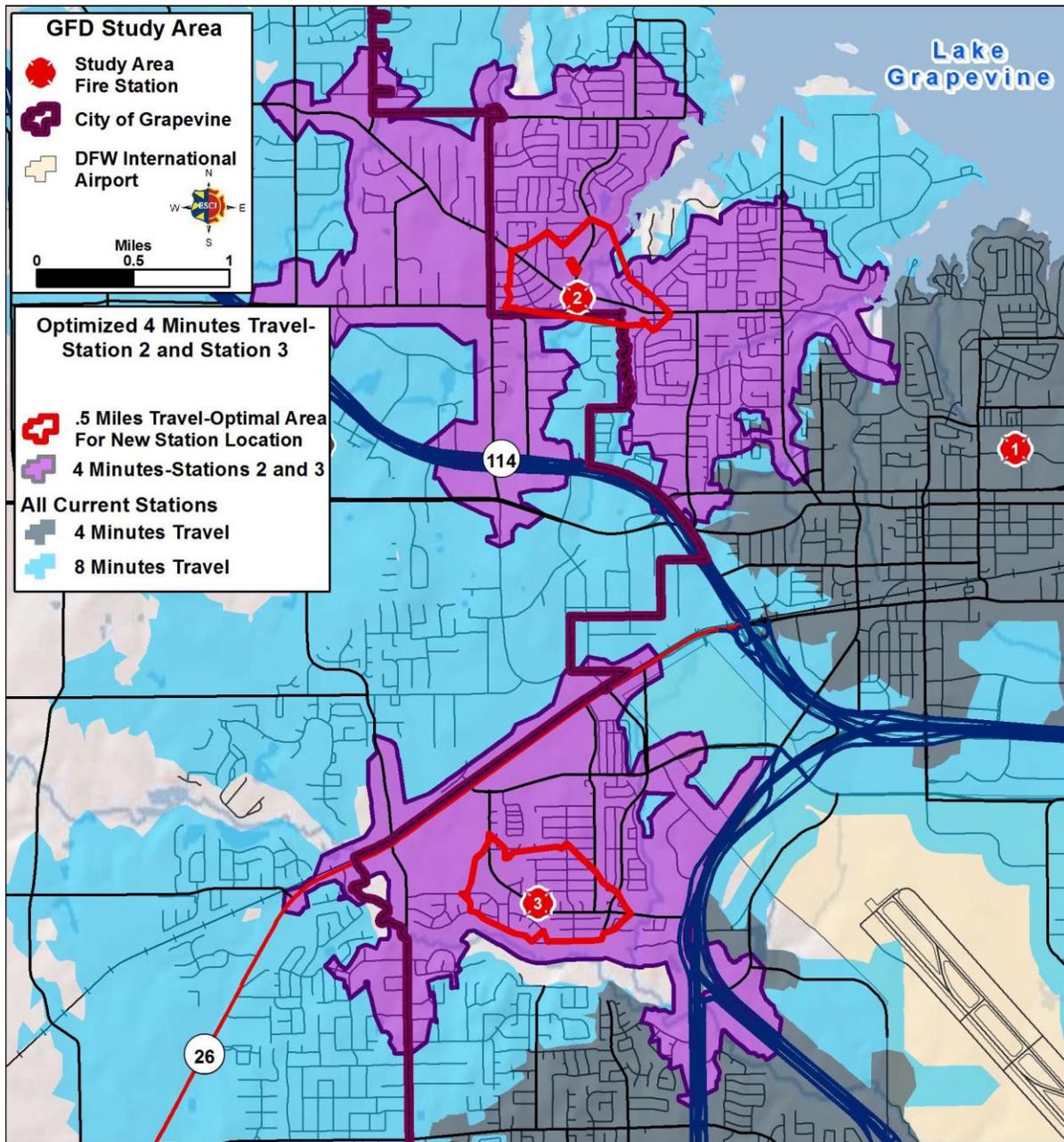
The two newest fire Stations, 4 and 5, are nearing 20 years old. The buildings are beginning to show signs of age and a need for greater maintenance. It is ESCI's observation that some updating is necessary in both stations to fully address the dual-gender and ADA issues. Station 5 appears to have signs of foundation issues that, if left unaddressed, may shorten the overall life cycle of the facility.

ESCI recommends three elements of a comprehensive Fire Department Facility Master Plan:

- Conduct a facilities study of the current fire stations and conditions that provide recommendations and costs to address current essential facility, ADA, dual gender, and industry safety and functionality best practice standards. The study should include evaluation and findings that address foundational, HVAC, and other capital systems with maintenance and replacement schedule recommendations.
- Conduct a fire station prototype study. A qualified architect firm utilizing a cross section of department members, fire administration, city representatives and other desired stakeholders should conduct this study. The study should address basic spatial and square footage requirements for single, dual, and headquarters apparatus configurations. The study should also address station functions; workflow modeling and room adjacencies resulting in a Grapevine station configuration standard. While exterior fire station elevations should vary, interior station lay out consistency can lead to economies of scale, enhanced productivity, and increased employee satisfaction.
- Establish a capital fire facility funding and finance strategy. Work with city staff to evaluate and develop a funding strategy for the upgrade and replacement of Grapevine fire stations. Based on the findings and development of fire station prototype requirements, a city (general or city capital Fund) or community (essential facilities bond program) should be established. As fire stations are normally amortized as 50-year assets and capital or debt financing is frequently limited, a phased or incremental approach to upgrade and replacement of fire stations is a common and often preferred approach.

While all GFD stations are located in a good geographic location to provide optimized response times, ESCI's believes the current lot/parcel configuration of Station 2 and 3 will not allow for appropriate modification or construction of a compliant and functional fire station that will meet the future emergency service needs for the city of Grapevine. The following displays a half-mile radius where ESCI recommends future site acquisitions for Station 2 and 3. These locations will maintain optimized response throughout the first in districts and not degrade citywide response capabilities.

Figure 80: Optimized Station Re-Location Area



The following two figures provide a breakdown of the cost to construct a 9,900 square foot fire station. The example is a cost projection for a fire station located in the market area of central Texas. While the city may choose different design, materials, square footage, and amenities, the illustration provides an idea of the costs to construct a modern fire station.

**Figure 81: Illustration Project Information**

• Projected Size – Square Feet	9,900
• Site Size	217,800
• Square Foot Cost	\$223.51
• Non-Building Costs	\$758,091
• Project Location	TX - Houston
• Project Date	June 2014
• Foundation	CON
• Exterior Wall	MAS
• Interior Wall	MAS
• Roof Type	MET
• Floor Type	CON

**Figure 82: Fire Station Construction Cost Illustration**

Targeted Building Costs			
Name	Percent	\$/ft^2	Cost
Bidding Requirements	0.78%	\$1.73	\$17,171
General Requirements	6.22%	\$13.90	\$137,758
Concrete	11.60%	\$25.93	\$256,969
Masonry	11.55%	\$25.82	\$255,895
Metals	6.29%	\$14.06	\$139,362
Wood & Plastics	15.45%	\$34.52	\$342,102
Thermal & Moisture Protection	4.49%	\$10.04	\$99,522
Doors & Windows	5.39%	\$12.04	\$119,267
Finishes	14.18%	\$31.69	\$314,020
Specialties	3.36%	\$7.51	\$74,367
Equipment	0.00%	\$0.00	\$0
Furnishings	0.16%	\$0.35	\$3,491
Special Construction	0.00%	\$0.00	\$0
Conveying Systems	0.00%	\$0.00	\$0
Mechanical	10.50%	\$23.46	\$232,502
Electrical	10.04%	\$22.44	\$222,347
<b>Total Building Costs</b>	<b>100.00%</b>	<b>\$223.51</b>	<b>\$2,214,774</b>

Construction costs vary widely with property acquisition, materials, and labor often being unknown until the time of a bid announcement. Over the last two-years, building costs have decreased significantly in Texas as with much of the rest of the Country. However, as the market recovers, costs are likely to return to their pre-recession levels.

### *Training Facility Development*

ESCI learned that hands-on training facilities are limited in the area. As a result, most training has to be completed using available buildings and local training locations. Consideration is recommended for the long-term development of a training site when funding and space becomes available.

Classroom instruction is an essential component of preparing emergency responders with knowledge and skills. A training facility or drill ground is a second indispensable element. Training facilities provide a controlled and safe environment to simulate emergencies and develop and test the skills of emergency workers.

*NFPA 1402: Guide to Building Fire Service Training Centers* is a standard that addresses the design and construction of facilities for fire training.<sup>11</sup> The document covers the features that should be considered when planning a fire training facility. Absent the availability of suitable training facilities, some fire departments may forego essential training.

Proficient emergency responders have confidence in their own abilities to handle the emergencies they encounter. Best practices suggest that emergency workers have regular access to training grounds for repetitive drills and to develop new skills. An effective and continuous training program results in safer, more efficient, and effective emergency operations.

Constructing a modern training facility to comply with industry standards concerning classrooms, practice grounds, training tower, live-fire building, and training props is a significant investment of capital. In addition, the on-going cost of operating and maintaining a training facility further advances the case for joint ownership.

GFD has a clear need, but will be challenged to finance the full build-out of the training facility on its own. The following alternatives are available: First, entering into a cooperative partnership with regional perspective, including not only fire agencies, but also law enforcement, emergency management, and other neighboring agencies can be valuable by sharing costs. Secondly, grants and private funding combined with in-kind donations can be pursued. The likelihood of success in receiving grants is dramatically increased when an effort is cooperative and inclusive of regional partners.

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<sup>11</sup> National Fire Protection Association, *Standard 1402: Guide to Building Fire Service Training Centers*, 2002 Edition.

Examples of recently constructed basic fire training facilities illustrated in the following figure show that these facilities need not be complicated nor ornate to be quite functional.

**Figure 83: Sample Training Grounds**



With in-kind donations and grant funding, these fire departments were able to construct the basic buildings with very limited agency expense.

### *Industry Best Practices and Standards*

As the GFD continues to move toward a high performing agency that meets or exceeds system best practices, ESCI recommends the following programs and accreditations be implemented and maintained. These programs will ensure the GFD is at the forefront of industry innovation and efficiencies. In addition, these best practices will position the department to minimize risk while maximizing opportunities for partnerships and grant programs as well as maintaining and/or increasing ISO ratings, supplement funding, resources, and services provided.

- **Texas Fire Chiefs Association Best Practices recognition:**  
An accreditation process that provides a well-defined, Texas Fire Chiefs Association recognized benchmark system for measuring the delivery of fire and emergency services in relation to Texas best practices.
- **Commission on Fire Accreditation recognition of accreditation:**  
An accreditation process that provides well-defined, internationally-recognized benchmark system for measuring the delivery of fire and emergency services in relation to industry best practices.

- **International Academies of Emergency Dispatch Accreditation (ACE Accreditation):**  
An established high standard of excellence for emergency dispatch, by providing the tools to achieve this high standard at both the dispatcher level through certification, and at the communication center level through the accreditation program.
- **Commission on Accreditation of Ambulance Services (CAAS Accreditation):**  
CAAS accreditation signifies that your service has met the "gold standard" determined by the ambulance industry to be essential in a modern emergency medical services provider. These standards often exceed those established by state or local regulation. The CAAS standards are designed to increase operational efficiency and clinical quality, while decreasing risk and liability to the organization.



## Conclusion

This document provides an enormous amount of technical data, much of which was provided by the department, and allows the reader to gain a clear understanding of the services provided by GFD as well as an indication of how *well* those services are being provided. The intent of this document is not intended to be a critical evaluation of the Organization but rather provide fire department personnel and city policymakers information from which to make informed decisions about the future of the department.

Based on information obtained throughout this process, GFD is functioning at a level commensurate with community expectations and are providing services to the city in line with adopted objectives. While Response Performance Analysis indicates that the department could improve, it is possible that the adoption of the tiered performance recommendations will show that the department is performing much better than presented here based on a single objective. Given the method of funding the fire department, the Organization is well resourced and should be commended for undertaking this project to initiate a formal plan for future service delivery.

ESCI began collecting data and information for this project in April 2014 and the analysis presented in this report is comprised of months of data review and evaluation including one-on-one interviews with department personnel, evaluation of internal documents, policies, rules and regulations, assessment of current service delivery, and the creation of projected service demand and alternative service delivery options.



## Appendix

### TABLE OF FIGURES

Figure 1: Service Area Map .....	11
Figure 2: Survey Table – Governance .....	12
Figure 3: Survey Table – Organizational Design.....	14
Figure 4: Grapevine Fire Department Organizational Chart.....	15
Figure 5: Survey Table – Service Area and Infrastructure.....	16
Figure 6: Comparison of Capital Resources per 1,000 Population .....	18
Figure 7: Survey Table – Operating Budget and Financial Resources.....	19
Figure 8: Cost per Capita.....	20
Figure 9: Survey Table – Emergency Response Type and Frequency .....	21
Figure 10: Incidents per 1,000 Population.....	22
Figure 11: Fires per 1,000 Population .....	23
Figure 12: Comparison of Fire Loss Per Capita .....	23
Figure 13: Survey Table – Mission, Vision, Strategic Planning, Goals and Objectives .....	24
Figure 14: Survey Table – Foundational Documents and Processes .....	26
Figure 15: Survey Table – Record Keeping and Documentation .....	32
Figure 16: Survey Table – Administrative and Support Staffing .....	34
Figure 17: Survey Table – Emergency Response Staffing .....	37
Figure 18: Survey Table – Staffing.....	37
Figure 19: Career Staffing per 1,000 Population .....	39
Figure 20: GFD Historical Service Demand, 2009 through 2013.....	41
Figure 21: GFD Percent Change by Incident Category, 2009 through 2013 .....	41
Figure 22: GFD Service Demand by Incident Category .....	42
Figure 23: GFD Service Demand by Month, 2013.....	43
Figure 24: GFD Service Demand by Day of the Week, 2013 .....	43
Figure 25: GFD Service Demand by Hour of the Day, 2013 .....	44
Figure 26: GFD Incident Density, 2013.....	45
Figure 27: GFD Fire Incidents, 2013 .....	46
Figure 28: GFD Service Area and Station Response Districts.....	48
Figure 29: GFD Population Density, 2010 Census Data .....	50
Figure 30: GFD Engine Company Distribution-ISO Criteria .....	52

---

Figure 31: GFD Aerial Company Distribution-ISO Criteria .....	53
Figure 32: GFD Travel Time Model, Current Station Locations .....	55
Figure 33: GFD Travel Time Capability and Emergency Service Demand, 2013 .....	56
Figure 34: GFD ALS Transport Medic Units .....	58
Figure 35: GFD Full First Alarm Capability, 8 Minutes Travel .....	60
Figure 36: NFPA 1710 Full First Alarm Capability, 8 Minutes Travel.....	61
Figure 37: GFD Personnel Concentration, Current Three/Four 26 Minimum Staffing .....	62
Figure 38: GFD Personnel Concentration, Four Person 31 Daily Minimum Staffing .....	64
Figure 39: GFD Personnel Concentration, Mutual Aid 8 Minute Response.....	65
Figure 40: Mutual/Automatic Aid Resources within 8 Minutes Travel of GFD.....	66
Figure 41: GFD Unit Hour Utilization (UHU), 2013 .....	67
Figure 42: GFD Concurrent Incidents, 2013.....	68
Figure 43: GFD Apparatus Drawdown, 2013 .....	68
Figure 44: GFD Station Reliability, 2013 .....	69
Figure 45: GFD Workload by Station Area .....	69
Figure 46: GFD Response Frequency, 2013 Priority Incidents.....	71
Figure 47: GFD Overall Response Performance, 2013 Priority Incidents .....	72
Figure 48: GFD 90 <sup>th</sup> Percentile Turnout Time, 2013 Priority Incidents.....	72
Figure 49: GFD Response Performance by Apparatus, 2013 Priority Incidents .....	73
Figure 50: GFD Call Processing and Response Time Elements .....	74
Figure 51: Survey Table – Capital Assets and Capital Improvement Planning.....	75
Figure 52: Grapevine Fire Department Station 1 601 Boyd Drive .....	77
Figure 53: Grapevine Fire Department Station 2 - 2801 Panhandle.....	78
Figure 54: Grapevine Fire Department Station 3 - 2627 Briarwood.....	79
Figure 55: Grapevine Fire Department Station 4 - 4500 Merlot.....	80
Figure 56: Grapevine Fire Station 5 - 2801 Grapevine Mills Blvd N.....	81
Figure 57: GFD Station 1 Major Apparatus .....	83
Figure 58: GFD Station 2 Major Apparatus .....	83
Figure 59: GFD Station 3 Major Apparatus .....	83
Figure 60: GFD Station 4 Major Apparatus .....	83
Figure 61: GFD Station 5 Major Apparatus .....	83
Figure 62: GFD Reserve Apparatus .....	84
Figure 63: Economic Theory of Vehicle Replacement .....	86

Figure 64: Apparatus Life Expectancies ..... 87

Figure 65: Apparatus Life Expectancies ..... 88

Figure 66: Benchmark Comparison of Capital Assets ..... 89

Figure 67: GFD Historical Service Demand, 2009 through 2013..... 91

Figure 68: TWDB Population Projection for Grapevine, 2010-2050..... 92

Figure 69: GFD Projected Service Demand by Incident Category, 2010-2050..... 93

Figure 70: Community Risk ..... 95

Figure 71: Sample of Critical Task Staffing by Risk..... 99

Figure 72: Non-Structure Fire Critical Tasking ..... 100

Figure 73: Hazardous Materials Incident Critical Tasking ..... 100

Figure 74: Motor Vehicle Collision with Entrapment Critical Tasking ..... 101

Figure 75: Emergency Medical Incident Critical Tasking ..... 101

Figure 76: NFPA 1710 Performance Measurement Recommendations..... 102

Figure 77: Additional NFPA Response Performance Objectives by Population Density Categories ..... 103

Figure 78: First Due Response Standard Example ..... 103

Figure 79: First Alarm Response Standard Example ..... 104

Figure 80: Optimized Station Re-Location Area..... 113

Figure 81: Illustration Project Information ..... 114

Figure 82: Fire Station Construction Cost Illustration..... 114

Figure 83: Sample Training Grounds..... 116



**Corporate Offices**  
25030 SW Parkway Avenue, Suite 330  
Wilsonville, Oregon 97070  
800.757.3724

**Eastern Region Office**  
111 Kilson Drive, Suite 208  
 Mooresville, North Carolina 28117  
704.660.8027

**National Capital Region Office**  
4025 Fair Ridge Drive  
Fairfax, Virginia 22033  
703.273.0911