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VOLUME 1 of 3 – Main Report (this volume)

EXECUTIVE SUMMARY

Travis County Emergency Service District #6 (ESD #6) retained Citygate Associates, LLC to develop a Master Operations and Standards of Response Plan (fire station and company deployment) which includes a review of some administrative services for ESD #6. This comprehensive study is presented in several sections including: this Executive Summary summarizing the most important findings and recommendations; the deployment analysis supported by maps and response statistics; the administrative functions review; and the fiscal costs associated with the proposed Master Plan recommendations. The final section integrates all findings and recommendations throughout the report and concludes with priorities and fiscal impacts.

Planning for the ESD #6 involves two stages of effort: (1) a short-range plan that addresses current service delivery needs in light of the ESD #6's economic situation; and (2) a longer-range plan that addresses fire services delivery at the current planned build-out of the District.

By correctly modeling deployment and following best practices in developing the policies and organization, this transition can be smooth. Thus, Citygate has made recommendations and designed solutions that will sustain the Department's capabilities in the near term of one to three years while maintaining a firm foundation upon which the Department can evolve over the longer term.

POLICY CHOICES FRAMEWORK

First, the ESD #6 leadership must understand there are no mandatory federal or state regulations directing the level of fire service response times and outcomes. Thus, communities have the level of fire services that they can afford, which is not always what they would desire. However, the body of regulations on the fire service provides that *if fire services are provided at all, they must be done so with the safety of the firefighters and citizens in mind* (see regulatory discussion on page 13). Given this situation, the overall challenge for the ESD #6 is to design fire services within the fiscal constraints that limit its ability to staff, train and equip a safe and effective fire/medical response force in a community experiencing growth that will increase the demand on fire services.

ESD #6 cannot grow its fire services overnight for these critical reasons:

- There is tremendous lead time in the locating, design, construction and staffing of a fire station;
- There is a current revenue struggle to support the cost of staffing additional firefighters per day and an additional fire station, much less adding headquarters support staff positions;

In this fire station location/administrative master plan, Citygate acknowledges these limitations and proposes the ESD #6 Board adopt several strategies to deal with the above constraints:

Citygate envisions that the ESD #6 consider adding resources in several ways as fiscal resources permit:

1. Adding a 4th firefighter full-time to *three* of the existing units;
2. Adding a second staffed quint/ladder truck;
3. Relocating Station 603;
4. Consider a joint fire station at the southern end of Hamilton Pool Road;
5. Adding a 6th fire station southwest of Lakeway and Village of the Hills as the development occurs and revenues allow;
6. Increase necessary headquarters support positions.

CITYGATE'S OVERALL OPINIONS ON THE STATE OF ESD #6'S FIRE SERVICES

In brief, Citygate finds that the challenge of providing fire services in the ESD #6 is similar to that found in many Texas communities: providing an adequate level of fire services within the context of limited fiscal resources, competing needs, growing populations and uncertainty surrounding the exact timing of future development.

Citygate evaluated all aspects of the Department during the preparation of this study and two critical challenges for ESD #6 emerged. To address these challenges, there are findings and recommendations that deserve specific and particular consideration. Finally, the remainder of the recommendations only requires the regular, ongoing attention they currently receive.

Throughout this report, Citygate makes observations, key findings and, where appropriate, specific action item recommendations. Starting in Section 5 on page 75, all the findings and recommendations are presented together, in order. Overall, there are 25 key findings and 16 specific action item recommendations.

It needs to be stated at the front of this study that Citygate Associates team members who spent time in ESD #6 found the fire staff at all levels very cooperative and helpful. They are committed to their agency and mission. Given the struggle to keep pace in the ESD #6 to cope with revenue reductions, there is pride and on-going effort to deliver the best customer service with the currently available resources. Fires are being attended to with successful outcomes and medical calls are being answered with excellent patient care.

In this Executive Summary, instead of citing all the findings and recommendations, Citygate will *only* highlight the most critical ones related to the two main challenges:

MAIN CHALLENGES

One can summarize the fire service challenges that face ESD #6 in two words, *insufficient revenue*. Because of the slow pace of development until more recently and a low tax rate at ten cents, the ESD #6 has not been unable to add needed resources. At the same time as the ESD #6 would like to add more field response capabilities, it has to deal with some very old and inadequate volunteer era facilities it inherited at the inception of the ESD #6.

Challenge 1: Field Operations Deployment (Fire Stations)

Fire department deployment, simply stated, is about the ***speed*** and ***weight*** of the attack. Speed

calls for first-due, all risk intervention units (engines and trucks) strategically located across a department. These units are tasked with controlling everyday average emergencies without the incident escalating to second alarm or greater size, which then unnecessarily depletes the department's resources as multiple requests for service occur. Weight is about multiple-unit response for significant emergencies like a "room and contents structure fire," a multiple-patient incident, a vehicle accident with extrication required, or a complex rescue incident. In these situations, departments must assemble enough firefighters in a reasonable period in order to control the emergency safely without it escalating to greater alarms.

In **Section 2** of this study, *Standards of Cover (Deployment) Analysis*, Citygate's analysis of prior response statistics and use of geographic mapping tools reveals that ESD #6 has *both a speed and weight of attack problem*. There are not enough primary fire stations in some neighborhoods, and given this, there are not enough total on-duty firefighters (weight) to handle more than one modest emergency or one to three less serious emergencies at once.

The maps in **Volume 2** and the corresponding text explanation beginning on page 34 of **Section 2** of this volume show that ESD #6 should, over time as area growth continues, increase daily staffing and add at least one more neighborhood fire station.

For effective outcomes on serious medical emergencies and to keep serious, but still-emerging fires small, this study and national best practices all conclude that the first-due fire unit should arrive within **7** minutes of the 911-call receipt, 90 percent of the time. For serious fires and rescues, the balance of the multiple units needed (first alarm) should arrive within **11** minutes of the 911-call receipt, 90 percent of the time. In ESD #6, with only five fire stations, this does not occur. In ESD #6, averaged district-wide it actually occurs:

1st Apparatus on scene 7:00 minutes @ 71% of the time

1st Alarm on Scene <= 11:00 @ 60% of the time

Currently, ESD #6 is staffed for one serious fire at a time or one to three medical calls for service at once. When a fire is also being worked it takes 100 percent of the current 5-station force and mutual aid units must cover other simultaneous calls for service during the period of the fire. This model has served the community well over its early growth years, but is now increasingly strained to handle more than one serious event and to provide equitable coverage especially to neighborhoods in all parts of the ESD. A community of approximately 50,000 residents with a possible population growth to 75,000 to 90,000 over the next few years is no longer a rural recreation area. Added to the resident population is the "mobile" population of employees and tourists that will increase as growth occurs. ESD #6 should consider growing its fire defenses commensurate with the risk and call-for-service growth.

Thus, Citygate's **key** deployment findings and recommendations are summarized below. For reference purposes, the findings and recommendation numbers refer to the sequential numbers in the main body of the report. Note that not all findings and recommendations that appear in this report are listed in this Executive Summary.

Finding #1: ESD #6 has not adopted a fire service deployment measure. Such a measure should include a specific time measure definition that specifies the beginning and end time measurement points, and a desired outcome goal statement tied to risks.

The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

Finding #4: The ESD is too large for one ladder truck to cover given the lack of cross connect streets. The only way to improve this issue would be to operate a second quint/ladder truck and position these units at stations 604 and 603.

Finding #5: With 15 firefighters on duty per day, ESD #6 has just enough firefighters for one moderate building fire at once or two to three simultaneous medical emergencies.

Finding #7: With a department fire and emergency medical incident response performance of 10:15 minutes/seconds at 90 percent, as the ISO 1.5-mile response distance map measure predicated, ESD #6 does not have enough primary neighborhood fire stations to serve a very difficult terrain and road network.

Summarized in priority order, ESD #6 has two fire deployment deficits that need improvement:

1. There are not enough primary neighborhood fire stations in the probable growth areas to provide equitable, first-due unit coverage for all emergency types.
2. There are not enough firefighters on-duty to handle more than one modest fire at a time or 1 to 3 medical calls when fires occur. Fortunately for ESD #6, the vast majority of calls for service are medical emergencies. However, two medical calls at once consume 6 firefighters, which is 40 percent of the total number of firefighters and 40 percent of the fire attack units. During these periods, the ESD cannot also field an effective response force (first alarm) to a serious building fire.

As this study has identified and measured, the ESD #6 Fire Department is *insufficiently* staffed with enough firefighters to address more than one moderate fire or 2 to 3 EMS incidents at the same time. As it grows, the ESD has a distribution of fire station problem, in that there are not enough fire stations to equitably cover all the developed neighborhoods in a timely manner. This particularly occurs in the western ESD, south of Lakeway and Village of the Hills. If there were one more fire station, and a 4th firefighter per crew on three engines per day, the resultant increase in the number of firefighters per day (6) would also help to control serious fires more quickly, or to handle two serious fires at once, plus medical incidents, all with less dependence on automatic aid response being quickly available.

Citygate's recommendations are designed to improve Priorities 1 and 2 simultaneously. By increasing three engines to 4-firefighters per day, there are both more firefighters on the street; over time adding a 6th station southeast of Lakeway will improve response times in the western ESD as well as adding more firefighters on duty.

Recommendation #1: The ESD should adopt revised performance measures to direct fire station location planning based on population density per square mile. The measures should take into account a realistic company turnout time of 2 minutes and be designed to deliver outcomes that will save patients medically salvageable upon arrival; and to keep small, but

serious fires from becoming greater alarm fires. Citygate recommends these measures be:

1.1 Distribution of Fire Stations for Built-up Urban-Suburban Areas: To treat medical patients and control small fires, the first-due unit should arrive within 7 minutes, 90 percent of the time from the receipt of the 911 call. This equates to 1-minute dispatch time, 2 minutes company turnout time and 4 minutes drive time spacing for single stations.

1.2 Effective Response Force for Built-up Urban-Suburban Areas: To confine fires near the room of origin, to stop wildland fires to under 5 acres when noticed promptly, and to treat up to 5 medical patients at once, a multiple-unit response of at least 15 personnel should arrive within 11 minutes from the time of 911 call receipt, 90 percent of the time. This equates to 1-minute dispatch time, 2 minutes company turnout time and 8 minutes drive time spacing for multiple units.

1.3 Consider adopting emerging suburban and rural area response performance measures and outcomes based on this table and the discussion in Section 2.8:

Proposed Deployment Measures Based on Population Densities

	Urban-Suburban	Emerging Suburban	Rural	Wildland
	>1,000 people/sq. mi.	**500-1,000 people/sq. mi.**	**<500 people/sq. mi.**	**Permanent open space areas**
1st Due Travel Time	4	8	14	10
Total Reflex Time	7	11	17	13
1st Alarm Travel Time	8	12	20	12
1st Alarm Total Reflex	11	15	23	15

Recommendation #2: Add a 4th firefighter per day to engines 601, 602 and quint 605 to improve the weight of response staffing and to leave one unit available for simultaneous responses during structure fires. Thus, 3 engines and 1 quint would deliver the needed 15 firefighters.

If there are funding limitations that prevent 3 crews from increasing to a 4th firefighter, then the highest priority is to first staff the quint(s) with four personnel.

Recommendation #3: Add a second quint at Station 603. When opened, transfer the 4th firefighter per day from 605 to 603.

Recommendation #4: Work with the adjoining fire district to see if a joint, shared cost career fire station is possible to serve the southern Hamilton Pool Road area.

Recommendation #5: Remodel Station 604 and move the quint from Station 605 to Station 604.

Recommendation #6: As a parcel can be found, re-locate and build a more appropriate Station 603.

Recommendation #7: Replace Station 601 at or very near its existing location.

Recommendation #8: Work to site and fund a 6th fire station and engine crew southwest of Lakeway and Village of the Hills as the development occurs and revenues allow.

Challenge 2: Headquarters Support Service Issues

The fire headquarters team is stretched thin as the needs of the Department grow and the need for specialty programs in operations, fire prevention and public education are more pronounced. Especially in fire services, it takes time and effective, experienced leadership to operate fire stations and provide other services such as fire prevention, public education, wildfire hazard abatement and departmental disaster preparedness coordination.

For the overall headquarters team, Citygate's key findings are:

Finding #10: The prevention program follows the legal authorities of the adopted codes.

Finding #12: The current staff is operating at as close to peak efficiency as possible. Additional commercial building growth plus the need for ongoing public education and wildland fuel reduction programs will cause the staff to fall behind and not be able to meet all the various needs.

Finding #17: Citygate finds that there is a need for a dedicated full-time Public Education and Information Officer.

Finding #18: ESD #6 lacks a NIMS-compliant disaster plan to guide the agency during times of a local or wide area disaster.

Finding #20: The ESD #6 fireboat, while better than nothing, is older and far too small for anything other than a single-patient EMS call in smooth waters or a small ski boat size fire. Large cabin cruisers, water front building and wharf fires would overwhelm the fireboat's abilities. A large party boat accident could generate many patients, clearly overwhelming one small boat and crew.

Finding #22: For a department of ESD #6's size, the head of the training division should be at least at the battalion chief level. This is appropriate at the supervising officer level. As the Department expands, as it will, this will become more problematic. It already shows itself in the spotty compliance with reporting training completed.

Finding #24: The Department has no master training policy; this leads to a number of issues. Company officers have no guidance concerning what drills to conduct and when to conduct them. They have not standardized training references to use to prepare and execute training in the station.

To address these and other findings, Citygate's recommendations are:

Recommendation #9: As soon as funding is available, ESD #6 should consider hiring another Fire Inspector/Investigator. This position can also take the lead in designing and delivering public education programs.

Recommendation #12: ESD #6 should develop an agency-level disaster operations plan that integrates with the plans of the County, cities, and school and water districts. The plan should be compliant with federal requirements and spell out the policy role of the Board of Directors under the County Commissioners when the County Disaster Plan is activated.

Recommendation #13: ESD #6 should explore with these partner agencies the possibility of jointly submitting for a federal or state grant to purchase a larger capacity fire and rescue boat which should be commensurate with the risks to protect. While other public safety agencies operate boats on Lake Travis, none are well equipped for firefighting and multiple EMS patient emergencies. Given the multiple ESDs around the lake, staffing and operating the boat could also be handled jointly.

Recommendation #14: When funding becomes available, Citygate recommends that the Department establish a battalion chief position in charge of training. Concurrent with this recommendation, Citygate recommends that the Department retain the current staffing of two company officer positions in the training division.

MASTER PLAN PHASING AND COSTS

While there will always be some uncertainty in the growth rate of ESD #6, the ESD staff did provide Citygate with the most recent information that was used in the fire deployment analysis section (**Section 2**) of this master plan. Given the likely near-term growth, the following costs are estimated in current dollars to show the order of magnitude of what is ahead for ESD #6 fire services in the near to mid-term.

While all the recommendations can be worked on in parallel and some will take several fiscal years both in time and funding, Citygate recommends the staff work on developing the following short-term needs:

Phase One

- Absorb the policy recommendations of this master plan and adopt revised fire department performance measures to drive the location and timing of fire stations
- Conduct discussions to determine the feasibility and cost sharing structure for a joint-use fire station to serve southern Hamilton Pool Road
- Staff needs to carefully analyze the ESD's ability to remodel Station 604 to re-locate the quint/ladder truck there
- Staff needs to determine if the ESD can afford to add a 4th firefighter to 3 crews per day.

Phase Two

- Add a 3rd Fire Inspector position
- Determine if land is available for a relocation of Station 603
- Work to determine and acquire a site for a 6th station in the southwest ESD near Texas 71.

Phase Three

- Add a Battalion Chief – Training Officer
- Add a dedicated public education position.

Phase Four

- Add a 6th fire station
- Add a second quint/ladder truck at new Station 603.

Phasing Plan Estimated Costs

Phase	Item	Operating Cost	Capital Cost
One	Add a 4th firefighter to three engines per day	$720K	
	Remodel Station 604 to house the quint/ladder truck		$300,000
Two	Add a 3rd fire inspector	$70K	
Three	Construction of re-located Station 603		$2.5M
	Add a Battalion Chief – Training Officer	$92K	
	Add a public education specialist	$50K	
	Subtotal:	$142K	
Four	Add a 6th fire station in the southwest area	$720K	$2.5M
	Add a 2nd quint/ladder truck		$700K
	Minimum Four Phase Totals:	$1.66M	$6.0M

Fiscal Impacts Discussion

Capital station and fire apparatus costs can be debt financed and/or partially covered by updated fire development fees charged to new development. Operating and maintenance expenses are General Fund ongoing costs and will have to be carried by additional General Fund revenue growth.

Concluding Thoughts

With regard to ESD #6's fire services, the area's residents need to know that they do have a caring, committed, fire department. However, it is trying to catch up with demand for service, develop appropriate distribution of fire stations, and maintain a support organization adequate for the Department. The Department needs the support of the community to acquire the significant, but needed, additional resources to perform emergency services in an equitable and timely manner for all the residents and visitors in ESD #6.

SECTION 1—INTRODUCTION AND BACKGROUND

1.1 REPORT ORGANIZATION

This report and future planning document is structured into the following sections that group appropriate information together for the reader.

This Volume (**Volume 1**) includes:

Section 1 Introduction and Background: Background facts about ESD #6's current fire services.

Section 2 Standards of Response Cover (Deployment) Analysis: An in-depth examination of the Fire Department's deployment ability to meet the community's risks, expectations and emergency needs.

Section 3 ESD #6 Fire Department Review: Non-Deployment Functions: A review of some of the Fire Department's non-emergency operations and headquarters functions.

Section 4 Fiscal Analysis: An outline of the costs of the master plan recommendations.

Section 5 Recommended Solutions and Phasing Plan: A recommendations and conclusions section.

Separately attached:

Volume 2 Response Coverage Geographic Maps

Volume 3 In-depth Response Statistics Appendix.

As each of the sections mentioned above impart information, this report will cite findings and make recommendations, if appropriate, that relate to each finding. There is a sequential numbering of all of the findings and recommendations throughout the first three sections of this report. To provide a comprehensive summary, a complete ordered listing of all these same findings and recommendations is presented in Section 5. Finally, attention will be brought to the highest priority needs and possible timing of addressing those needs.

This document also provides technical information about how fire services are provided, legally regulated, and how the ESD #6 Fire Department currently operates. This information is presented in the form of recommendations and policy choices for the ESD #6 leadership and community to discuss.

The result is a solid technical foundation upon which to understand the advantages and disadvantages of the choices facing the ESD #6 leadership and community on how best to provide fire services, and more specifically, at what level of desired outcome and expense.

In the United States, there are no federal or state regulations on what a minimum level of fire services has to be. Each community, through the public policy process, is expected to understand the local fire risks, their ability to pay, and then to choose their level of fire services.

If fire services are provided at all, the federal and state regulations specify how to do it safely for the personnel involved.

While this report, master plan recommendations and technical explanation can provide a framework for the discussion of fire services for ESD #6, neither this report nor the Citygate consulting team can make the final decisions or cost out in detail every possible alternative. Once final master plan choices are given policy approval by the ESD #6 Board, staff can conduct any final costing and fiscal analysis.

1.2 BACKGROUND

This project involved the development of a fire services deployment analysis plan and operational services review. This effort involved the study of the fire services risk within the ESD #6. In this report, the term "Department" will be used when referring to the fire agency details, and the term "ESD or ESD #6" will be used when referring to Travis County ESD #6.

The ESD commissioned this study to evaluate the current capacity of the Department to respond to emergency fire, rescue, and medical incidents within its area, and review other related operational issues within the context of very limited revenue to support all service needs of the ESD. In its entirety, this analysis and corresponding findings and recommendations will allow the ESD #6 Board of Directors to make informed policy decisions about the level of fire, rescue, and emergency medical services desired and the best method to deliver and fund them.

The challenges facing the community are not unique. Growing communities in Texas all face the dilemma of how to provide municipal services, while prior to the build-out of an area, there is usually not a high enough growth rate in revenue sources to build up fire services as fast as the community would prefer.

1.3 ESD #6 PROJECT APPROACH AND RESEARCH METHODS

Citygate used several tools to gather, understand, and model information about the ESD service area and Fire Department for this study. We started by making a large document request to the Department to gain background information on costs, current and prior service levels, the history of service level decisions and what other prior studies, if any, had to say.

In subsequent site visits, Citygate team members followed up on this information by conducting focused interviews of fire management team members and other appropriate ESD staff. We reviewed demographic information about the ESD service area and proposed developments. As we collected and understood information about the ESD and Department, Citygate obtained electronic map and response data from which to model current and projected fire services deployment. The goal was to identify the location(s) of stations and company quantities required to serve the ESD as it develops.

Once Citygate gained an understanding of the Department service area with its fire, rescue, and EMS risks, the Citygate team developed a model of fire services that was tested against the mapping and prior response data to ensure an appropriate fit. This resulted in Citygate being able to propose an approach to improving fire services in the Department that would also meet reasonable expectations and fiscal abilities of the ESD citizens.

1.4 ESD #6 Fire Department Background Information

Emergency Services District #6, located in Travis County, is of course a long-time recreation destination in western Travis County. Of late, it also is attracting more subdivision development and other amenities. ESD #6 has an area of approximately 200 square miles which given topography, permanent open space designations and waterways is not all developable. The 2007 population within the ESD is estimated to be close to (if not) 50,000 residents. This does not take into account the ESD's "mobile" population of visitors and employees. Just tourism alone on a big "lake weekend" can add thousands of visitors on and around the waterfront areas. The ESD is adding, over the next few years, more homes, businesses and recreation amenities as will be detailed below in the risk assessment section. Population in general drives the call-for-service workload for fire departments.

1.5 Newer Legal Changes and Challenges to the Provision of Fire Services

In addition to restrictions on local government finance, there have been a number of new state and federal laws, regulations, and court cases that limit the flexibility of cities in determining their staffing levels, training, and methods of operation. These are given an abbreviated overview below:

1. 1999 OSHA Staffing Policies – Federal OSHA applied the confined space safety regulations for work inside tanks and underground spaces to America's firefighters. This requires in atmospheres that are "IDLH" (Immediately Dangerous to Life and Health) that there be teams of two inside and two outside in constant communication, with the outside pair equipped and ready to rescue the inside pair. This situation occurs in building fires where the fire and smoke conditions are serious enough to require the wearing of self-contained breathing apparatus (SCBA). This is commonly called the "2-in/2-out" policy. This policy requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

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

2. May 2001 National Staffing Guidelines – The National Fire Protection Association (NFPA) Standard on Career Fire Service Deployment was issued five years ago. While *advisory* to local governments, as it starts to become locally adopted and used, it develops momentum, forcing adoption by neighboring communities. NFPA 1710 calls for four-person fire company staffing, arriving on one or two apparatus as a "company." The initial attack company should arrive at the emergency within four minutes travel time, 90 percent of the time, and the total effective response force (first alarm assignment) shall arrive within eight

minutes travel time, 90 percent of the time. These guidelines will be explained and compared to ESD #6 in the deployment measures section of this document.

3. The on-scene Incident Commanders (battalion chiefs) at Hazardous Materials Incidents must have certification compliant with NFPA 472, Standard for Emergency Response to Hazardous Materials Incidents. This is also now an OSHA requirement.

1.6 NEGATIVE PRESSURES ON VOLUNTEER-BASED FIRE SERVICES

While ESD #6 does not operate a pure volunteer firefighter system, a common question is why not continue to solve some or all of the ESD's fire staffing problems with volunteers? To pre-address this question, here is a brief overview of the state of depending on volunteer firefighters:

All volunteer-based fire departments are under great pressure today to maintain an adequate roster. The reasons for this are not unique to any one type of community and are placing pressure on small community volunteer systems across the state and nation:

1. Economic pressures result in more two-income families and less time to volunteer.

2. In a commuter economy, more jobs are clustered in metropolitan and dense suburban areas. Communities like ESD #6 increasingly have residents who work elsewhere, and many of the younger age people who would consider volunteering are just too busy.

3. Due to the growth in society of complex systems and technology, the fire service was given more missions, like emergency medical services, hazardous materials response, and technical rescue. This dramatically increased the legally mandated training hours for volunteers, causing many to drop out as the time commitments became unbearable.

4. Early in this decade, due to rising firefighter injuries and deaths, especially in the volunteer ranks, more safety regulations and training minimums were placed on all firefighters:

   This change, coupled with all the other factors, means that volunteer firefighter programs dry up due to lack of members. Additional training and additional responses mean a significant time commitment for "true" volunteers, who are serving for love of community and to give something back. Most departments feel that it takes 100 to 120 hours of training per year to meet safety minimums, and this time is *before* a volunteer goes on a single emergency call.

In addition, most employers today are unwilling to allow volunteers to leave their jobs to respond to an emergency dispatch. Across the fire service, volunteer programs have been changing and adapting to a different model. The current model understands the commitment needed, and usually includes two types of volunteers: the first is the usual community-based person; the second is a younger person who desires to be a career firefighter. While the younger person is going through community college fire science classes, after obtaining basic firefighter certification, they work "part-time" for shift stipend or for an hourly wage, without benefits.

These personnel are used successfully to increase daily station staffing and are called "reserve" firefighters or part-time firefighters. They do not need to live in the community they serve, as they are often not needed to respond from home with quick travel times. Community-based volunteers can be used from home for major emergencies, within their limited training as they gain certifications and experience. Once they meet state minimums, they also can be used for per diem shifts.

As this report will explain in detail, ESD #6 fire services are already spread thin and understaffed for headquarters functions. Even if the ESD could find enough willing volunteers, a reserve program takes design, supervision, and fiscal support for training and firefighter protecting equipment. In Citygate's opinion, the needs of the ESD #6 Fire Department far outweigh what a small volunteer or per diem apprentice firefighter program could solve. While the volunteer program could continue as an adjunct to the career department, a volunteer force cannot by itself solve the ESD's staffing needs.

SECTION 2—STANDARDS OF RESPONSE COVER (DEPLOYMENT) ANALYSIS

Section intent: This section serves as an in-depth analysis of the current ESD #6 Fire Department's ability to deploy and meet the emergency risks presented. During this analysis, the ESD #6 Fire Department will be compared and contrasted to fire services recommended best practices for a community of ESD #6's size. The response analysis will use prior response statistics and geographic mapping to help the ESD Board of Directors and community visualize what the current or a possible response system can and cannot deliver.

2.1 GENERAL FIRE DEPLOYMENT BACKGROUND INFORMATION

The Commission on Fire Accreditation International recommends a systems approach known as "Standards of Response Coverage" to evaluate deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to assist elected officials in making informed decisions on fire and EMS deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station location. Depending on the needs of the study, the depth of the components can vary.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination of the level of deployment to meet the risks presented in each community. In this comprehensive approach, each agency can match local need (risks and expectations) with the costs of various levels of service. In an informed public policy debate elected officials "purchase" the fire, rescue, and EMS service levels (insurance) the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than any singular component can. If we only look to travel time, for instance, and not look at the frequency of multiple and overlapping calls, the analysis could miss over-worked companies. If we do not use risk assessment for deployment, and merely base deployment on travel time, a community could under-deploy to incidents.

The Standard of Response Cover process consists of eight parts:

1. Existing Deployment – each agency has something in place today.
2. Community Outcome Expectations – what does the community expect out of the response agency?
3. Community Risk Assessment – what assets are at risk in the community?
4. Critical Task Time Study – how long does it take firefighters to complete tasks to achieve the expected outcomes?
5. Distribution Study – the locating of first-due resources (typically engines).
6. Concentration Study – first alarm assignment or the effective response force.
7. Reliability and Historical Response Effectiveness Studies – using prior response statistics to determine what percent of compliance the existing system delivers.
8. Overall Evaluation – proposed standard of cover statements by risk type.

Fire department deployment, simply stated, is about the ***speed*** and ***weight*** of the attack. Speed calls for first-due, all risk intervention units (engines, trucks and ambulance companies) strategically located across a department. These units are tasked with controlling everyday average emergencies without the incident escalating to second alarm or greater size, which then unnecessarily depletes the department resources as multiple requests for service occur. Weight is about multiple-unit response for significant emergencies like a room and contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, departments must assemble enough firefighters in a reasonable period in order to control the emergency safely without it escalating to greater alarms.

Thus, small fires and medical emergencies require a single- or two-unit response (engine and ambulance) with a quick response time. Larger incidents require more companies. In either case, if the companies arrive too late or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The art of fire company deployment is to spread companies out across a community for quick response to keep emergencies small with positive outcomes, without spreading the stations so far apart that they cannot amass together quickly enough to be effective in major emergencies.

Given the need for companies to be stationed throughout a community for prompt response instead of all companies responding from a central fire station, communities such as ESD #6 are faced with neighborhood equity of response issues. When one or more areas grow beyond the reasonable travel distance of the nearest fire station, the choices available to the elected officials are limited: add more neighborhood fire stations, or tell certain segments of the community that they have longer response times, even if the type of fire risk found is the same as other areas.

For the purposes of this fire services study, Citygate used all eight components of the Standards of Response Cover process (at varying levels of detail) to understand the risks in ESD #6, how the ESD #6 Fire Department is staffed and deployed today, and then modeled those parameters using geographic mapping and response statistical analysis tools. The models were then compared to the proposed growth in ESD #6 so that the study can recommend changes, if any, in fire services to the Department's service area.

Thus, Citygate tailored the deployment recommendations in this report to ESD #6's unique needs, and did not use one-size-fits-all national recommendations.

The next few subsections will cover the ESD #6 area factors and make findings about each component of the deployment system. From these findings of fact about the ESD #6 area fire deployment system, the study is then able to make deployment change recommendations.

2.2 ESD #6 Community Outcome Expectations – What is Expected of the Fire Department?

The next step in the Standards of Response Cover process is to review existing fire and emergency medical outcome expectations. This can be restated as follows: for what purpose does the current response system exist? Has the governing body adopted any response time performance measures? If so, the time measures used by the ESD need to be understood and good data collected.

The community, if asked, would probably expect that fires be confined to the room or nearby area of fire origin, and those medical patients salvageable upon arrival have their injuries stabilized and be transported to the appropriate care location. Thus, the challenge faced by the Department is to maintain an equitable level of fire service deployment across the entire ESD area without adding significantly more resources as demand for services grows and traffic congestion increases, slowing response times. Another headache for the ESD Board is the perceptions of the newer homeowners in larger lot subdivisions. In years past, homeowners knew they were in a rural area with a commensurate volunteer fire response system. Today, however, the newer homeowners see large homes, golf courses, new shopping centers and new schools. Their perception will likely be that their area looks like any other suburban city or outer part of Austin, and as such, would of course have suburban-urban levels of fire services.

The Insurance Services Office (ISO) Fire Department Grading Schedule would like to see fire stations spaced 1.5 miles apart, which, given travel speeds on surface streets, is a 3 to 4-minute travel time. The newer National Fire Protection Association (NFPA) guideline 1710 on career fire services deployment suggests a 4-minute travel time for the initial fire apparatus response and 8 minutes travel time maximum for the follow-on units. NFPA 1720 for combination (volunteer) fire services recommends 10 to 14-minute travel times for fire units in rural and emerging suburban areas.

More importantly, within the Standards of Response Coverage process, positive outcomes are the goal, and from that company size and response time can be calculated to allow efficient fire station spacing. Emergency medical incidents have situations with the most severe time constraints. In a heart attack that stops the heart, a trauma that causes severe blood loss, or in a respiratory emergency, the brain can only live 8 to 10 minutes maximum without oxygen. Not only heart attacks, but also other events can cause oxygen deprivation to the brain. Heart attacks make up a small percentage; drowning, choking, trauma constrictions, or other similar events have the same effect on the brain and the same time constraints. In a building fire, a small incipient fire can grow to involve the entire room in a 4 to 5-minute time frame. The point in time where the entire room becomes involved in fire is called “flashover” when everything is burning, life is no longer possible, and the fire will shortly leave the room of origin.

If fire service response is to achieve positive outcomes in severe EMS situations and incipient fire situations, ***all*** the companies must arrive, size up the situation and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Given that the emergency started before or as it was noticed and continues to escalate through the steps of calling 911, dispatch notification of the companies, their response and equipment set-up once on scene, there are three “clocks” that fire and emergency medical companies must work against to achieve successful outcomes:

1. The time it takes an incipient room fire to fully engulf a room in 4 to 5 minutes, thus substantially damaging the building and most probably injuring or killing occupants.
2. When the heart stops in a heart attack, the brain starts to die from lack of oxygen in 4 to 6 minutes and brain damage becomes irreversible at about the 10-minute point.

3. In a trauma patient, severe blood loss and organ damage becomes so great after the first hour that survival is difficult if not impossible. The goal of trauma medicine is to stabilize the patient in the field and get them to the trauma surgeon inside of one hour.

Somewhat coincidently, in all three situations above, the first responder emergency company must arrive on-scene within 5 to 7 minutes of the 911-phone call to have a chance at a successful resolution. Further, the follow-on (additional) companies for serious emergencies must arrive within the 8 to 11-minute point. These response times need to include the time steps for the dispatcher to process the caller's information, alert the stations needed, the companies to then don OSHA mandated safety clothing and drive to the emergency. The sum of these three time steps – dispatch, company turnout and drive time – comprises "total reflex," or response time. Thus, to get the first firefighters on-scene within only 5 to 7 minutes of the 911 call being answered is very challenging to all parts of the system, as this study will describe later in detail.

The three event timelines above start with the emergency happening. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine actually starts to drive the response route. It is hoped that the emergency is noticed immediately and the 911 system is activated. This step of awareness – calling 911 and giving the dispatcher accurate information – takes, in the best of circumstances, 1 minute. Then company notification and travel take additional minutes. Once arrived, the company must walk to the patient or emergency, size up the problem and deploy their skills and tools. Even in easy to access situations, this step can take 2 or more minutes. It is considerably longer up long driveways, apartment buildings with limited access, multi-storied office complexes or shopping center buildings such as those found in parts of the ESD.

Given the relatively new age of ESD #6 in its current governance configuration, it has not yet adopted response time measures to guide deployment decisions on how many fire stations and firefighters it needs. One of the purposes of this master deployment plan is to make recommendations on deployment polices for the ESD Board of Directors to adopt.

For fire station deployment measures, current best practice nationally is to measure percent completion of a goal (i.e., 90 percent of responses) instead of an average response time measure. This is because a measure of average just identifies the central or middle point of response time performance for all calls for service in the data set. From an average statement, it is impossible to know how many incidents had response times that were considerably over the average or just over. For example, if a department had an average response time of 5 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5 minutes were answered slightly past the 5th minute in the 6th minute or way beyond at 10 minutes. This is a significant issue if hundreds or thousands of calls are answered much beyond the average point.

Finding #1:	ESD #6 has not adopted a fire service deployment measure. Such a measure should include a specific time measure definition that specifies the beginning and end time measurement points, and a desired outcome goal statement tied to risks. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

Thus, from the time of 911 *receiving the call*, an effective deployment system is ***beginning*** to manage the problem within 7 to 8 minutes total reflex time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point to leave the room of origin and become very serious. Therefore, a final ESD #6 Fire Department first-due response goal should be within the time range to give the situation hope for a positive outcome. Yes, sometimes the emergency is too severe even before the Fire Department is called in for the responding company to reverse the outcome; however, given an appropriate response time policy and if the system is well designed, then only issues like bad weather, poor traffic conditions or a significant number of multiple emergencies will slow the response system. Consequently, a properly designed system will give the citizens hope of a positive outcome for their tax dollar expenditure.

2.3 ESD #6 COMMUNITY RISK ASSESSMENT

The ESD mostly contains a mix of single and multi-family dwellings, small and larger businesses, and retailers. There is also some light manufacturing. Both newcomers to the community, as well as long-term residents, may not realize the community assets that are at risk today in such a vibrant and diverse community. The ESD #6 Fire Department is charged with responding to a variety of emergencies, from fires to medical calls to special hazards and cargo transportation emergencies. Here is a partial inventory of the types of risk demographics in addition to the visible homes and business buildings:

- Some hazardous materials storage, use, and release, including industrial and transportation on the highways;
- The potential for some additional growth in commercial and industrial buildings as well as several types of housing across the ESD;
- The threat of wildland fires given the considerable permanent open space areas around the housing subdivisions;
- The unique challenges presented by high tourism and boating on the lake, including multiple marinas and boat storage buildings.

The significance of the above information is that ESD #6 Fire Department must be staffed, equipped and trained to deal with (at least through the first alarm level prior to automatic or mutual aid) most any type of emergency faced by a United States fire department. True, the ESD does not have multiple, very tall high-rise buildings, an international airport, or an oil refinery, but that is about all the Department does not experience in its calls for service.

Building Fire Loss History for the Prior Three Years

	2004	2005	2006
# of Fires	15 fires	21 fires	20 fires
Amount of Loss	$952,000	$1,302	$120,400

These fire loss figures are subjective fire personnel estimates, not final insurance industry payments. By comparison, even if the above fire loss figures were doubled due to final insurance payments, this level of fire loss, as a percentage of assessed valuation, is very modest. Most recent building fires in ESD #6 have started small and allowed the available on-duty force to catch them. The reasons for this can range from the impact of automatic fire sprinklers in commercial buildings to the fire being still small upon being reported, to the fire having occurred close to a fire station in an area that has one to begin with combined with the newer age of some of the housing stock. The adopted building code in the County only requires automatic fire sprinklers in large multi-family and commercial buildings. However, much of the community's building stock, given its age and single-family residential nature, does not enjoy fire sprinkler protection, and as such needs an effective fire department response.

In order to understand the importance of response time in achieving satisfactory outcomes, the deployment of resources must be based upon assessment of the values at risk. There are actually many different *types* of values at risk depending upon the nature of the emergency. At a very basic level, a fire in a structure is among the most frequent event with a measurable outcome. A *single*-patient medical emergency is a different event, and while it is the most frequent, it is normally not as threatening to life and property as the structure fire since the structure fire can spread and eventually become a conflagration.

From a hazard, risk and value perspective, the number of structural fires is usually linked to the distribution and concentration of different building types in the community. As is expected in an urban-suburban area, communities have a very specific growth and development pattern consistent with past decisions on land use. As would be anticipated, there are pockets of various densities of housing stock ranging from low-cost, high-density housing to high-cost, medium-density neighborhoods. There is widespread distribution of neighborhood retail and commercial facilities. Along the main transit routes are typical commercial, mixed and public uses. Then, of course, there are clusters of high concentration of values that exist in the traditional "downtown" area. These are the locations of many job providers and sales tax businesses.

Citygate reviewed the Department's response performance information, its operational plans, community zoning, interviewed Fire Department members and drove through some of the community. As is expected in a Texas outer-suburban community, much of the ESD consists of low- and medium-density residential housing. There are some pockets of higher density residential housing and newer commercial development. Retail/commercial/industrial development zones, of course, compliment housing areas.

The fire incident reporting system indicates a wide variety of events that can result in a call for service, but it is a reported fire in a building that is the essence of a fire department's deployment plan. This same reporting system is often the only statistically significant evidence of the frequency and consequence regarding the values at risk in any community.

2.3.1 Building Fire Risk

In a Standards of Response Coverage study, building fire risk can best be understood by looking at types of zoning and the quantity of different zoning types in a community.

In addition to the various types of zoning that the ESD is already familiar with, as an additional risk assessment step, Citygate and the Department asked the national Insurance Services Organization (ISO) to provide its data on the ESD #6. The ISO evaluates fire departments for the insurance underwriting industry. One of their methods is to send an evaluation engineer to assess significant buildings in a community to determine their risk of serious fire. The ISO assessed over 550 buildings in all. There are 51 buildings where the calculated required fire flow is 1,500 gallons per minute or greater if the building was heavily involved in fire. This is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would outstrip the on-duty ESD #6 fire staffing. Using the generally accepted figure of fifty gallons per minute per firefighter on large buildings, a fire in a building requiring 1,500 gallons per minute would require 30 firefighters, *double* the on-duty staffing of the ESD #6 Fire Department.

In Volume 2 of this report, the mapping appendix, Map #2 displays the location of the larger ISO rated fire flow buildings in the ESD. Most are concentrated in commercial zoning areas along primary streets. As the later mapping evaluation of fire company coverage will discuss, these buildings are where the community needs an effective multiple-unit force to come together in a timely manner to combat serious fires.

Also very important to the assessment of building fire risk in ESD #6 is the projected commercial growth. There is considerable active or pending construction activity ranging from the new regional mall in Bee Cave to smaller retail, mixed-use retail and residential, to hotel rooms.

An effective response force is the deployment of multiple units (pumpers, ladder trucks and incident commander) so they can arrive close enough together to combat serious ***building*** fires and keep them to less than greater alarm, mutual aid size. This refers back to the earlier points in this report on speed and weight of attack. The massing of units in a timely manner (weight) must be such that serious fires do not typically become larger. Since County zoning has placed these buildings throughout the ESD, this places additional pressure to have a multiple-unit effective response force of pumpers and, also importantly, ladder trucks throughout most of the ESD.

2.3.2 Special Hazard Risks

ESD #6 has some businesses that use or resell hazardous materials. Examples are gasoline stations and dry cleaners. These businesses are highly regulated by the building, fire and environmental codes. ESD #6 handles the enforcement of some advanced hazardous materials regulations under the fire code. The ESD #6 Fire Department participates in a regional, multi-fire department Hazardous Materials Response Team.

The ESD has a special set of risk challenges in the marinas and boat storage buildings. In all, there are 3,130 marina boat slips, 812 dry storage rack slots in buildings, which when totaled, contain an area of 1,440,741 square feet. Six of these buildings and/or marinas have fuel storage and dispensing tanks.

The boat dry rack buildings present several challenges. The boats are fiberglass or wood and usually stored with fuel in their tanks. Not all the storage buildings have fire sprinklers. Many have limited firefighting access and fire hydrants due to their proximity near the water. All this combines to present a severe firefighting challenge should a serious fire ever get started.

The marinas present another fire challenge due to limited shoreline access. A docked boat fire could easily spread to other boats and walkways. The ESD partners with other safety agencies on the lake for medical emergencies, but at present, no one agency has an adequate fire boat.

2.3.3 Wildland Fire Risk

ESD #6 has pockets of grass, scrub brush and native small trees in between developed areas. Much of this area is permanently protected open space. During dry and drought climate periods, the threat of wildfire in ESD #6 is quite high. To combat this risk, the ESD #6 Fire Department works closely with its mutual aid partner fire departments while training for wildland firefighting in Texas hill country conditions. The ESD does operate some specialty wildland fire units and tanker apparatus.

2.3.4 Population Growth

Given the multiple government agencies that can approve new development in ESD #6, it is difficult to obtain accurate growth estimates at any one point. Even exact current population counts are difficult given recent growth. However, all current estimates place the ESD #6's population at 46-50,000 residents. In the development process currently are at least 12 housing projects that contain 5,782 units. At a people per dwelling unit factor of 2.4, this equals approximately 13,800 more residents. In addition to this, there is the Steiner Ranch development, which in its early steps of processing is proposing 15,000 – to 19,000 people over several years. If all this development were to occur, ESD #6 could see an additional 28,000 plus residents in less than ten years. A future population of 75 – 80,000 plus residents and visitors is no longer a quiet rural area; it has become an area of suburban density.

Recent traffic studies by the Texas Department of Transportation have predicated that traffic on US 290 and Texas 71 could double in 20 years. Other regional studies have pointed out that along US 290 west of Austin there are 4,900 dwelling units approved covering 4,500 acres.

A growth indicator within ESD #6's area is the development of the potable water system to support growth. On US 290 a new 24" water main with 1.2 million gallons of storage has been built. On Hamilton Pool Road, there is a new network of 20" and 24" mains and 1.25 million gallons of storage all supported by new pump stations by the lake.

What does this mean for calls for service? If we take the 2006 total incident count rounded off at 6,300 and a current population estimate of 50,000 residents, then ESD #6 is handling 126 calls for service per 1,000 population. Extrapolating forward, using the current approved growth of 13,800 residents and the lower population range of Steiner Ranch, a population of 80,000 residents in less than 8 to 10 years could drive the calls for service to 10,080 per year, or 27.6 per day. Given that some calls for service occur simultaneously at peak hours of the day, a daily rate of 27 calls will challenge the response capacity of a five-station system.

2.3.5 Desired Outcomes

Once policy makers choose outcomes, then the response system can be designed with staffing and station locations to accomplish the desired outcomes. An outcome example is, "confine a residential fire to the room of origin." That outcome requires a more aggressive response time and staffing plan than "confine the fire to the building of origin, to keep it from spreading to adjoining structures."

2.4 STAFFING – WHAT MUST BE DONE OVER WHAT TIMEFRAME TO ACHIEVE THE STATED OUTCOME EXPECTATION?

The next step in the Standards of Response Cover process is to take the risk information above and review what the firefighting staffing is, and what it is capable of, over what timeframe.

Fires and complex medical emergencies require a timely, coordinated effort in order to stop the escalation of the emergency. Once the tasks and time to accomplish them to deliver a desired outcome are set, travel time and thus station spacing can be calculated to deliver the requisite number of firefighters over an appropriate timeframe.

2.4.1 Offensive vs. Defensive Strategies in Structure Fires Based on Risk Presented

Most fire departments use a strategy that places emphasis upon the distinction between offensive or defensive methods. These strategies can be summarized:

> It is important to have an understanding of the duties required at a structural fire to meet the strategic goals and tactical objectives of the Fire Department response. Firefighting operations fall in one of two strategies – **offensive <u>or</u> defensive.**
>
> > We may risk our lives a lot to protect savable lives.
> >
> > We may risk our lives a little to protect savable property.
> >
> > We will not risk our lives at all to save what is already lost.
>
> Considering the level of risk, the Incident Commander will choose the proper strategy to be used at the fire scene. The Incident Commander must take into consideration the available resources (including firefighters) when determining the appropriate strategy to address any incident. The strategy can also change with conditions or because certain benchmarks are achieved or not achieved. For example, an important benchmark is "all clear," which means that all savable persons have been removed from danger or placed in a safe refuge area.
>
> Once it has been determined that the structure is safe to enter, an **offensive** fire attack is centered on <u>life safety</u>. When it is safe to do so, departments will initiate offensive operations at the scene of a structure fire. Initial attack efforts will be directed at supporting a primary search – the first attack line will go between the victims and the fire to protect avenues of rescue and escape.
>
> The decision to operate in a **defensive** strategy indicates that the offensive attack strategy, or the potential for one, has been abandoned for reasons of personnel safety, and the involved structure has been conceded as lost (the Incident

Commander makes a conscious decision to write the structure off). The announcement of a change to a defensive strategy means all personnel will withdraw from the structure and maintain a safe distance from the building. Officers will account for their crews. Interior lines will be withdrawn and repositioned. Exposed properties will be identified and protected.

For safety, federal and state Occupational Health and Safety Regulations (OSHA) mandate that firefighters cannot enter a burning structure past the incipient or small fire stage, without doing so in teams of 2, one team inside and one team outside, ready to rescue them. This totals a minimum of 4 firefighters on the fireground to initiate an interior attack. The only exception is when there is a known life inside to be rescued. This reason, along with the fact that a 4-person company can perform more work simultaneously than a three-person company, is why NFPA Deployment Standard 1710 for career fire departments recommends four-person company staffing.

Many fire department deployment studies using the Standards of Response Coverage process, as well as NFPA guidelines, arrive at the same fact – that an average (typically defined by the NFPA as a modest single-family dwelling) risk structure fire needs a minimum of 14 to 15 firefighters, plus one on-scene incident commander. The NFPA recommendation is that the first unit should arrive on-scene within 6 minutes of call receipt (1-minute dispatch, 1-minute company turnout, and 4-minute travel), 90 percent of the time. The balance of the units should arrive within 10 minutes of call receipt (8-minute travel), 90 percent of the time, if they hope to keep the fire from substantially destroying the building. (The NFPA recommendation of 1-minute dispatch time is generally attainable; the 1-minute company turnout time is generally unattainable considering the time it takes fire fighters to don the required full personal protective equipment.)

For an extreme example, to confine a fire to one room in a multi-story building requires many more firefighters than in a single-story family home in a suburban zone. The amount of staffing needed can be derived from the desired outcome and risk class. If the community desires to confine a one-room fire in a residence to the room or area of origin, that effort will require a minimum of 14 personnel plus incident commander. This number of firefighters is the minimum needed to safely conduct the *simultaneous* operations of rescue, fire attack, and ventilation plus providing for firefighter accountability and incident command *in a modest, one fire hose line house fire*. A significant fire in a two-story residential building or a one-story commercial or multi-story building would require, at a minimum, an additional two to three engines and an additional truck and chief officer, for upwards of 12 plus additional personnel. As the required fire flow water gallonage increases, concurrently, the required number of firefighters increases. Simultaneously, the travel distance for additional personnel increases creating an exponential impact on the fire problem. A typical auto accident requiring multiple-patient extrication or other specialty rescue incidents will require a minimum of 10 firefighters plus the chief for accountability and control.

2.4.2 Staffing in the ESD #6 Fire Department

Below is the typical minimum unit and staffing assignment on emergences in the ESD #6 Fire Department currently:

Units and Minimum Staffing Daily Plan

Per Unit			Extended
4 Engines @	3	Firefighters/day	12
1 Ladder truck/quint @	3	Firefighters/day	3
		Subtotal *firefighters:*	*15*
1 Battalion Chief @	1	Per day for command	1
		Total 24/hr Personnel:	***16***

2.4.3 Staffing Discussion

If ESD #6 provides fire services at all, safety of the public and firefighters must be the first consideration. Additionally, the chief officers, as on-scene incident commanders, must be well trained and competent, since they are liable for mistakes that violate the law. An under-staffed, under-led token force will not only be unable to stop a fire, it also opens the ESD up for real liability should the Fire Department fail.

As stated earlier in this section, national norms indicate that 15 or so firefighters, including an incident commander, are needed at significant building fires if the expected outcome is to contain the fire to the room of origin and to be able to simultaneously and safely perform critical tasks. The reason for this is that the clock is still running on the problem after arrival, and too few firefighters on-scene will mean the fire can still grow faster than the efforts to contain it. Chief officers also need to arrive at the scene in a timely manner in order to intervene and provide the necessary leadership to the organization.

In theory the ESD operates with enough firefighters per day to field one alarm (team) of firefighters to building fires. However, this count assumes all the personnel are available and can be committed to serious building fires. Given the low occurrence of building fires in the ESD, and the strong mutual aid unit support from neighboring ESDs and the City of Austin, ESD #6 can typically field enough firefighters at a serious fire, but doing so during periods of medical emergency calls means the ESD really cannot field a force to two major events at once.

2.4.4 Company Critical Task Time Measures

In order to understand the time it takes to complete all the needed tasks on a residential moderate to high-risk fire and a modest emergency medical rescue, the Department conducted several timed trials using their standard operating procedures to demonstrate how much time the entire operations take. The following tables (beginning on page 29) start with the time of fire company notification and finish with the outcome achieved. There are several important themes contained in these tables:

1. These results were obtained under best conditions, in that the day was sunny and moderate in temperature. The test building was a building that the companies were not familiar with.
2. It is noticeable how much time it takes after arrival or after the event is ordered by command to actually accomplish key tasks to arrive at the actual outcome. This is

because it requires firefighters to carry out the ordered tasks. The fewer the firefighters, the longer some task completion times will be. *Critical steps* are highlighted in ***grey*** in the table.

3. The time for task completion is usually a function of how many personnel are ***simultaneously*** available so that firefighters can complete some tasks simultaneously.

4. Some tasks have to be assigned to a minimum of two firefighters to comply with safety regulations. An example is two firefighters would be required for searching a smoke filled room for a victim.

The following tables of unit and individual duties are required at a first alarm fire scene in a moderate risk building – a modestly sized house. This set of duties is taken from the ESD #6 Fire Department operational procedures. This set of needed duties is entirely consistent with the usual and customary findings of other agencies using the Standards of Response Cover process and that found in NFPA 1710.

The scenario represents a single-story single-family dwelling fire with heavy smoke conditions existing in the house. Fire is one room with approximately 1000 square feet of involvement. No conditions existed to override the OSHA 2-in/2-out safety policy.

Moderate Risk Structure Fire **3-Engines, 1-Truck, 1-Chief - 13 personnel**
First-Due Engine Company
1. Stretch a 200-foot 1-3/4 inch pre-connect hose line to the point of access for the residence.
2. Operate the pump to supply water and hook-up a five-inch hydrant supply line.
3. Assume command of initial operations.
Second-Due Engine Company
1. If necessary, lay in a hydrant supply line to the first company.
2. Stretch a second hose line for exposures or safety-line function.
3. Fill out initial rescue team (IRIT), so interior attack can start.
4. Conduct primary search.
Truck Company
1. Using tools and methods provide vertical or positive pressure ventilation.
2. Secure utilities.
3. Escape ladder.
Third-Due Engine Company
1. Staff functions not already underway and/or provide a full rapid intervention company to rescue firefighters.

Shown below are the individual critical tasks for a house structure fire:

Critical Tasks – Structure Fires

Task Description	Running Clock Time	Elapsed from Time of Call
Time of Call		00:00
Dispatch		01:00
Company Turnout		02:00
Travel to on Scene		04:00
Response time subtotal		07:00
Engine 601 on-scene	00:00	
Engine 601, attack line to door	01:05	8:05
Eng. 601 360 degree survey Complete, secure Utilities	01:17	
Battalion Chief on-scene, assume command	03:36	
Bat. 601 360 degree survey and establish 2 In- 2 Out	04:20	11:25
Eng. 601 Begins Fire Attack	04:39	11:44
Eng. 602 on-scene	04:56	
Eng. 602 water supply to Eng. 601	09:12	16:12
Eng. 602 begin positive pressure ventilation	09:25	
Eng. 602 become rapid intervention team	10:08	
Eng. 601 Primary Search Complete	10:15	17:08
Eng. 601 Fire Out/ Extension	10:56	17:56
Bat. 601 Personnel Accountability Report	11:38	
Eng. 601 Secondary Search Complete	13:56	
Quint. 605 on-scene	14:12	
Eng. 601 gives All Clear/Fire Out	17:10	24:10
Engine 603 on-scene – overhaul and rehab for attack crews		

The above duties grouped together to form an *effective response force or first alarm assignment*. Remember that the above discrete tasks must be performed simultaneously and effectively to achieve the desired outcome. Just arriving on-scene does not stop the escalation of the emergency. Firefighters accomplishing the above tasks do, but as they are being performed, the clock is still running, and has been since the emergency first started.

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

The next table shows the tasks and time progression on a more serious fire in an apartment building. The fire was on the second floor, with full fire involvement of the front three rooms and one civilian to be rescued from a balcony:

Critical Tasks – Apartment Structure Fire

Task Description	Running Clock Time	Elapsed from Time of Call
Time of Call		00:00
Dispatch		01:00
Company Turnout		02:00
Travel to on Scene		04:00
Response time subtotal		07:00
Eng. 602 on-scene assume command	00:00	
Eng. 602 360 survey and secure utilities	01:27	08:27
Bat. 601 on-scene & establish 2-In/2-Out compliance	02:44	09:44
Eng. 601 on-scene	04:40	
Eng. 602 Ladder to Balcony	05:36	12:36
Eng. 602 1.75" to Landing & start Search	05:58	
Eng. 602 Fire Victim Located & Removed	07:52	14:52
Eng. 601 begin positive pressure ventilation	08:23	
Eng. 601 water supply to Eng. 602	09:36	16:36
Quint 605 on-scene	10:12	
Eng. 602 Fire Victim on Ladder	10:51	
Quint 605 Fire Attack & Primary Search	11:26	18:26
Eng. 602 Fire Victim off Ladder	12:09	
Eng. 602 Fire Victim to EMS	12:39	19:39
Personnel accountability Report	12:36	

Task Description	Running Clock Time	Elapsed from Time of Call
Eng. 601 Established a back up line	14:59	
Eng. 602 Fire Under Control	16:18	23:18
Quint 605 Primary Search Complete	16:44	
Quint 605 Search of other areas Complete	22:56	
Engine 603 on-scene – overhaul and rehab for attack crews		

Here again is the ESD #6 daily staffing plan:

Units and Staffing Daily Plan

Per Unit			Extended
4 Engines @	3	Firefighters/day	12
1 Ladder truck/quint @	3	Firefighters/day	3
		Subtotal *firefighters:*	*15*
1 Battalion Chief @	1	Per day for command	1
		Total 24/hr Personnel:	***16***

If ESD #6 commits 13 personnel as discussed above to one building fire, it has only one crew available for other emergencies; mutual aid units requested by the ESD will provide any additional coverage of emergencies, if they are available.

What this means is that ESD #6 currently is only fielding the capacity for one serious incident at a time. Multiple fires or a singular large fire will quickly exhaust the ESD's resources and draw aid from across the area.

For comparison purposes, the critical task table below reviews the tasks needed on a typical auto accident rescue call that requires multiple units using 6 firefighters total: *(continued on following page)*

Critical Tasks – Auto Incident – 2 Vehicles, 3 Patients

Task Description	Running Clock Time	Elapsed from Time of Call
Time of Call		00:00
Dispatch		01:00
Company Turnout		02:00
Travel to on Scene		04:00
Response time subtotal		07:00
1st Engine on-scene & Size Up	00:00	
EMS Equipment & Tools to Veh. #1	01:10	

Task Description	Running Clock Time	Elapsed from Time of Call
Veh. #1 Patients Accessed	02:00	09:00
Veh. #2 Patient Accessed & EMS Equipment to autos	02:10	
Charged Hose line & Scene Lights Up	03:23	
Bat 601 Arrived & Command	04:15	11:15
Veh. #1 Stabilized with Cribbing	04:23	
Began removing Veh. #1's Driver Door	04:56	
Veh. #1's Driver Door Removed	06:25	19:25
Veh. #2's Windshield Removed	06:04	
Veh. #1's Passenger Removed	06:59	13:59
Veh. #2's Driver Removed	07:56	
Veh. #1's Driver removed	08:06	
Veh. #1's Pass & Veh. #2's Driver @ Ambulance	08:29	15:29
Veh. #1's Driver @ Ambulance	08:54	15:54

Thus the table above shows that while the patients needing care were taken care of in an appropriate time frame, 2 of 5 ESD #6 fire units were required, which is 6 firefighters or 40 percent of the on-duty force committed for one, two-car accident.

2.4.5 Critical Task Measures Evaluation

What does a deployment study derive from a response time and company task time analysis? The total completion times above to stop the escalation of the emergency have to be compared to outcomes. We know from nationally published fire service "time vs. temperature" tables that after about 4 to 5 minutes of free burning a room fire will grow to the point of flashover where the entire room is engulfed, the structure becomes threatened and human survival near or in the fire room becomes impossible. We know that brain death begins to occur within 4 to 6 minutes of the heart having stopped. Thus, the effective response force must arrive in time to stop these catastrophic events from occurring.

The response and task completion times discussed above show that the citizens of ESD #6 are able to expect good outcomes and have a better than not chance of survival in a *modest* fire or medical emergency, when the first-due responding unit *is* available in 7 minutes or less total response time and the balance of the response force units can also promptly arrive after the 911 call was received. However, this performance is not possible in all areas of the ESD, as the mapping and response statistics in later sections will show.

The point of the tables above is that mitigating an emergency event is a team effort once the units have arrived. This refers back to the "weight" of response analogy. If too few personnel arrive too slowly, then the emergency will get worse, not better. Control of the structure fire incident

still took 24 minutes after the time of receipt of the 911 calls being received. The outcome times of course will be longer, with less desirable results, if the arriving force is later or smaller.

In EMS trauma incidents, the patient is initially being assessed within 9 minutes total reflex time and is able to be transported within 16 minutes. These times are good for trauma patients, when all the needed units can arrive by minute 7, which is not always possible at the outer perimeter areas of the Department, or when multiple calls for service occur.

However, each of these incidents, while only being moderate in size, required 6 to 13 personnel, or 80 percent of the entire on-duty firefighter force for a modest structure fire. Due to limited staffing, even modest house fires frequently need a 2nd alarm comprised of mutual aid engines, if available, to complete the needed functions at the fire.

Fires and complex medical incidents require that the other needed units arrive in time to complete an effective intervention. Time is one factor that comes from ***proper station placement***. Good performance also comes from ***adequate staffing***. On the fire and rescue time measures above, the ESD #6 Fire Department can do a good job, in terms of time, on small fires and routine medical calls. This is typical of departments that staff 3-person companies for average, routine emergencies. However, serious fires and medical emergencies where the closest unit is not available to respond ***will*** challenge the ESD #6 Fire Department response system to deliver good outcomes. This factor **must** be taken into account when we look at fire station locations.

Previous critical task studies conducted by Citygate, the Standard of Response Cover documents reviewed from accredited fire departments, and NFPA recommendations all arrive at the need for 15+ firefighters arriving within 11 minutes (from the time of call) at a room and contents structure fire to be able to ***simultaneously and effectively*** perform the tasks of rescue, fire attack and ventilation.

If fewer firefighters arrive, what from the list of tasks mentioned would not be done? Most likely, the search team will be delayed as will ventilation. The attack lines only have two firefighters, which does not allow for rapid movement above the first floor deployment. Rescue is done with only two-person teams, thus when rescue is essential; other tasks are not done in a simultaneous, timely manner. Remember what this report stated in the beginning: effective deployment is about the **speed** *(travel time)* and the **weight** *(firefighters)* of the attack.

Yes, 15 initial (4 engines, 1 quint/truck) firefighters (not including command/safety) can handle a low to moderate risk house fire (especially on the first floor), but only if they do not need, at the same time, to perform rescue, fire attack and ventilation. An effective response force of even 15 will be seriously slowed if the fire is in a low-rise apartment building or commercial / industrial building.

Thus, today, the ESD #6 Fire Department has *just* enough on-duty personnel to handle a low to moderate one to two-room building fire in a single-story building or a few medical incidents occurring at the same time. The Department would be seriously challenged to handle two working building or vegetation fires at the same time it was handling more than one EMS incident. The existing staffing, equipment capabilities and training have adequately served the community, as it emerged from a rural population density. When the on-duty staffing is stretched thin, the Department can bring in automatic or mutual aid equipment, but from a distance and under the assumption that the aiding department is not already busy.

2.5 CURRENT STATION LOCATION CONFIGURATIONS

The ESD #6 is served today by five fire stations. As part of this fire services study, it is appropriate to understand what the existing and proposed stations do and do not cover, and if there are any coverage gaps needing one or more stations, what, if anything, to do about them as the ESD Service area continues to evolve. In brief, there are two geographic perspectives to fire station deployment:

- Distribution – the spreading out or spacing of first-due fire units to stop routine emergencies.
- Concentration – the clustering of fire stations close enough together so that building fires can receive enough resources from multiple fire stations quickly enough. This is known as the Effective Response Force or commonly the "first alarm assignment" – the collection of a sufficient number of firefighters on-scene, delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due and first alarm fire unit travel time coverage for this study, Citygate used a geographic mapping tool from ESRI Mapping Corporation program called *Network Analyst* that can measure travel distance over the street network. Citygate ran several deployment map studies and measured their impact on various parts of the community.

The maps (***found in Volume 2 of this study***) display travel time using the normal posted speed limits per type of street. Since the ESD does not currently have an adopted response goal, some of the maps will use 4 minutes travel time travel time as a measure which is consistent with NFPA 1710 and good emergency outcomes and up to 8 minutes travel time for the balance of the effective response force (first alarm) units. When one minute is added for dispatch reflex time and two minutes for company notification times, the maps then effectively show the area covered within 7 minutes for first-due units and 11 minutes for a first alarm assignment from the time the 911 call is made.

An additional measure used was the Insurance Service Office 1.5-mile recommendation for first-due fire companies and 2.5-mile service for second-due companies and ladder trucks. 1.5 miles driving distance equates to 3.5 to 4 minutes travel time over the road network.

For most maps, in order to show the most detail given the large size of the ESD, two map scales are used for each map. Map # "a" is a wide area view of the entire ESD. Map # "b" is a scaled-in view of the more populated areas of the ESD.

Map #1 – General Plan Land Use Types and Current Station Locations

The first two maps show the existing ESD #6 Fire Department fire station locations with ESD boundaries. Also shown are the boundaries of the communities within the ESD. This map view is important to remember as later maps in the set display the fire station coverage areas. This map also demonstrates how difficult it is to serve the ESD area with quick travel times and few fire stations. The hilly terrain, meandering streets and waterways all combine to make the ESD a difficult area to serve efficiently.

Map #2 – Risk Assessment Locations

Displayed here is a type of building fire risk assessment and these buildings lay in the community. This study received information from the Insurance Service Office (ISO) that sends field engineers into buildings to evaluate them for underwriting risk. One expression of that risk is called fire flow, or the firefighting water in gallons per minute that a major fire in the building would require to be controlled. Plotted here are the locations of the larger fire flow buildings in the ESD. These areas are where the entire firefighting force must concentrate quickly if serious commercial building fire is to be controlled. As can be seen, the majority of the commercial buildings are in the communities of Lakeway and Bee Cave as well as along major roadways.

Map #3 – First-Due Unit Distribution

This map shows in green colored street segments the *distribution* or first-due response time for each station (ESD #6 and mutual aid) per the current response goal of 4 minutes travel time. Thus, the computer shows how far each company travels within 6 to 7 minutes fire department response time from the time of the fire communications center receiving the call. Therefore, the limit of color per station area is the time an engine could reach the 4-minute travel time limit, ***assuming*** they are in-station and encounter no unusual traffic delays. In addition, the computer uses speed limits per roadway type. Thus, the projection is a view of the best possible circumstances without fire units being slowed by traffic or bad weather. Real dispatch data *is* showing response times to be longer in the ESD as will be reviewed in the next section of this report. This is due to not enough primary station coverage in all neighborhoods, traffic congestion, the non-grid street network, or the company being on a prior call and another unit covering the incident.

It is not possible to serve every road segment out to the outer perimeter areas of the Department in 4 travel minutes; however, these maps show that many of the ESD's streets are covered, by the first-due unit except in the outer perimeter areas not close to the existing stations.

A goal to deliver the best outcomes for the ESD would be to cover 90 percent of the geography in suburban population density areas with a first-due unit coverage plan based on a goal measure statement to deliver acceptable outcomes. This would only leave the very hard-to-serve outer perimeter areas or dead-end pockets with coverage in a 4 or 8-minute travel time range. There should be some overlap between station areas so that a second-due unit can have a chance of an adequate response time when it covers a call for another station. The outer perimeter areas are hard to serve and, in many cases, cost prohibitive to serve for a small number of calls for service.

The message to be taken from this map is that the ESD's five station locations are appropriate for the suburban developed areas. The more rural areas such as south Hamilton Pool road or expansions areas southwest of Lakeway are not covered within 4 minutes of travel by one fire unit.

Map #4 – ISO Engine Coverage Areas

This map exhibit displays the Insurance Service Office (ISO) requirement that stations cover a 1.5-mile distance response area. Depending on the road network in a department, the 1.5-mile measure usually equates to a 3 to 4-minute travel time, which is *very* conservative. This measure was designed for urban areas to ensure multiple units (weight of response) could arrive quickly

enough to prevent conflagrations (fire spreading building to building) from occurring. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. When this measure is applied to ESD #6 is it apparent that the stations cannot cover all the more developed areas in 1.5 miles travel distance due to the non-grid type road network. This map measure also is indicative of what occurs when traffic congestion or bad weather would slow down the first-due unit from doing the speed limit.

Map #5 – Engine and Ladder Unit Concentration (First Alarm)

This map exhibit shows the *concentration* or massing of fire companies for serious fire or rescue calls. Building fires, in particular, require 15+ firefighters arriving within a reasonable time frame to work together and effectively to stop the escalation of the emergency. Otherwise, if too few firefighters arrive, or arrive too late in the fire's progress, the result is a greater alarm fire, which is more dangerous to the public and the firefighters.

The concentration map exhibits look at the Department's ability to deploy four of its engines, one quint/truck company and one battalion chief to building fires within 8 minutes travel time (11 minutes total fire department response time from the 911 call receipt). This measure ensures that a minimum of 15 firefighters and one battalion chief deployed can arrive on-scene to work ***simultaneously*** and effectively to stop the spread of a modest fire. Such a measure is recommended by NFPA #1720 for career departments in urban-suburban areas.

The colors in the map show the area in dark **green** color where ESD #6's current fire deployment system should deliver the initial effective response force. Streets without the dark green highlights have four-unit or less coverage.

Map set #5 shows that, given the difficulty to serve road network and wide station spacing, only the area between stations 604 and 605 receives the full 5-unit coverage within 8 minutes travel. However, much of the ESD does receive 3 engines in 8 minutes travel. Much of the more highly populated and commercial areas receive 3-engine coverage.

Thus, the limiting factor to the 5-unit desired coverage is the limitation of the quint/ladder truck responding from Station 605. Given no cross street from Station 605 back to Texas 71, this station must "go around" to get to the Lakeway and Bee Cave areas.

Map #6 – Firefighter Concentration (First Alarm)

Map #5 showed the concentration coverage for 3 engines, 1 quint/ladder, and the battalion chief as one color. Here, using color bands are the areas receiving the least to most *multiple firefighter* coverage is shown. This map helps to show that some, but not all of the commercial building areas of the ESD receive all of the on-duty force within 8 minutes of travel time. Even for total firefighter count, Lakeway and Bee Cave do not receive an effective response force within 8-minutes travel time. The outer perimeter areas of the ESD receive from five to ten firefighters.

Map #7 – Ladder Truck Coverage

This map series shows, in station *order*, the effect of locating the ESD's one quint/ladder truck using 8 minutes travel time. These maps also use the normal speed limits. The truck is very heavy and slower to get up to speed. Therefore, when moderate to serious traffic is present causing the truck to slow frequently for traffic lights and cross traffic, the coverage will be far

less than these maps display. In reviewing this series of maps it becomes apparent due to the road network, that no one station can provide ladder truck coverage to all the more populated and commercial building areas of the ESD.

Map #7a shows the truck at Station 601. While there is good coverage to the western commercial areas, there is less coverage to the east and northeast.

Map #7b shows the truck at Station 603 re-located. Current Station 603 does not have the apparatus room large enough to house the truck. If a rebuilt Station 603 were to exist, then a ladder truck from this location covers the western commercial areas of the ESD. However, there is no coverage east of Station 601.

Map #7c shows the truck at Station 604. While there is good coverage to the eastern commercial areas, there is no coverage to the east and northeast. There is also good coverage into Austin, which would help the ESD reach an agreement on automatic with the ESD sharing the truck resource in exchange for Austin's engine coming into the ESD.

Map #7d shows the truck at it is currently at Station 605. While there is good coverage to the western commercial areas, there is almost no coverage west of Station 601.

Map #7e shows the positive effect of the ESD operating two quints, one at Station 604 and one at Station 603 (relocated). With this plan, most all of the suburban development density and commercial areas of the ESD receive ladder truck coverage within 8 minutes travel.

Map #8 – Relocation of Station 603

This fire station is very small and old. It was designed for the volunteer era with no real sleeping or housing quarters for a full-time crew. The parcel location is also poor with limited immediate major street access. The ESD leadership asked Citygate to look at an alternative location in this study.

Map #8a displays both the 4 and 8-minute drive time coverage from the existing station location. Map #8b shows the effect of moving the station slightly nearer to a better intersection where a new road is being connected. There are only minor differences in coverage and since a new location would provide a more suitable parcel size and access to major roads, the ESD should consider moving the station, rather than re-building it in place.

Map #9 – Coverage for the Southern Area of Hamilton Pool Road

While there is proposed development activity along Hamilton Pool road, and existing development at the end of the ESD service area, all the development is lighter density residential. The NFPA guidelines for volunteer departments consider an area as emerging suburban when the population density exceeds 500 people per square mile and urban-suburban when the density exceeds 1,000 per square mile. Given the housing cluster will likely not exceed 500 people per square mile, it may not be cost effective to site an ESD #6 station in an area with very light risk and call volumes and that, to some extent, will always appear rural in character.

As an option to a full ESD #6 station, Citygate modeled in this map the effect of the ESD partnering with the adjoining department that has a volunteer station just south of the ESD #6 area. If the two departments could cost share operating one career crew from this existing station, then between this station and re-located Station 603, all of Hamilton Pool would receive one unit

in 8 minutes of travel time, which would exceed the NFPA 1720 rural recommendation of 10 to 14 minutes travel time.

Citygate believes that shared coverage in this area should strongly be explored.

Map #10 – All Incident Locations

The next set of maps plots the locations of types of calls for service a 3.5-year period. Map #10 shows the locations of all calls for service. It is apparent that over a multi-year period that all the more developed neighborhoods require some type of fire department services.

Map #11 – EMS Incident Locations

This map further breaks out only the emergency medical and rescue call locations. Again, with the majority of the calls for service being emergency medical, almost all areas need fire department services even in a single calendar year.

Map #12 – All Fire Type Locations

This map set identifies the location of all fires in the Department. All fires include any type of fire call from auto to dumpster to building. There are obviously fewer fires than medical or rescue calls. Even given this, it is evident that all first-due engine districts experience fires. However, it should be noted that the lighter density housing areas such as Hamilton Pool Road and the area of the ESD south of Austin Station 39 experience few fires over a multi-year period.

Map #13 – Structure Fire Locations

This map is similar to the previous map, but only displays structure fires for the 3.5 years. While the structure fire count is a smaller subset of the total fire count, there are two meaningful findings to this map. There are still structure fires in every first-due fire company district. The location of many of the building fires parallels the higher risk and older building type commercial areas in the core of the ESD. Fires in the more complicated building types must be controlled quickly or the losses will be very large. As was shown in the multiple-unit/firefighter maps, there is better multi-unit coverage in the higher quantity structure fire areas.

Map #14 – All Incident Location Hot Spots

This map set examines, by mathematical density, where clusters of incident activity occurred. In this set, all incidents are plotted by high-density workload. For each density measure, the darker the color, the greater the quantity of incidents in a small area. This type of map makes the location of frequent workload more meaningful than just mapping the dots of all locations as done in Map #10.

Why is this perspective important? Overlap of units and ensuring the delivery of a good concentration for the effective response force. When we compare this type of map with the concentration map, we want the best concentration of unit coverage (first alarm) to be where the greatest density of calls for service occurs. For the ESD #6 Fire Department, this mostly occurs currently in station areas 601 and 602, which also receive timely back-up support from stations 603 and 604.

Map #15 – EMS Incident Location Densities

This map set is similar to Map #14, but only the medical and rescue hot spots of activity are plotted. The clusters of activity look very similar to the all-incident set in Map #14 because medical calls are such a large part of the total.

Map #16 – All Fire Location Densities

This map sets shows the hot spot activity for all fires. Again, the call-for-service density is highest in Station 601's area.

Map #17 – Structure Fire Densities

This map only shows the building fire workload by density. Here the activity cluster shifts to more of 602's area. There is less structure fire activity in Station 604's area and the rural areas such as south Hamilton Pool Road.

2.6 FUTURE STATION LOCATION CONFIGURATION

The preceding maps have shown that each of the currently more developed areas of ESD #6 has a fire station. While station spacing and ladder truck locations do not currently provide urban levels of multi-unit coverage, there is two to four unit coverage within 8-minutes travel time in the more developed areas of the ESD. This provides a level of effort somewhat less than a dense suburban-urban area, but far better than a rural area with volunteer coverage in 10 to 14 minutes of single-unit travel time.

While there is some development in the more rural areas out to the edges of the ESD, it is not cost effective in Citygate's opinion to cover each of these areas with fire stations for very few calls for service. However, there is an area of significant proposed suburban density development southwest of Lakeway and Village of the Hills.

Map #18 – Coverage from a 6th Fire Station

Currently, there are not enough streets in the proposed growth areas southwest of Lakeway to accurately model potential fire station locations. However, on this map, it can be seen that Station 602 in Lakeway can reach in 4 minutes travel only to the current limits of Village of the Hills and a bit more within 8 minutes travel. By either measure, however, Station 602 cannot cover back to State Route 71. As this area develops it should have a first-due fire station and this station will assist with multiple-unit coverage in the western area of the ESD.

Map #18 then shows the possible area that a station between Village of the Hills and Route 71 would cover with a 1.5-mile driving distance polygon. As this measure illustrates, the expansion area can be well covered by only one more fire station.

2.6.1 Mapping Measures Evaluation

Based on the above mapping evaluation, Citygate offers the following findings:

Finding #2:	As both the 4-minute coverage and Insurance Service Office requirements 1.5-mile coverage maps display, the ESD has a fire station in each of the more intensely developed areas of the ESD.
Finding #3:	The spacing of the fire stations is just adequate without overlap to provide first-due unit coverage for rural to moderate suburban levels of development.
Finding #4:	The ESD is too large for one ladder truck to cover given the lack of cross connect streets. The only way to improve this issue would be to operate a second quint/ladder truck and position these units at stations 604 and 603.
Finding #5:	With 15 firefighters on duty per day, ESD #6 has just enough firefighters for one moderate building fire at once or two to three simultaneous medical emergencies.
Finding #6:	The ESD and adjoining North Hayes County VFD should explore jointly staffing a career company and operating a joint fire station at the Hayes County site to cover the southwest area of Hamilton Pool road.

After the historical response statistics are analyzed in the next section of this report, then an integrated set of deployment recommendations will be made.

2.7 CURRENT WORKLOAD STATISTICS SUMMARY

In this section of the Standards of Response Cover process, prior response statistics are used to determine what percent of compliance the existing system delivers. In other words, if the geographic map measures say the system will respond with a given travel time, does it actually deliver up to expectations? A detailed analysis of in-depth statistics is provided in Volume 3 of this report. What follows is a summary of those comprehensive measures and findings.

The sections of this report that concentrated on distribution and concentration used geographic mapping tools to estimate travel time over the street network. Thus, the maps show what ***should*** occur from the station placements. However, in the real world, traffic, weather, and units being out of quarters on other business such as training or fire prevention duties affect response times. Further, if a station area has simultaneous calls for service, referred to as "call-stacking," the cover engine must travel much further. Thus, a complete Standards of Response Coverage study looks at the actual response time performance of the system from incident records. Only when combined with map measures, can the system fully be understood and configured.

As a review of actual performance occurs, there are two perspectives to keep in mind. First, NFPA 1710 only requires that a ***department-wide*** performance measure of 90 percent of the historical incidents (not geography) be maintained. This allows the possibility that a few stations with great response time performance can "mask" the performance of stations with poorer travel times.

In the Standards of Response Coverage approach, it is recommended that the performance of each *station area* also be determined to ensure **equity** of coverage. However, even this approach is not perfect – a station area may well have less than 90 percent performance, but serve lower risk open space areas with limited buildings thereby not having an economic justification for better performance. In addition, the study must discuss just what is measured within the under-performing statistic. For example, a station area with a first-due performance of 88 percent with only 50 calls in the 88th to 90th percentile is far different from an area with 500 calls for service in that 88th to 90th percentile.

All measures then must be understood in the complete context of geography, risk, and actual numbers of calls for service that exceed the community's performance measure. The Department's response time performance must be compared to outcomes such as fire loss or medical cases and be contrasted to the community's outcome expectations. A community could be well deployed and have poor outcomes, or the reverse. A balanced system will avoid such extremes and strive for equity of service within each category of risk.

Fire departments are required to report response statistics in a format published by the U.S. Fire Administration called the National Fire Incident Reporting System (NFIRS). The private sector develops software to do this reporting to state and federal specifications.

Data sets for this section of the study were extracted from the ESD #6 fire incident records management system (RMS). Due to the recent transfer of dispatch operations to the Austin Fire Department, a complete set of time records for more than a year were not available for this study. Since the federal NFIRS system only requires a crew notify time record and the on-scene arrival time, this study cannot determine how long the call took in dispatch processing, or how long it took the crew to don safety clothing and get the unit moving. To measure these segments of "total reflex" the ESD needs to gather from dispatch the time of call receipt, the time of crew alert, the time the crew was responding (rolling) and the time on scene. The Department is working with Austin Fire on a records system to accomplish this.

Therefore "response time" in this study is measured from the time of the fire crew receiving the dispatch to the time the unit is on scene. In most systems, the dispatch step should take no longer than 1 minute, 90 percent of the time, and the crew turnout step no more than 2 minutes, 90 percent of the time. Thus, a 4-minute road travel time when 2 minutes is added for turnout time and 1 minute for dispatch processing is a 7-minute total reflex (customer) measure. For multiple-unit calls, the NFPA recommendation for career departments is an outer measurement of 8 travel minutes, plus two for turnout and one minute for dispatch, which is an 11-minute total reflex measure.

Data sets in this study were "cleaned" to eliminate records without enough time stamps or records with impossible times, such as a 23-hour response. The data sets were modeled in a new fire service analysis tool called *NFIRS 5 Alive*.

For this review, we are modeling the Department's prior performance and comparing the data results to the "ideal" per NFPA 1710 for career fire service deployment since the ESD does not yet have an adopted response time measure. Later, this study will integrate all the SOC study elements to propose refined deployment measures that best meet the risk and expectations found in ESD #6.

The ESD #6 furnished NFIRS 5 data for 6,306 incidents dated for the 3 calendar years of 2004, 2005 and 2006. An additional set of 1,108 records was submitted for the first 6 months of 2007.

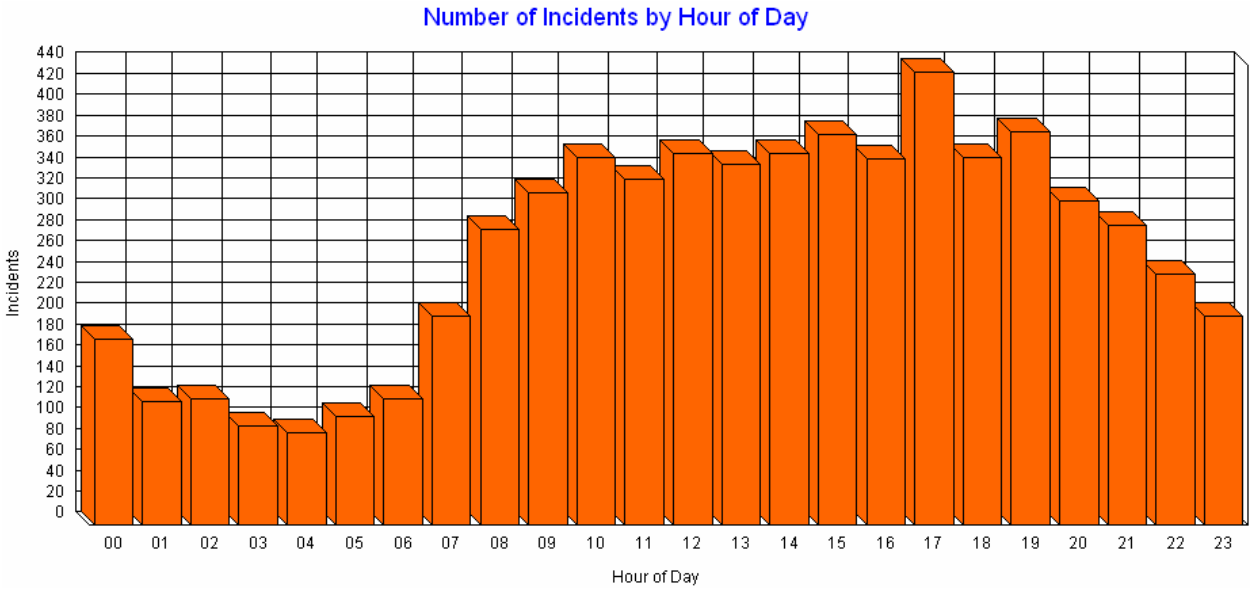
Over a 36-month data period covering 2004 to 2006 the ESD #6 responded to an average of **5.76 incidents per day**. There were 3.7 EMS incidents per day as well as nearly 11.52 fire incidents per month. ESD #6 averages 18.67 structure fires per year. For the 36-month time period 5.12 percent of incident responses were to fire, 54.65 percent to EMS and 40.23 percent were to other types of incidents.

2.7.1 Incident Types

The three years of available data break down as follows:

	2004	2005	2006	Total
Fires	128	108	144	380
Structure Fires	15	21	20	56
EMS	1,409	1,177	1,466	4,052

ESD #6 incidents occur following a predictable pattern for most departments by hour of day:



Here is a list of the top incidents by Incident Type over the dates that data was available:

NFIRS Code/Incident Type	Count
311 Medical assist, assist EMS crew	2,429
321 EMS call, excluding vehicle accident with injury	1,079
700 False alarm or false call, other	361
611 Dispatched & canceled en route	256

NFIRS Code/Incident Type	Count
322 Vehicle accident with injuries	210
300 Rescue, emergency medical call (EMS) call, other	153
631 Authorized controlled burning	144
561 Unauthorized burning	133
324 Motor vehicle accident no injuries	85
735 Alarm system sounded due to malfunction	64
554 Assist invalid	62
745 Alarm system sounded, no fire - unintentional	61
142 **Brush, or brush and grass mixture fire**	**58**
730 System malfunction, other	49
500 Service Call, other	48
111 **Building fire**	**47**
733 Smoke detector activation due to malfunction	46
743 Smoke detector activation, no fire - unintentional	46
531 Smoke or odor removal	42
511 Lock-out	39
143 **Grass fire**	**37**

Here are the top property types receiving service from the ESD #6 Fire Department during the 36-month data period. Property types with fewer than 100 responses were eliminated from the list:

NFIRS Code/Property Type	Count
419 1 or 2 family dwelling	2,808
961 Highway or divided highway	511
311 24-hour care Nursing homes, 4 or more persons	284
962 Residential street, road or residential driveway	164
429 Multifamily dwellings	161
931 Open land or field	156
936 Vacant lot	149
960 Street, other	132
400 Residential, other	122
888 Fire station	122

2.7.2 ESD #6 Response Times

This section will focus on the most recent year of response activity (7/1/06 – 6/30/07) that was available when this report was prepared. While many fire departments track average response time, it is not highly regarded as a performance measurement. One of the most commonly used criteria to measure response effectiveness is fractile analysis of response time. A fractile analysis splits responses into time segments and provides a count and percentage for each progressive time segment.

Below is a fractile analysis of ***all*** incidents in 2006. Time begins with the time the fire crew was notified:

1st Apparatus On Scene <= 00:04:00 32.8%
1st Apparatus On Scene <= 00:05:00 44.2%
1st Apparatus On Scene <= 00:06:00 56.0%
1st Apparatus On Scene <= 00:07:00 67.7% **– Citygate desired Goal Point, suburban areas**
1st Apparatus On Scene <= 00:08:00 76.7%
1st Apparatus On Scene <= 00:09:00 83.1%
1st Apparatus On Scene <= 00:10:00 87.6%
*1st Apparatus On Scene <= 00**:10:45 89.1**% – **Actual 90% Compliance Point***

If the above incidents are reduced to **fire and EMS incidents**, the following fractile results:

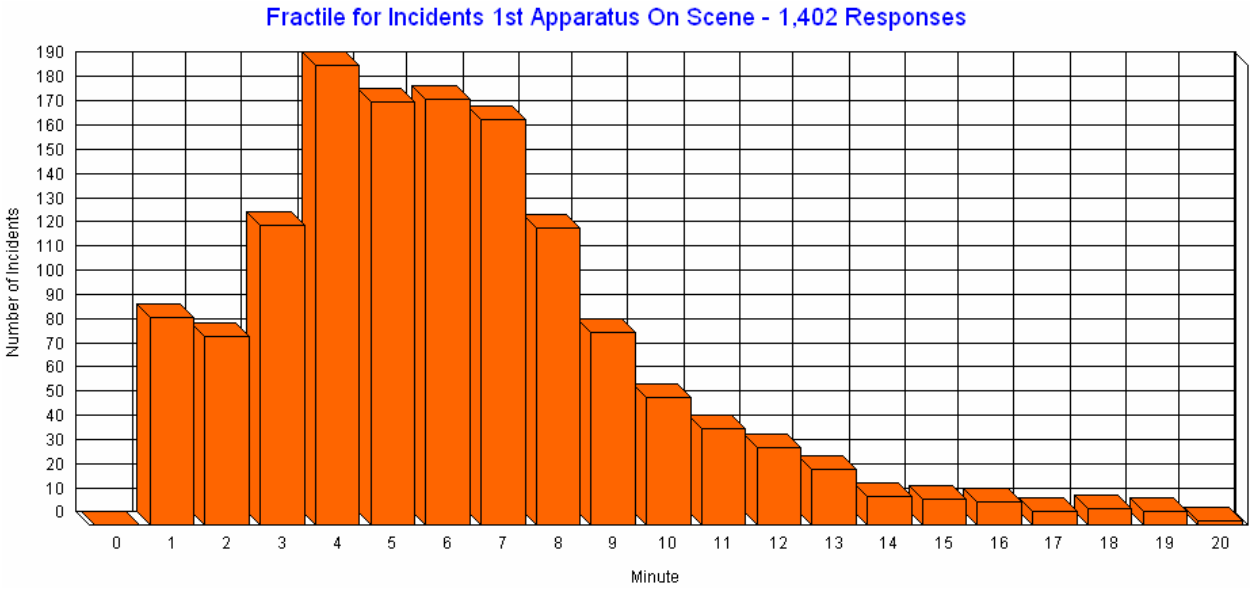
1st Apparatus On Scene <= 00:04:00 34.1%
1st Apparatus On Scene <= 00:05:00 46.6%
1st Apparatus On Scene <= 00:06:00 59.1%
1st Apparatus On Scene <= 00:07:00 71.1% **– Citygate desired Goal Point, suburban areas**
1st Apparatus On Scene <= 00:08:00 79.9%
1st Apparatus On Scene <= 00:09:00 85.6%
1st Apparatus On Scene <= 00:10:00 89.4%
*1st Apparatus On Scene <= 00:**10:15 89.9% – Actual 90% Compliance Point***

Here is a breakdown of the above incidents when incidents are narrowed down to **structure fires**:

1st Apparatus On Scene <= 00:04:00 22.2%
1st Apparatus On Scene <= 00:05:00 22.2%
1st Apparatus On Scene <= 00:06:00 33.3%
1st Apparatus On Scene <= 00:07:00 44.4% **– Citygate desired Goal Point, suburban areas**
1st Apparatus On Scene <= 00:08:00 61.1%
1st Apparatus On Scene <= 00:09:00 61.1%
1st Apparatus On Scene <= 00:10:00 72.2%
1st Apparatus On Scene <= 00:11:00 72.2%
1st Apparatus On Scene <= 00:12:00 77.8%
1st Apparatus On Scene <= 00:13:00 77.8%
1st Apparatus On Scene <= 00:14:00 77.8%
1st Apparatus On Scene <= 00:15:00 83.3%
*1st Apparatus On Scene <= 00:**16:00 88.9% – Actual 90% Compliance Point***

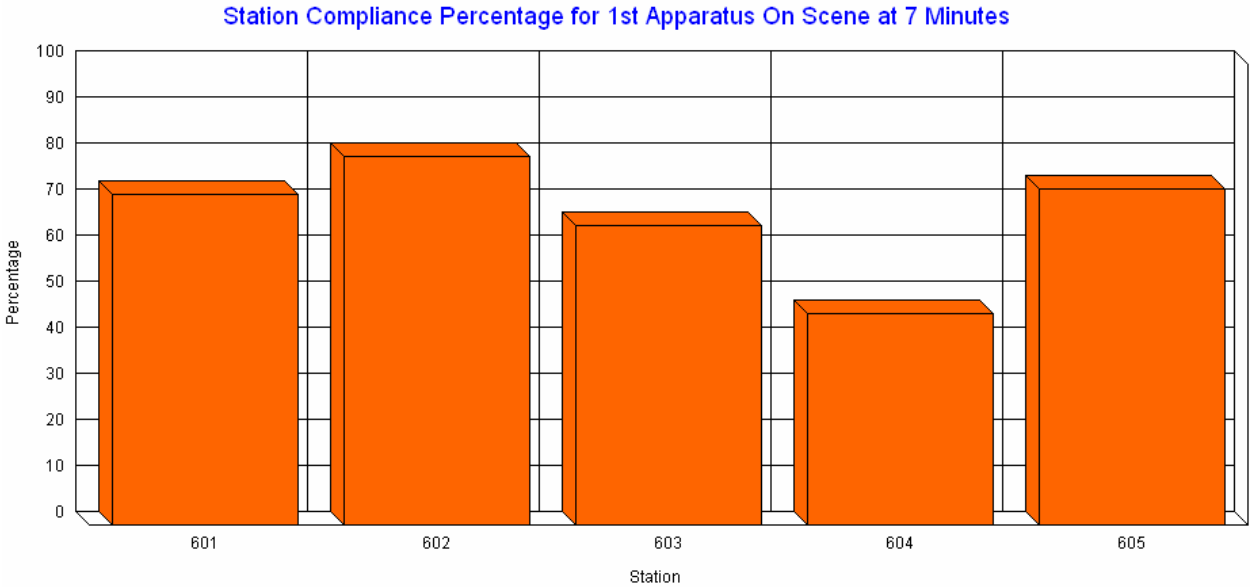
Given the above information on citywide responses, the response time performance is consistent by the severity of the emergency except for structure fires. There are fewer building fires than medical calls and many of them were further out from the fire stations as the call density maps have shown. While part of the above time measure is crew turnout, we do not know how much. Assuming the greatest time for crew turnout to be 2 minutes, then the fire and EMS response times above likely reflect across the ESD an 8-minute travel time, or twice what urban-suburban areas would prefer. This also means the ISO 1.5-mile maps are more reflective of the stations being a little too far apart to deliver 4-minute travel times to the majority of the ESD. The terrain and limited road network really hampers a 4-minute travel time from occurring.

Fractile response times can also be viewed graphically. The following is a graph illustrating the number of incidents by response time minute for 2006 **fire and EMS incidents**. Incidents with a zero response time were eliminated from the graph.



Notice the minute with the most 1st arriving apparatus is minute 4. The graph illustrates there are many more responses immediately to the right of 4 minutes (longer than 4 minutes) than immediately to the left (shorter than 4 minutes). This "right-shifting" of the graph indicates many ESD #6 responses are located further from fire stations, and some incident locations are far more remote requiring response times up to 19 minutes.

Here is a breakdown of station response time compliance at 7 minutes from company notification:



Station 602 has the highest first apparatus arrival compliance near 80 percent given its compact first-due area and more calls for service in this smaller area as compared to Stations 603 thru 605.

The following table summarizes the total response performance of the individual engine companies for **all incident types**:

Total Response Performance by Station Area

	Time	Percent
Station 1 Engine	10:00	89.9%
Station 2 Engine	09:15	90.2%
Station 3 Engine	12:45	89.6%
Station 4 Engine	12:15	89.8%
Station 5 Quint	10:00	91.1%

The above graph and table show that overall response times are a little sluggish in the two districts where the areas served are too large and there is a lack of cross connect streets to help a second-due "cover" company take another call in the district when the primary unit is committed on a call.

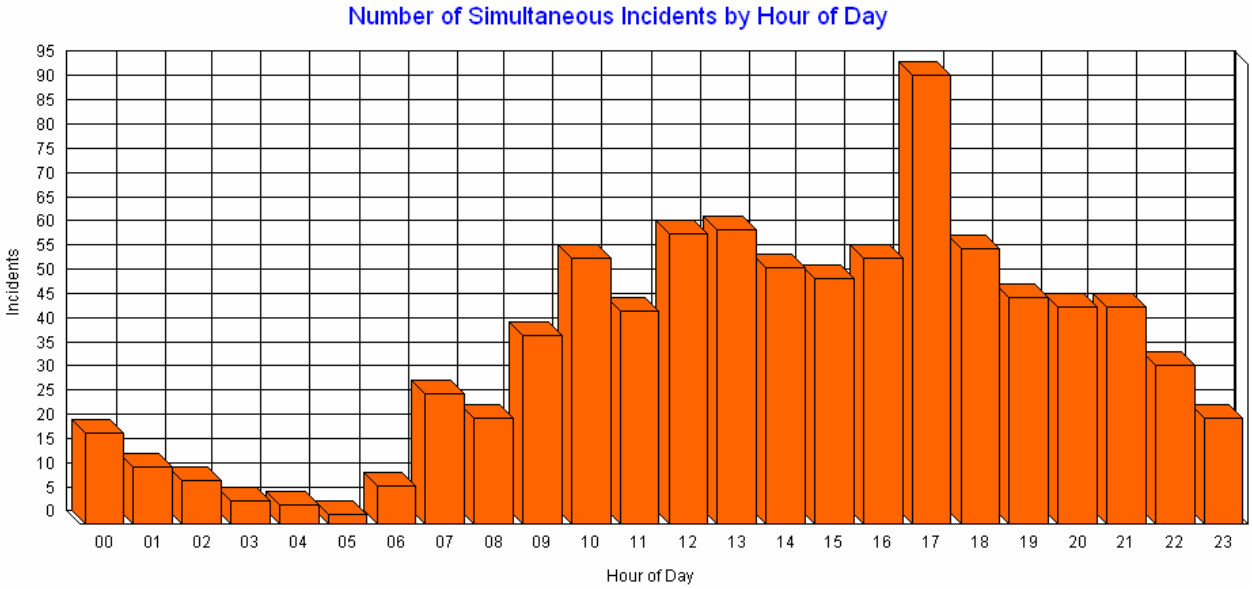
2.7.3 Simultaneous Call Measurements

Obviously incidents that occur at the same time tax fire department resources more than those occurring when there is no other fire department response activity. Examining incident data for the 36-month period shows **13.76** percent of incidents occurred when the ESD #6 Fire Department was already engaged in other response activity.

Here is the breakdown by number of incidents:

At least 2 Incidents occurring at the same time	13.76%
At least 3 Incidents occurring at the same time	1.22%

The graph below illustrates the hourly distribution of 2 or more (13.76 percent) incidents. The "hour of day" graph roughly follows the distribution frequency of the same graph of all incidents. Notice the largest share of simultaneous incidents occurs from 10:00am – 7:00pm with a dramatic spike between 5:00pm – 6:00pm. The pattern of simultaneous incidents roughly resembles total incident activity during the 24-hour day. This indicates hourly simultaneous incidents are correlated with incident activity in general.



It is common sense that simultaneous calls for service in a five-station department can affect the department's ability to respond within its desired goal measures. However, given the very modest rate of 14 percent double incidents at a time, this issue is not an immediate problem for ESD #6 or for the design of station locations.

2.7.4 Mutual Aid Measurements

According to NFIRS 5 data ESD #6 rarely utilizes interdepartmental aid. When used, the Department is more likely to give aid than to receive it. During 36 months of available data, aid types breakdown as follows:

NFIRS Code/ Aid Type	Count
1 Received	14
2 Automatic Aid Received	0
3 Given	50
4 Automatic Aid Given	8
5 Other Aid Given	3
N None	6,231

2.7.5 Responses Between ESD #6 Stations

The following chart quantifies out-of-station area apparatus movements ordered by the apparatus most likely to respond out of their primary station area into another ESD #6 station area. This chart is assembled to quantify major movements in 2006. Only 5 responses or more are recorded. Totals in grey highlight engine companies frequently providing aid to other station areas. E602 provides the most out-of-area aid while Station 601 receives the most responses from outside apparatus.

Major Apparatus Movements in Past Year to Support Other Station Areas

	601	602	603	604	605	Total
E601	(573)	19	8	5	6	611
E602	57	(573)	32			662
E603		19	(505)			524
E604	49	5		(180)	8	242
E605	6	(21)			20	47
Q602	15	5		12	(101)	133
Q605	9			12	(78)	99
Total	709	642	545	209	213	**2,318**

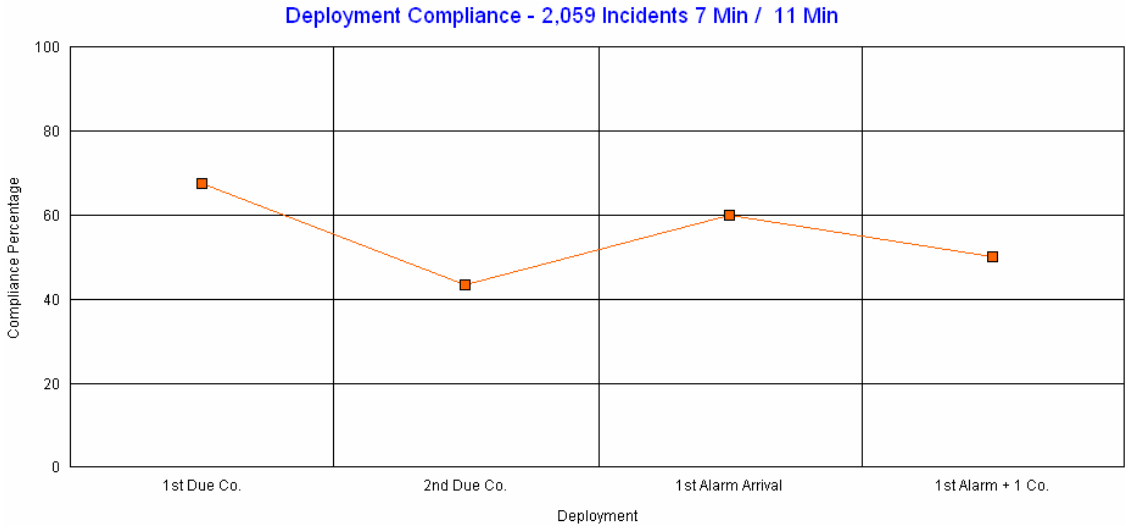
It is apparent from the above table that, given a modest simultaneous call-for-service rate, the units are helping on calls into other station areas. This is partially why overall response time performance can be longer than desired.

2.7.6 First Alarm Response Time Compliance

Deployment Compliance is a type of compliance report that measures the percentage of time a preset goal is realized. Again, the percentage range can run from 0 to 100 percent. For example, a goal could be set to measure compliance with having at least one company on the scene of an emergency within seven (7) minutes of a call and having a first alarm assignment on the scene within eleven (11) minutes. In this case we will use these minute goals for a first alarm assignment of 3 engines and 1 ladder responding from the ESD #6 apparatus inventory.

The following Deployment Compliance graphs plot compliance for the first-due company (first plot) as well as a 3 engine/1 ladder first alarm assignment (third plot). The second and fourth plots illustrate compliance level for additional resources, the second company at 7 minutes and an augmented first alarm assignment at 11 minutes. An augmented first alarm assignment is simply 3 engines and 1 ladder plus one additional ladder or engine. These graphs do not include engines and ladders responding from outside agencies for aid.

The following charts may not exactly match the response times in the text above. This is because first-due is calculated only for incidents where both a first-due and second-due company responded. This department-wide Deployment Compliance graph measures **fire and EMS incidents only** in calendar year **2006**. The graph shows good performance with second-due apparatus stressing the system more than adding another company to a first alarm assignment:



Notice the first-due company response has a nearly 70 percent compliance at 7 minutes; however, the second-due companies arrive within the same 7-minute criteria about 45 percent of the time, showing how far apart the stations are. Having a 2/1 first alarm assignment arrive within 11 minutes occurs about 60 percent of the time, while an augmented first alarm response (response of one additional engine or ladder from Hudson Bend) was in place less than 60 percent of the time within the same 11 minutes.

While getting the first alarm on scene 60 percent of the time by the 11th minute is not meeting urban-suburban deployment guidelines, it is also far better than a rural or all-volunteer response system could deliver.

2.7.7 Response Time Statistics Discussion

Given the above summary of Citygate's response statistics analysis, the detailed data in the comprehensive statistics analysis, and the findings based on the geographic mapping section, we offer the following findings and recommendations:

Finding #7:	With a department fire and emergency medical incident response performance of 10:15 minutes/seconds at 90 percent, as the ISO 1.5-mile response distance map measure predicated, ESD #6 does not have enough primary neighborhood fire stations to serve a very difficult terrain and road network.
Finding #8:	Currently, the number of 2 or more simultaneous incidents is not a significant problem that should drive more fire stations and firefighters.
Finding #9:	The multiple-unit (first alarm) compliance measures are weak across the department due to the wide apart spacing of the fire stations and the difficult to serve road network.

2.8 TIMING OF FIRE STATIONS AND INITIAL STAFFING/EQUIPMENT STRATEGIES

As was stated in the beginning of this study, there are no federal or state requirements for a minimum level of fire services, other than to provide them safely if done at all. Two sources do exist to assist local elected officials in making fire service level of effort decisions: (1) the National Fire Protection Association Standard 1710 on Career Fire Services Deployment; and (2) the Commission on Fire Accreditation's Standards of Response Cover process.

The Commission on Fire Accreditation in its 4th Edition Standard of Response Cover Manual recommends the use of this trigger points table for when to add additional fire stations:

Trigger Points for Adding Additional Fire Stations

Choices	Distance	Response time	Percent of Calls	Bldg inventory
Maintain status quo	All risks WITHIN 1.5 miles	First-due Co. is within 4 minutes travel time, 90 percent of the time	100 percent in District	Existing inventory and infill
Temporary facilities and minimal staffing	Risks 1.5 to 3.0 miles from existing station	First-due Co. exceeds 4 minutes travel time 10 percent of the time, but never exceeds 8 minutes	More than 10 percent of calls are in adjacent area	New area has 25 percent of same risk distribution as Initial area
Permanent station needed	Risk locations exceeding four miles from the station	First-due Co. exceeds 4 minutes travel time, 20-25 percent of the time; some calls less than 8 minutes	More than 20-25 percent of calls are in outlying area	New area has 35 percent of same risk distribution as in initial area of coverage
Permanent station essential	Outlying risk locations exceeding five miles from the first station	First-due Co. exceeds 4 minutes travel time 30 percent of the time. Some calls less than 10 minutes	More than 30 percent of calls are in outlying area	New area has 50 percent of same risk distribution as in Initial area.

While this table can assist ESD #6 in planning for when fire stations should occur, the final timing is dependent on the pace and location of development. Typically, fire stations are added when *more than one* of the above trigger points has been exceeded **and revenue is available** to support adding staffing.

Given the constraints of slower initial development and slow revenue increases, Citygate recommends the ESD adopt a philosophy of phasing in fire services starting from a rural level of service to emerging suburban and finally the final response time coverage goals of a continuous, suburban community. One way to view this type of response planning is this table adapted from NFPA 1720 for combination fire departments:

Proposed Deployment Measures Based on Population Densities

	Urban-Suburban	Emerging Suburban	Rural	Wildland
	>1,000 people/sq. mi.	**500-1,000 people/sq. mi.**	**<500 people/sq. mi.**	**Permanent open space areas**
1st Due Travel Time	4	8	14	10
Total Reflex Time	7	11	17	13
1st Alarm Travel Time	8	12	20	12
1st Alarm Total Reflex	11	15	23	15

These service level goals, which would be consistent with national best practices for different community types, would be:

2.8.1 Urban-Suburban – Greater Than 1,000 People per square Mile

First-Due Unit Coverage for EMS and Structure Fires:

4 minutes travel time which equals 7 minutes total reflex from Fire Dispatch Receipt, 90 percent of the calls for service.

First Alarm:

8 minutes travel time which equals 11 minutes total reflex from Fire Dispatch Receipt, 90 percent of the time for the calls for service.

Goal Statement:

The first-due unit should be able to mitigate and terminate routine emergencies without additional assistance other than a transport ambulance. Small fires will be extinguished and medical patients that can be saved upon arrival will receive medical care to stabilize and transport them.

The first alarm assignment to a structure fire will be sized to stop the escalation of the fire and confine it to or very near the room of origin, upon the arrival of the full assignment. Additional units may be needed for rehab and overhaul.

2.8.2 Emerging Suburban – 500 to 1,000 People Per Square Miles

First-Due for EMS and Structure Fires:

8 minutes travel time which equals 11 minutes total reflex from Fire Dispatch Receipt, 90 percent of the calls for service.

First Alarm:

12 minutes travel time which equals 15 minutes total reflex from Fire Dispatch Receipt, 90 percent of the time for the calls for service.

Goal Statement:

The first-due unit should be able to mitigate and terminate routine emergencies without additional assistance other than a transport ambulance. Small fires will be extinguished and medical patients that can be saved upon arrival will receive medical care to stabilize and transport them.

The first alarm assignment to a structure fire will be sized to stop the escalation of the fire, upon the arrival of the full assignment. Building fires will be contained near the area of origin, with smoke and heat damage confined to the floor of origin. Additional units may be needed for rehab and overhaul.

2.8.3 Rural – Less Than 500 People Per Square Mile

First-Due for EMS and Structure Fires:

14 minutes travel time which equals 17 minutes total reflex from Fire Dispatch Receipt, 90 percent of the calls for service.

First Alarm:

20 minutes travel time which equals 23 minutes total reflex from Fire Dispatch Receipt, 90 percent of the time for the calls for service.

Goal Statement:

The first-due unit should be able to mitigate and terminate routine emergencies without additional assistance other than a transport ambulance. Small fires will be extinguished and medical patients that can be saved upon arrival will receive medical care to stabilize and transport them.

The first alarm assignment to a structure fire will be sized to stop the escalation of the fire, upon the arrival of the full assignment. Additional units may be needed for rehab and overhaul. Fires will be contained to the building of origin, with smoke and heat damage throughout. Structure fires will be prevented from spreading to wildland areas.

2.8.4 Wildland/Specialty

Initial Attack – Normal Hazard Days:

1 Engine, 1 Wildland Fire Unit, 1 B/C with 10 minutes travel time which equals 13 minutes total reflex from Fire Dispatch Receipt, 90 percent of the time for the calls for service.

First Alarm:

12 minutes travel time which equals 15 minutes total reflex from Fire Dispatch Receipt, 90 percent of the time for the calls for service.

Goal Statement:

The first-due units should be able to mitigate and terminate routine emergencies without additional assistance other than a transport ambulance. Small fires will be extinguished and kept under two acres in size.

The first alarm assignment to a wildland fire will be sized to stop the escalation of the fire, based on reported size and fire weather severity upon the arrival of the full assignment. Additional units may be needed for rehab and overhaul. Fires will be contained to less than 5 acres.

2.8.5 Integrated Fire Station Deployment Recommendations

As discussed previously in Section 2.4.2, ESD #6 is only staffing 15 firefighters per day:

Units and Staffing Daily Plan

Per Unit			Extended
4 Engines @	3	Firefighters/day	12
1 Ladder truck/Quint @	3	Firefighters/day	3
		Subtotal *firefighters:*	*15*
1 Battalion Chief @	1	Per day for command	1
		Total 24/hr Personnel:	***16***

Currently, ESD #6 is staffed for one serious fire at a time **or** 1 to 3 medical calls for service. This model has served the community well over its growing years, but is now increasingly strained to handle more than one serious event and to provide equitable coverage in all of the neighborhoods. A community of 45 to 50,000 residents plus visitors is no longer a quiet little rural recreational area. ESD #6 should grow its fire defenses commensurate with the risk and call-for-service growth.

Summarized in priority order, ESD #6 has two fire deployment deficits that need improvement:

1. There are not enough primary neighborhood fire stations in the probable growth areas to provide equitable, first-due unit coverage for all emergency types.
2. There are not enough firefighters on-duty to handle more than one modest fire at a time or 1 to 3 medical calls when fires occur. Fortunately, for ESD #6, the vast majority of calls for service are medical emergencies. However, two medical calls at once consume 6 firefighters, which is 40 percent of the total number of firefighters and 40 percent of the fire attack units. During these periods, the ESD cannot also field an effective response force (first alarm) to a serious building fire.

Citygate's deployment recommendations are designed to improve Priorities 1 and 2 simultaneously. Citygate envisions that the ESD consider adding resources in the following ways as fiscal resources permit:

1. Adding a 4th firefighter full-time to three of the existing units;
2. Adding a second staffed quint/ladder truck;

3. Relocating Station 603;

4. Consider a joint fire station at the southern end of Hamilton Pool Road;

5. Adding a 6th fire station southwest of Lakeway and Village of the Hills as the development occurs and revenues allow.

By increasing three engines to 4 firefighters per day, there are more firefighters on the street: over time adding a 6th station southeast of Lakeway will improve response times in the western ESD as well as adding more firefighters on duty. With both of these service improvements, both the deployment deficits identified above are substantially corrected.

Recommendation #1: The ESD should adopt revised performance measures to direct fire station location planning based on population density per square mile. The measures should take into account a realistic company turnout time of 2 minutes and be designed to deliver outcomes that will save patients medically salvageable upon arrival; and to keep small, but serious fires from becoming greater alarm fires. Citygate recommends these measures be:

1.1 Distribution of Fire Stations for Built-up Urban-Suburban Areas: To treat medical patients and control small fires, the first-due unit should arrive within 7 minutes, 90 percent of the time from the receipt of the 911 call. This equates to 1-minute dispatch time, 2 minutes company turnout time and 4 minutes drive time spacing for single stations.

1.2 Effective Response Force for Built-up Urban-Suburban Areas: To confine fires near the room of origin, to stop wildland fires to under 5 acres when noticed promptly, and to treat up to 5 medical patients at once, a multiple-unit response of at least 15 personnel should arrive within 11 minutes from the time of 911 call receipt, 90 percent of the time. This equates to 1-minute dispatch time, 2 minutes company turnout time and 8 minutes drive time spacing for multiple units.

1.3 Consider adopting emerging suburban and rural area response performance measures and outcomes based on this table and the discussion in Section 2.8:

Proposed Deployment Measures Based on Population Densities

	Urban-Suburban	Emerging Suburban	Rural	Wildland
	>1,000 people/sq. mi.	500-1,000 people/sq. mi.	<500 people/sq. mi.	Permanent open space areas
1st Due Travel Time	4	8	14	10
Total Reflex Time	7	11	17	13
1st Alarm Travel Time	8	12	20	12
1st Alarm Total Reflex	11	15	23	15

Recommendation #2: Add a 4th firefighter per day to engines 601, 602 and quint 605 to improve the weight of response staffing and to leave one unit available for simultaneous responses during structure fires. Thus, 3 engines and 1 quint would deliver the needed 15 firefighters.

If there are funding limitations that prevent 3 crews from increasing to a 4th firefighter, then the highest priority is to first staff the quint(s) with four personnel.

Recommendation #3: Add a second quint at Station 603. When opened, transfer the 4th firefighter per day from 605 to 603.

Recommendation #4: Work with the adjoining fire district to see if a joint, shared cost career fire station is possible to serve the southern Hamilton Pool Road area.

Recommendation #5: Remodel Station 604 and move the quint from Station 605 to Station 604.

Recommendation #6: As a parcel can be found, re-locate and build a more appropriate Station 603.

Recommendation #7: Replace Station 601 at or very near its existing location.

Recommendation #8: Work to site and fund a 6th fire station and engine crew southwest of Lakeway and Village of the Hills as the development occurs and revenues allow.

As the phasing section of this report explains in detail in Section 5, achieving improved fire station coverage in ESD #6 will take even more time and fiscal resources than the ESD currently has. However, it must be understood that not all neighborhoods today receive an equal opportunity (not guaranteed, due to prior emergencies, etc.) of a timely fire response. The ESD needs to address this situation as it continues to grow.

SECTION 3—ESD #6 FIRE DEPARTMENT REVIEW: NON-DEPLOYMENT FUNCTIONS

The first two sections of this report and planning effort described background information and station/crew deployment material on fire services in ESD #6. These sections described in detail the current response system and needs for a fire and emergency medical response in the ESD service area. The third aspect of fire services ESD #6 asked Citygate to review is a composite of other functions that facilitate the emergency response system or are part of the support functions of the department.

The functions that the ESD #6 Fire Department asked Citygate to review were:

- Fire Prevention and Code Enforcement
- Fire Investigations
- Public Education and Public Information
- Disaster Preparedness
- Special Responses (specifically Hazardous Materials response).

Additionally given the information the Citygate team had to collect on the Department's field operations, we also chose to review and offer feedback to the Department on its Training Program.

Citygate reviewed these functions by reviewing agency records, interviewing fire staff, touring the fire stations, and speaking with some of the line personnel. This helps to form a composite picture of how well the administrative functions perform, and where they should go in the future. Citygate also reviewed the authorities, codes, policies, and procedures as well as interviewed staff. Some of the items mentioned are normal and routine, and as such should just continue to receive the proper management focus and support to keep the Department healthy and compliant with regulations. In other areas where significant deficiencies are noted, Citygate made recommendations for the Department to take additional action.

Citygate observed in the Department at all levels a very committed, can-do attitude to deliver the best services they can, given the staffing and fiscal constraints on the District. The Department leadership, staff, and line personnel all exhibited a very strong work ethic. Even though the Department has grown significantly in the last decade and has relatively young personnel, all appear committed to providing quality and efficient service.

3.1 FIRE PREVENTION AND CODE ENFORCEMENT

Issue:

Are the legal authorities, established policies, and procedures for development, implementation, and enforcement of relevant codes adequate for the community's needs?

Fire prevention includes any activity that decreases the incidence and severity of uncontrolled fire. Usually the methods used by the fire service focus on inspection, which includes engineering, code enforcement, public information, public education, and fire investigation. It is very difficult to quantify the effectiveness of fire prevention programs; a fire prevented never

shows up as a statistic. However, studies show that programs that follow best practice procedures do reduce the incidence of unwanted fires and their attendant losses.

- Is there an adopted fire code and staffing plan to meet the needs of new construction, existing commercial occupancy inspection and public education?
- Do engine companies perform inspections? Of what?
- Are inspectors trained?

Observations:

- The Fire Marshal is an Assistant Chief and reports directly to the Fire Chief. This is at the Administrative Officer Level (NFPA Fire Officer III) and is the appropriate level for the Prevention Program.
- Staffing of the prevention division consists of the Fire Marshal; two Fire Inspector/ Arson Investigators, and an Administrative Assistant. There is a vacant half-time public education position; the Fire Marshal is considering making this into another full-time Fire Inspector / Arson Investigator. The Department contracts for Fire Protection Systems Engineering plan check review work on new construction. They also contract from a professional engineer for hazardous materials plans review, in those processes that use hazardous materials.
- Training for Inspectors meets the standards required in Texas and certified by the Texas Commission on Fire Protection. The Division schedules 2 hours of training a week for all members; due to workload, they actually complete the training 50 to 75 percent of the time.
- The Fire Marshal attends the Society of Fire Protection Engineers monthly meeting about 50 percent of the time.
- Both of these functions have sign-in sheets and count as training hours for the Fire Prevention Division. In addition to these functions, fire prevention trains with the Central Texas Fire Investigators. Fire prevention records their training as a PDF file in their computer; they do not use the central records management system.
- Engine companies do not conduct inspections.
- In Travis County the fire departments all use the 2003 edition of the International Fire Code, published by the International Code Council. All the incorporated cities use the 2006 International Code; the County simply has not adopted the new code yet. Occasionally this causes difficulties for the Fire Prevention Division as they work in both the County and cities.
- The Division also enforces Texas law on outdoor burning in those areas where it is permitted. Outdoor burning is banned if trash pickup is available.
- The inspection schedule is annually for the following properties:
  - Schools – Nine (9) public schools
  - Licensed facilities (care homes, etc.)
  - "Big Box" retail

- Public Assemblies.

Fire Marshal Activity Summary—May 2006 through May 2007

Month	Inspections	Plan Reviews
May	26	43
June	58	39
July	61	71
August	47	60
September	135	58
October	93	31
November	27	36
December	40	47
January	32	38
February	94	72
March/April	56	59
May	109	39
Total	778	593

- During 2004 through 2006 prevention staff completed 4,725 inspections. If the inspectors did nothing else (no training, no investigations, no public education and no follow-up on inspection violations), each inspection would use 3.44 hours. Of course, many other activities take the time of the prevention staff. A typical three week period in May 2006 for the three-person staff looked like this:

Activity	Number/Hours
Total Inspections/Hours	26/21.42
Hazards Found/Hazards Corrected	22/3
Total Plan Reviews/Hours	43/47.25

- Not included in the table above are staff activities that are group activities which include team inspection, fire investigations and plan reviews, prevention staff meetings and office activities including inspection procedure updates, database and code research.
- There are no national standards to describe how to measure the performance of prevention staff. Many variables affect the staff's productivity, including the complexity of the facilities requiring inspection, the cooperation of the business or owner, driving time from the office to the inspection site, and the presence of violations. One factor that will continue to have a significant impact on prevention staff productivity in ESD #6 is driving time. The District covers a large geographic and widely dispersed area. Traffic on the current road system already has an impact. As the area grows and traffic worsens, this will only compound the situation.

- The records management system (RMS) contains a list of all names and addresses of the required inspection properties. All violations and corrections are also listed in the RMS; an aide makes the data entries into the RMS. Firehouse® Software has an electronic tablet system available; the current plan is to buy the tablets and use them in the field to eliminate the transfer of data from the field to the RMS. This will also have the added benefit of reducing data entry errors.
- Some new construction and new businesses have never received an inspection.
- In the County area, the County is in the process of developing citation forms. Without citation forms enforcement is difficult. In the cities that are in the District, the Fire Prevention Division refers violations to the city building departments. Although it is not consistent, there is law enforcement aid available from the County to assist with violators.

Finding #10:	The prevention program follows the legal authorities of the adopted codes.
Finding #11:	The prevention program follows established policies and procedures when enforcing the codes.
Finding #12:	The current staff is operating at as close to peak efficiency as possible. Additional commercial building growth plus the need for ongoing public education and wildland fuel reduction programs will cause the staff to fall behind and not be able to meet all the various needs.
Finding #13:	The staff is adequately trained, properly led and in the correct organizational location to be very effective.

Recommendation #9:	As soon as funding is available, ESD #6 should consider hiring another Fire Inspector/Investigator. This position can also take the lead in designing and delivering public education programs.

3.2 FIRE INVESTIGATIONS

Issue:

Does the program of investigation of fires and other emergencies assist with the development of an effective hazard and risk prevention program?

Preliminary and subsequent fire investigations of all fires are essential to understand the sources of the community's fire problems. Accidental fires may reveal weaknesses in the codes, in the building inspection process, or in other aspects of processes. Suspicious fires may reveal an arson problem.

- Are all fires investigated to determine cause?
- Does the fire investigation system coordinate with law enforcement to bring about the appropriate arrests and convictions in arson cases?

Observations:

- When responding companies determine they have a need for assistance they contact the Fire Marshal by telephone, or one of the Inspector/Investigators to assist.
- The Fire Marshal and Inspector/Investigators are all trained fire investigators. In addition, they can get help from the County Fire Marshal, State Fire Marshal or the Bureau of Alcohol, Tobacco and Firearms.
- The full-time clerical also handles juvenile fire setter initial counseling and screening. More serious cases are referred to outside counseling sources.
- There are policies in the Emergency Operations Manual that describe situations that *might* require the presence of an investigator or law enforcement personnel.

Finding #14: There is a need for an improved investigation policy to define when fires and other emergencies need investigation by a trained investigator.

Finding #15: Given the small number of building fires in the District, every uncontrolled fire of consequence deserves an adequate investigation by a trained investigator.

Finding #16: There is no evidence that company officers or chief officers receive training in fire investigation; such training would assist in the evaluation of the need for a specially investigator. It would also reduce the investigator's workload on small fires with obvious reasons for the fire starting.

Recommendation #10: The ESD should add preliminary fire investigation to the training for company and chief officers.

3.3 PUBLIC EDUCATION AND PUBLIC INFORMATION

Issue:

Does the program work in concert with school systems, community organizations, special interest groups, corporate partners, and government agencies in delivering public safety information regarding fire, medical emergency, natural disaster, and other threats?

On the level of human behavior, including the basic ignorance that often causes unwanted fires, there is a need for more public education. Now that the fire service is in a lead role in the emergency medical arena, the role of public education has expanded to a much broader area of accident prevention. Simultaneously the Fire Department's message plays against an increasingly noisy backdrop of media messages.

Public information for the fire service serves three purposes. First, providing the public with information about emergencies as well as information that they can use to prevent fires and injuries and prepare for emergencies and other Fire Department activities. The second and third purposes are most critical in ESD #6. People are moving to this area from Austin, other parts of Texas, and out of state. Their knowledge of the fire hazards in this region will be limited, and without a good information program it will stay that way. In addition, the Department will be expanding, moving stations to better locations and in other ways affecting the people who support it. They have both a right and need to know what is happening with their fire department. Only through a properly staffed and operated information program, can that happen effectively.

- Does the Department have an effective public education program that takes advantage of opportunities for exposure?
- Does the public education program recognize the changing role of the fire service by broadening its scope?
- Is the public information system effective in providing information about the Fire Department and providing information about fire prevention?

Observations:

- The half-time public education/information position in the Fire Prevention Division is vacant. The Fire Marshal would like to have this position converted to a full-time Fire Inspector/Investigator.
- Lacking a Public Education and Information Officer over time will necessitate the fire chief and executive staff spending increasing amounts of time developing and maintaining information contacts and outlets, preparing information documents, and acting as the voice of the Department. This is not necessarily a bad thing, and there are occasions when it is appropriate, but on a routine basis it is not the best use of high-level personnel.
- In this increasingly complex world, developing and maintaining appropriate messages internally, to other agencies, and the public is imperative if the Department is to get the three critical messages across.

- On the public education side, the Department currently serves nine schools, soon to be ten. As the population grows, there will be additional schools.
- The wildland urban interface (WUI) is an ever-increasing issue as the housing in the Lake Travis area extends in fingers out into the brush covered ridges. There is "Community Fire Safe Council" that needs the attention of a Public Education and Information Officer.
- The Department operates a firefighter safety team that conducts education programs in the schools and other venues. But this delivery by fire station based personnel can be curtailed by emergencies or is more expensive when done on overtime by off-duty personnel.

Finding #17: Citygate finds that there is a need for a dedicated full-time Public Education and Information Officer.

Recommendation #11: When funding is available, the Department should hire a full-time Public Education and Information Officer. In the interim, when the Department hires the third inspector/investigator, ensure that person has the skill sets to be a half-time Public Education and Information Officer and provide the necessary training.

3.4 Disaster Preparedness – Components of Best Current Practices

Issue:

Does the current Emergency Operations Plan (Disaster plan) and training program adhere to best practices and meet the foreseeable needs of the District and its inter-governmental partners?

The Emergency Operations Plan (EOP), to meet the Department of Homeland Security requirements for the National Incident Management System (NIMS) and to adhere to best practices, should contain the following components:

- Define the scope of preparedness and incident management activities necessary for the local jurisdiction
- Describe the organizational structures, roles and responsibilities, policies, and protocols for providing emergency support
- Facilitate response and short-term recovery activities
- Contain enough flexibility for use in all emergencies

- Contain a description of its purpose
- Describe the situation and assumptions
- Describe the concept of operations
- Describe the organization and assignment of responsibilities
- Describe administration and logistics
- Contain a section that covers the development and maintenance of the EOP itself
- Contain authorities and references
- Contain functional annexes
- Contain hazard-specific appendices
- Contain a glossary
- Pre-designates functional area representatives to the EOC
- Contain pre-incident and post-incident public awareness, education, and communications plans and protocols.

Observations:

- ESD #6 assisted Lakeway with the development of specific disaster plan annexes for the city.
- There is no ESD #6 Disaster Plan.
- ESD #6 is expected to coordinate with the County plan; however, the details and mechanics are not well developed or understood by the staff in ESD #6.
- The only formal link to the County Emergency Operations Center is by a group page to ESD #6's command chiefs.
- As such, with no plan or formal command, control and decision links with the County, the ESD command staff is reactive in times of a large-scale disaster.
- For local serious emergencies, the ESD staff would quickly develop specific Incident Action Plans to guide the incident and/or the departmental operations.
- The Board of Directors has received partial training in the National Incident Management System.
- Fire Command staff is fully trained in NIMS and disaster planning.
- The policy and governance role of the ESD Board in a disaster have not been well designed or educated by the County.

Finding #18: ESD #6 lacks a NIMS-compliant disaster plan to guide the agency during times of a local or wide area disaster.

Recommendation #12:	ESD #6 should develop an agency-level disaster operations plan that integrates with the plans of the County, cities, and school and water districts. The plan should be compliant with federal requirements and spell out the policy role of the Board of Directors under the County Commissioners when the County Disaster Plan is activated.

3.5 SPECIAL RESPONSES

Issue:

Does the Hazardous Materials System provide for effective planning, enforcement, and response?

As mentioned in the fire prevention section, hazardous materials planning and code enforcement is handled by the Fire Marshal and outside specialist contractors. This is how many fire departments handle this work and it meets best practice expectations. The building and fire codes contain numerous regulations for the handling and use of hazardous materials. The transportation of these materials is regulated by the federal and state governments and is not within the purview of the ESD.

In addition to responding to fires and medical emergencies, fire departments are normally first responders to other types of emergencies that require immediate response, technical training and specialized equipment. There are a number of requirements for training and certification governing departments that engage in these activities. Among them are the Code of Federal Regulations (CFR); NFPA 1006 *Standard for Rescue Professional Qualifications;* NFPA 1670 *Standard on Operations and Training for Technical Search and Rescue Incidents*; NFPA 471 *Recommended Practice for Responding to Hazardous Materials Incidents;* and NFPA 472 *Standard for Professional Competencies of Responders to Hazardous Materials Incidents.*

Of these types of incidents, ESD #6 only engages in hazardous materials response.

- Hazardous materials response—a hazardous materials response occurs after an unintentional release of a material that is either toxic or thought to be toxic or harmful. Normally firefighters isolate the release, evacuate the area, and identify the material. Private companies usually handle the actual clean up. (See 29 CFR 1910.120)

Observations:

- Chief officers receive Hazardous Materials Incident Commander training.
- ESD #6 is a partner in a multi-fire department (four) regional hazardous materials response team. As such:
  - The team fields four equipment and four science trailers with specialty tools;

- ESD #6 has 12 field personnel trained to the hazardous materials technician level;
- ESD #6 houses one of the hazardous materials trailers at Station 604;
- There are four science officers in the regional team that rotate being on call;
- Every quarter there a team training session is scheduled for all the participating ESDs;
- Every month in ESD #6 continuing education training is scheduled for department technicians.

Finding #19: The hazardous materials response program is adequate for the number of responses, the area, and the potential. The use of a regional shared team is considered a best practice and very common among suburban fire departments.

Issue:

Does the ESD Have an Emergency Response Program for the Waterways and Marinas?

As described in the deployment risk assessment section of this document, ESD #6 protects a significant number of marinas, covered boat storage buildings and miles of waterfront. Lake Travis is one of, if not the busiest, lakes in Texas. ESD #6 covers the majority of the lake used by the public from the dam to mile marker #19. This typically represents over a million visitors per year to the lake region and three parks. During peak weekends and holidays on the lake, there is an even larger influx of visitors. The ESD does experience emergency medical and small boat fires out on the water. ESD #6 has estimated that over 3,100 boat slips exist and a conservative estimate of the boat valuation is over 150 million dollars. In 2003, one single boat fire in a covered slip at Emerald Point resulted in a fire loss of $1.6 million dollars.

Observations

- ESD #6 operates a small fireboat located at the West Beach Marina, which is staffed by the crew of Engine 601.
- The ESD does have plans for EMS and boat fires in their Emergency Operations Manual.
- ESD #6 coordinates responses on Lake Travis with the other ESDs, LCRA, TCSO, Starflight and regional parks.
- In a typical summer boating season, ESD #6 can participate in 30 or more water rescue emergencies.
- ESD #6 operates one fire/rescue boat obtained in 1998. The LCRA approved a grant for the $9,000 which paid for the cost of the boat. Yacht Harbor donated the 2 motors and ESD #6 added another $6,000 for equipment. ESD #6 Boat 1 was

fully in service at a total cost of $18,500. The boat is only 22' long, with an open cockpit, limited storage and one 300 gallon per minute fire pump and very limited foam capacity for fuel fires. With three firefighters on board, the boat can really only handle one serious patient at a time or 2-3 evacuees and its response speed and stability are low in windy chop conditions.

- ESD #6 staff has researched rescue/fire boats that would meet the risks present on the ESD's section of Lake Travis. At a minimum an appropriate boat would be:
  - A longer boat with a deep V hull for stability
  - Have the horsepower for appropriate response times in rough water
  - Have a 1,500 GPM fire pump with significant foam capacity
  - Have a small all weather cabin for the firefighter crew, with good communication and navigation equipment
  - The cost has been estimated to be in the$350K to $400K range.

Finding #20:	The ESD #6 fireboat, while better than nothing, is older and far too small for anything other than a single-patient EMS call in smooth waters or a small ski boat size fire. Large cabin cruisers, water front building and wharf fires would overwhelm the fireboat's abilities. A large party boat accident could generate many patients, clearly overwhelming one small boat and crew.

Recommendation #13:	ESD #6 should explore with these partner agencies the possibility of jointly submitting for a federal or state grant to purchase a larger capacity fire and rescue boat which should be commensurate with the risks to protect. While other public safety agencies operate boats on Lake Travis, none are well equipped for firefighting and multiple EMS patient emergencies. Given the multiple ESDs around the lake, staffing and operating the boat could also be handled jointly.

3.6 TRAINING SYSTEMS

Issue:

Is there an effective training program in the Department?

The job of a firefighter is extremely complex, and the services they deliver must be performed correctly every time. This is particularly critical for those tasks that are very hazardous do not

occur very often, and for which there is little decision time. Training in the fire service has two parts: (1) vocational training which teaches the skill sets necessary to perform the "hands-on" type work that firefighters do; (2) and education which teaches the knowledge necessary to do the "mental" work that firefighters do.

- Is there an effective education program in ESD #6?
- What percent of employees are in a certification process? What percent are certified at their level?
- Training is the keystone to effective emergency response. During emergency operations, time is always of the essence, and an effective training program can mean the difference between modest or great outcomes.
- The NFPA has several recommended standards that cover the training arena; among the ones that apply to ESD #6 are:
  - NFPA 1001 Standard for Fire Fighter Professional Qualifications—This standard establishes the basic qualifications for Firefighter I and II.
  - NFPA 1002 Standard for Fire Apparatus Driver Operator/ professional Qualifications—This standard sets forth the performance objectives for driver/operators of all types of fire apparatus and emergency vehicles.
  - NFPA 1006 Standard for Rescue Technician Professional Qualifications—This standard delineates the performance objectives for firefighters who perform technical rescue.
  - NFPA 1021 Standard for Fire Officer Professional Qualifications—This standard covers the four levels of fire officer progression; Fire Officer I, Fire Officer II, Fire Officer III, and Fire Officer IV. The International Association of Fire Chiefs developed the Officer Development Handbook, which coordinates Fire Officer I with Supervising Fire Officer; Fire Officer II with Managing Fire Officer; Fire Officer III with Administrative Fire Officer; and Fire Officer IV with Executive Fire Officer. Each of these four levels of Officer development has a complete training, education, and experience and self-development component. This handbook endorses Fire and Emergency Services Higher Education, the national model of training and education development.
  - NFPA 1031 Standard for Professional Qualifications for Fire Inspector and Plan Examiner—This standard describes the professional performances of the fire inspector and plan examiner.
  - NFPA 1041 Standard for Fire Service Instructor Professional Qualifications—This standard guides the development of the fire-service training instructor through the three levels of advancement: Instructor I, II and III. It is critical for proper delivery of training that all instructors meet the appropriate level of instructor development, which also includes delivery of instruction, evaluation and testing processes, and management of training programs.

- NFPA 1401 Recommended Practice for Fire Service Training Reports and Records—This standard is of particular importance to ESD #6 since it includes all aspects of training documentation such as training schedules, reports, records, legal characteristics of training records, record management systems (RMS), and means to evaluate the RMS.
- NFPA 1403 Standard on Live Fire Training Evolutions—Sadly, live fire training has been the source of many injuries and fatalities to firefighters. In the present day failure to adhere to this standard would be negligent.
- NFPA 1404 Standard for Fire Service Respiratory Protection Training—This standard covers the proper use, inspection, maintenance, and program administration of SCBAs. ESD #6 is compliant with the 29 Code of Federal Regulation requirements and OSHA.
- NFPA 1451 Standard for a Fire Service Vehicle Operations Training Program—This standard covers the minimum requirements of a vehicle operations training program. ESD #6 does not reference this standard specifically or indirectly.

Observations:

- Two lieutenants head components of the training division; one is in charge of fire/rescue training specifically and the other is responsible for emergency medical service quality assurance. According to the organization chart the training function is on a par with the operations function. Both lieutenants report to the operations assistant fire chief.
- The lieutenants have offices in two separate facilities, Station 601 and Station 605.
- The Department training program is organized to ensure that all personnel attend appropriate training to meet the requirements of the Texas Commission on Fire Protection.
- The Department has no formal mentoring program.
- The training division is developing a staff development program.
- Stations do not have a standard training library; however, headquarters maintains a library as required by the state.
- The Department has no dedicated training facility. There are two classrooms: one at Station 601, primarily for fire training programs; the other at Station 605, primarily for EMS programs.
- There are two training calendars on Outlook available to all stations. The calendars track the use and availability of the two classrooms.
- The Department has no specific policy on the number of hours members are to spend on training including by subject and overall.

- The Department started using the Firehouse® RMS as the management information system this year. Using whatever training data they could find, the training division inputted three years worth of data. Consequently, there are very few records in the database. The Department has no policy on reporting training.
- There is a career development process for all the ranks; it follows the requirements of the Texas Commission on Fire Protection. While the process is comprehensive, it is also appropriate and not overwhelming. The Department tries to get all personnel to Basic Wildland Firefighter (S-130) and Introduction to Wildland Fire Behavior (S-190).
- The Hazardous Materials Technicians assigned to Station 604 receive hazardous materials technical training. Upon certification they must train 20 hours per year; at Station 604 they train on hazmat 2 to 3 hours per month
- The Department maintains an incident-rehabilitation support team, somewhat akin to a volunteer company with limited operational responsibilities. All members receive training in properly refilling self-contained breathing apparatus bottles.
- The Department follows the NIMS system for Incident Command System (ICS).
- Qualified members also receive the Texas version of "red cards," issued by the Texas Commission on Fire Protection. This system generally follows the National Wildfire Coordinating Group (NWCG) standards.
- Members participate in some of the offerings of the national Fire Academy including the Executive Officer program and fire prevention programs.
- The Texas Commission on Fire Protection provides the certification system used by the Department.
- The training division is developing a distance-learning program.
- There are some salary incentives for training including a college degree, intermediate, and advance firefighter and paramedic training.

Finding #21: The Department training division developed a contemporary and appropriate training system, one it should take rightful pride in having. It needs policy and leadership to support it.

Finding #22: For a department of ESD #6's size, the head of the training division should be at least at the battalion chief level. This is appropriate at the supervising officer level. As the Department expands, as it will, this will become more problematic. It already shows itself in the spotty compliance with reporting training completed.

Finding #23: The failure of field personnel to properly maintain their training records on the RMS is of concern. Even though the system is relatively new, personnel should be entering all their data. Without that, by what measure does management evaluate the training and its effectiveness?

Finding #24: The Department has no master training policy; this leads to a number of issues. Company officers have no guidance concerning what drills to conduct and when to conduct them. They have not standardized training references to use to prepare and execute training in the station.

Finding #25: Having no dedicated training facility hampers effective multi-company training. Multi-company training is the capstone by which individual company training pulls together.

Recommendation #14: When funding becomes available, Citygate recommends that the Department establish a battalion chief position in charge of training. Concurrent with this recommendation, Citygate recommends that the Department retain the current staffing of two company officer positions in the training division.

Recommendation #15: Using nationally recognized standards that are consistent with Texas' standards, develop needed policy for the Department's training effort.

Recommendation #16: When capital funding becomes available, develop a training facility including appropriate classroom and props.

SECTION 4—FISCAL ANALYSIS

4.1 COSTING OF ADDED SERVICES

This chapter outlines the costs of these Master Plan recommendations for improved fire services for ESD #6. The costs in this section are in current (FY 07/08) dollars and are not increased for inflation or future employee agreements. However, the costs do, by order of magnitude, show what will be necessary. The timing of these additions will be estimated later in Section 5.3 taking into account the typical lead-time necessary to acquire final sites, design, bid, construct and hire employees. The costing below will need to be refined by staff as part of each budget preparation cycle after the ESD Board of Directors chooses the level of service and implementation timing they desire for the community.

4.2 COMPONENT COSTS

4.2.1 Fire Stations

1–Fire Station: Cost to construct without land, with furnishings can range from *$2.1 to $2.5M*

A replacement headquarters building can range from *$2.1 to $2.5M*

The land issue is complex. Land prices can vary significantly.

4.2.2 Personnel

1–Firefighter position	$60,000
1–Three-person fire company: This includes 1 fire captain, 1 firefighter/paramedic and 1 firefighter times 3 platoons for a total of 9 positions plus relief to cover 24/7/365.	
Total salaries, benefits and overtime costs:	*$720,000*
Fire Station/personnel annual operating cost, utilities, repairs etc.	$80,000
Total 6th Fire Station reoccurring costs:	*$800,000*
Remodel for Fire Station 604 to house the quint:	$300,000
1–Fire Pumper for 6th company: (Including all tools, radios)	*$500,000*
1–Fire Inspector:	$70,000
1–Public Education Specialist	$50,000
1–Battalion Chief/Training Officer	$92,000

4.3 FISCAL IMPACTS DISCUSSION

Capital station and fire apparatus costs can be debt financed and/or partially covered by updated fire impact fees charged to new development.

Operating and maintenance expenses are General Fund on-going costs and will have to be carried by additional General Fund revenue growth. Some, but not all, of this could be offset using new development assessment districts in the growth areas. Thus, the ESD is looking at Capital Costs for a 6th fire station of $2.1-2.54M dollars, plus apparatus costing $500,000. Staffing and operating a recommended 6th fire station will cost $800,000 dollars annually.

Increasing staffing on three engines per day will require a total of nine positions plus relief positions, so the cost of this is equivalent at $720,000 to adding a 6th crew in the western ESD as it develops.

SECTION 5—RECOMMENDED SOLUTIONS AND PHASING PLAN

5.1 INTEGRATED DEPLOYMENT PLAN FINDINGS AND RECOMMENDATIONS

As this study has identified and measured, the ESD #6 Fire Department is *insufficiently* staffed with enough firefighters to address more than one moderate fire or 2 to 3 EMS incidents at the same time. As it grows, the ESD has a distribution of fire station problem, in that there are not enough fire stations to equitably cover all the developed neighborhoods in a timely manner. This particularly occurs in the western ESD south of Lakeway and Village of the Hills. If there were one more fire station, and a 4th firefighter per crew on three engines per day, the resultant increase in the number of firefighters per day (6) would also help to control serious fires more quickly, or to handle two serious fires at once, plus medical incidents, all with less dependence on automatic aid response being quickly available.

While automatic aid is very beneficial to ESD #6, its partners are also very busy departments that find their fire station spacing and increasing call volumes being challenged by growth. ESD #6 should not assume that automatic and mutual aid will always be available when needed.

Citygate's Deployment findings and recommendations for ESD #6 as noted in Section 2 are:

Finding #1: ESD #6 has not adopted a fire service deployment measure. Such a measure should include a specific time measure definition that specifies the beginning and end time measurement points, and a desired outcome goal statement tied to risks. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

Finding #2: As both the 4-minute coverage and Insurance Service Office requirements 1.5-mile coverage maps display, the ESD has a fire station in each of the more intensely developed areas of the ESD.

Finding #3: The spacing of the fire stations is just adequate without overlap to provide first-due unit coverage for rural to moderate suburban levels of development.

Finding #4: The ESD is too large for one ladder truck to cover given the lack of cross connect streets. The only way to improve this issue would be to operate a second quint/ladder truck and position these units at stations 604 and 603.

Finding #5: With 15 firefighters on duty per day, ESD #6 has just enough firefighters for one moderate building fire at once or two to three simultaneous medical emergencies.

Finding #6: The ESD and adjoining North Hayes County VFD should explore jointly staffing a career company and operating a joint fire station at the Hayes County site to cover the southwest area of Hamilton Pool road.

Finding #7: With a department fire and emergency medical incident response performance of 10:15 minutes/seconds at 90 percent, as the ISO 1.5-mile response distance map measure predicated, ESD #6 does not have enough primary neighborhood fire stations to serve a very difficult terrain and road network.

Finding #8: Currently, the number of 2 or more simultaneous incidents is not a significant problem that should drive more fire stations and firefighters.

Finding #9: The multiple-unit (first alarm) compliance measures are weak across the department due to the wide apart spacing of the fire stations and the difficult to serve road network.

Summarized in priority order, ESD #6 has two fire deployment deficits that need improvement:

1. There are not enough primary neighborhood fire stations in the probable growth areas to provide equitable, first-due unit coverage for all emergency types.
2. There are not enough firefighters on-duty to handle more than one modest fire at a time or 1 to 3 medical calls when fires occur. Fortunately, for ESD #6, the vast majority of calls for service are medical emergencies. However, two medical calls at once consume 6 firefighters, which is 40 percent of the total number of firefighters and 40 percent of the fire attack units. During these periods, the ESD cannot also field an effective response force (first alarm) to a serious building fire.

Citygate's recommendations are designed to improve priorities 1 and 2 simultaneously. By increasing three engines to 4 firefighters per day, there are more firefighters on the street; over time adding a 6th station southeast of Lakeway will improve response times in the western ESD as well as adding more firefighters on duty. When both of these service improvements are done, both the deployment deficits identified above are substantially corrected.

Based on Citygate's above findings and the national best practices outlined in this study, Citygate makes the following recommendations regarding fire station and company deployment. The highest priority recommendations are noted in ***italic, bold, and grey shaded language***:

Recommendation #1: ***The ESD should adopt revised performance measures to direct fire station location planning based on population density per square mile.*** The measures should take into account a realistic company turnout time of 2 minutes and be designed to deliver outcomes that will save patients medically salvageable upon arrival; and to keep small, but serious fires from becoming greater alarm fires. Citygate recommends these measures be:

1.1 Distribution of Fire Stations for Built-up Urban-Suburban Areas: To treat medical patients and control small fires, the first-due unit should arrive within 7 minutes, 90 percent of the time from the receipt of the 911 call. This equates to 1-minute dispatch time, 2 minutes company turnout time and 4 minutes drive time spacing for single stations.

1.2 Effective Response Force for Built-up Urban-Suburban Areas: To confine fires near the room of origin, to stop wildland fires to under 5 acres when noticed promptly, and to treat up to 5 medical patients at once, a multiple-unit response of at least 15 personnel should arrive within 11 minutes from the time of 911 call receipt, 90 percent of the time. This equates to 1-minute dispatch time, 2 minutes company turnout time and 8 minutes drive time spacing for multiple units.

1.3 Consider adopting emerging suburban and rural area response performance measures and outcomes based on this table and the discussion in Section 2.8:

Proposed Deployment Measures Based on Population Densities

	Urban-Suburban	Emerging Suburban	Rural	Wildland
	>1,000 people/sq. mi.	**500-1,000 people/sq. mi.**	**<500 people/sq. mi.**	**Permanent open space areas**
1st Due Travel Time	4	8	14	10
Total Reflex Time	7	11	17	13
1st Alarm Travel Time	8	12	20	12
1st Alarm Total Reflex	11	15	23	15

Recommendation #2: ***Add a 4th firefighter per day to engines 601, 602 and quint 605*** to improve the weight of response staffing and to leave one unit available for simultaneous responses during structure fires. Thus, 3 engines and 1 quint would deliver the needed 15 firefighters.

If there are funding limitations that prevent 3 crews from increasing to a 4th firefighter, then the highest priority is to first staff the quint(s) with four personnel.

Recommendation #3: Add a second quint at Station 603. When opened, transfer the 4th firefighter per day from 605 to 603.

Recommendation #4: Work with the adjoining fire district to see if a joint, shared cost career fire station is possible to serve the southern Hamilton Pool Road area.

Recommendation #5: Remodel Station 604 and move the quint from Station 605 to Station 604.

Recommendation #6: As a parcel can be found, re-locate and build a more appropriate Station 603.

Recommendation #7: Replace Station 601 at or very near its existing location.

Recommendation #8: Work to site and fund a 6th fire station and engine crew southwest of Lakeway and Village of the Hills as the development occurs and revenues allow.

5.2 INTEGRATED ADMINISTRATIVE FINDINGS AND RECOMMENDATIONS

5.2.1 Findings

In addition to multiple observations about the Fire Department's field deployment functions, Citygate's administrative findings are:

Finding #10: The prevention program follows the legal authorities of the adopted codes.

Finding #11: The prevention program follows established policies and procedures when enforcing the codes.

Finding #12: The current staff is operating at as close to peak efficiency as possible. Additional commercial building growth plus the need for ongoing public education and wildland fuel reduction programs will cause the staff to fall behind and not be able to meet all the various needs.

Finding #13: The staff is adequately trained, properly led and in the correct organizational location to be very effective.

Finding #14: There is a need for an improved investigation policy to define when fires and other emergencies need investigation by a trained investigator.

Finding #15: Given the small number of building fires in the District, every uncontrolled fire of consequence deserves an adequate investigation by a trained investigator.

Finding #16: There is no evidence that company officers or chief officers receive training in fire investigation; such training would assist in the evaluation of the need for a specially investigator. It would also reduce the investigator's workload on small fires with obvious reasons for the fire starting.

Finding #17: Citygate finds that there is a need for a dedicated full-time Public Education and Information Officer.

Finding #18: ESD #6 lacks a NIMS-compliant disaster plan to guide the agency during times of a local or wide area disaster.

Finding #19: The hazardous materials response program is adequate for the number of responses, the area, and the potential. The use of a regional shared team is considered a best practice and very common among suburban fire departments.

Finding #20: The ESD #6 fireboat, while better than nothing, is older and far too small for anything other than a single-patient EMS call in smooth waters or a small ski boat size fire. Large cabin cruisers, water front building and wharf fires would overwhelm the fireboat's abilities. A large party boat accident could generate many patients, clearly overwhelming one small boat and crew.

Finding #21: The Department training division developed a contemporary and appropriate training system, one it should take rightful pride in having. It needs policy and leadership to support it.

Finding #22: For a department of ESD #6's size, the head of the training division should be at least at the battalion chief level. This is appropriate at the supervising officer level. As the Department expands, as it will, this will become more problematic. It already shows itself in the spotty compliance with reporting training completed.

Finding #23: The failure of field personnel to properly maintain their training records on the RMS is of concern. Even though the system is relatively new, personnel should be entering all their data. Without that, by what measure does management evaluate the training and its effectiveness?

Finding #24: The Department has no master training policy; this leads to a number of issues. Company officers have no guidance concerning what drills to conduct and when to conduct them. They have not standardized training references to use to prepare and execute training in the station.

Finding #25: Having no dedicated training facility hampers effective multi-company training. Multi-company training is the capstone by which individual company training pulls together.

5.2.2 Recommendations

Citygate's administrative recommendations are:

Recommendation #9: ***As soon as funding is available, ESD #6 should consider hiring another Fire Inspector/Investigator.*** This position can also take the lead in designing and delivering public education programs.

Recommendation #10: The ESD should add preliminary fire investigation to the training for company and chief officers.

Recommendation #11: When funding is available, the Department should hire a full-time Public Education and Information Officer. In the interim, when the Department hires the third inspector/investigator, ensure that person has the skill sets to be a half-time Public Education and Information Officer and provide the necessary training.

Recommendation #12: ***ESD #6 should develop an agency-level disaster operations plan*** that integrates with the plans of the County, cities, and school and water

districts. The plan should be compliant with federal requirements and spell out the policy role of the Board of Directors under the County Commissioners when the County Disaster Plan is activated.

Recommendation #13: ***ESD #6 should explore with these partner agencies the possibility of jointly submitting for a federal or state grant to purchase a larger capacity fire and rescue boat which should be commensurate with the risks to protect.*** While other public safety agencies operate boats on Lake Travis, none are well equipped for firefighting and multiple EMS patient emergencies. Given the multiple ESDs around the lake, staffing and operating the boat could also be handled jointly.

Recommendation #14: When funding becomes available, Citygate recommends that the Department establish a battalion chief position in charge of training. Concurrent with this recommendation, Citygate recommends that the Department retain the current staffing of two company officer positions in the training division.

Recommendation #15: Using nationally recognized standards that are consistent with Texas' standards, develop needed policy for the Department's training effort.

Recommendation #16: When capital funding becomes available, develop a training facility including appropriate classroom and props.

5.3 PHASING AND TIMING

While all the recommendations can be worked on in parallel and some will take several fiscal years both in time and funding, Citygate recommends the staff work on developing the following short-term needs:

5.3.1 Phase One

- Absorb the policy recommendations of this master plan and adopt revised fire department performance measures to drive the location and timing of fire stations
- Conduct discussions to determine the feasibility and cost sharing structure for a joint-use fire station to serve southern Hamilton Pool Road
- Staff needs to carefully analyze the ESD's ability to remodel Station 604 to re-locate the quint/ladder truck there
- Staff needs to determine if the ESD can afford to add a 4th firefighter to 3 crews per day.

5.3.2 Phase Two

- Add a 3rd Fire Inspector position
- Determine if land is available for a relocation of Station 603

- Work to determine and acquire a site for a 6th station in the southwest ESD near Texas 71.

5.3.3 Phase Three

- Add a Battalion Chief – Training Officer
- Add a dedicated public education position.

5.3.4 Phase Four

- Add a 6th fire station
- Add a second quint/ladder truck at new Station 603.

5.3.5 Phasing Plan Estimated Costs

Phase	Item	Operating Cost	Capital Cost
One	Add a 4th firefighter to three engines per day	$720K	
	Remodel Station 604 to house the quint/ladder truck		$300,000
Two	Add a 3rd fire inspector	$70K	
Three	Construction of re-located Station 603		$2.5M
	Add a Battalion Chief – Training Officer	$92K	
	Add a public education specialist	$50K	
	Subtotal:	$142K	
Four	Add a 6th fire station in the southwest area	$720K	$2.5M
	Add a 2nd quint/ladder truck		$700K
	Minimum Four Phase Totals:	$1.66M	$6.0M