CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

FIRE AND EMS OPERATIONAL AND ADMINISTRATIVE ANALYSIS

Brownsville, Texas

Final Report-January 2023

CPSM®

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ICMA

Exclusive Provider of Public Safety Technical Services for
International City/County Management Association

THE ASSOCIATION & THE COMPANY

The International City/County Management Association is a 108-year old, nonprofit professional association of local government administrators and managers, with approximately 11,000 members. ICMA provides member support; publications; data and information; peer and results-oriented assistance; and training and professional development to over 12,000 city, town, and county managers, their staffs, and other individuals and organizations throughout the world.

Since its inception in 1914, ICMA has been dedicated to assisting local governments and their managers in providing services to its citizens in an efficient and effective manner.
ICMA advances the knowledge of local government best practices with its website (www.icma.org), publications, research, professional development, and membership. The ICMA Center for Public Safety Management (ICMA/CPSM) was launched by ICMA to provide support to local governments in the areas of police, fire, and emergency medical services.

ICMA also represents local governments at the federal level and has been involved in numerous projects with the Department of Justice and the Department of Homeland Security.

In 2014, as part of a restructuring at ICMA, the Center for Public Safety Management (CPSM) was spun out as a separate company. It is now the exclusive provider of public safety technical assistance for ICMA. CPSM provides training and research for the Association's members and represents ICMA in its dealings with the federal government and other public safety professional associations such as CALEA, PERF, IACP, IFCA, IPMA-HR, DOJ, BJA, COPS, NFPA, and others.

The Center for Public Safety Management, LLC, maintains the same team of individuals performing the same level of service as when it was a component of ICMA. CPSM's local government technical assistance experience includes workload and deployment analysis using our unique methodology and subject matter experts to examine department organizational structure and culture, identify workload and staffing needs, and align department operations with industry best practices. We have conducted 341 such studies in 42 states and provinces and 246 communities ranging in population from 8,000 (Boone, Iowa) to 800,000 (Indianapolis, Ind.).

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SECTION 1. INTRODUCTION

The Center for Public Safety Management LLC (CPSM) engaged with the City of Brownsville in association with iParametrics to complete an analysis of the city's Fire Department.

The service demands and challenges generated by the community are numerous for the department and include Advanced Life Support (ALS) EMS first response and ground transport, fire, technical rescue, hazardous materials, density challenges, transportation emergencies to include vehicle and water traffic, an active port and space center, and other non-emergency responses typical of urban and suburban fire departments.

A significant component of this report is the completion of an All-Hazards Risk Assessment of the Community. The All-Hazards Risk Assessment of the Community contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The All-Hazards Risk Assessment of the Community is an important component of this report as it links directly to staffing and deploying fire and EMS assets in the community.

The response time and staffing components discussion of this report are designed to examine the current level of service provided by the BFD compared to national best practices. As well, these components provide incident data and relevant information to be utilized for future planning and self-review of service levels for continued improvement which is designed to meet community expectations and mitigate emergencies effectively and efficiently.

Other significant components of this report are an analysis of the current EMS system to include revenues, expenditures and operations; deployment of resources and the performance of these resources in terms of response times and fire management zones; a comprehensive review of the current ISO Public Protection Classification report; current staffing levels and patterns; department resiliency (ability to handle more than one incident); critical tasking elements for specific incident responses and assembling an effective response force; fire prevention and training.

Based upon CPSM's detailed assessment of the Brownsville Fire Department (BFD), it is our conclusion that the department, overall, provides quality EMS and fire services. The BFD staff is professional and dedicated to the mission of the department, were transparent during our discussions, and were quite focused on creating a positive future for the agency.

The comprehensive risk assessment and review of deployable assets which are critical aspects of a fire and EMS department's operation will first assist the BFD in quantifying the risks that it faces. Second, the BFD will be better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned. The factors that drive service needs are examined and then link directly to discussions regarding the assembling of an effective response force and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking.

This report also contains a series of observations and planning objectives and recommendations provided by CPSM which are intended to help the BFD deliver services more efficiently and effectively. Recommendations and considerations for continuous improvement of services are presented here. CPSM recognizes there may be recommendations and considerations offered that first must be budgeted and/or bargained, or for which processes must be developed prior to implementation.

RECOMMENDATIONS

Community Risk Reduction

(See pp. 14-24.)

1. The BFD should complete a comprehensive review of the city's actual costs for providing fire prevention services. The review should include a full costing of providing all fire prevention services, reviewing the city's fire code(s), as well as a comparative analysis of the fees charged for similar services by other fire departments. The review should be designed to capture the full range of services provided and capture the full scope of the plans review, operational permits, and certain inspections required as part of a comprehensive fire prevention program.
2. In order to fund the BFD's fire prevention and safety activities the City of Brownsville should consider the adoption of registration, inspection, and/or permit fees to offset the actual costs of providing these services throughout the city. These fees should include inspections conducted by in-service fire companies.
3. The BFD should implement an in-service company inspection program at residential, medical, manufacturing, and retail business establishments throughout the city.
4. The BFD should provide appropriate training in conducting routine fire prevention inspections to all field personnel, particularly the company officers who will be responsible for supervising their companies.
5. The City of Brownsville should give serious consideration to the adoption of a city ordinance that mandates the installation of an automatic fire suppression (sprinkler) system in all new construction, <u>including one- and two-family dwellings</u>. This requirement has been included in the International Residential Code since 2009.
6. The BFD should develop a compelling public education program that includes discussing the significant life-saving benefits of installing residential fire sprinklers in all new one- and two-family dwellings.
7. The City of Brownsville should explore possible funding opportunities to encourage businesses to install smoke alarms and sprinkler systems. Part of this evaluation could include analyzing the feasibility of establishing tax increment financing districts or business improvement districts.
8. The BFD should explore the feasibility of utilizing Remote Video Inspections (RIV) to assist with managing the inspection workload.
9. The BFD should implement a station-level voluntary home inspection and assistance program targeted to first due areas with the most dwelling fires with a goal of reducing fires by 15 percent within five years.

Education, Training, and Professional Development

(See pp. 25-31.)

10. The BFD should make it a priority to develop and budget in the near term a company fire officer training and development program that is competency-based on National Fire Protection Association (NFPA), International Association of Fire Chiefs (IAFC), International Fire Service Training Association (IFSTA), and Texas Commission on Fire Protection standards, and that focuses on contemporary fire service issues including community fire protection and emergency services delivery approaches, fire prevention practices, firefighter safety and risk management and labor/staff relations; reviewing, approving, or preparing technical documents and specifications, departmental policies, standard operating procedures and

other formal internal communications; improving organizational performance through process improvement and best practices initiatives; and having a working knowledge of information management and technology systems.

11. The BFD should develop task books for firefighter, driver, lieutenant, captain, and assistant chief. Firefighters should be required to complete their book as part of their probationary period. For other ranks, all personnel aspiring for promotion to a higher rank should successfully complete all elements of that rank's task book to be eligible to participate in the formal promotional testing process.
12. The BFD should develop training programs that establish the following rank appropriate certifications as mandatory job requirements for supervisory and command levels with the department:

- □ Lieutenant.
- □ Fire Instructor I.
  - Fire Officer (or Company Fire Officer) I.
  - IMS I-300.
- □ Captain.
- □ Fire Instructor II.
  - Fire Officer II.
  - IMS- I-400.
  - Incident Safety Officer.
- □ Assistant Chief.
- □ Fire Officer III.
  - Chief Fire Officer.

13. The BFD should make a concerted effort to send as many officers as possible to the National Fire Academy (NFA). Further, any officers who meet the admissions criteria should be encouraged to enroll in the Academy's Executive Fire Officer Program.
14. The BFD should develop and institute written and practical skills testing and proficiency evaluations as part of the department's comprehensive fire training program.
15. The BFD should move forward with its plan to provide all companies and personnel with high intensity training on various subjects, including periodic live fire training on at least a semi-annual basis.
16. To stay current with the considerable amount of training that needs to be accomplished in an ongoing manner, the City of Brownsville and BFD should conduct a comprehensive training needs assessment to determine the number of personnel who are needed to properly staff the Training Division, including civilian administrative staff.

Facilities

(See pp. 32-39.)

17. The BFD should install automatic fire alarm systems with heat, smoke, and carbon monoxide detection in all fire stations. These systems should not only be equipped with both audible

and visible warning devices, but they should also automatically transmit an alarm to either the department's alarm room/dispatch center or an approved central monitoring station.

18. The BFD should give consideration to equipping all fire stations with complete, automatic fire sprinkler systems for the protection of the occupants, buildings and equipment, as well as complete, supervised smoke detection systems already recommended, that transmit an alarm to the fire dispatch center or central monitoring station.
19. The BFD should install disconnect switches interfaced with alarm notification systems on all kitchen stoves to automatically shut them off to prevent kitchen fires during responses to alarms.
20. The BFD should ensure that the vehicle exhaust extraction systems for all vehicles in all of the apparatus bays at all department fire stations are repaired to proper working order and maintained in a serviceable state at all times.

Fleet

(See pp. 39-43.)

21. The BFD should provide the assistant chiefs/shift commanders and EMS supervisors with vehicles that are appropriately designed, and equipped to provide for effective, efficient, and safe incident management operations.
22. BFD should begin the replacement process as soon as possible for at least three of the six 2017 model year ambulances.

ISO Rating

(See pp. 44-48.)

23. CPSM recommends to the extent possible the BFD address the deficiencies in the most recent ISO-PPC rating criterion, with a focus on first improving the training and water supply deficiencies, and then developing a plan to address the engine and ladder company deployment over the mid to longer term.

911-Dispatch

(See pp. 104-107.)

24. The BFD should work with the BPD to implement performance measures and compliance methodologies for call processing times in the 911-dispatch center to address those calls that are missing call processing data and to address the long call processing times. There should be a focus on closing the gap between the national standard and the current time to process and dispatch a fire or EMS call.
25. The City of Brownsville and BFD should consider expanding the hours and making permanent the EMS screening program in the 911-dispatch center.
26. The City of Brownsville should form an advisory board for the 911-dispatch center that is comprised of representatives of both the BFD and BPD. The advisory board should meet monthly to discuss issues such as staffing and turnover, dispatcher training, and the development of standard operating procedures for handling fire and EMS incidents.
27. The City of Brownsville and BFD should, with potential partners, explore the feasibility of establishing a regional/county fire and EMS centric 911-dispatch and communications center.

Response Metrics

(See pp. 108-119.)

28. The Brownsville Fire Department should aggressively take whatever steps are necessary to significantly improve dispatch and travel times for both fire and EMS incidents in order to reduce and improve overall response times to emergency incidents.

Fire Operations, Effective Response Force, Critical Tasking

(See pp. 137-161.)

29. The BFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack for when the fire scenario and the number of available units/responding personnel warrants this approach.
30. In acknowledgement of the fact that the BFD operates in a minimal staffing mode and recognizing the potential for rapid fire spread particularly in the more densely developed areas of the city, the BFD should equip all its apparatus with the appropriate appliances and hose and develop standardized tactical operations that will enable arriving crews to quickly deploy high-volume fire flows of 1,200 to 1,500 gallons per minute (if the water supply will permit this), utilizing multiple hose lines, appliances, and master stream devices. This flow should be able to be developed within four to five minutes after arrival of an apparatus staffed with three personnel.
31. CPSM recommends the BFD, to the extent possible and if practical and depending on available resources, increase its response resources to strip mall/commercial, apartment, and high-rise fire responses that at a minimum align more closely with the NFPA 1710 standard, or even the enhanced responses suggested in this section.
32. The Brownsville Fire Department should adopt a response procedure that includes the immediate response of the ladder truck (Truck 1) from Central Fire Station on every reported structure fire regardless of occupancy type.
33. The Brownsville Fire Department should develop a funding plan to increase staffing on the ladder truck (Truck 1) from three to four personnel (three total added personnel) to increase its operational capabilities on emergency incidents and add to the BFD's ability to more effectively assemble an Effective Response Force.
34. The Brownsville Fire Department should consider the future acquisition of a "quint" apparatus that has a 75-foot or 100-foot aerial ladder and is configured to also fully function as a fire pumper to be assigned to a replacement Station 2 in the northern section of the city. Along with Truck 1 it should respond on every reported structure fire.
35. The Brownsville Fire Department should staff this unit (Truck 2) with four personnel to increase its operational capabilities on emergency incidents and add to the BFD's ability to more effectively assemble an Effective Response Force. If adopted, this recommendation adds an additional three personnel to the department.
36. In order to reduce the span of control to a recommended and manageable level the BFD should be divided into two divisions on each shift, each commanded by an Assistant Chief who would be in charge of five stations. The addition of another assistant chief on each shift will significantly improve fire ground operations and administrative functions at the shift level, while simultaneously reducing the span of control to an acceptable level.
37. In order to provide for more effective, efficient, and safe overall incident management, and to enhance critical incident scene safety for all personnel, the BFD should implement the position of Field Incident Technician/Division Safety Officer, at the rank of captain, to function as a part of an integrated command team with each Assistant Chief.

38. Once the city is divided into two divisions, a second EMS supervisor should be deployed to each shift, placing one in each division. Again, this will reduce the span of control to an acceptable level.

Fire Preplanning

(See pp. 161-163.)

39. CPSM recommends that as a planning objective, the BFD should continue to make preplan development a high priority until such time as plans have been developed for all high- and medium-hazard occupancies located in the city, placing a high priority on those identified structures that are not protected by automatic sprinkler systems. Further, the BFD should compile an inventory of the locations of vacant and unsafe structures throughout the city and mark them accordingly with regard to offensive- or defensive-only fire suppression operations.

Auto and Mutual Aid

(See pp. 163-164.)

40. The BFD should include mutual aid from neighboring departments on its box assignments/run cards—primarily for ladder trucks—when appropriate for major/multiple alarm incidents that occur within the city.

Specialized Response

(See pp. 164-169.)

41. The city of Brownsville and the BFD should develop a funding plan over the next one to three year period to replace the current heavy rescue truck with a contemporary rescue/special hazards apparatus. The planning for this vehicle's personnel should include the organization of a Special Operations/Hazards Unit as a response company staffed with four personnel. This unit should continue to be deployed from Station 9. All personnel assigned to this station should be certified to the technician level in multiple special hazards disciplines, thus making it the Special Operations Station.
    - The City of Brownsville and BFD should seek to make this a joint endeavor with funding also coming from both the Port of Brownsville and SpaceX Starbase.
42. In conjunction with the Port of Brownsville, the BFD should make it a high priority to provide all personnel with intensive hands-on shipboard firefighting training.
43. In conjunction with the Port of Brownsville, the BFD should work to obtain funding, including through grants, for the purpose of obtaining firefighting apparatus and equipment that would be needed to handle significant fire incidents in the port area. This includes the following recommended major equipment acquisitions:
    - A fireboat.
    - A foam pumper to be deployed from Station 8.
    - A foam tender to be deployed from Station 5.
    - One or more high-capacity foam monitor trailers to be stored at fire stations, or the port area, for quick response.
    - One or more large diameter hose trailers to be stored at fire stations, or in the port area, for quick response.

Ambulance Workload

(See pp. 170-173.)

44. BFD's leadership should closely monitor response volume trends and adjust staffed unit hours to prevent overstaffing for current ambulance workloads.
45. BFD should explore options to flexibly deploy ambulances to match predictable EMS response demand patterns; specifically, adding ambulance resources between 8:00 a.m. and 8: 00 p.m. and reducing resources between 8:00 p.m. and 8:00 a.m.

Ambulance Response Times

(See pp. 174-175.)

46. BFD and BPD should evaluate the EMS dispatching process to try and reduce the call processing times for EMS calls.

Ambulance Service Fees

(See pp. 176-178.)

47. The City of Brownsville should consider raising ambulance service fees to be at least the median of FairHealth regional fees for ambulance services.

EMS Subscription Program

(See pp. 178-179.)

48. BFD should consider creating an EMS subscription program to defray out-of-pocket ambulance costs for residents.

Ambulance Billing

(See pp. 179-180.)

49. BFD should evaluate options for outsourcing its billing services to reduce costs and enhance revenue generation.

Priority Medical Dispatch

(See pp. 180-182.)

50. BPD and BFD should work together to implement an evidence-based emergency medical dispatch system to enhance 911 call taking and EMS response.

Ambulance Operation Modes

(See pp. 182-183.)

51. BFD should evaluate and identify processes to reduce vehicle operations with lights and siren (L&S). Ideally, L&S responses in Brownsville should be less than 50 percent, and L&S transports should be less than 5 percent. Every L&S transport should receive a medical QA review to determine if the L&S transport was clinically appropriate.

EMS Quality Improvement

(See pp. 183-184.)

52. BFD should develop a process for clinical process dashboard development and reporting to identify opportunities for improvement.
53. Working closely with its Medical Director, BFD should create a dedicated position for a Clinical Quality Coordinator and select a suitable candidate for this position.

ET3 Program

(See p. 184.)

54. BFD should make it a priority to implement its ET3 Model as soon as practically possible.

MIH

(See p. 185.)

55. BFD should investigate ways to enhance its MIH program offerings so as to develop sustainable economic models for its MIH operations to enhance revenues to the agency.

Accreditation

(See pp. 198-199.)

56. CPSM recommends the BFD consider, as a near term planning objective, becoming a registered agency for accreditation under the Commission of Fire Accreditation International, and over mid-term, completing the three required documents that include the Community Risk Assessment-Standard of Cover; Community Driven Strategic Plan; and Self-Assessment Manual as it works toward becoming an accredited agency.
57. CPSM recommends as a planning objective that once the BFD accomplishes some of the pressing strategic plan recommendations contained in this report, it should, with support from the City of Brownsville, consider undertaking the accreditation process.

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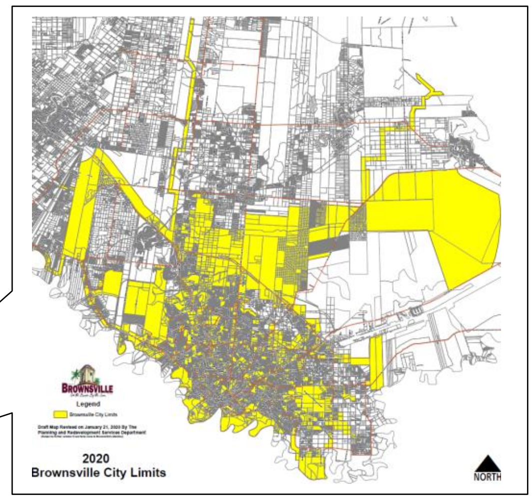
SECTION 2. AGENCY REVIEW AND CHARACTERISTICS

CITY OF BROWNSVILLE

The City of Brownsville is located in southeast Cameron County, Texas. The city encompasses an area of 145.2 square miles, with only a small percentage of this being water. Brownsville is the eighteenth largest city in Texas. It is home to the Port of Brownsville, is at a crossroads of international trading, is the site of a new space launch facility, and is contiguous with Mexico on the city's southern and southwest borders.

FIGURE 2-1: City of Brownsville



The city operates under the council-manager form of government. The City Commission is the governing body of the municipality; the City Manager is the chief executive officer and head of the administrative branch of the city government and is responsible for all affairs of the city in their charge, except as otherwise provided in the City Charter.[1]

Pursuant to Article V, Section 21 of the City Charter, the City Manager appoints certain city officials and department heads, which includes the Fire Chief, who is a direct report to the City Manager.

The following figure illustrates the organizational chart of the city and where the fire department fits.

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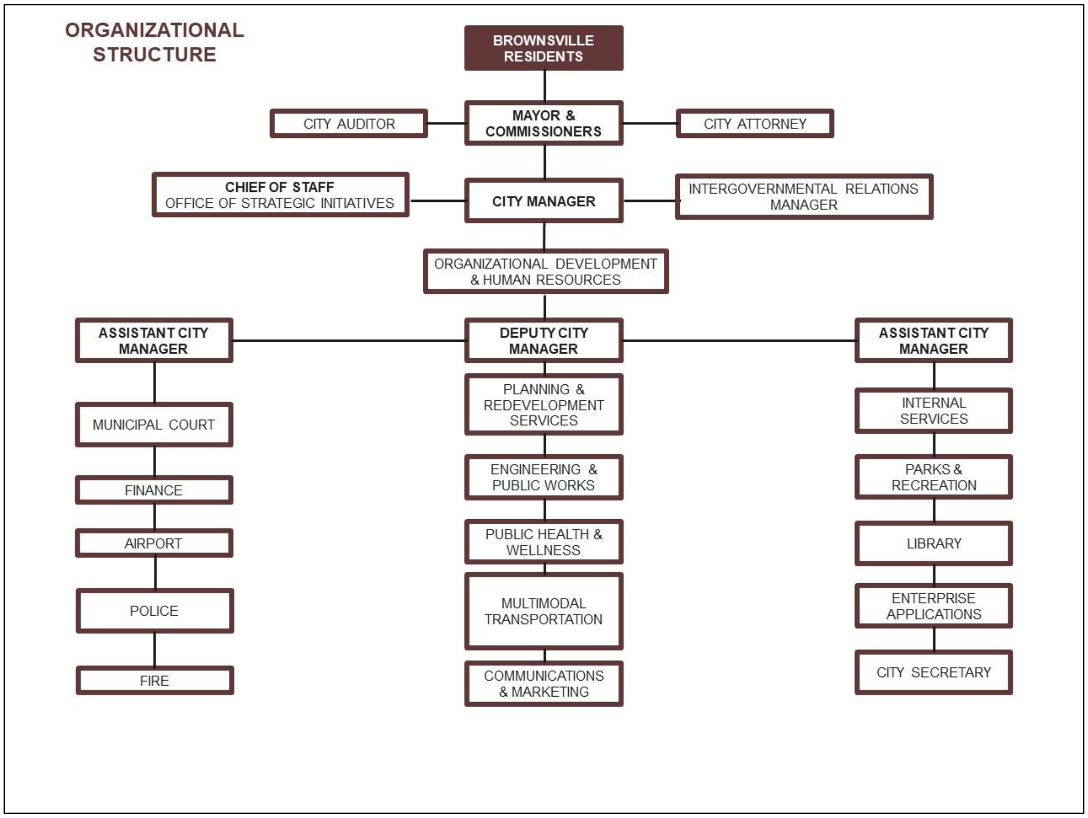
1. City of Brownsville, City Charter

FIGURE 2-2: City of Brownsville Organizational Chart



DEPARTMENT OVERVIEW AND ORGANIZATIONAL STRUCTURE

The Brownsville Fire Department (BFD) is a career fire department that employs full-time administrative, community risk reduction, emergency management, support staff, and operational-level officers and firefighters. When fully staffed, the BFD deploys eight advanced life support engine companies, one advanced life support truck company, eight advanced life support emergency medical services (EMS) ground transport units, one EMS ground transport interfacility unit (8:00 a.m. to 5:00 p.m./daily), and two Aircraft Rescue and Firefighting units on Brownsville/South Padre Island International Airport grounds. The BFD operational units operate on a 24/48 work schedule (24 hours on duty, 48 hours off duty). There are three operational shifts or platoons (A, B, C shifts).

The BFD is led by a Fire Chief who has overall responsibility for the management and leadership of the department. The Fire Chief is assisted by two Deputy Fire Chiefs, five Assistant Fire Chiefs, an Emergency Management Administrator, a Medical Director, a Fire Marshal, program managers, and civilian support staff.

The two Deputy Fire Chiefs manage the operational and administrative/support branches of the department. One Deputy Chief manages the three operational shifts as described above. This includes all operational components and staffing. Each of the three operational shift Assistant Chiefs report directly to the operations Deputy Fire Chief. The administrative/support Deputy Chief manages the EMS and training divisions of the department. Each of these divisions is commanded by an Assistant Chief, who report directly to the administrative/support Deputy Chief.

The Fire Marshal is responsible for all fire prevention and technical services linked to community risk reduction, which includes fire prevention code enforcement, fire and life safety elements of building plans review, and fire investigation to include origin and cause. The Fire Marshal is assisted by a lieutenant and fire code inspectors/investigators.

The Training Division is responsible for incumbent and new-hire training as well as maintaining and providing compliance records for state, local, and federal mandates. This division also produces public service announcements (PSAs), public cardio-pulmonary resuscitation (CPR-hands only) training, fire extinguisher training, and FAA drone pilot training. The Training Division is led by an Assistant Chief who is currently assisted by a staff of four instructors. This includes one EMS training lieutenant, one driver, and two firefighters.

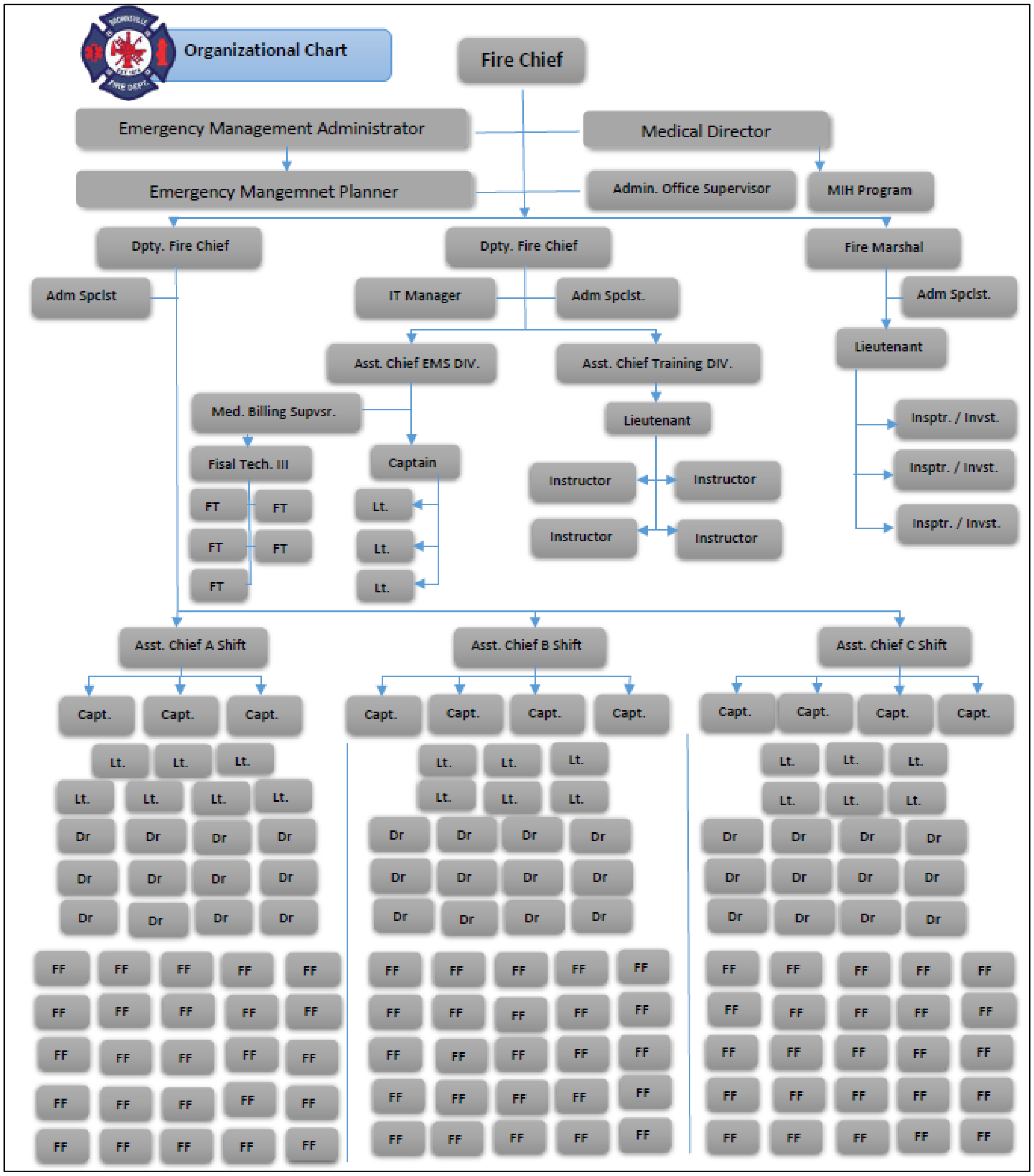
The city's disaster preparedness, emergency management, and homeland security functions also operate under the fire department. The Brownsville Office of Emergency Management and Homeland Security (OEMHS) is responsible for overall emergency planning and preparedness within the City of Brownsville. As a coastal community at risk for tropical system impacts, the city has a comprehensive emergency operations plan and program in place.

The key elements of the BFD include:

- Fire protective services.
- EMS first-tier response (ALS level) and ground transport at the ALS and BLS levels.
  - Certified tactical medic response.
  - Advanced and basic life support mass crowd event specialty vehicles.
- Fire prevention, fire code enforcement, and fire protection plans review.
- Fire cause and origin investigation.
- Emergency management / homeland security coordination, preparation, and management.
- Technical rescue response and mitigation.
- Hazardous materials response and mitigation (leak and spill/operations response).
- Employee training and education.
- Fleet, facility, and logistical support and management.
- Special event support.
- Mobile Integrated Healthcare/Community Paramedicine.
- Unmanned aerial operations (drone operations).
- Wildland firefighting.
- Urban flood and swift water rescue operations.
- Dive team operations.

The next figure illustrates the BFD organizational chart.

FIGURE 2-3: Brownsville Fire Department Organizational Chart

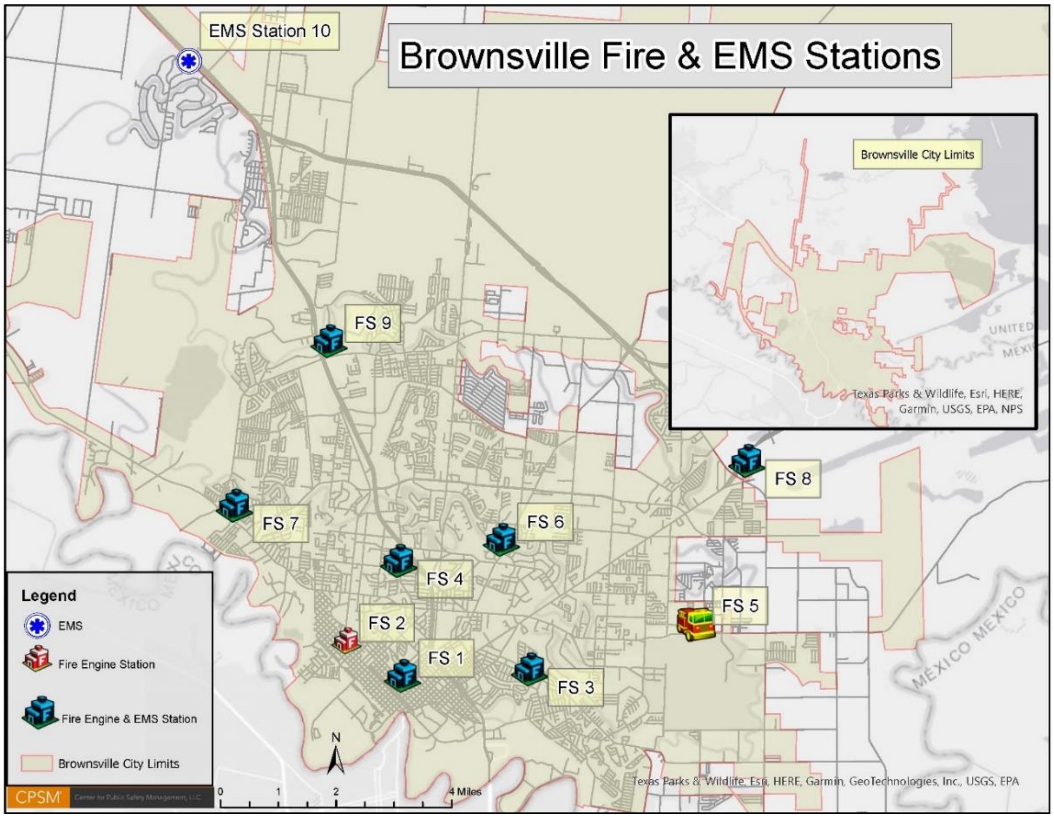


Service Area

Fire and EMS operations are deployed from ten stations located strategically throughout the city. Fire and EMS operations on each of the three operational shifts are commanded by an Assistant Fire Chief. The operations division delivers field operations and emergency response services through a clearly defined division of labor that includes a middle manager (Assistant Chief), first-line operational supervisors (Captains/Lieutenants), Engineers (apparatus driver/operators), and firefighters and firefighter/paramedics. The entire city is considered a single operational unit and is commanded each day by the Assistant Chief who acts as the overall day-to-day shift commander managing daily shift scheduling, on-duty crews, employee relations, assigned administrative and logistical duties, and serves as an incident commander on those incidents to which they respond.

The following figure illustrates Brownsville's municipal boundaries and fire station locations. The accompanying list is of assigned first-line response apparatus by station.

FIGURE 2-4: Brownsville Municipal Boundaries and BFD Stations



- Station 1: Engine 1, Truck 1, Medic 1, Brush 1, Rescue Boat 1, Shift Commander.
- Station 2: Engine 2.
- Station 3: Engine 3, Medic 3, Ranger 3.
- Station 4: Engine 4, Medic 4.
- Station 5: ARFF/Rescue 1, ARFF/Rescue 2.
- Station 6: Engine 6, Medic 6.
- Station 7: Engine 7, Medic 7.
- Station 8: Engine 8, Medic 8, Brush 8.
- Station 9: Engine 9, Medic 9, EMS Supervisor, Rescue Truck Rescue Boat 2, Ranger 2, EMS Supervisor, Haz-Mat pickup and trailer.
- Station 10: Medic 10.

COMMUNITY RISK REDUCTION PROGRAMS

Community risk reduction activities are important undertakings of a modern-day fire department. A comprehensive fire protection system in every jurisdiction should include, at a minimum, the key functions of fire prevention, code enforcement, inspections, and public education. Preventing fires before they occur, and limiting the impact of those that do, should be priority objectives of every fire department. Fire investigation is a mission-important function of fire departments, as this function serves to determine how a fire started and why the fire behaved the way it did, providing information that plays a significant role in fire prevention efforts. Educating the public about fire safety and teaching them appropriate behaviors on how to react should they be confronted with a fire is also an important life safety responsibility of the fire department.

Fire suppression and response, although necessary to protect property, have minor impact on preventing fires. Rather, it is public fire education, fire prevention, and built-in fire protection systems that are essential elements in protecting citizens from death and injury due to fire, smoke inhalation, and carbon monoxide poisoning. The fire prevention mission is of utmost importance, as it is the only area of service delivery that dedicates 100 percent of its effort to the reduction of the incidence of fire.

Fire prevention is a key responsibility of every member of the fire department, and fire prevention activities should include all personnel. On-duty personnel can be assigned the responsibility for "in-service" inspections to identify and mitigate fire hazards in buildings, to familiarize firefighters with the layout of buildings, identify risks that may be encountered during firefighting operations, and to develop pre-fire plans, such as the BFD does currently. On-duty personnel in many departments are also assigned responsibility for permit inspections and public fire safety education activities.

Fire prevention should be approached in a truly systematic manner; many community stakeholders have a personal stake and/or responsibility in these endeavors. A significant percent of all the requirements found in building/construction and related codes are related in some way to fire protection and safety. Various activities such as plan reviews, permits, and inspections are often spread among different departments in the municipal government and are often not coordinated as effectively as they should be. Every effort should be made to ensure these activities are managed effectively between departments.

The community risk reduction (CRR) function in the BFD is commanded by the Fire Marshal. In addition, the office is staffed with a lieutenant and three fire inspectors. They are also assisted by one civilian administrative assistant. Three of the CRR staff are also certified peace officers with law enforcement authority. Together, these personnel administer the fire code inspection, fire investigation, development plan reviews, and public education missions of the department. The Fire Marshal's office works closely with the city's Planning, Zoning and Building Permits divisions concerning matters of new development plan reviews and fire code enforcement when building code issues are identified.

Community risk reduction involves a wide-ranging portfolio of duties and responsibilities. These include plans review, witnessing fire prevention system tests, and ensuring code compliance through inspections regarding both new buildings while under construction, as well as ongoing maintenance inspections after the building or business is occupied. A significant percentage of these are mandated as part Texas building, residential, and fire codes. The remainder are performed in accordance with nationally recognized standards and best practices.

At the time of this assessment the City of Brownsville and BFD were utilizing the following fire prevention codes:

- The International Fire Code – 2018 edition (Adopted in 2021).

The city also utilizes the following building-related codes:

- The International Building Code.
- The International Residential Code.
- The international Existing Building Code.
- The International Property Maintenance Code.
- The National Electric Code.
- International Plumbing Code.
- International Mechanical Code.
- NFPA 101 Life Safety Code.

In 2021 the division conducted the following activities:

TABLE 2-1: BFD 2021 Community Risk Reduction Activities

Fire Prevention Task	Number
Fire Inspections	1,328
Fire Alarm and Sprinkler Plans Reviewed	118
Site Plans Reviewed	250
Fire Investigations	38

There are many reasons why existing buildings should be inspected for fire code compliance. The obvious purpose is to ensure that occupants of the building are living, working, or occupying a building that is safe for them to do so. Some buildings are required to have specific inspections conducted based on the type of occupancy and the use of the buildings such as but not limited to healthcare facilities (hospitals, nursing homes, etc.), schools, restaurants, and places of assembly. These inspections are mandated by various statutes, ordinances, and codes. The inspections themselves are often limited to specific areas within the building and to specific time frames. The fire inspectors will also witness tests of required fire protection systems and equipment. Conversely, many businesses are not required to have any type of periodic fire safety inspections.

Fire inspections can also identify violations and make follow-up inspections to ensure that violations are addressed and that the fire code is enforced. In fire prevention, the term "enforcement" is most often associated with inspectors performing walk-throughs of entire facilities, looking for any hazards or violations of applicable codes. Educating the owner to the requirements, as well as the spirit and intent, of the code can also attain positive benefits for fire and life safety.

With several thousand businesses in Brownsville, many of them large, along with numerous schools, multifamily residential complexes and other hazards, there is no consistent or comprehensive program that ensures that all businesses and commercial occupancies receive a routine "maintenance" fire prevention inspection on a regular basis.

In many departments, on-duty firefighters can be assigned the responsibility for "in-service" inspections to identify and mitigate fire hazards in buildings, to identify risks that may be encountered during firefighting operations, and to develop pre-fire plans (which the BFD already does). On-duty personnel in many departments are also assigned responsibility for permit inspections and public fire safety education activities. Fire department personnel are often able to recognize hazards or violations, whereas inspectors are often able to identify features of a specific property that could prove important during an emergency. Effective information sharing enhances the ability of the fire department to protect the community.

Performing complex, technical inspections can be a very time-consuming, but necessary endeavor. Nationwide, communities that have proactive fire inspection and code enforcement programs in place often have a lower incidence of fire loss because many potential fire and life-safety hazards are identified and corrected before they cause or contribute to a fire.

Of course, having sufficient personnel to perform fire prevention inspections can be a costly proposition. To help offset these costs, many jurisdictions are now assessing registration or inspection fees for businesses. The fees assessed often vary widely by jurisdiction. New Jersey has enacted a uniform state-wide fee structure for different types of businesses with the annual registration fees for businesses ranging from $108 to $4,781. Fees for various permits range from $54 to $641. Kern County, Calif., has established a fee schedule that covers a wide range of permits, inspections, and services such as plans reviews. The county's fee schedule includes:

- Operating Permits: $50 to $520.
- Construction Permits: $35 to $1,000.
- Fireworks Permit: $325.
- Plan Review: $130 to $195.
- Special Inspections: $450 to $520 and $140/hour (minimum two hours).
- Fire Safety Inspections and Standbys (all two-hour minimum): $140/hour to $455/hour.
- Administrative Fees: $10 to $1,000.

Some jurisdictions also assess a reinspection fee if an inspector must make a return visit to determine if code violations have been abated. At the time of this assessment, the BFD did not have in place any significant fees for fire prevention and safety functions and services.

The BFD currently uses the inspection and permit fee schedule shown in the following table.

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TABLE 2-2: BFD Fee Schedule

Permit or Activity	Fee
New sprinkler system or addition permit fee	$100.00 (1 to 200 heads)
	0.50/Head (201 or more)
	1,500.00 max (over 3,000 heads)
Major sprinkler system (underground fire line permit)	100.00
Review of sprinkler, site, and fire alarm plans	50.00/hr (Min. 2 hrs for sprinkler plans)
Underground storage tanks	50.00 per tank
	75.00 over 10,000 gal.
Plan review/inspections after hours	50.00 per hour
Hospital/nursing home inspections	200.00 first annual insp.
	50.00 each additional
Day care	50.00
Foster home	30.00
Retest fee for sprinklers and alarm	40.00 per test
Re-schedule fees (cancellations)	50.00
Lab/clinics	100.00
Temporary food stands	10.00 per stand/per day
Aboveground storage tanks	75.00
	100.00 over 10,000 gal.
Burning permits	75.00
Bonfire permits	100.00
	200.00 w/truck
Fixed pipe extinguishing inspection	40.00
Underground fire line, sprinkler system, and fire alarm inspection	100.00
Fireworks display permit	200.00 w/truck
Environmental research	50.00
Fire reports	10.00
Review evacuation route and fire drills	50.00
Pressure test fuel oil lines	50.00
Certificate of occupancy inspection	30.00 up to 1,500 sq. ft.
	50.00 over 1,500 sq. ft.
Apartment inspection fee	100.00 up to 20 units
	200.00 over 20 units
Warehouse and bonded warehouse inspections	200.00
Re-inspection fee	50.00
Fire safety equipment demonstration for business and commercial occupancies	100.00
Fire safety/truck presentation	100.00
Fire alarms, second call thereafter	200.00 commercial
	50.00 residential

Permit or Activity	Fee
Vehicle/motorcycle in covered mall permit	15.00 Vehicle
	10.00 Motorcycle
Fire alarm permit	50.00
Fire alarm modification permit	5.00/Device (1 to 9)
	50.00 Device (10 to 200)
Sprinkler modification permit	5.00/Head (1 to 9)
	50.00 Head (10 to 2,000)
Liquid propane gas tank permit	50.00
Temporary aboveground flammable liquid tank permit	50.00 Temp. A 90 days
	75.00 Temp. B 180 days
	100.00 Temp. C 1 year
Commercial inspections (by request, non-C.O.)	30.00 under 1,500 sq. ft.
	50.00 over 1,500 sq. ft.
Detention facilities (up to three inspections per year per facility)	200.00 per year/per facility
	50.00 each additional inspection
Temporary structures (tents, portable buildings) (Non-food stands—Permit valid for one year from date purchased)	30.00
Hotel/motel inspections	100.00
Circus/carnivals (per food stand for the duration of the stay)	30.00

It appears that these fees, first adopted in 1994, have not been updated since 2006. The city also has a false alarm penalty fee that can be assessed to property owners whose fire alarm systems generate repeated unnecessary and nuisance false alarms.

Community Risk Reduction Recommendations:

- The BFD should complete a comprehensive review of the city's actual costs for providing fire prevention services. The review should include a full costing of providing all fire prevention services, reviewing the city's fire code(s), as well as a comparative analysis of the fees charged for similar services by other fire departments. The review should be designed to capture the full range of services provided and capture the full scope of the plans review, operational permits, and certain inspections required as part of a comprehensive fire prevention program. (Recommendation No. 1.)
- In order to fund the BFD's fire prevention and safety activities the City of Brownsville should consider the adoption of registration, inspection, and/or permit fees to offset the actual costs of providing these services throughout the city. These fees should include inspections conducted by in-service fire companies. (Recommendation No. 2.)
- The BFD should implement an in-service company inspection program at residential, medical, manufacturing, and retail business establishments throughout the city. (Recommendation No. 3.)

- The BFD should provide appropriate training in conducting routine fire prevention inspections to all field personnel, particularly the company officers who will be responsible for supervising their companies. (Recommendation No. 4.)

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As previously mentioned, fire suppression and response, although necessary to minimize property damage, have little impact on preventing fires. Rather, public fire education, fire prevention, and built-in fire protection and notification systems are essential elements in protecting citizens from death and injury due to fire. Automatic fire sprinklers have proven to be very effective in reducing fire loss and minimizing fire deaths in residential structures. However, many communities, Brownsville among them, have been reluctant to impose code provisions that require these installations. The city's current fire code, the 2018 edition of the International Fire Code, mandates the installation of these life safety systems; however, as in many communities, when the city adopted the code they excluded a residential sprinkler system mandate. .

Automatic sprinklers are highly effective elements of total system designs for fire protection in buildings, <u>including one- and two-family dwellings</u>. Sprinklers help prevent fires from reaching flashover in a compartment fire, which is key to reducing fire deaths and injuries. They save lives and property, producing large reductions in the number of deaths per thousand fires, in average direct property damage per fire, and especially in the likelihood of a fire with large loss of life or large property loss. They do so much quicker, and often more effectively and with less damage than firefighters do. **<u>No fire safety improvement strategy has as much documented life safety effectiveness as fire sprinklers because they actually extinguish the fire or, at a minimum, hold it in check and prevent flashover, until the arrival of the fire department.</u>**

In 2007 to 2011 in fires in all types of structures, when sprinklers were present in the fire area of a fire large enough to activate sprinklers in a building not under construction, sprinklers operated 91 percent of the time.[2] When they operated, they were effective 96 percent of the time, resulting in a combined performance of operating effectively in 87 percent of reported fires where sprinklers were present in the fire area and the fire was large enough to activate sprinklers[3]. **<u>In homes (including apartments), wet-pipe sprinklers operated effectively 92 percent of the time. When wet-pipe sprinklers were present in the fire area in homes that were not under construction, the fire death rate per 1,000 reported structure fires was lower by 82 percent, and the rate of property damage per reported home structure fire was lower by 68 percent</u>**.[4] In all structures, not just homes, when sprinklers of any type failed to operate, the reason most often given (64 percent of failures) was shutoff of the system before the fire began.[5]

Residential sprinklers have proven their effectiveness a number of times in Upper Merion Township, Pennsylvania, which has had a residential sprinkler ordinance since 1988. According to a January 2011 article in *Fire Engineering* by John Waters and Tim Knisely, "Residential Sprinklers Still Under Fire," on December 22, 2006, Upper Merion Township Fire and Rescue Services responded to a house fire in the Candlebrook section of the township. The first apparatus arrived six minutes after the initial dispatch. The Candlebrook fire achieved flashover and resulted in one fatality.[6] The following figure shows a residential fire that has experienced flashover. In addition

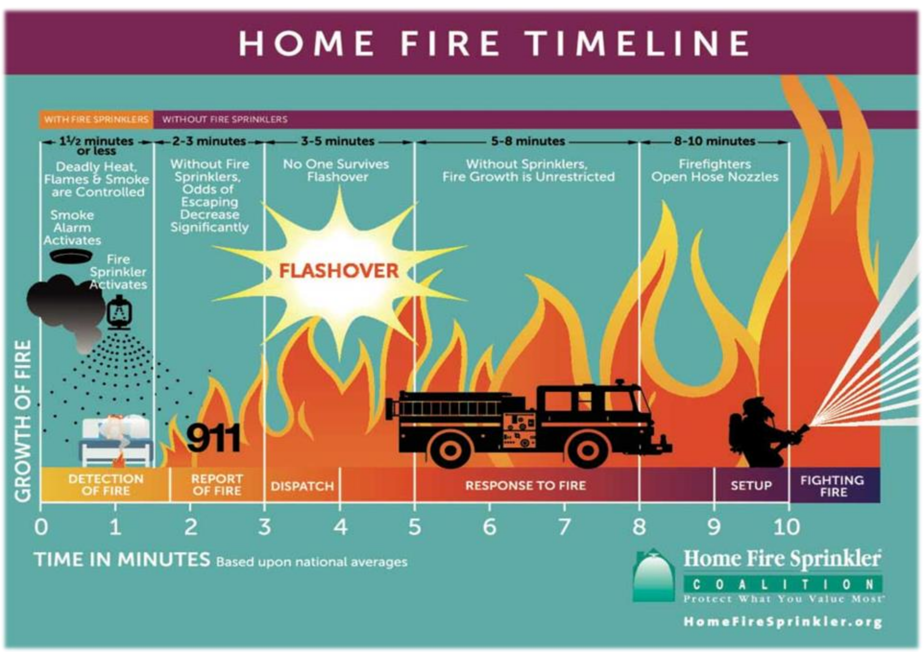
2. U. S. Experience with Sprinklers. John R. Hall, Jr. National Fire Protection Association, June 2013.
3. U. S. Experience with Sprinklers. John R. Hall, Jr. National Fire Protection Association, June 2013.
4. U. S. Experience with Sprinklers. John R. Hall, Jr. National Fire Protection Association, June 2013.
5. U. S. Experience with Sprinklers. John R. Hall, Jr. National Fire Protection Association, June 2013.
6. http://www.fireengineering.com/articles/print/volume-164/issue-1/features/residential-sprinklers-still-under-fire.html

to the damage to the home on fire, note the damage to the house to the right caused by radiated heat.

FIGURE 2-5: Fire in a Residence that was not Equipped with Residential Sprinklers

The next figure provides a typical residential fire timeline.

FIGURE 2-6: Typical Residential Fire Timeline



On January 12, 2009, Upper Merion firefighters responded to a house fire in the township's Valley Forge Estates section. The following figure depicts the conditions on arrival—eight minutes from dispatch.[7] It shows a bedroom fire that was extinguished by the activation of a single residential sprinkler head and virtually no damage to the room itself.

FIGURE 2-7: Bedroom Fire Extinguished with the Activation of a Single Sprinkler Head

On January 9, 2009, firefighters responded to a house fire in the township's Rebel Hill section. The following figure depicts conditions on arrival 10 minutes from dispatch; the missing object to the left of the washer is the dryer (right photo).[8] The photo shows the result of a fire in a clothes dryer that was extinguished with the activation of a single sprinkler head; there was no damage to the home, other than the to the dryer.

FIGURE 2-8: Clothes Dryer Fire Extinguished with the Activation of a Single Sprinkler Head

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7 http://www.fireengineering.com/articles/print/volume-164/issue-1/features/residential-sprinklers-still-under-fire.html

8. http://www.fireengineering.com/articles/print/volume-164/issue-1/features/residential-sprinklers-still-under-fire.html

Both the Valley Forge Estates and Rebel Hill fires were well on their way to flashover; however, just one sprinkler head operated at each fire. There was minimal damage in both cases, and neither family was displaced.[9]

According to the NFPA, the average cost nationally for installing automatic fire sprinklers in new, single family residential structures is estimated to be $1.61 per square foot.[10] For a 2,000 square-foot home, the estimated cost would be approximately $3,220. This can be less than the cost of granite counter tops or a carpeting upgrade. In addition, many homeowner insurance policies provide a discount for homes equipped with residential fire sprinklers. The State of California has mandated the installation of residential fire sprinkler systems in all new one- and two-family dwellings and townhouses statewide since 2010.

Until such time as the city adopts an ordinance requiring sprinkler installation in every habitable structure, including one- and two-family dwellings, the fire department should approach the developer/builder/owner to discuss the significant life safety advantages of residential sprinkler systems during the approval process for subdivisions and large single-family residences, and encourage them to consider the installation of these life-safety systems. There are a number of publications that the fire department can use as a resource to market the benefits of residential fire suppression systems, including from the NFPA, which has developed standards for sprinkler design and installation.

Community Risk Reduction Recommendations:

- The City of Brownsville should give serious consideration to the adoption of a city ordinance that mandates the installation of an automatic fire suppression (sprinkler) system in all new construction, including one- and two-family dwellings. This requirement has been included in the International Residential Code since 2009. (Recommendation No. 5.)
- The BFD should develop a compelling public education program that includes discussing the significant life-saving benefits of installing residential fire sprinklers in all new one- and two-family dwellings. (Recommendation No. 6.)
- The City of Brownsville should explore possible funding opportunities to encourage businesses to install smoke alarms and sprinkler systems. Part of this evaluation could include analyzing the feasibility of establishing tax increment financing districts or business improvement districts. (Recommendation No 7.)

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One of the newest rends in fire prevention inspections is the use of Remote Video Inspection (RVI). According to the NFPA, *"RVI provides an effective alternative means for building inspection, enabling one or more parties to remotely perform an inspection of a building or building component."*[11] The NFPA has released a new infographic that emphasizes the five key considerations for an RVI inspection program: procedures, communication, technology, verification, and completion.

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9. http://www.fireengineering.com/articles/print/volume-164/issue-1/features/residential-sprinklers-still-under-fire.html
10. NFPA, "Cost of Installing Residential Fire Sprinklers Averages $1.61 per Square Foot" Quincy, MA: September 11, 2008.
11. https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/News-releases/2020/New-infographic-from-NFPA-highlights-remote-inspection

FIGURE 2-9: Remote Video Inspection (RVI) Components

Image credit: National Fire Protection Association

According to the NFPA:

> *"RVI provides an effective alternative means for building inspection, enabling one or more parties to remotely perform an inspection of a building or building component. Just like traditional on-site or in person inspections, an RVI typically occurs as part of a jurisdiction's permitting or inspection process. Virtual inspections are not intended to be less complete than an on-site inspection; they are meant to achieve the same (or enhanced) results as an on-site inspection."* [12]

Until recently, use of RVI was limited and sporadic. The COVID-19 pandemic and remote work conditions combined with a normal extensive workload have made more jurisdictions consider alternatives to traditional inspection procedures and processes. Long term, the use of a program such as this can help any fire prevention entity better manage often unrealistic inspection workloads.

Community Risk Reduction Recommendation:

- The BFD should explore the feasibility of utilizing Remote Video Inspections (RIV) to assist with managing the inspection workload. (Recommendation No. 8.)

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[12]https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/News-releases/2020/New-infographic-from-NFPA-highlights-remote-inspection

The BFD has a very active public fire education program, which is an important component of an overall fire prevention program, particularly in the residential areas of the city. This effort is very commendable and results in time and resources well spent. Nearly 75 percent of all fires, fire deaths, and injuries occur in the home, an area where code enforcement and inspection programs have little to no jurisdiction. Public education is the area where the fire service will make the greatest impact on preventing fires and subsequently reducing the accompanying loss of life, injuries, and property damage through adjusting people's attitudes and behaviors with regard to fires and fire safety. This program should also include the aggressive distribution and installation of smoke detectors particularly in areas of the city with high proportions of at-risk populations. The city did have a program to do this; however, it was suspended with the onset of the COVID pandemic.

Community Risk Reduction Recommendation:

- The BFD should implement a station-level voluntary home inspection and assistance program targeted to first due areas with the most dwelling fires with a goal of reducing fires by 15 percent within five years. (Recommendation No. 9.)

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The investigation of the cause and origin of fires is also an important part of a comprehensive CRR system. Determining the cause of fires can help with future prevention efforts. At the time of this evaluation, assistant chiefs and company officers are charged with initiating the fire origin and cause determination process. When possible, they can make those determinations. When needed, particularly when the fire involves a significant loss, injury, or fatality, a fire investigator responds to perform an in-depth investigation.

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FIRE EDUCATION, TRAINING, AND PROFESSIONAL DEVELOPMENT PROGRAMS

Training is, without question, one of the most essential functions that a fire department should be performing on a regular basis. One could even make a credible argument that training is, in some ways, more important than emergency responses because a department that is not well trained, prepared, and operationally ready will be unable to fulfill its emergency response obligations and mission. Education and training are vital at all levels of fire service operations to ensure that necessary functions as needed on a fireground are completed correctly, safely, and effectively. A comprehensive, diverse, and ongoing training program is critical to the fire department's level of success.

An effective fire department training program must cover all the essential elements of that department's core missions and responsibilities. The level of training or education required given a set of tasks varies with the jobs to be performed. The program must include an appropriate combination of technical/didactic training, manipulative or hands-on/practical evolutions, and training assessment to gauge the effectiveness of these efforts. Most of the training—particularly the practical, standardized, hands-on training evolutions—should be developed based upon the department's own operating procedures and operations while remaining cognizant of widely accepted practices and standards that could be used as a benchmark to judge the department's operations for any number of reasons.

Certain Occupational Safety and Health Administration (OSHA)[13] regulations dictate that minimum training must be completed on an annual basis, and must cover assorted topics that include:

- A review of the respiratory protection standard, self-contained breathing apparatus (SCBA) refresher and user competency training, SCBA fit testing (29 CFR 1910.134).
- Blood Borne Pathogens Training (29 CFR 1910.1030).
- Hazardous Materials Training (29 CFR 1910.120).
- Confined Space Training (29 CFR 1910.146).
- Structural Firefighting Training (29 CFR 1910.156).

In addition, National Fire Protection Association (NFPA) standards contain recommendations for training on diverse topics such as a requirement for a minimum of 24 hours of structural firefighting training annually for each fire department member. As well, the ISO-Fire Suppression Rating System (ISO-FSRS) has certain training requirements for which fire departments receive credit during the ISO-FSRS review.

Because so much depends upon the ability of the emergency responder to effectively deal with an emergency, education and training must have a prominent position within an emergency responder's schedule of activities when on duty. Education and training programs also help to create the character of a fire service organization. Agencies that place a real emphasis on their training tend to be more proficient in performing day-to-day duties. The prioritization of training also fosters an image of professionalism and instills pride in the organization. Overall, the BFD has

13. The Texas Commission on Fire Protection has adopted NFPA and federal OSHA standards and incorporates them by reference into the regulations which cover firefighters in the State of Texas.

an excellent robust and comprehensive training program and there exists a dedicated effort focused on a wide array of training activities.

The BFD Training Division is a stand-alone unit within the department commanded by an Assistant Chief. At the time of this assessment the Assistant Chief commanded a staff of four instructors. This includes one EMS training lieutenant, one driver, and two firefighters. However, except for the Assistant Chief and EMS lieutenant, all of the training positions are considered to be temporary duty assignments, not a normal operational or staff position. The division also has no administrative support staff to handle training records, recertifications, class scheduling, etc. Each of the training personnel have a portfolio of multiple duties and responsibilities assigned them that are related to various operations, programs, and liaison duties. The Training Division also handles the BFD's safety functions and works closely with the city's safety and risk management office.

The BFD has training programs for fire, EMS, and technical responses that include but are certainly not limited to:

- Five month new-hire academy that includes certification in Firefighter Level 1 and Emergency Medical Technician–Basic training. The department tries to run a new recruit academy every year for 12 to 15 personnel.
- Haz-mat materials training.
- Vehicle extrication, technical rescue (rope rescue, water response, trench collapse, confined space, building collapse) both basic and advanced.
- On-going EMS basic and continuing education training including initial paramedic training and required recertification.
- Daily company in-service training.

In addition to providing in-house fire and EMS academies as well as maintaining and providing compliance records for state, local, and federal mandates the division also provides public safety training to include: STOP THE BLEED, AHA hands-only CPR, fire extinguisher training, and FAA drone pilot training. It also produces public safety PSAs in conjunction with the Fire Marshal's Office. In 2021, the training personnel trained nearly 900 civilians in hands-only CPR. **The BFD is to be commended for this commitment to training, which CPSM considers to be a Best Practice.**

All members of the BFD are certified to a minimum of the Firefighter I and Firefighter II and EMT-Basic levels. Many members have earned additional certifications. In-service training is usually topic-specific to either teach or practice important skills and to allow crews to work together in simulated emergency situations.

The BFD utilizes CSUTest.com as its platform for all department in service training. CSUTest.com is a robust course catalog for fire and EMS training that can be utilized to meet all federal, state, and local public safety training mandates. CSUTest.com can also provide the platform for managing all training records and reports. The use of this program will help to ensure that there is a reliable and accurate database for tracking and retrieval of all department level training and for recording and tracking the status of certifications for all personnel.

All personnel and shifts are required to complete two training drills a per day, or about 20 hours per month. This training is supposed to be a combination of the training that is assigned by the Training Division augmented by additional training on topics identified by the company officers and Assistant Chiefs. This results in more flexibility in the training that is completed. With any good fire department training program, at least 50 percent of the drills should include manipulative (hands-on) training to allow for the development of proficiency and to review critical skills.

CPSM was informed that it is sometimes "difficult to meet" the required 20 hours of documented training each month that the department and ISO require for maximum credit during an evaluation. It is clearly reasonable that some days it will be difficult to complete the required training as various time demands throughout the duty day, including emergency responses, increasingly compete with each other. Yet, in many fire departments less-than-efficient time management and even past practice can hinder attempts to provide training for on-duty personnel. We believe that this is at least partially true in Brownsville. Every effort should be made to continue to make completion of this daily task a priority.

Additional daily opportunities for training can be found during related activities such as daily/weekly apparatus and equipment inspections and building pre-planning activities. Annual inspection and testing requirements such as for hose, pumps, hydrant flow testing, etc. can also provide additional training credits for personnel who participate. Training can and should also be conducted during evening hours and on weekends.

An area where CPSM noted a deficiency in training for the BFD was in the area of providing all companies and personnel with high-intensity training on various subjects, including periodic live fire training on at least a semi-annual basis. However, the team was informed that the department has plans to begin this type of program in the latter part of 2022. The plan is to have all members participate in this type of training at least two times per year. CPSM encourages the BFD to move forward with this initiative.

On the EMS side of operations, the training programs and requirements are primarily driven by the mandatory nature of continuing education and recertification requirements for various levels of practitioners. If individual personnel or the agency were to not keep up with required training and/or certification requirements they could lose their ability to practice or provide the prescribed levels of service.

EMS training is also conducted through the Training Division and delivered by department personnel who are certified to provide various levels of EMS certification. Much of the EMS training is conducted in partnership with the Center for Learning and Innovation at Memorial Medical Center. This includes the lengthy EMT–Paramedic training program that all new BFD personnel must complete. It was reported to CPSM that this is a major bottleneck in getting new personnel fully trained and out into the field.

All levels of EMS training require continuing education credits on a multiyear cycle for recertification, including 72 hours of training every two years for personnel who are nationally registered EMTs and paramedics and 144 hours every four years under Texas requirements. Whenever possible, fire training should be tied into EMS continuing education credits, providing dual discipline benefit for personnel. Since EMS incidents make up a large percentage of the department's responses, ensuring that these certifications continue to be maintained should remain a significant component of the department's training focus.

Professional development for fire department personnel, especially officers, is also an important part of overall training. There are numerous excellent opportunities for firefighters and officers to attend training on a wide range of topics outside of Brownsville, including those offered at various state firefighting academies and at the National Fire Academy in Emmitsburg, Maryland. Beyond the practical benefits to be gained from personnel participating in outside training, encouraging personnel to earn and/or maintain various specialized certifications such as Fire

Instructor or Fire Officer increases the positive professional perception of the organization and can help to demonstrate a commitment to continued excellence.

At the time of this assessment the BFD had no formal professional development program in place. While many department officers have earned various professional certifications, both fire- and EMS-related, some as the result of mandatory training, it has primarily been through their own pursuit of professional development. All officers have completed Fire Instructor I and Fire Officer I training and certification programs. However, there is no real formal system for professional development in anticipation of promotion. All of the senior staff personnel possess college degrees.

BFD officers typically provide feedback to personnel regarding their performance but there is no formal testing or skills assessments for fire training in the department with the exception of ARFF certification. Training is a required activity in the fire service and the ability to incorporate a formal testing process as part of the learning effort is essential. EMS skills assessments, both practical and written, are regularly incorporated into EMS training. Traditionally, fire departments are reluctant to incorporate skills testing into their fire training components. However, an increasingly common way to evaluate the department's training program is through annual skills proficiency evaluations where all members of the department are required to successfully perform certain skills or complete standardized evolutions, either individually, or as part of a team.

The ability to monitor and record training test scores is beneficial for ensuring overall proficiency. In addition, training scores should be incorporated into the annual performance appraisal process for both the employee, his or her supervisor, and the training staff. In addition, the concept of adding a testing process to each training evolution adds to the importance and seriousness in which these activities are carried out.

The BFD does not currently utilize a formal task book process to provide training guidance and new rank orientation. A growing number of fire departments are employing task books for personnel who aspire to (or in some cases have already been promoted to) higher rank. Task books would be appropriate for the BFD for firefighter, driver, lieutenant, captain, and assistant chief. The successful completion of any task book can be considered as a prerequisite for promotion to higher rank, or alternatively, can be a required element of the post-promotional evaluation process.

Many departments today are developing company fire officer courses for their officers. These are often an approximately three-week company officer academy. A component of these programs also involves the development of task books, which would be comprised of JPRs that personnel would complete following the classroom portion of the academy. Personnel would have a predetermined amount of time to complete to complete the task book.

The BFD should also consider conducting a formal one- or two-week driver/engineer academy to assist candidates with completing their task book requirements. These efforts can help provide newly promoted personnel with the tools needed to operate both administratively and in field settings. The completion of the task book could also qualify individuals to assume acting driver/engineer and officer assignments in which they receive practical experience and on-the-job training.

Beyond the establishment of requirements to achieve certain levels of certification for promotion, the department should consider the implementation of a formal professional development program for all department personnel. The program should attempt to strike an appropriate balance between technical/practical task books, simulator training, formal certifications, mentor relationship, and outside influences. Where practical, best practices identified by the NFPA, ISO, IFSTA, IFSAC, Texas Commission of Fire Protection, and the Center for Public Safety Excellence (CPSE) should be incorporated.

Education, Training, and Professional Development Recommendations:

- The BFD should make it a priority to develop and budget in the near term a company fire officer training and development program that is competency-based on National Fire Protection Association (NFPA), International Association of Fire Chiefs (IAFC), International Fire Service Training Association (IFSTA), and Texas Commission on Fire Protection standards, and that focuses on contemporary fire service issues including community fire protection and emergency services delivery approaches, fire prevention practices, firefighter safety and risk management and labor/staff relations; reviewing, approving, or preparing technical documents and specifications, departmental policies, standard operating procedures and other formal internal communications; improving organizational performance through process improvement and best practices initiatives; and having a working knowledge of information management and technology systems. (Recommendation No. 10.)
- The BFD should develop task books for firefighter, driver, lieutenant, captain, and assistant chief. Firefighters should be required to complete their book as part of their probationary period. For other ranks, all personnel aspiring for promotion to a higher rank should successfully complete all elements of that rank's task book to be eligible to participate in the formal promotional testing process. (Recommendation No. 11.)
- The BFD should develop training programs that establish the following rank appropriate certifications as mandatory job requirements for supervisory and command levels with the department: (Recommendation No. 12.)
  - Lieutenant.
    - Fire Instructor I.
    - Fire Officer (or Company Fire Officer) I.
    - IMS I-300.
  - Captain.
    - Fire Instructor II.
    - Fire Officer II.
    - IMS- I-400.
    - Incident Safety Officer.
  - Assistant Chief.
    - Fire Officer III.
    - Chief Fire Officer.
- The BFD should make a concerted effort to send as many officers as possible to the National Fire Academy (NFA). Further, any officers who meet the admissions criteria should be encouraged to enroll in the Academy's Executive Fire Officer Program. (Recommendation No. 13.)

- The BFD should develop and institute written and practical skills testing and proficiency evaluations as part of the department's comprehensive fire training program. (Recommendation No. 14.)
- The BFD should move forward with its plan to provide all companies and personnel with high intensity training on various subjects, including periodic live fire training on at least a semi-annual basis. (Recommendation No. 15.)

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The Training Division is also responsible for the department's various compliance efforts. These duties include, but are not limited to:

- Annual SCBA FIT tests.
- Annual SCBA flow tests.
- Quarterly air quality testing.
- Semi-annual personal protective equipment (PPE) inspections.

Other responsibilities of the Training Division include:

- Storage and distribution of all new equipment.
- Doing peer support (140 sessions in 2021).
- Doing Critical Incident Stress Management (CISM). In 2022 the division provided assistance to local schools after the shooting in Uvaldi.
- Providing training for local police departments, colleges, and regional academies.
- Assisting with planning for large-scale events.

The BFD has a training facility located at the rear of Station 8 where personnel can participate in certain hands-on training evolutions. The department received a grant to upgrade the training facility several years ago. Improvements made to the facility at that time included:

- Upgrading the three-story burn tower.
- Construction of a portable training tower.
- Installation of LPG and ventilation props.
- Construction of a running track for physical fitness.

The following figure shows the main props at this facility.

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FIGURE 2-10: BFD Training Facility

Future planned upgrades to the facility, if grant funding can be obtained, include the addition of an ARFF training capability and a flammable liquids burn pit. Currently, personnel needing training/certification for ARFF go to Laredo to train.

Education, Training, and Professional Development Recommendation:

- To stay current with the considerable amount of training that needs to be accomplished in an ongoing manner, the City of Brownsville and BFD should conduct a comprehensive training needs assessment to determine the number of personnel who are needed to properly staff the Training Division, including civilian administrative staff. (Recommendation No. 16.)

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Facilities

Fire stations are a critical community public safety asset. The fire station facilities of a modern fire department are designed to do much more than simply provide a garage for apparatus and a place for firefighters to wait for a call. Fire department capital facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied and operational 24 hours a day.[14]

Fire facilities must be designed and constructed to accommodate both current and forecast trends in fire service vehicle type and manufactured dimensions. A facility must have sufficiently-sized bay doors, circulation space between garaged vehicles, departure and return aprons of adequate length and turn geometry to ensure safe response, and floor drains and oil separators to satisfy environmental concerns. Station vehicle bay areas should also consider future tactical vehicles that may need to be added to the fleet to address forecast response challenges, even if this consideration merely incorporates civil design that ensures adequate parcel space for additional bays to be constructed in the future.

Personnel-oriented needs in fire facilities must enable performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas for essential equipment and supplies; space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort; and—where a fire department is committed to minimize "turnout time"—bunking facilities.

A fire department facility may serve as a de facto "safe haven" during local community emergencies, and serve as a command center for large-scale, protracted, campaign emergency incidents. Therefore, design details and construction materials and methods should embrace a goal of having a facility that can perform in an uninterrupted manner despite prevailing climatic conditions and/or disruption of utilities. Programmatic details, such as the provision of an emergency generator connected to automatic transfer switching—even going as far as to provide tertiary redundancy of power supply via a "piggyback" roll-up generator with manual transfer (should the primary generator fail)—provide effective safeguards that permit the fire department to function fully during local emergencies when response activity predictably peaks.

Personnel/occupant safety is a key element of effective station design. This begins with intricate details such as the quality of finish on bay floors and nonslip treads on stairwell steps to decrease tripping/fall hazards, or use of hands-free plumbing fixtures and easily disinfected surfaces/countertops to promote infection control. It continues with installation of specialized equipment such as an exhaust recovery system to capture and remove cancer-causing by-products of diesel fuel exhaust emissions. A design should thoughtfully incorporate best practices for achieving a safe and hygienic work environment.

An ergonomic layout and corresponding space adjacencies in a fire station should seek to limit the travel distances between occupied crew areas to the apparatus bays. Likewise, facility design should carefully consider complementary adjacencies, such as lavatories/showers in proximity of bunk rooms, desired segregations, and break rooms or fitness areas that are remote from sleeping quarters. Furnishings, fixtures, and equipment selections should provide thoughtful

14. Compton and Granito, eds., *Managing Fire and Rescue Services*, 219.

consideration of the around-the-clock occupancy inherit to fire facilities. Durability is essential, given the accelerated wear and life cycle of systems and goods in facilities that are constantly occupied and operational.

National standards such as NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program*, outlines standards that transfer to facilities such as infection control, personnel and equipment decontamination, cancer prevention, storage of protective clothing, and employee fitness. NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Firefighting and Proximity Fire Fighting*, further delineates laundering standards for protective clothing and station wear. Laundry areas in fire facilities continue to evolve and are being separated from living areas to reduce contamination. Factors such as wastewater removal and air flow need to be considered in a facility design.

Typically, fire stations have an anticipated service life of approximately 50 years, although some newer stations are being designed to remain functional longer. In most cases facilities require replacement because of the size constraints of the buildings, a need to relocate the facility to better serve changing population centers, the absence of needed safety features or service accommodations, and the general age and condition of the facility. The day-to-day cost of operating a fixed capital facility can burden the operating budget. Properly maintaining mechanical and structural components is critical to the longevity of the facility. Deferring routine maintenance creates inefficiencies of mechanical systems and increases costs for replacement and repairs. It can also shorten the station's serviceable life.

Sound community fire-rescue protection requires the strategic distribution of fire station facilities to ensure that effective service area coverage is achieved, that predicted response travel times satisfy prevailing community goals and national best practices, and that the facilities are capable of supporting mission-critical personnel and vehicle-oriented requirements and needs. Additionally, depending on a fire-rescue department's scope of services, size, and complexity, other facilities may be necessary to support emergency communications, personnel training, fleet and essential equipment maintenance and repair, and supply storage and distribution.

The City of Brownsville operates 10 emergency response stations strategically located throughout the city. The stations range in age from 95 years old for station 2 near downtown (and 94 years old for the Central Fire Station located in downtown Brownsville) to 21 years old for station 9. The fire administration offices are located in the City Hall Annex building located on City Plaza, several block from the central station. The fire prevention and emergency management offices are located in other locations several blocks away.

The following table lists the location of each current station along with the apparatus that is deployed from that location.

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TABLE 2-3: BFD Fire Station Locations and Equipment Deployed

Station	Address	Staffed Operations Units	Other Units Assigned
Central Fire Station	1000 E. Adams Street	Engine 1 Truck 1 Medic 1 Shift Commander	Brush 1 Rescue Boat Utility Truck 104
Fire Station 2	536 W. St. Charles	Engine 2	
Fire Station 3	814 Hortencia Blvd.	Engine 3 Medic 3	Ranger 3
Fire Station 4	605 Old Alice Rd.	Engine 4 Medic 4	
Fire Station 5 (Airport)	60 Vermillion Ave.	Rescue 1 Rescue 2	
Fire Station 6	1100 Old Port Isabel Rd.	Engine 6 Medic 6	
Fire Station 7	1863 Military Rd.	Engine 7 Medic 7	
Fire Station 8	1855 Captain David Foust Rd.	Engine 8 Medic 8	Brush 8
Fire Station 9	62 E. Alton Gloor	Engine 9 Medic 9 EMS Supervisor	Rescue Truck Rescue boat 2 Ranger 2 Haz-mat pick-up truck and trailer
EMS Station 10	500 Hildago Ave.	Medic 10	

The following figures are of each BFD fire station with an accompanying description of the facility.

FIGURE 2-11: Central Fire Station

Year Built: **1928**

Square Footage: **3,000**

Number of Apparatus Bays: **4**

Condition: **Poor**

This station has numerous maintenance and safety issues. Although it has been designated as a historical building it has outlived its functionality as a contemporary fire and EMS facility.

FIGURE 2-12: Fire Station 2

Year Built: **1927**

Square Footage: **800**

Number of Apparatus Bays: **1**

Condition: **Fair**

While this station is still in fair condition despite being 95 years old (it was extensively renovated in 1988) its small size and lack of room for expansion make it obsolete as a contemporary fire station. It is questionable whether a new fire apparatus would fit in the bay.

FIGURE 2-13: Fire Station 3

Year Built: **1980**

Square Footage: **1,300**

Number of Apparatus Bays: **2**

Condition: **Very Good**

FIGURE 2-14: Fire Station 4

Year Built: **1957**

Square Footage: **1,000**

Number of Apparatus Bays: **2**

Condition: **Good**

FIGURE 2-15: Fire Station 5 (Airport)

Year Built: **2002**

Square Footage: **3,000**

Number of Apparatus Bays: **2**

Condition: **Very Good**

This facility only serves the airport. It also has a training room.

FIGURE 2-16: Fire Station 6

Year Built: **1983**

Square Footage: **1,200**

Number of Apparatus Bays: **2**

Condition: **Very Good**

FIGURE 2-17: Fire Station 7

Year Built: **1983**

Square Footage: **1,300**

Number of Apparatus Bays: **2**

Condition: **Very Good**

FIGURE 2-18: Fire Station 8

Year Built: **1990**

Square Footage: **5,000**

Number of Apparatus Bays: **3**

Condition: **Very Good**

Station 8 also houses the Training Division and training facility. The Training Division occupies 3,000 square feet, the fire station 2,000.

FIGURE 2-19: Fire Station 9

Year Built: **2001**

Square Footage: **3,000**

Number of Apparatus Bays: **4**

Condition: **Very Good**

FIGURE 2-20: EMS Station 10

Year Built: **1980**

Square Footage: **800**

Number of Apparatus Bays: **2**

Condition: **Fair**

Although it has two apparatus bays, both are undersized and this former volunteer fire station is not suitable for contemporary fire apparatus. This station will eventually be replaced with a new station in the Madeira development.

Site visits to all stations by the CPSM team showed that the stations appear to be clean and orderly as maintained by the personnel assigned to them. All of the stations are equipped with back-up emergency generators and electric shorelines for the units assigned there.

Some stations appeared to have a limited fire detection systems, but their functionality could not be determined. Some stations, but not all, have carbon monoxide detectors in the bunk room area.

Facilities Recommendations:

- The BFD should install automatic fire alarm systems with heat, smoke, and carbon monoxide detection in all fire stations. These systems should not only be equipped with both audible and visible warning devices, but they should also automatically transmit an alarm to either the department's alarm room/dispatch center or an approved central monitoring station. (Recommendation No. 17.)
- The BFD should give consideration to equipping all fire stations with complete, automatic fire sprinkler systems for the protection of the occupants, buildings and equipment, as well as complete, supervised smoke detection systems already recommended, that transmit an alarm to the fire dispatch center or central monitoring station. (Recommendation No. 18.)

- The BFD should install disconnect switches interfaced with alarm notification systems on all kitchen stoves to automatically shut them off to prevent kitchen fires during responses to alarms. (Recommendation No. 19.)

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All fire stations are equipped with vehicle exhaust extraction systems. However, CPSM was informed that many of them are not operational.

Vehicle exhaust extraction systems are designed to enable apparatus operators to attach a large flexible hose to the exhaust pipe before backing into the station. The system fan automatically discharges vehicle exhaust to the outside atmosphere. When the vehicle is driven out of the station, the discharge hose is automatically released once the apparatus clears the station. As a result of the lack of this type of system, the department's personnel are exposed on a regular basis to the harmful effects of breathing in both diesel and gasoline engine exhaust emissions. This exposure occurs during response to, and return from, emergency responses, during training exercises, routine vehicle inspections, and any other time that any vehicle in the station must be started and driven either out of, or backed into, the station.

In the short term, breathing in diesel and gasoline fumes can cause coughing, itchy or burning eyes, chest constriction, wheezing, and difficulty breathing. Over the long term, exposure to these fumes may increase the risk of lung cancer and possibly bladder and other cancers. There is additional evidence that the fine particles found in diesel emissions, particularly the soot, can aggravate heart problems and respiratory illnesses such as asthma. In addition, the members' personal protective equipment (PPE), which is stored in the apparatus bays in many stations, is continuously exposed to deposits of soot and other exhaust emission products that are released every time a vehicle is started in the station, resulting in a secondary exposure hazard to personnel as they perform their emergency response duties. Some studies suggest that diesel exhaust can penetrate into and be absorbed into clothing, furniture, and other items which firefighters routinely are in contact with, where it can later be absorbed into the firefighters' skin. Every time the firefighters put on this gear they are being exposed to these contaminates and potential carcinogens.

The U.S. Occupational Safety and Health Administration (OSHA) notes that the organic carbons found in diesel exhaust include polyaromatic hydrocarbons (PAH), some of which cause cancer when tested in animals. Workers exposed to diesel exhaust face the risk of health effects ranging from irritation of the eyes and nose, headaches, and nausea, to respiratory disease and lung cancer. In 1990, the State of California, under Proposition 65, identified diesel exhaust as a chemical known to cause cancer. The California Environmental Protection Agency, Air Resources Board has a fact sheet titled "Toxic Air Contaminant Emissions from Diesel-fueled Engines." It notes, among other things, that research studies show emissions from diesel-fueled engines may cause cancer in animals and humans and that studies also show that workers exposed to higher levels of emissions from diesel-fueled engines are more likely to develop lung cancer. There is also a link between emissions from diesel-fueled engines and non-cancer damage to the lung.

Facilities Recommendation:

- The BFD should ensure that the vehicle exhaust extraction systems for all vehicles in all of the apparatus bays at all department fire stations are repaired to proper working order and maintained in a serviceable state at all times. (Recommendation No. 20.)

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As noted in the descriptions above, the Central Fire Station and station 2 have outlived their useful lives as functioning fire stations, as has EMS station 10. Planning should begin now for replacing these facilities since it may take at least five years from the time planning begins on a new facility until it is ready for use. Obtaining funding, finding suitable sites for new facilities, and design and construction work can all be lengthy endeavors.

For the Central Fire Station, any replacement facility should also include moving the fire administration, fire prevention, and emergency management functions into one centralized facility.

As is recommended in other parts of this report, consideration should be given to relocating Station 2 to a location in the northern part of the city to assist with reducing response times in that area.

EMS station 10 will be replaced with a full-service fire and EMS station located in the Madeira development.

Although it is a relatively new station, the city and BFD should also explore potential options regarding Fire Station 5 including whether it could also serve as a full-service fire and EMS station from its current location to reduce response times in that area, or, whether a new facility located on the airport perimeter that could serve a dual function as a city and ARFF station would be more feasible.

Fire Fleet

The resources that the fire department uses to perform its core mission and mitigate a wide range of emergency incidents are generally divided into two major categories, those are apparatus and tools/equipment. Apparatus generally includes major emergency response apparatus such as pumpers (engines), tenders/tankers (water supply vehicles), aerial apparatus/quints,[15] rescue vehicles, and ambulances. Specialized apparatus includes emergency units such as brush trucks and other off-road vehicles. Apparatus also includes trailers for technical rescue, hazardous materials response/ equipment, hazardous material decontamination, structural collapse rescue equipment, breathing air/light support units, foam units/supplies, and mass casualty incident supplies. Support vehicles that are critical to fire department operations, both routine and emergency, include command post and emergency communications units, command/staff vehicles, and maintenance trucks.

The mission, duties, responsibilities, demographics, geography, infrastructure, hazards protected, and construction features within the community a department is protecting all play a major role in the composition of the apparatus fleet and equipment inventory. The geography, infrastructure, and building construction characteristics of Brownsville present the fire department with a wide variety of strategic and tactical challenges related to emergency response preparedness and mitigation. This includes firefighting, emergency medical incidents, motor vehicle crashes and rescues, and the potential for complex incidents requiring special operations capabilities such as technical rescue and hazardous materials emergencies. Large commercial buildings and an assortment of target hazards present much different hazards and challenges, and thus different apparatus and equipment needs and capabilities, than those required for operations in single-family dwellings. These factors, as well as projected future needs, must be taken into consideration when specifying and purchasing apparatus and equipment.

15. A "quint" serves the dual purpose of an engine and a ladder truck. The name "*quint*" refers to the five functions that these units provide: fire pump, water tank, fire hose, aerial device, and ground ladders.

The provision of an operationally ready and strategically located fleet of mission-essential fire- and rescue vehicles is fundamental to the ability of a fire-rescue department to deliver reliable and efficient public safety within a community.

The BFD currently operates a fleet of fire operational response apparatus as outlined in the following table.

TABLE 2-4: BFD Fleet

Apparatus	Year In Service	Mileage
Engine 1	2019	12,277
Engine 2	2016	38,057
Engine 3	2013	75,162
Engine 4	2019	26,125
Engine 6	2005	190,000
Engine 7	2008	141,154
Engine 8	2019	28,256
Truck 1 (Ladder)	2021	5,225
Rescue 1 (ARFF)	1999	232,290
Rescue 2 (ARFF)	1999	22,440
Heavy Rescue	2003	84,937
Reserve Engine 1	2009	--
Reserve Engine 2	2012	--

The department did have a third reserve pumper; however, that 2001 unit designated Reserve Engine 9 was severely damaged in a motor vehicle incident in August 2022 and later deemed to be a total loss.

The procurement, maintenance, and eventual replacement of response vehicles is one of the largest expenses incurred in sustaining a community's fire-rescue department. While it is the personnel of the BFD who provide emergency services within the community, the department's fleet of response vehicles is essential to operational success. Reliable vehicles are needed to deliver responders and the equipment/materials they employ to the scene of dispatched emergencies within the city. Maintenance is currently contracted out for vehicle maintenance to King George Fleet Services. While this vendor previously had an emergency vehicle technician (EVT)-certified mechanic, at the present time they do not**.** As a result, they are subcontracting out certain repairs to an authorized service center which has certified personnel. At one time the BFD had its own EVT-certified mechanic. However, that position was eliminated at some point.

One of the biggest factors that can impact serviceable life of an apparatus is the level of preventive maintenance that it receives. NFPA 1915, *Standard for Fire Apparatus Preventive Maintenance Program*, provides guidance on this important aspect of fire department support operations. Apparatus manufacturers also identify suggested programs and procedures to be performed at various intervals. As apparatus ages it is reasonable to expect that parts will wear out and need to be replaced. It follows then that maintenance costs and overall operating expenses will increase. As a result, cost history and projected costs for the future must be considered as a factor in determining when to replace, or refurbish, a fire apparatus. In addition, reliability of the apparatus must be considered. Low downtime and high availability of parts are critical factors for emergency equipment maintenance and serviceability. A proactive preventive maintenance program can assist with holding costs to an acceptable level.

Based on the size of its fleet, the BFD would seem able to support a dedicated, in-house (or city garage) mechanic who can perform routine maintenance, testing, inspections, and minor repairs. Larger engine work, drive train, and suspension maintenance and repairs on the apparatus could still be contracted out to an authorized repair center. In any case, the BFD should ensure that any personnel performing maintenance and/or repairs on its vehicles are either ASE certified[16] and/or are emergency vehicle technicians (EVTs).[17]

Replacement of fire-rescue response vehicles is a necessary, albeit expensive, element of fire department budgeting that should be grounded in careful planning. A well-planned and documented emergency vehicle replacement plan ensures ongoing preservation of a safe, dependable, and operationally capable response fleet. A plan must also include a schedule of future capital outlays in a manner that is affordable to the community.

NFPA 1901, *Standard for Automotive Fire Apparatus*, serves as a guide to the manufacturers that build fire apparatus and the fire departments that purchase them. The document is updated every five years using input from the public/stakeholders through a formal review process. The committee membership is made up of representatives from the fire service, manufacturers, consultants, and special interest groups. The committee monitors various issues and problems that occur with fire apparatus and attempts to develop standards that address those issues. A primary interest of the committee over the past years has been improving firefighter safety and reducing fire apparatus crashes.

The Annex Material in NFPA 1901 (2016) contains recommendations and work sheets to assist in decision making in vehicle purchasing. With respect to recommended vehicle service life, the following excerpt is noteworthy:

> *"It is recommended that apparatus greater than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status and upgraded in accordance with NFPA 1912, Standard for Fire Apparatus Refurbishing (2016), to incorporate as many features as possible of the current fire apparatus standard. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many improvements and upgrades required by the recent versions of the standards are available to the firefighters who use the apparatus."*

The impetus for these recommended service-life thresholds is continual advances in occupant safety. Despite good stewardship and maintenance of emergency vehicles in sound operating condition, there are many advances in occupant safety, such as fully enclosed cabs, enhanced rollover protection and air bags, three-point restraints, antilock brakes, higher visibility, cab noise abatement/hearing protection, and a host of other improvements as reflected in each revision of NFPA 1901. These improvements provide safer response vehicles for those providing

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16. According to its website, ASE is short for the National Institute for Automotive Service Excellence. It states that it tests and certifies automotive professionals so that shop owners and service customers can better gauge a technician's level of expertise before contracting the technician's services. ASE certification enables an automotive technician professional to offer tangible proof of their technical knowledge.
17. The EVT Certification Commission Inc. is a nonprofit corporation dedicated to improving the quality of emergency vehicle service and repair throughout the United States and Canada by means of a certification program that provides technicians recognition for the education, training, and experience they have in the service and repair of emergency vehicles.

emergency services within the community, as well those "sharing the road" with these responders.

The BFD follows the NFPA recommendations for apparatus replacement, with most apparatus scheduled to be replaced in the CIP at the 15-year interval with another five in reserve. Recently the department has been able to replace some front-line apparatus at the 12-year mark. This allows the department to replace the apparatus so as not to extend the service life much beyond 15 years, ***a best practice.*** The department is scheduled to receive two new pumpers in 2023.

Staff vehicles are replaced based on age, mileage, and review of maintenance costs.

One concern that CPSM noted during our visit was that both the assistant chiefs/shift commanders and the EMS supervisor were both utilizing basic pick-up trucks as their emergency response vehicles. These trucks were not even equipped with caps over the bed. They did not appear to be equipped with any of the usual equipment, radios, command boards, etc. that are critical to incident commanders being able to manage a wide range of incidents effectively, efficiently, and safely. Traditionally chief officers and EMS supervisors have used SUV type vehicles for this purpose. However, the recent trend in many departments is to equip them with either pick-up trucks outfitted for the purpose, or even specially designed vehicles. The following figure shows a command vehicle being used by a fire department in Northern Virginia.

FIGURE 2-21: Typical Emergency Command/Supervisor Response Vehicles

Fleet Recommendation:

- The BFD should provide the assistant chiefs/shift commanders and EMS supervisors with vehicles that are appropriately designed, and equipped to provide for effective, efficient, and safe incident management operations. (Recommendation No. 21.)

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EMS Fleet

The BFD also operates a fleet of 12 ambulances, eight of which are in frontline service and the remainder in spare or reserve status. The replacement cycle for ambulances is usually much shorter than for fire apparatus as they are used much more frequently. The BFD tries to keep its ambulances in frontline service no more than five years, followed by several more years as reserve vehicles. In the BFD fleet the oldest ambulances are from 2014. The department received four new ambulances in 2017 and two more in 2019. Three new units are expected to be delivered in the latter part of 2022.

The industry standard is that the useful life of an ambulance is five years, or 250,000 miles, whichever is reached first. The ambulance inventory provided by BFD reveals its 8 current frontline ambulance fleet is still well within useful life guidelines.

Further, the industry standard is to maintain at least a 35 percent reserve fleet as back-up for frontline ambulances and for special events. BFD has three "mini-ambulances" and four other reserve units, with 2 of the reserve units currently out of service while being remounted. This is a more than adequate back-up reserve fleet for the department. The remount process is an industry best practice, as it entails replacing the chassis of the ambulance and rehabbing the patient compartment box. This provides a significant cost savings compared to replacing the ambulance completely. Best practice is that patient compartment boxes should only be remounted twice, so BFD should plan ahead to assure that after the second remount of the patient compartment box, it plans on replacing the ambulance at the end of its useful life.

It appears that BFD has done an excellent job maintaining a relatively young fleet, with at least two ambulances purchased or remounted every two years. Ambulance asset numbers 9343, 9344, 9347, 9870, 9871, and 9872 appear to have all been purchased in 2017 and have averaged 28,000 miles per year. Although these ambulances are approaching the five-year replacement cycle, it is likely that they can remain in service for another year or two, with appropriate maintenance.

There is currently a significant supply chain issue in the ambulance chassis market. Agencies have recently been informed by ambulance manufacturers that a two- to three-year lead time is necessary to manufacture an ambulance. The demand for new ambulances is far outstripping available supply, and some ambulance manufacturers are telling agencies that they will not even accept new ambulance orders until 2023. Considering this situation, we recommend that BFD begin the replacement process for at least three of the six 2017 model year ambulances now to assure replacement ambulances will be available when needed, likely in 2024.

Fleet Recommendation:

- BFD should begin the replacement process as soon as possible for at least three of the six 2017 model year ambulances. (Recommendation No. 22.)

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ISO COMMUNITY AND FIRE DEPARTMENT RATING

The ISO is a national, not-for-profit organization that collects and evaluates information from communities across the United States regarding their capabilities to combat building fires. ISO conducts field evaluations in an effort to rate communities and their relative ability to provide fire protection and mitigate fire risk. This evaluation allows ISO to determine and publish a Public Protection Classification (PPC) grade. The data collected from a community is analyzed and applied to ISO's Fire Suppression Rating Schedule (FSRS) from which a Public Protection Classification (PPC™) grade is assigned to a community; the grade ranges from 1 to 10.

A Class 1 represents an exemplary community fire suppression program that includes all of the components outlined below. A Class 10 indicates that the community's fire suppression program does not meet ISO's minimum criteria. It is important to understand the PPC is not just a fire department classification, but a compilation of community services that include the fire department, the emergency communications center, and the community's potable water supply system operator.

A more favorable rating may translate into lower insurance premiums for business owners and homeowners. A favorable rating makes the community more attractive from an insurance risk perspective. How the PPC for each community may affect premiums can be complicated because each insurance underwriter is free to utilize the information as they deem appropriate. Many factors feed into the determination of an insurance premium, not just the PPC.

A community's PPC grade depends on:

- **Needed Fire Flows** (building locations used to determine the theoretical amount of water necessary for fire suppression purposes).
- **Emergency Communications** (10 percent of the evaluation).
- **Fire Department** (50 percent of the evaluation).
- **Water Supply** (40 percent of the evaluation).

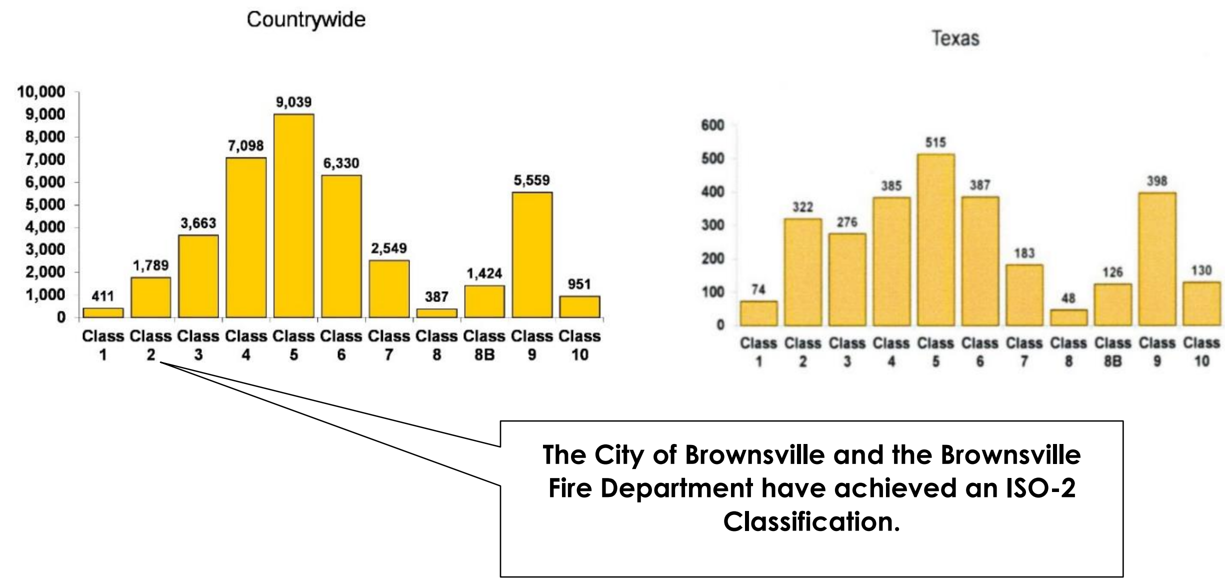
The City of Brownsville has an ISO rating of ***Class 02/2X, the second highest rating achievable***. This rating became effective in about April 2022. The final rating included the following credit by category:

- **Emergency Communications**: 9.35 earned credit points/10.00 credit points available.
- **Fire Department**: 38.02 earned credit points/50.00 credit points available.
- **Water Supply:** 30.28 earned credit points/40.00 credit points available.
- **Community Risk Reduction** (Fire Prevention/Inspection, Public Education, and Fire Investigation activities): 3.94 earned credit points/5.50 credit points available.

Overall, **the community PPC rating yielded 81.52 earned credit points out of 105.50 credit points available.** There was a 0.07 point diversion reduction assessed as well, which is automatically calculated based on the relative difference between the fire department and water supply scores. **80.00 points or more qualify a community for a rating of 2. The City of Brownsville and BFD are to be commended for this accomplishment.**

The following figures illustrate the distribution of PPC ratings across the United States and in Texas.

FIGURE 2-22: PPC Ratings in the United States and Texas[18]



The following table provides a summary scoring of Brownsville's March 2022 PPC report from ISO.

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18. Brownsville, TX PPC Report, March 2022

TABLE 2-5: Brownsville ISO PPC Rating Summary[19]

FSRS Feature	Earned Credit	Credit Available
Emergency Communications		
414. Credit for Emergency Reporting	3.00	3
422. Credit for Telecommunicators	3.35	4
432. Credit for Dispatch Circuits	3.00	3
440. Credit for Emergency Communications	9.35	10
Fire Department		
513. Credit for Engine Companies	5.87	6
523. Credit for Reserve Pumpers	0.34	0.50
532. Credit for Pump Capacity	3.00	3
549. Credit for Ladder Service	3.74	4
553. Credit for Reserve Ladder and Service Trucks	0.00	0.50
561. Credit for Deployment Analysis	5.22	10
571. Credit for Company Personnel	12.78	15
581. Credit for Training	5.07	9
580A. Credit for Texas State Training	0.00	3.26*
*Note: Maximum value for 581 + 580A = 9 points		
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	38.02	50
Water Supply		
616. Credit for Supply System	27.28	30
621. Credit for Hydrants	3.00	3
631. Credit for Inspection and Flow Testing	0.00	7
640. Credit for Water Supply	30.28	40
Divergence	-0.07	--
1050. Community Risk Reduction	3.94	5.50
Texas Addendum Credit- CAFS	0.00	1
Total Credit	81.52	106.50

Areas of scoring that should be analyzed by the city and the BFD and which have the potential to improve the PPC are:

Fire Department

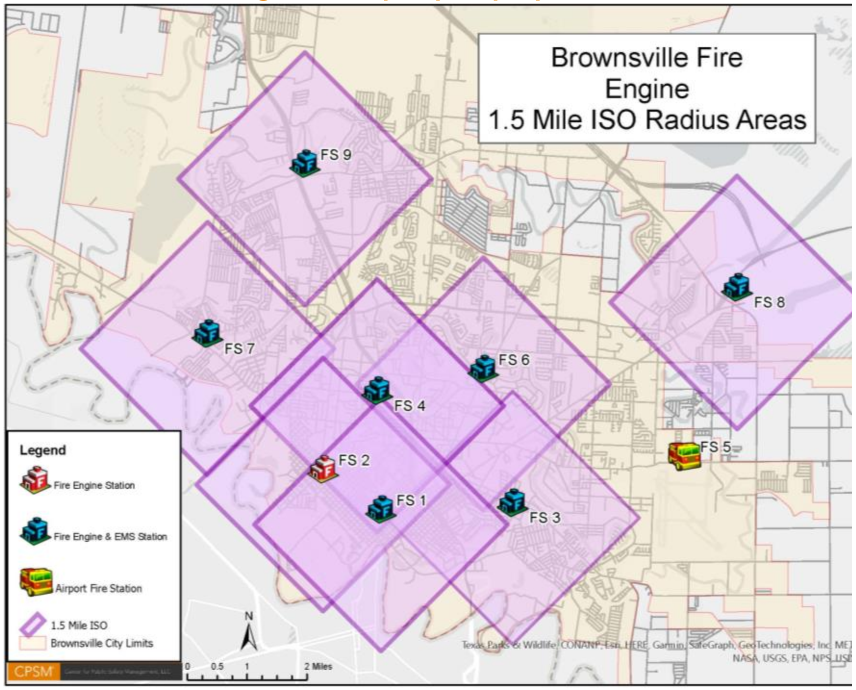
- Credit for Deployment Analysis: 5.22/10.0

This section contemplates the deployment of engine and ladder companies against the percentage of built-upon area within 1.5 miles of a first-due engine company and within 2.5 miles of a first-due ladder-service company. The FSRS recognizes eight engine companies and one ladder company in Brownsville. As is often the case, there is considerable area of overlap in the older, more densely populated areas of the city, while there are gaps in some of the areas that have been developed later. This is discussed in more detail in the section of this report that covers operations of the BFD.

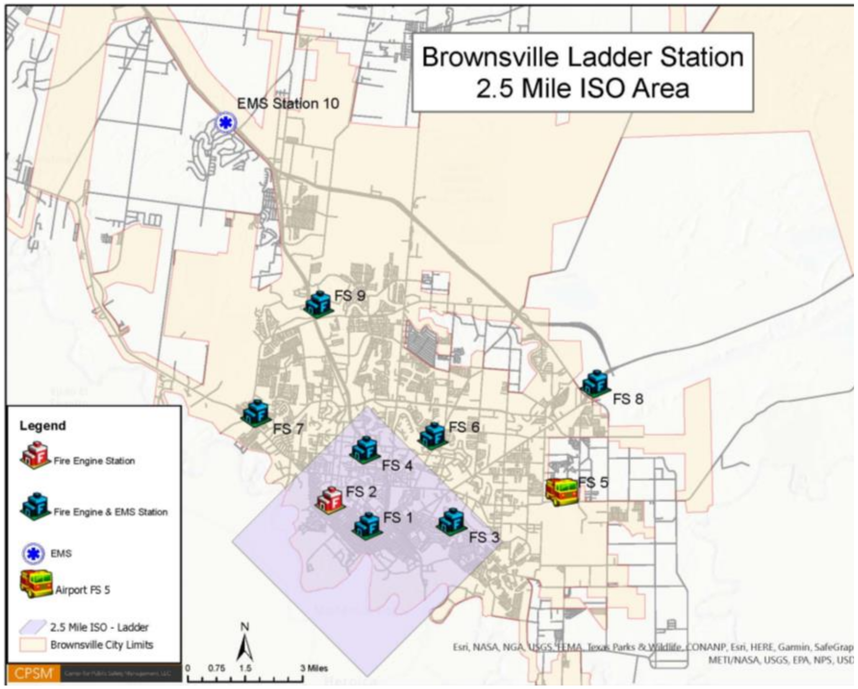
19. Ibid

FIGURE 2-23: ISO Engine and Ladder Coverage Deployment

1.5 Miles For Engine Company Deployment



2.5 Miles for Ladder Company Deployment



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Training

This section looks at various aspects of the fire department's initial and on-duty training programs. Areas where the BFD was deficient during the most recent evaluation—and where improvement can definitely be made—are:

- Training facilities and use: 17.5/35.
- Company training: 13.14/25.
- Officer training: 8.51/12.
- Pre-incident planning inspections: 1.2/12.
- Water supply inspection and flow testing: 0.0/7.0. This item contemplates "Credit for Inspection and Flow Testing (CIT)." This item reviews the fire hydrant inspection frequency and the completeness of the inspections. Inspection of hydrants should be in accordance with AWWA M-17, *Installation, Field Testing and Maintenance of Fire Hydrants*.

Frequency of Inspection (FI): Average interval between the three most recent inspections. Since Brownsville received no points for this component of the FSRS it means it has been at least five years since the fire hydrants were tested and inspected. This is an area that the BFD and Brownsville Public Utilities Board should enter in discussions regarding how to ensure that the city's fire hydrants are inspected, flushed, and flow tested on a periodic basis. While optimally this should be done annually, every two to three years may be a more realistic goal.

ISO Rating Recommendation:

- CPSM recommends to the extent possible the BFD address the deficiencies in the most recent ISO-PPC rating criterion, with a focus on first improving the training and water supply deficiencies, and then developing a plan to address the engine and ladder company deployment over the mid to longer term. (Recommendation No. 23.)

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BFD FINANCIAL RESOURCES

The BFD operating budget is depicted in the next table, which includes the FY 2020, FY 2021, and the FY 2022 general fund budget allocations. Property taxes are the city's primary revenue source and represent the main source of revenue for the General Fund (GF). The BFD is a GF department. Revenues for this fund also come from sales taxes and operating transfers from other funds.

The next figures illustrate the FY 2022 GF and combined revenue sources and GF and combined expenditures.

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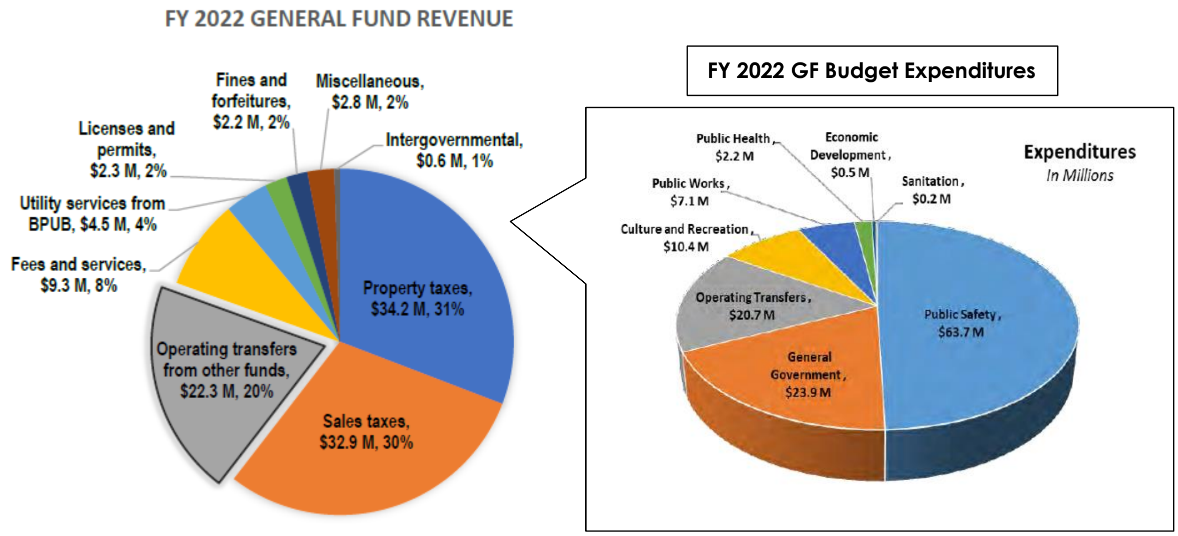
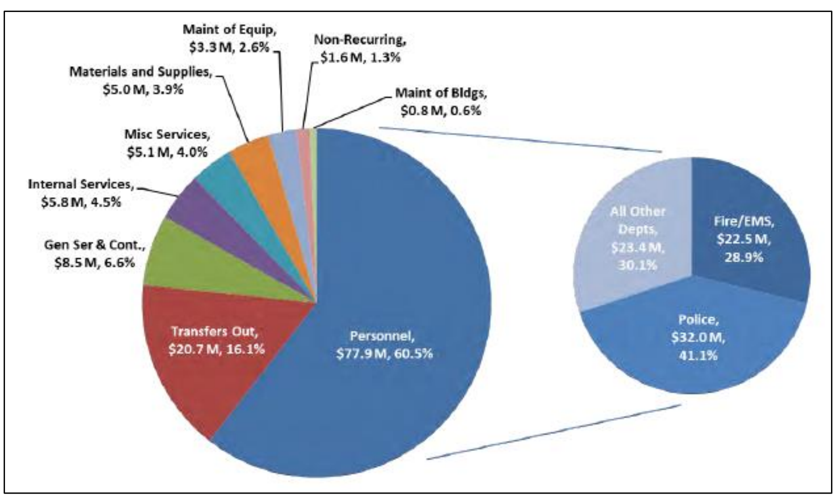
FIGURE 2-24: City of Brownsville General Fund Revenues and Expenditures



In FY 2022 personnel expenses (payroll expenditures to include salary, benefits, and pension costs) have the highest impact on the GF budget in Brownsville. This is common as GF-supported departments and activities are typically service-oriented departments and heavily weighted in staffing and personnel costs. Public safety departments make up the largest percentage overall of personnel costs (60.5 percent). The FY 2022 Fire/EMS GF personnel costs are $22.5 million, or 28.9 percent of the overall city GF personnel costs.

FIGURE 2-25: City of Brownsville General Fund Personnel Costs



The BFD has six budget units: EMS Billing (213), Emergency Management (303), Fire Administration (320), Fire Operations (321), Fire SAFER Grants (321), an Emergency Medical Services (536). The total FY 2022 budget is $24,116,562. The budget units are broken down in the next table.

TABLE 2-6: BFD General Fund Operating Budget

Category	FTE Count	FY 2022 Adopted Budget
EMS Billing	7	$398,499
Emergency Management	3 (+1 from FY 2021)	$323,455
Fire Administration	17	$1,897,183
Fire Operations	120	$15,345,232
Fire SAFER Grants	15	$855,005
Emergency Medical Services	53	$6,333,480
FY 2022 Totals	**215**	**$25,152,854**
FY 2021 Totals	**214**	**$24,092,544**

The BFD also receives major capital assets through the five-year Captail Improvement Program (CIP). These typically include heavy equipment such as fire apparatus, ambulances, and facility renovation and construction. Included in the FY 2022 CIP for the BFD are:

- Ambulance Replacement: Two with $200,000 budgeted.

The city also budgets one-time expenditures utilizing surplus funding from the Brownsville Public Utilities Board and sales tax revenues. The FY 2022 budget identifies several one-time purchases for the BFD totaling $623,500. These are:

- One ambulance purchase.
- Lucas Devices (automated CPR).
- Portable radios (XTS model).
- Ambulance stretchers (replacements).
- Computer-aided dispatch and EMS billing software.

An additional one-time funding source (Bridge Fund) also identifies a one-time purchase for the BFD totaling $50,000 for:

- Structural firefighting gear.

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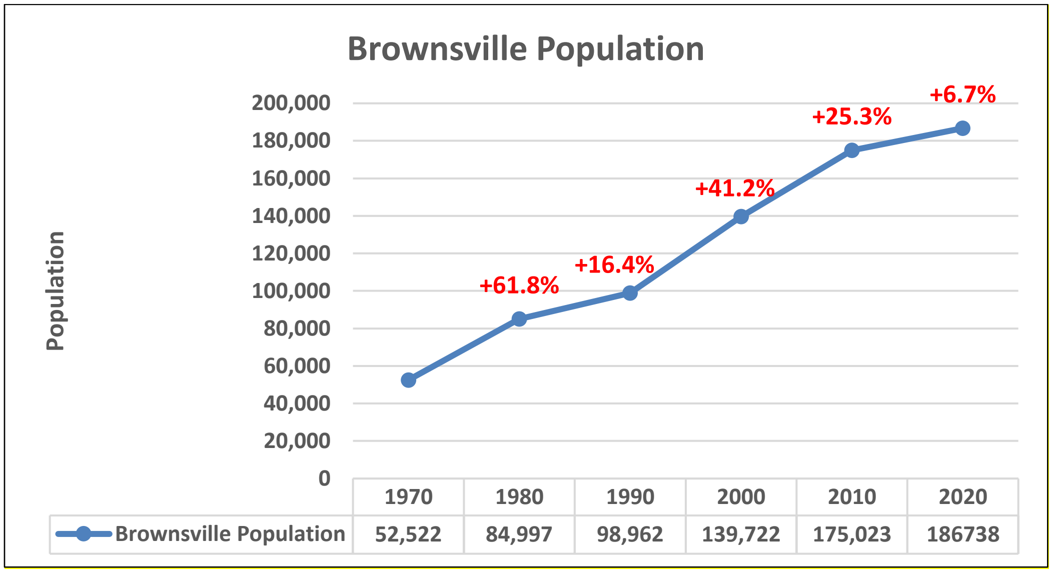
SECTION 3. ALL-HAZARDS RISK ASSESSMENT OF THE COMMUNITY

POPULATION AND COMMUNITY GROWTH

The 2020 decennial census population for Brownsville is 186,738 (U.S. Census Bureau). This is a 6.7 percent increase from the 2010 population of 175,023. The city's population has more than tripled (+ 356%) in size since 1970. The next figure shows the city's population and percentage increase for each census from 1970 through 2020.

FIGURE 3-1: Brownsville Population Growth, 1970–2020



With an area approximately 145.2-square miles, the population density based on the Census Bureau population data is 1,419.8/square mile, which classifies the city as urban in character. The Brownsville Fire Department also provides fire protection and EMS services to some of the unincorporated areas of Cameron County, including the Port of Brownsville. According to the BFD its total first due response area encompasses an area of approximately 244 square miles with a population of about 215,313 residents. However, some estimates place the population at any given time as high as 275,000.

In terms of fire and EMS risk, the age and socio-economic profiles of a population can have an impact on the number of requests for fire and EMS services. Evaluation of the number of seniors and children by fire management zone can provide insight into trends in service delivery and quantitate the probability of future service requests. In a 2018 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2011–2015:[20]

- Males were more likely to be killed or injured in home fires than females and accounted for larger percentages of victims (57 percent of the deaths and 54 percent of the injuries).

20. M. Ahrens, "Home Fire Victims by Age and Gender," Quincy, MA: NFPA, 2018.

- The largest number of deaths (19 percent) in a single age group was among people ages 55 to 64.
- Half (50 percent) of the victims of fatal home fires were between the ages of 25 and 64, as were three of every five (62 percent) of the non-fatally injured.
- One-third (33 percent) of the fatalities were age 65 or older; only 15 percent of the non-fatally injured were in that age group.
- Children under the age of 15 accounted for 12 percent of the home fire fatalities and 10 percent of the injuries. Children under the age of 5 accounted for 6 percent of the deaths and 4 percent of the injuries.
- Adults of all ages had higher rates of non-fatal fire injuries than children.
- While smoking materials were the leading cause of home fire deaths overall, this was true only for people in the 45 to 84 age group.
- For adults 85 and older, fire from cooking was the leading cause of fire death.

In Brownsville, the following age and socioeconomic factors are considered herein when assessing and determining risk for fire and EMS preparedness and response:[21]

- Children under the age of five represent 8.1 percent of the population.
- Persons under the age of 18 represent 29.6 percent of the population.
- Persons over the age of 65 represent 12.4 percent of the population.
- Female persons represent 52 percent of the population.
- The median household income in 2019 dollars is $40,924.
- Persons living in poverty make up 27.5 percent of the population, nearly double the Texas rate of 14.2 percent. This ranks Brownsville as one of the poorest large cities (population 100,000+) in the United States. However, the poverty rate declined 6.4 percent from 35.7 percent in 2014 to 29.3 in 2019.[22]
- Persons who identify as of Hispanic or Latino origin represent 94.1 percent of the population. The remaining percentage of population by race includes White alone at 4.8 percent, Black or African American at 0.4 percent, American Indian or Alaska Native alone at 0.1 percent, Asian alone at 0.6 percent, and two or more races at 10.4 percent.

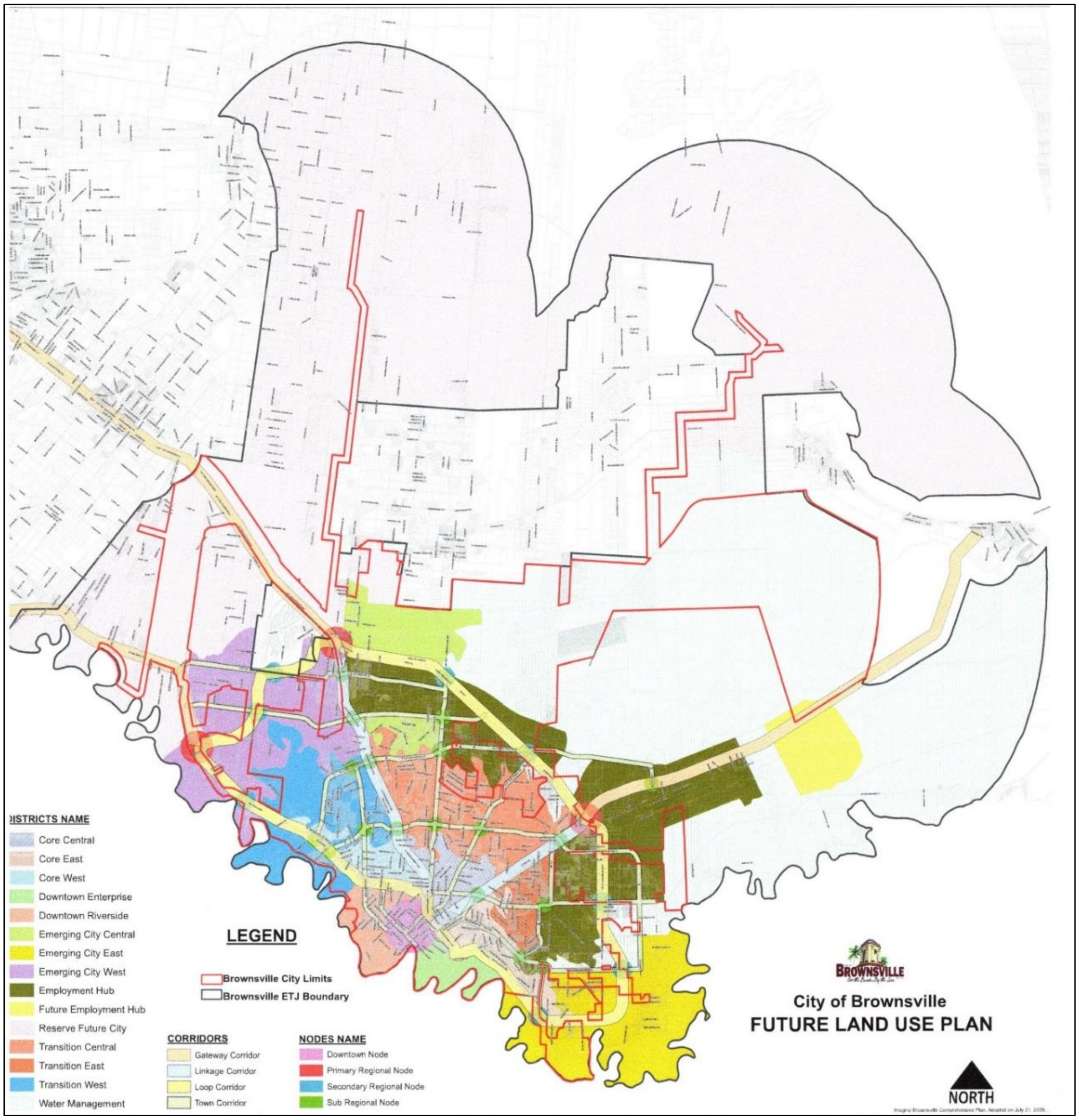
The Census Bureau's estimated 2021 population for Brownsville is 187,831, an increase of 0.7 percent from 2020. The population is projected to continue to increase by two to three percent per year for the forseeable future.

In July 2009, the City Of Brownsville adopted the *Imagine Brownsville Comprehensive Plan* for future growth and development in the city. This plan projected Brownsville's population reaching about 364,000 by 2035. While it does not appear that the city's population will nearly double in the next 13 years, the city and its emergency services will need to continue to plan for steady future growth and development. Conversely, the SpaceX project located southeast of Brownsville could accelerate population growth along with supporting commercial and

21. https://www.census.gov/quickfacts/brownsvillecitytexas
22. https://www.forbes.com/sites/andrewdepietro/2021/11/26/us-poverty-rate-by-city-in-2021/?sh=1b32d3a45a54

industrial growth. The Imagine Brownsville plan envisions the city's future development occurring in a planned manner in designated regional nodes, local corridors, local nodes, and districts (see next Figure). The current land use plan designates 80 percent of land for residential use and about 20 percent to industrial and commercial uses.

FIGURE 3-2: Brownsville Future Land Use Map



It is anticipated the largest single development project proposed at the time of this report is the Madeira development, which will be located on 1,330 acres of land in the northwest corner of city near the intersections of U.S. Highway 77 and State Highway 100. The project is described as a master planned residential, commercial, office, retail, and entertainment regional commercial project. It is expected to add about 3,000 new residential units over the next 10 years (about 300 per year) along with office and commercial occupancies. This development does include land set aside for community services including a future fire station.

FIGURE 3-3: Madeira Development Preliminary Master Plan

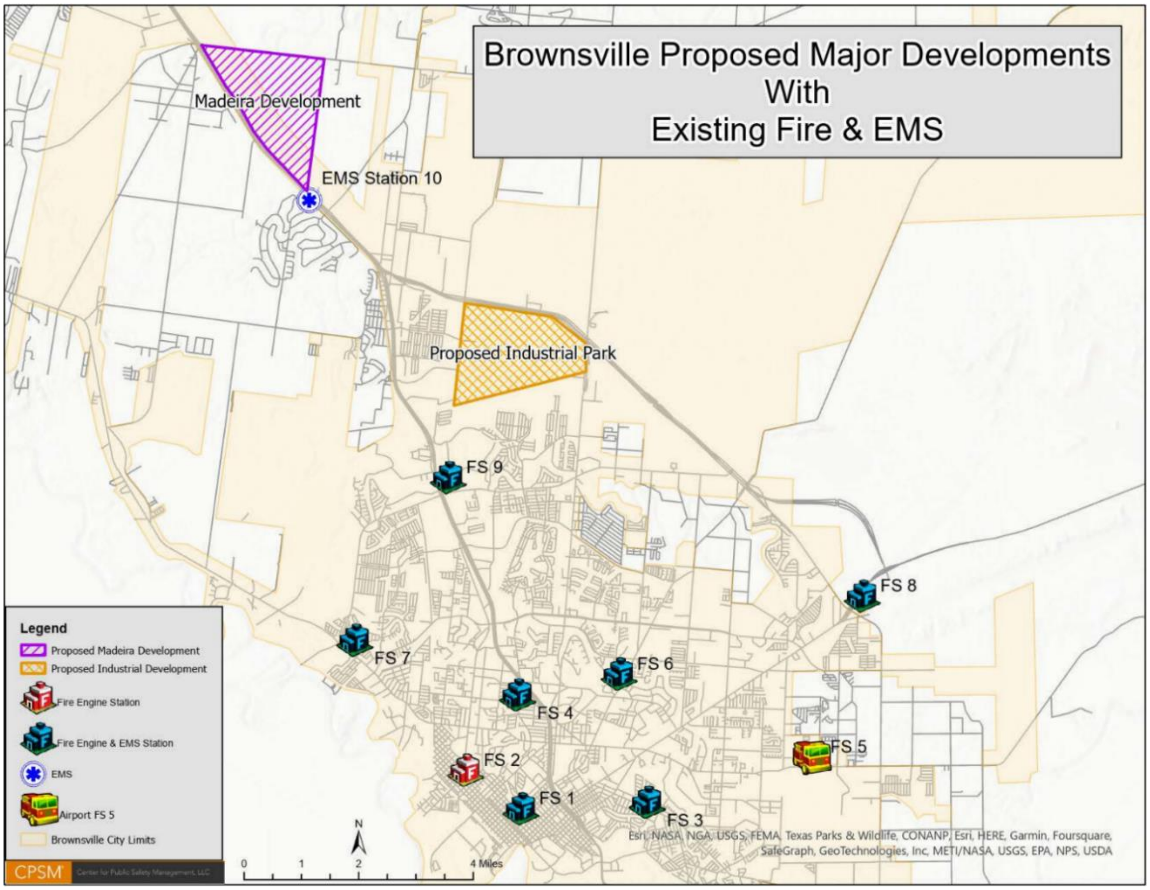
Image souce: Madeira Properties/Vitual Builders Exchange

An additional residential development is being discussed that would include about 1,000 homes south of the downtown area near the border.

Brownsville is poised for additional industrial growth in the north central part of the city. A new 730+ acre *Business I-169 North Corridor Industrial Park* is planned for an area roughly bordered by I-169, Old Alice Road, and Paredes Line Road. This growth is anticipated to include large footprint commercial/industrial buildings utilized for manufacturing and warehousing/distribution of goods. Manufactuing and warehousing growth in this area of the city (as well as new growth and development in the port area) will pose additional fire and EMS risks to the BFD due to the potential footprint size of some of the buildings, some due to height of roofline (fire extension potential), and significant around-the-clock workforce. Depending upon the tenants that eventually occupy this park there is a potential for millions of square feet of building footprint and thousands of new employees in the workforce (1,500 to 2,000 on a shift at one time) in the coming years.

The next figure illustrates the projected growth in Brownsville.

FIGURE 3-4: Brownsville Projected Future Development



ENVIRONMENTAL, TECHNOLOGICAL, AND SECURITY FACTORS

The City of El Brownsville is prone to and will continue to be exposed to certain environmental hazards that may impact the community. The most common natural hazards prevelant to the region, according to the Brownsville Fire Department Office of Emergency Management and Homeland Security, are:[23]

- Hurricanes and tropical storms from the Gulf of Mexico. These storms are unpredictable and create significant life safety and proprty damage issues.
- Extreme heat.
- Flash flooding from heavy rains over a short period of time moving quickly through normally dry washes and riverbeds.
- Tornados.
- Wildfires in the wildland/urban interface areas.
- Drought.

23. City of Brownsville Emergency Operations Plan 2021.

Brownsville has exposure and community risk to the environmental risks identified above.

In addtion to the city's environmental risk assessement, the BFD has conducted a more comprehensive hazard and vulnerability study utilizing historical data of events that have occurred in the city along with future probabilities. The assessment then determines the level of risk or likelihood of occurrence as Unlikely, Occasional, Likely, or Highly Likely. The estimated impacts on both public health and safety and property are classified as Limited, Moderate, or Major, which are generally defined as:

Major – High probability of occurrence; at least 50 percent or more of population at risk from hazard; significant to catastrophic physical impacts to buildings and infrastructure; major loss or potential loss of functionality to all essential facilities (hospital, police, fire, EOC and shelters)

Moderate – Less than 50 percent of population at risk from hazard; moderate physical impacts to buildings and infrastructure; moderate potential for loss of functionality to essential facilities.

Limited – Low probability of occurrence or low threat to population; minor physical impacts.

The next table illustrates the environmental Threat Hazard Identification and Risk Assessment the BFD has completed for the city.

TABLE 3-1: Brownsville Hazard Identification and Risk Assessment Profile Summary

HAZARD SUMMARY

	Likelihood of Occurrence*	Estimated Impact on Public Health & Safety			Estimated Impact on Property		
Hazard Type:	(See below)	Limited	Moderate	Major	Limited	Moderate	Major
Natural							
Drought	LIKELY	←	→		←	→	
Earthquake	UNLIKELY		←	→		←→	
Flash Flooding	HIGHLY LIKELY		←	→		←	→
Flooding (river or tidal)	OCCASIONAL		←	→		←	→
Hurricane	HIGHLY LIKELY			←→			←→
Subsidence	OCCASIONAL		←	→		←→	
Tornado	LIKELY			←→			←→
Wildfire	LIKELY	←→			←→		
Winter Storm	UNLIKELY		←→			←→	
Technological							
Dam Failure	UNLIKELY		←→				←→
Energy/Fuel Shortage	OCCASIONAL		←	→		←→	
Hazmat/Oil Spill (fixed site)	HIGHLY LIKELY			←→			←→
Hazmat/Oil Spill (transport)	HIGHLY LIKELY			←→			←→
Major Structural Fire	OCCASIONAL		←→				←→
Nuclear Facility Incident	UNLIKELY		←→				←→
Water System Failure	UNLIKELY			←→			←→
Security							
Civil Disorder	OCCASIONAL		←→			←→	
Enemy Military Attack	UNLIKELY		←	→		←	→
Terrorism	LIKELY			←→			←→
* **Likelihood of Occurrence**: Unlikely, Occasional, Likely, or Highly Likely							

Source: Brownsville Emergency Operations Plan

COMMUNITY RISK AND HAZARD ANALYSIS

With the cost of providing fire protection and EMS to a community continuing to escalate, it is paramount a department examine the planning processes and deployment models involved in providing services. The initial step in this planning process is determining the community's risk. Each jurisdiction decides what degree of risk is acceptable to the citizens it serves. This determination is based on criteria that has been developed to define the levels of risk (e.g., of fire) within all sections of the community.[24] To this end, a comprehensive planning approach that includes a fire risk assessment and hazard analysis is essential in determining local needs.

The term *integrated risk management* refers to a planning methodology that recognizes that citizen safety, the protection of property, and the protection of the environment from fire and related causes must include provisions for the reasonable safety of emergency responders. This means assessing the risk faced, taking preventive action, and deploying the proper resources in the right place at the right time. A fire department typically collects, organizes, and evaluates risk information about individual properties to derive a "fire risk score" for each property. The fire risk score is based on several factors, including:

- Needed fire flow if a fire were to occur.
- Probability of an occurrence based on historical events.
- The consequence of an incident in that occupancy (to both occupants and responders).
- The cumulative effect of these occupancies and their concentration in the community.

A community risk and vulnerability assessment will evaluate the community, and regarding buildings, it will review all buildings and the risks associated with each property segregating the property as either a high-, medium-, or low-hazard depending on factors such as the life and building content hazard, and the potential fire flow and staffing required to mitigate an emergency in the specific property. According to the NFPA *Fire Protection Handbook*, these hazards are defined as:

High-hazard occupancies: Schools, hospitals, nursing homes, explosives plants, refineries, high-rise buildings, and other high life-hazard (vulnerable population) or large fire-potential occupancies.

Medium-hazard occupancies: Apartments, offices, and mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces.

Low-hazard occupancies: One-, two-, or three-family dwellings and scattered small business and industrial occupancies.[25]

When the rated properties are plotted on a map, fire station locations and staffing patterns can be considered to provide a higher concentration of resources for worst-case scenarios or, conversely, a lower concentration of resources based on a lower level of risk.[26]

In addition to identifying occupancies of various hazard levels, a hazard analysis should include critical facilities, such as police and fire stations, public works facilities, hospitals, and shelters, 911

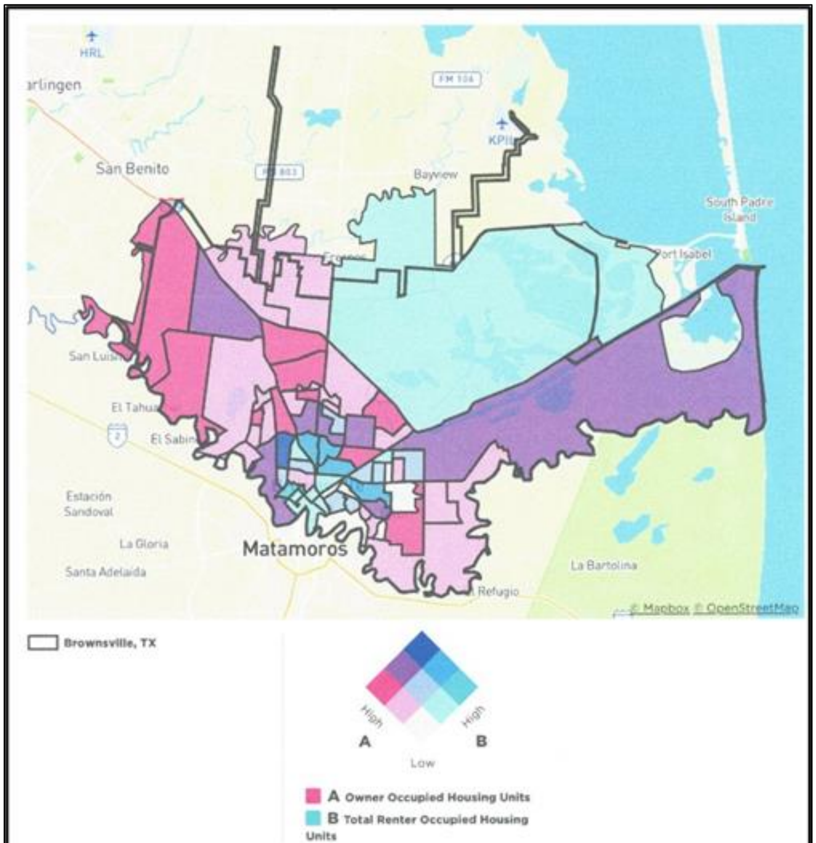
24. Compton and Granito, *Managing Fire and Rescue Services*, 39.
25. Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: National Fire Protection Association, 2008), 12.
26. *Fire and Emergency Service Self-Assessment Manual*, 8th edition (Center for Public Safety Excellence, 2009), 49.

emergency call centers, the emergency operations center, and other critical facilities that are vital to service delivery.

Housing Stock

The greatest fire safety concern throughout Brownsville is the potential life loss in fires that occur in non-sprinklered, single- and multifamily residential dwellings during sleeping hours.

FIGURE 3-5: Owner-Occupied and Rental Housing Units



Sources: US Census Bureau ACS 5-year 2015-2019

Areas of bright teal have a greater percent of owners while areas of bright pink have a greater percentage of renters. Purple areas are more even makeup of owners and renters.

These fires are fueled by new "lightweight" construction and more flammable home contents. The time to escape a house fire has dwindled from about 17 minutes, 20 years ago, to three to five minutes today. This poses a severe risk not only to occupants but also to firefighters as they now have less time to do their job and save residents' lives and property.

- The city has 63,191 housing units.[27] Of these, 57,460 (90.1percent) are occupied and 5,731 (9.9 percent) are vacant. Vacant housing can also present risks to both firefighters and homeless occupants.
- Of those that are occupied, 60.4 percent are owner-occupied.
- The Brownsville Fire Department estimates that it protects approximately 68,000 housing units.

27. https://data.census.gov/cedsci/table?q=housing%20brownsville%20tx&tid=DECENNIALPL2020.H1

- There are 53,506 households in Brownsville.
- There are 3.38 persons per household in Brownsville.

The predominant building type/building risk in Brownsville (as in most communities) is single-family detached dwellings (*low-hazard*). The primary construction type for residential structures in Brownsville is Type V-B (wood frame), which does not require a fire resistance rating for any of the building elements (typically wood frame).

A significant number of multifamily and apartments also exist in Brownsville. Typical construction includes non-fire resistive, wood frame with one-hour fire rating, and protected combustible. Many apartment complexes include a multibuilding footprint. The city does have an assortment of manufactured homes as well, which are typically made of light metal/wood construction with various exterior coverings.

Brownsville has the following residential building types:

- Single-family detached homes: 37,236 total (highest total building count).
- Single-family attached homes: 1,788
- Multifamily/apartment complexes/units: 67 with a total of 12,074 units. Of these, 7,817 units are located in buildings/complexes with five or more units.
- Manufactured homes: 2,408.

Of the city's occupied housing stock of 53,506 units, 48,459 (90.6 percent) have been built since 1960. Of those, 36,565 (75.4 percent) have been constructed since 1980,[28] which suggests that they probably were built utilizing lightweight construction techniques. The relevance of this is that buildings constructed using lightweight material and techniques are prone to early collapse in fire situations. This situation results in a decreased window of survivalbility for occupants and deprives firefighters of critical time necessary to rescue trapped occupants and control or extinguish a fire before the building's structural stability is severely compromised.

Building and Target Hazard Factors

Identifying high-hazard occupancies or target hazards that require a higher concentration of fire department resources is an essential part of fire risk assessment. The process of identifying target hazards and pre-incident planning are basic preparedness efforts that have been key functions in the fire service for many years. In this process, critical structures are identified based on the risk they pose. Then, tactical considerations are established for fires or other emergencies in these structures. Consideration is given to the activities that take place (public assembly, life safety vulnerability, manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped, detained, etc.), and other specific aspects relating to the construction of the facility, or any hazardous materials that are regularly found in the building. Target hazards are those occupancies or structures that are unusually dangerous when considering the potential for loss of life or the potential for property damage.

Brownsville has a variety of high hazard target hazards that include:

- Three hospitals (life safety, vulnerable population).

28. https://data.census.gov/cedsci/table?q=housing%20brownsville%20tx&tid=ACSST5Y2020.S2504

- Eight long-term and assisted living/care facilities (life safety, vulnerable populations).
- 142 child daycare/early education centers (life safety, vulnerable populations).
- 20 adult daycare centers (life safety, vulnerable populations).
- Five senior citizen complexes (life safety, vulnerable populations).
- 48 public educational/school facilities (life safety).
- 24 private/charter educational/school facilities (life safety).
- 33 hotels/motels (life safety).
- 12 detention facilities including seven ICE facilities, one of which houses 1,000 detainees (life safety, vulnerable populations).
- Two high-rise structures (seven stories or higher) (life safety, accessibility).

The next figure shows the location of high-risk target hazards located in Brownsville. It also shows the location of the Koura (formerly Mexichem; formerly Chimica Florr) chemical plant, which is located acroos the border in Matamoros, Mexico. This plant produces hydroflouric acid, which is reportedly one of the most dangerous chemicals in the world. Hydrofluoric acid is a highly corrosive liquid and is a powerful contact poison. Because of the capability of hydrofluoric acid to penetrate tissue, poisoning can occur readily through exposure of skin or eyes, or when inhaled or swallowed.

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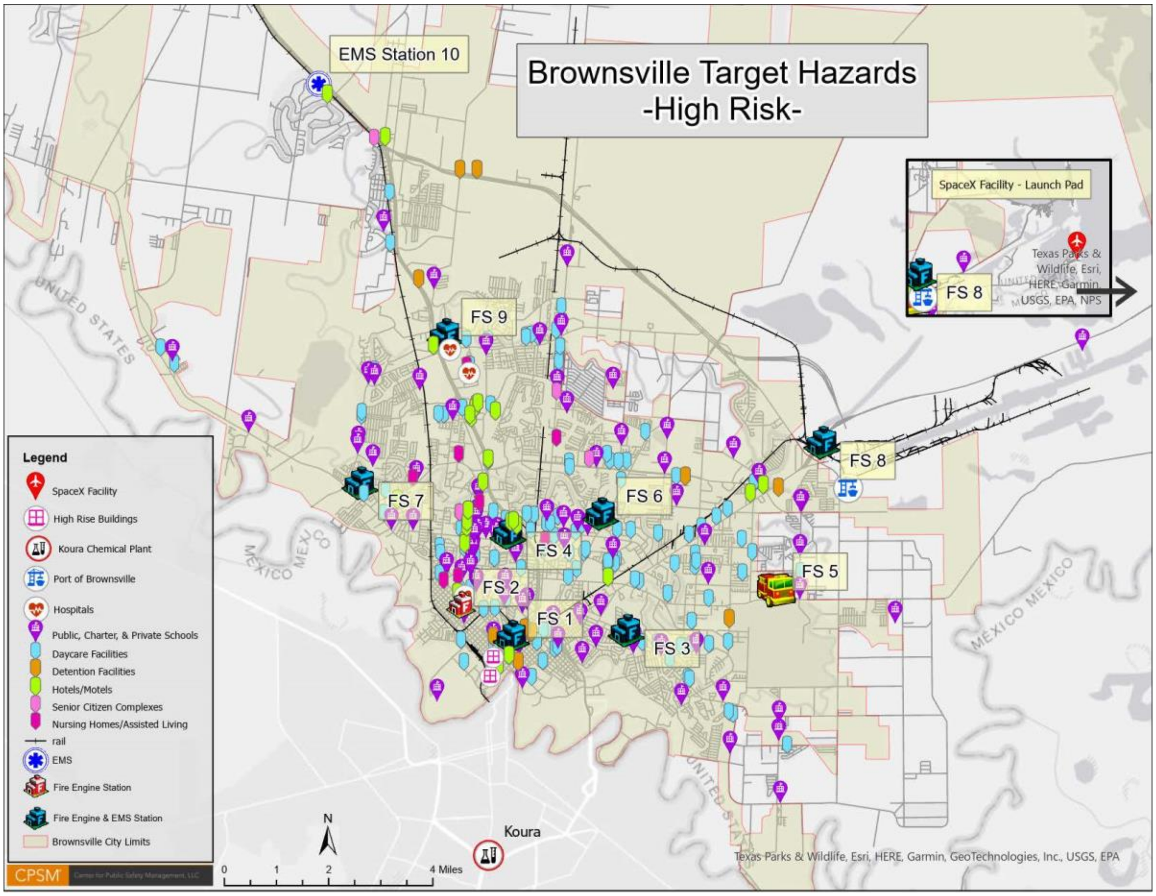
FIGURE 3-6: Brownsville High-Risk Taget Hazards



In addition to the specific occupancies illustrated on the map, other potential high- and medium-risk target hazards located throughout the city include:

- Places of public assembly when occupied (life safety).
- Mercantile/business/industrial (life safety, hazardous storage and or processes in significant quantities).
- Government business target hazards (life safety, continuity of operations).
- Private business target hazards (life safety).

The city has a mix of medium-risk structures that make up much of the target hazard risk including:

- Two college dormitories (life safety)
- One covered shopping mall (life safety).
- Two movie theaters (life safety).
- 12 big box stores (life safety, hazardous storage).
- Seven large office buildings (life safety).

- 67 multifamily/apartment complexes/buiuldings with a total 12,074 units. Of these, 7,817 units are located in buildings/complexes with five or more units.
- 112 warehouses/storage facilities (hazardous storage).

Larger footprint buildings that are projected to be constructed in the city will pose additional building risks to the BFD in terms of a large footprint, mass storage of commodities, and water flow requirements based on the size and commodities stored and mercantile processes being conducted in the buildings. These buildings are typically built of fire-resistive structural members and are sprinklered, but contain internally combustible accessories, storage, processes, and internal structures. While the life-safety hazard normally will not require extensive rescue by firefighting forces (in terms of the number of people on premises at one time to be rescued), the scope, and complications of the larger footprint to be covered by initial attack lines and in a search and rescue undertaking may raise these types of structures to a higher hazard.

The next figure shows the location of medium-hazard target hazards located with Brownsville.

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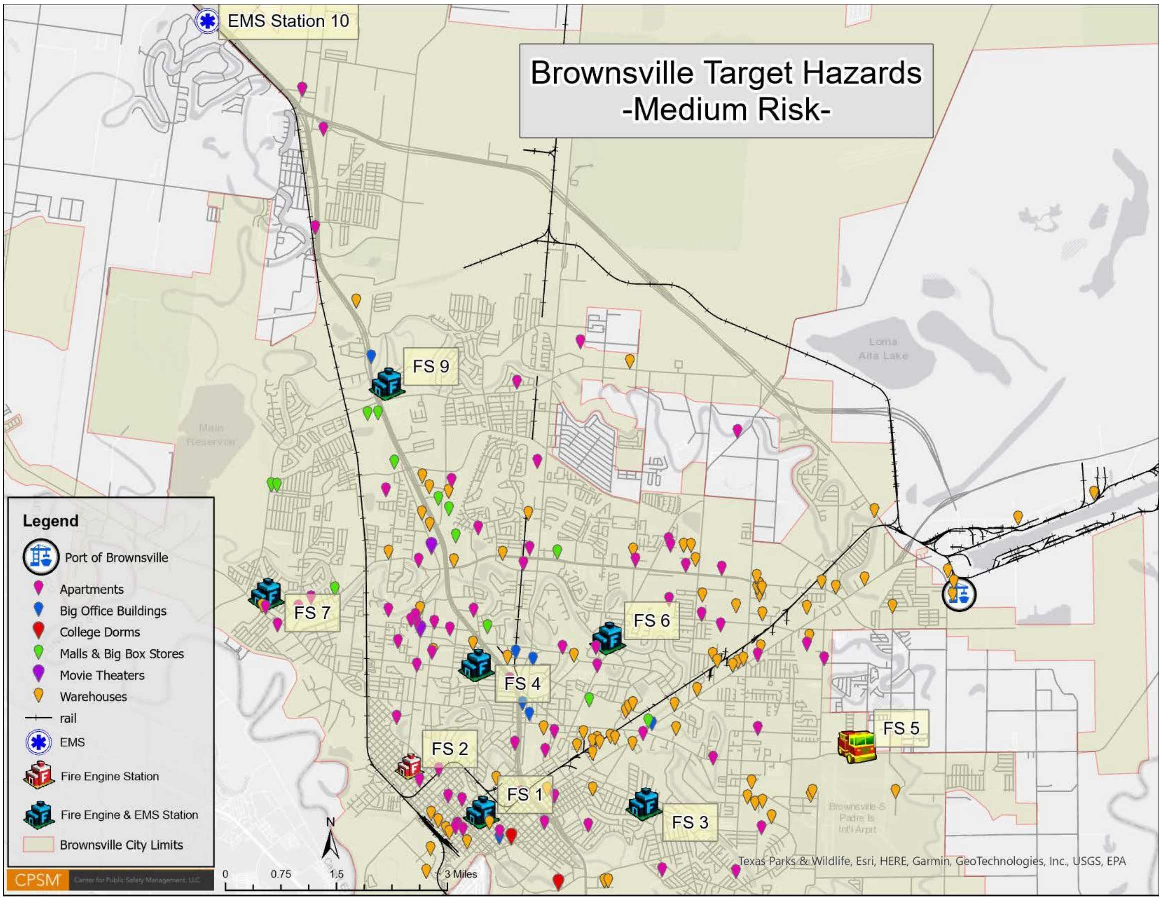
FIGURE 3-7: Brownsville Medium-Risk Taget Hazards



The City of Brownsville presents a mix of challenges and hazards that must be protected by its fire department. Like many old cities, Brownsville has an older center core and downtown area with numerous closely spaced, abutting, and even some interconnected buildings. Many of these buildings are of wood frame construction and date to the latter part of the nineteenth and early years of the twentieth century.

These types of structures and areas can contribute to rapid fire spread from one building to another, which requires an aggressive attack to contain and control. Although some of these buildings have been renovated over the years and equipped with automatic fire suppression systems, a significant number have not, which increases the potential life hazard and fire spread concerns. As the city enacts its plans for revitalizing downtown Brownsville it should ensure that all buildings that are renovated/rehabilitated are equipped throughout with automatic fire suppression systems.

FIGURE 3-8: Downtown Brownsville

Port of Brownsville

The Port of Brownsville is a deep-water seaport located just to the east of the City of Brownsville. At approximately 40,000 acres, the port is the largest land-owning public port authority in the nation. The port is connected to the Gulf of Mexico by a 17-mile-long ship channel. Principal commodities handled by the port include, but are not limited to, steel products; petroleum, including lubricants, gasoline, jet fuel, diesel, No. 6 oil, naphtha, and vacuum gas oils; various aggregates; and wind energy components. The port supports approximately 51,000 jobs and generates $3 billion in annual economic activity.

The port offers the following infrastructure to potential clients:

- Six liquid cargo docks.
- 13 general cargo docks.
- 1 million square feet of covered cargo storage area.
- 3 million square feet of open cargo storage area.

The following figures provide an overview of the port facility.

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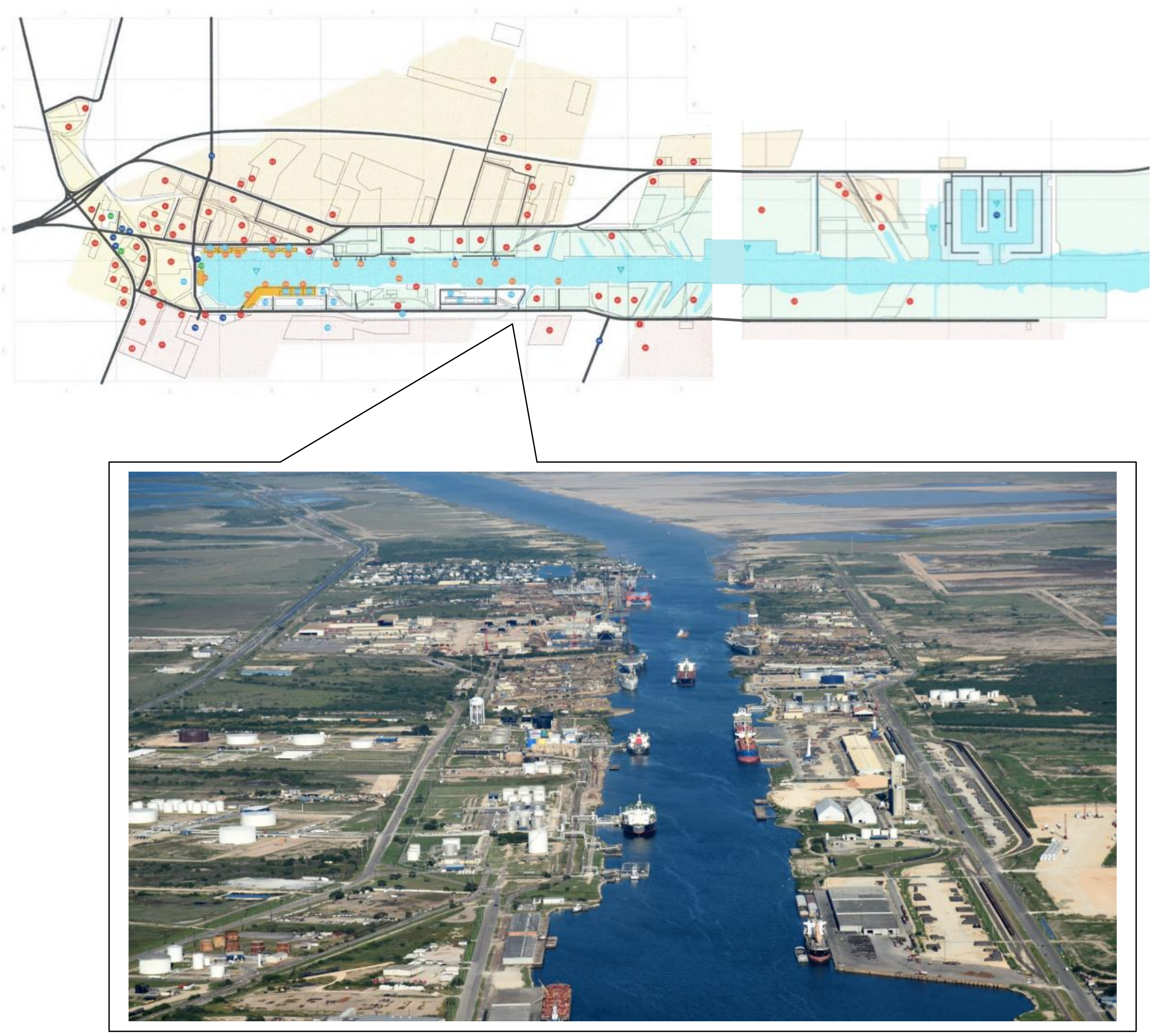
FIGURE 3-9: Port of Brownsville



There are multiple significant risks on the port property, which include:

- Tank farm storage capacity totaling approximately 7.1 million barrels (298,200,000 gallons) of product, most of it flammable, combustible, or otherwise hazardous. These facilities have multiple transloading operations to move product to and from ships, tanks, rail cars, and trucks. While some tank and transloading facilities have built-in automatic fire suppression systems, many do not. There is no large stockpile of firefighting foam available either in the port area or the city.
- There are numerous dangerous confined spaces located throughout the port area, both water- and land-based. Many of these are located deep inside of ships. The port terrain presents challenges and access is limited to many locations.
- A major port tenant builds offshore oil rigs and more recently large ocean-going liquified natural gas (LNG) vessels. The nature and complexity of these operations create multiple significant hazards and challenges in an emergency from both a firefighting and technical rescue/hazardous material operational perspective.

- Several port tenants conduct maritime vessel recycling operations where decommissioned ships are cut up and sold for scrap. At the time of this assessment the former *USS Kitty Hawk* had just arrived to be dismantled. The very nature of this operation creates a significant fire potential (several fires were observed burning on this property during a tour of the port), risk for hazardous materials incidents or releases, with personnel working daily in a variety of confined spaces, many of them deep within the ship but others high above ground.
  - The BFD has had only limited training on shipboard firefighting and that occurred many years ago. Most of the personnel who completed that training are no longer with the department.
- The port property has multiple large footprint buildings that are several thousand square feet in size, and although considered single story have the ceiling height of multistory structures. Some of these buildings have processes and storage that are combustible and hazardous. Larger footprint buildings pose additional building risks to the BFD in terms of mass storage of commodities and hazardous/combustible materials utilized in work processes, and considerable waterflow requirements based on the size of the building footprint, commodities stored, and mercantile processes being conducted.
- New buildings are typically built of fire-resistive or non-combustible structural members and are sprinklered, but contain internally combustible accessories, materials, storage, processes, and internal structures. However, many of the older building are not protected by sprinklers. While the life-safety hazard normally will not require extensive rescue by firefighting forces (in terms of the number of people on premises at one time to be rescued), the scope and complications of the larger footprint to be covered by initial attack lines and in a search and rescue undertaking raise these types of structures to a high-hazard building risk.
- The port property has other commercial and mercantile properties, although not large footprint buildings, which pose building and property risk due to the on-site storage (petroleum products, vehicles, hazardous materials) as well as business processes and storage in the interior of property buildings that are combustible and hazardous. Not all of these buildings have fire protection systems. These buildings are of medium to high risk based on building/property content. These occupancies also support heavy vehicles that move product to and from these properties, posing traffic and hazard risks.
- Significant rail traffic within the port property. The Brownsville and Rio Grande International Railway (BRG) serves more than 45 miles of track within the port. In 2021, BRG handled 65,865 cars, many of them carrying hazardous materials. The railroad recently completed an expansion of its Palo Alto yard bringing capacity to 398 cars. Future planned expansions will increase capacity to 658 cars. The BRG interchanges with Kansas City Southern de México Railroad for operations south of the border, with Union Pacific and Burlington Northern Santa Fe (BNSF) Railway serving northern routes to the rest of the United States.

  While these railroads have limited grade crossings, they do have some, which poses a traffic risk. They also travel through parts of the city transporting flammables, combustibles, and other hazards the BFD needs to be prepared to handle and mitigate in an emergency.
- To facilitate the movement of cargo to and from Mexico, the Port of Brownsville issues permits online to shippers allowing them to load trucks to the legal weight limits of Mexico (125,000 pounds; 45,000 pounds more than the US limit). This provides the most efficient and cost-effective movement of cargo by trucks to destinations in Mexico, eliminating double handling. This has the effect of allowing trucks that are carrying much greater quantities of hazardous materials than the U.S.-allowed weight limit to travel the roads between the port and the border crossings.

- The BFD reports that it has little knowledge regarding the adequacy of the water supply system, where fire hydrants are located, and to what extent they are functional.
- Proposed additions to port property include:
  - Rio Grande LNG transloading facility. If this facility comes to fruition (construction is expected to start in the first quarter of 2023) it will occupy 900 acres within the port and handle 27 million metric tons per year of LNG, making it the largest terminal in North America. Completion is anticipated in about three years. This facility will have its own on-site firefighting personnel and equipment.
    - Texas LNG has proposed a second LNG facility that would be located adjacent to Rio Grande LNG. This facility would occupy 625 acres and handle 3.6 million metric tons of product per year.
    - Expansion of warehousing capacity with the construction of a new industrial park adjacent to the current port facilities (but still on port property).
    - Increasing the depth of the shipping channel from 42 feet to 52 feet, which will allow access to the port by much larger maritime vessels.

At the time that CPSM was completing this assessment of the BFD and its operational capabilities, the port authority was preparing to undertake its own comprehensive risk assessment of the port and develop a long-range emergency preparedness and hazard mitigation plan. <u>The BFD should be a key stakeholder in this process and play an integral part in this endeavor particularly with regard to training, operational, and equipment needs.</u>

SpaceX Starbase

The SpaceX South Texas launch site (now more commonly known as SpaceX Starbase) is located near Boca Chica Beach, approximately 20 miles east of downtown Brownsville and about 10 miles from the city Limits. The company publicly announced in August 2014 that it had decided on Texas as the location for its non-governmental launch site. Major construction of facilities began in late 2018, with rocket engine testing and flight testing beginning in 2019.

The launch site was originally intended to support launches of the Falcon 9 and Falcon Heavy launch vehicles as well as "a variety of reusable suborbital launch vehicles," but in 2018, SpaceX announced a change of plans, stating that the launch site would be used exclusively for SpaceX's next-generation launch vehicle, Starship. Between 2018 and 2020, the site added significant rocket production and test capacity.

The main SpaceX facility now occupies about 93 acres and includes a large propellant tank farm including a 95,000-gallon horizontal liquid oxygen tank and 80,000-gallon liquid methane tank, a gas flare, industrial rocket build assembly buildings and storage areas, research labs and offices, and a small residential area.

FIGURE 3-10: SpaceX Starbase Complex

The launch area is located approximately 2 miles from the main facility and occupies approximately 50 acres. More than 500 people currently work at the facility, staffing multiple shifts. Future plans call for several thousand more to eventually be employed at this facility.

FIGURE 3-11: SpaceX Launch Facility

Future plans also suggest that SpaceX may eventually expand to the south. The expansion could see the addition of two suborbital test stands along with one orbital launch pad. The expansion could also include a new landing pad, an expansion to the current tank farm, a new tank farm situated next to the proposed orbital launch mount, and integration towers between the two launch mounts.

Although this facility is located a significant distance outside of the city limits, ultimately the BFD is responsible for fire protection and rescue operations at the site and will be called for any major incidents that occur. While SpaceX does have limited on-site EMS capability any incident that involves multiple patients will require response by the BFD.

The SpaceX facility has the potential to present the BFD with significant fire incidents involving oxygen enriched atmospheres and potential explosions, hazardous material releases, and complex technical rescue operations. However, the fire department reported that they do not have frequent interaction with facility personnel and have not planned or trained for handling the wide array of possible – and significant/highly dangerous - emergencies they may encounter.

Transportation Factors

The road network in Brownsville is typical of cities across the country. In Brownsville this includes arterial streets, or major thoroughfares (as an example Route 4); major/minor arterials that move traffic from one end of the city to the other such as Boca Chica Boulevard; collector streets, which provide connection to arterial roads; and local street networks which provide a direct road network to property and move traffic through neighborhoods and business communities.

Brownsville is served by Interstate 69E, sharing its alignment with U.S. Route 77. U.S. Route 77 was a proposed part of the North American Free Trade Agreement's completed Interstate 69 corridor. Other highways that serve the Brownsville area are U.S. Route 83, U.S. Route 281, State Highways 4, 48, and Interstate 169/State Highway 550.

Brownsville is host to three U.S.-Mexico border crossings and was the sixth busiest border crossing in the United States in 2021. The three crossings are:

- Gateway International Bridge.
- Veterans International Bridge.
- Brownsville and Matamoros International Bridge.

Thousands of trucks cross the border daily in both directions. Utilizing a specially designated route to or from the port, these trucks can load to the legal weight limit in Mexico, which is 125,000 pounds (45,000 pounds heavier than domestic limits). According to the United States Border Patrol[29] in 2021:

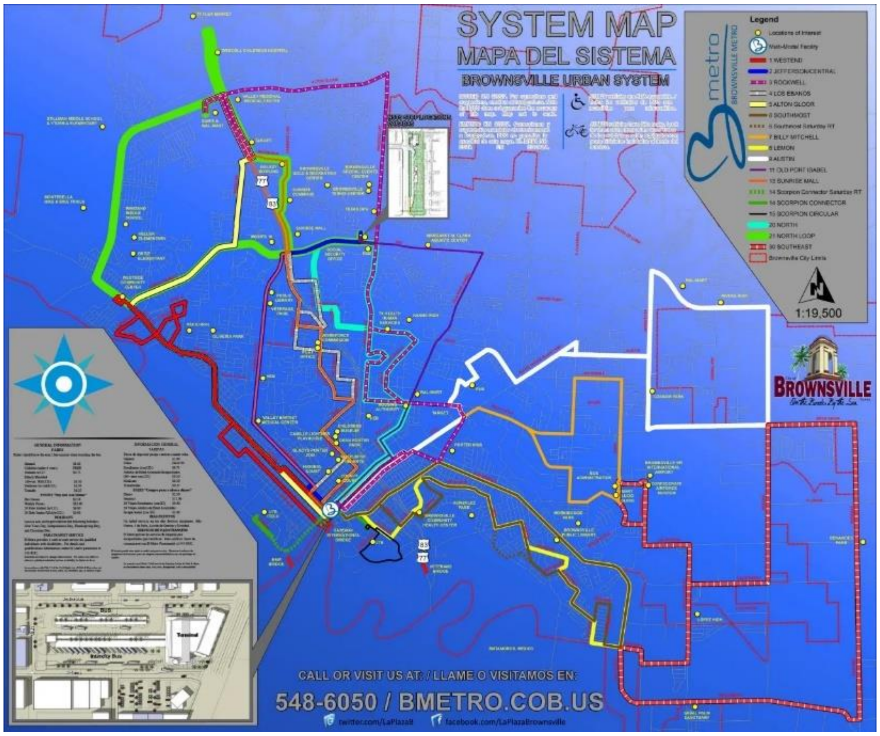
- 348,579 trucks crossed the U.S./Mexico border at one of the three Brownsville border crossings.
- 207,546 empty truck containers and 137,136 loaded truck containers also crossed the border.

In addition, 3,563,549 personal vehicles crossed the border at Brownsville in 2021.

The Brownsville Metro System operates 12 bus routes covering a large portion of the city. The system operates daily from 6:00 a.m. to 8:00 p.m. from its hub located at the La Plaza at Brownsville located on International Boulevard in downtown. The service operates on a modified schedule on weekends. It also provides paratransit services to those in the community who require such service.

[29]https://explore.dot.gov/views/BorderCrossingData/Annual?%3Aembed=y&%3AisGuestRedirectFromVizportal=y

FIGURE 3-12: Brownsville Metro System Routes



The border patrol also reports that, in 2021, 2,705 buses, carrying 23,683 passengers crossed the border. Bus accidents during rider-populated rides pose a mass casualty response risk if multiple riders are injured.

The road network described herein poses risks for a vehicular accident, some at medium to greater than medium speeds, as well as vehicular-versus-pedestrian risks. There are additional transportation risks since thousands of tractor-trailer and other commercial vehicles traverse the roadways of Brownsville daily, not only to and from the port, but also to deliver mixed commodities to business locations. Fires involving these products can produce smoke and other products of combustion risks that may be hazardous to health. Many of the commercial vehicles carry hazardous materials, thus increasing the possibility of incidents involving discharges, leaks, and/or fire.

Active railroad lines are also present in the city. The Brownsville and Rio Grande International Railway (BRG) serves more than 45 miles of track within the port. In 2021, BRG handled 65,865 cars, many of them carrying hazardous materials. The BRG interchanges with Kansas City Southern de México Railroad for operations south of the border, and with Union Pacific and Burlington Northern Santa Fe (BNSF) Railway serving northern routes to the rest of the United States.

FIGURE 3-13: Brownsville and Rio Grande Railroad

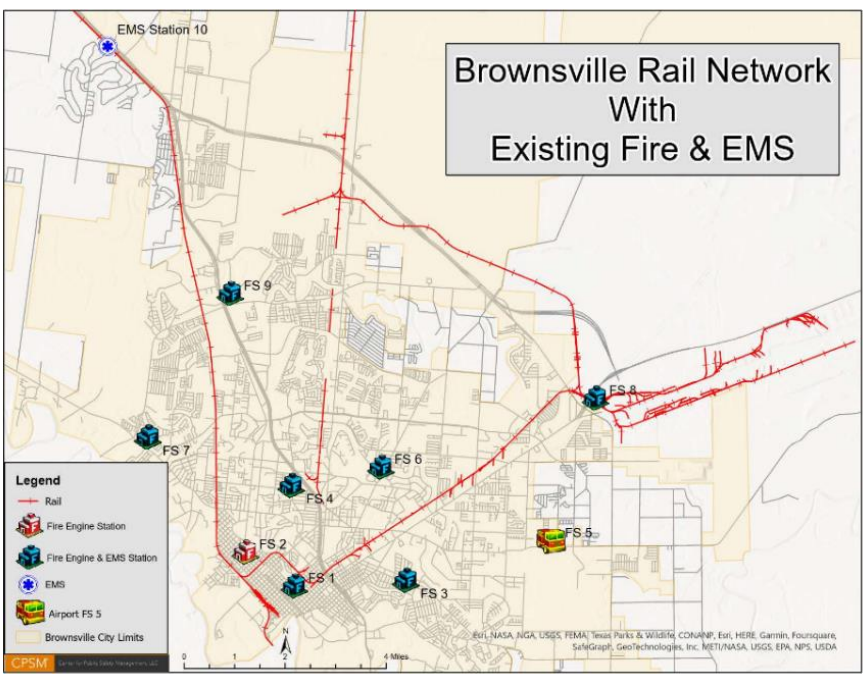
In 2021, 752 trains crossed the border carrying 70,471 empty containers and 14,503 full ones.

While not all the commodities carried may be considered hazardous materials, fires involving these commodities can produce smoke and other products of combustion risks that may be hazardous to health. Hazardous materials themselves present hazards to health risks if being transported and involved in a rail accident.

At-grade crossings are limited in the city but do exist (there are a multitude in the port area) posing transportation accident risks. Trains also travel through parts of the city transporting flammables, combustibles, and other hazardous materials the BFD needs to be prepared to handle and mitigate in an emergency.

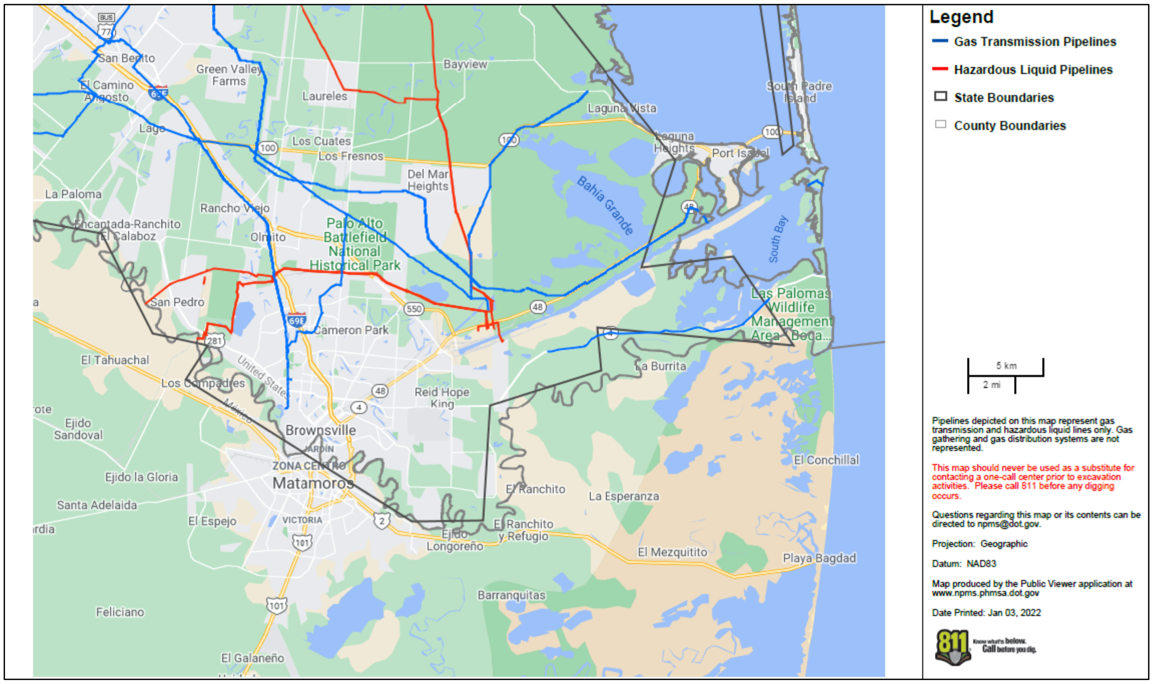
The next figure illustrates the rail lines in Brownsville.

FIGURE 3-14: Brownsville Rail Lines



Brownsville is traversed by multiple pipelines, many (but not all) of which originate or terminate at facilities in the port area (see next Figure). With the expected development of the two LNG facilities in the port, additional pipelines are anticipated. A significant pipeline leak can have significant fire, health, and environmental implications.

FIGURE 3-15: Brownsville Pipelines



Brownsville South Padre Island International Airport is locted within the city limits, approximately five miles east of downtown. The airport serves two airlines, six air taxis, and offers three fixed-base operations for general aviation. The airport has scheduled nonstop passenger flights to Dallas/Fort Worth International Airport and George Bush Intercontinental Airport in Houston.

FIGURE 3-16: BFD ARFF Units

The airport covers approximately 1,700 acres. It has three runways, the longest of which is 7,399 feet long. There are proposals to extend the runway to 10,000 to 12,000 feet in anticipation of increased demand. In 2021, the airport had 27,501 flight operations (an average of 75 per day) of which 3,053 (average of 8.4 per day; 11.1 percent) were by commercial air carriers. The current commercial aitlines serving the airport, American Airlines and United, primarily utilize smaller regional jets for service into Brownsville. In 2021, the FAA reported 167,957 passenger enplanements, an increase of 80.32 percent over the 2020 number of 93,145.[30] The potential for a mass casualty incident exists for any passenger aircraft arriving from or departing the airport. There is also the possibility of an aircraft with an in-flight emergency being diverted to Brownsville.

The BFD staffs the airport 24/7 with a two person Airport Rescue Firefighting (ARFF) crew out of Fire Station 5 which is located on airport property. The department recently reduced staffing at Station 5 from four to the current two due to fiscal concerns. The next table outlines the FAA requirements for ARFF capabilities for Brownsville related to quantity of extinguishing agents required based upon the airport index,

TABLE 3-2: Airport Rescue and Fire Fighting Requirements

Index	Aircraft Length	No. of ARFF Vehicles Required	ARFF Minimum Standards	Response Time
B	>90 feet <126 feet	1 on site	One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production.[31]	Within 3 minutes from the time of the alarm, reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or reach and begin application of extinguishing agent.
		2 on site	One vehicle carrying 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application.[32]	
			One vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons. [33]	

Tourism and Transient Population

Brownsville hosts a significant and growing tourism sector. It is also a gateway for other tourism-related destinations such as nearby South Padre Island. As previously noted, there are 33 hotels/motels located in Brownsville. According to the city's communications and marketing department, in FY 2021 Brownsville hosted approximately 795,264 nonresident visitors. Although a

30. https://www.faa.gov/sites/faa.gov/files/2022-08/cy21-commercial-service-enplanements_0.pdf
31. CFR § 139.317 Aircraft rescue and firefighting: Equipment and agent
32. CFR § 139.317 Aircraft rescue and firefighting: Equipment and agent
33. CFR § 139.317 Aircraft rescue and firefighting: Equipment and agent

breakdown was not available, the demographics of the visitor population is of particular relevance to emergency services, particularly when it comes to older (over age 65) visitors who are more likely to require EMS services.

In 2021, 3,563,549 personal vehicles carrying 5,856,213 passengers traversed one of the Brownsville border crossings. An additional 1,398,586 pedestrians crossed between the United States and Mexico. There were 23,683 passengers on the 2,705 buses that crossed the border. Finally, an unknown number of undocumented persons slip across the border each day and pass through Brownville enroute to destinations throughout the United States.

FIRE AND FIRE-RELATED RISK

An indication of the community's fire risk is the type and number of fire-related incidents the fire department responds to. CPSM conducted a data analysis for this project that analyzed BFD incident responses and workload for 2019. Where possible, the responses were compared to 2020. The following table details the call types and call type totals for these types of fire-related risks.

> ******It should be noted that all analysis of data in this report is based on information during the time prior to the COVID-19 pandemic.***

TABLE 3-3: Fire Call Types

Call Type	2019			2020		
	Total Calls	Calls per Day	Call Percentage	Total Calls	Calls per Day	Call Percentage
False alarm	1,020	2.8	3.6	1,011	2.8	3.7
Good intent	215	0.6	0.7	275	0.8	1.0
Hazard	411	1.1	1.4	355	1.0	1.3
Outside fire	271	0.7	0.9	329	0.9	1.2
Public service	1,167	3.2	4.1	1,435	3.9	5.3
Structure fire	151	0.4	0.5	170	0.5	0.6
Fire Total	**3,235**	**8.9**	**11.3**	**3,575**	**9.8**	**13.1**

Key takeaways from the data in this table are:

- Fire calls for 2019 totaled 3,235 (11.3 percent of all calls), an average of 11.3 calls per day. All calls also include EMS, canceled, and auto aid given calls.
- Fire calls for 2020 totaled 3,575 (13.1 percent of all calls), an average of 9.8 calls per day.
- Fire calls increased 10.5 percent from 3,235 in 2019 to 3,575 in 2020, or just under one call per day.
- Outside fire calls increased from 271 in 2019 to 329 in 2020 an increase of 58 or 21.4 percent.
- Structure fire calls increased from 151 in 2019 to 170 in 2020, an increase of 19 or 12.6 percent.

EMS RISK

As with fire risks, an indication of the community's pre-hospital emergency medical risk is the type and number of EMS calls to which the fire department responds. The following table outlines the call types and call type totals for these types of EMS risks.

TABLE 3-4: EMS Call Types

Call Type	2019			2020		
	Total Calls	Calls per Day	Call Percentage	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	1,092	3.0	3.8	1,198	3.3	4.4
Cardiac and stroke	953	2.6	3.3	902	2.5	3.3
Fall and injury	1,627	4.5	5.7	1,336	3.7	4.9
Illness and other	8,856	24.3	30.9	12,962	35.5	47.5
MVA	1,584	4.3	5.5	1,209	3.3	4.4
Non-emergency transfer	7,318	20.0	25.5	2,318	6.4	8.5
Overdose and psychiatric	1,470	4.0	5.1	995	2.7	3.6
Seizure and unconsciousness	1,713	4.7	6.0	1,916	5.3	7.0
EMS Total	**24,613**	**67.4**	**85.8**	**22,836**	**62.6**	**83.7**

Key takeaways from the data in this table are:

- EMS calls for 2019 totaled 24,613 (85.8 percent of all calls), an average of 67.4 calls per day.
- EMS calls for 2020 totaled 22,836 (83.7 percent of all calls), an average of 62.6 calls per day.
- EMS calls decreased about 7 percent from 2019 to 2020, an average of 4.8 calls per day.
- Illness and other calls increased 46.4 percent from 8,856 in 2019 to 12,962 in 2020, increasing from 24.3 per day to 35.5 per day, an average of 11.2 per day. This is most likely a result of the COVID-19 pandemic.
- Non-emergency transfers decreased 68 percent from 2019 to 2020, falling from 7,318 in 2019 to 2,318 in 2020, a daily average decrease of 13.6.

Aggregately (Fire, EMS, canceled calls, and auto aid), the department received:

- *28,687 calls for service in 2019.*
  - *An average of 78.6 calls per day in 2019.*
    - *768 canceled calls.*
    - *62 mutual aid responses.*
- *27,269 calls for service in 2020, a decrease of 1,418 (4.9 percent), or 3.9 per day.*
  - *An average of 74.7 calls per day in 2020.*
    - *791 cancelled calls.*
    - *67 mutual auto aid responses.*

FIRE AND EMS INCIDENT DEMAND

The fire and EMS risk in terms of numbers and types of incidents is important when analyzing a community's risk, as outlined above. Analyzing where the fire and EMS incidents occur, and the demand density of fire and EMS incidents, helps to determine adequate fire management zone resource assignment and deployment. For the BFD, the entire city is divided into eight fire and eight EMS management zones, but they are not aligned identically.

The following figures illustrate fire and EMS demand in the BFD coverage area. All demand maps are the aggregate of 2019–2020, which is the data analysis study period.

The demand maps (with current fire station locations shown) tell us that:

- Fire-related incidents are concentrated in and around the downtown area of the city where the highest population is concentrated. It is also where the fire stations are closest together. The heaviest concentration of fire activity is in station 1, 2, and 4's areas, with a somewhat lesser concentration in station 3, 6, and 7's areas.
- EMS incident demand is most concentrated in downtown Brownsville with additional hot spots located north and northwest of downtown. The highest concentrations are in stations 1, 2, 6, and 7's areas.

FIGURE 3-17: BFD Overall Fire Incident Demand and Heat Maps, 2019–2020

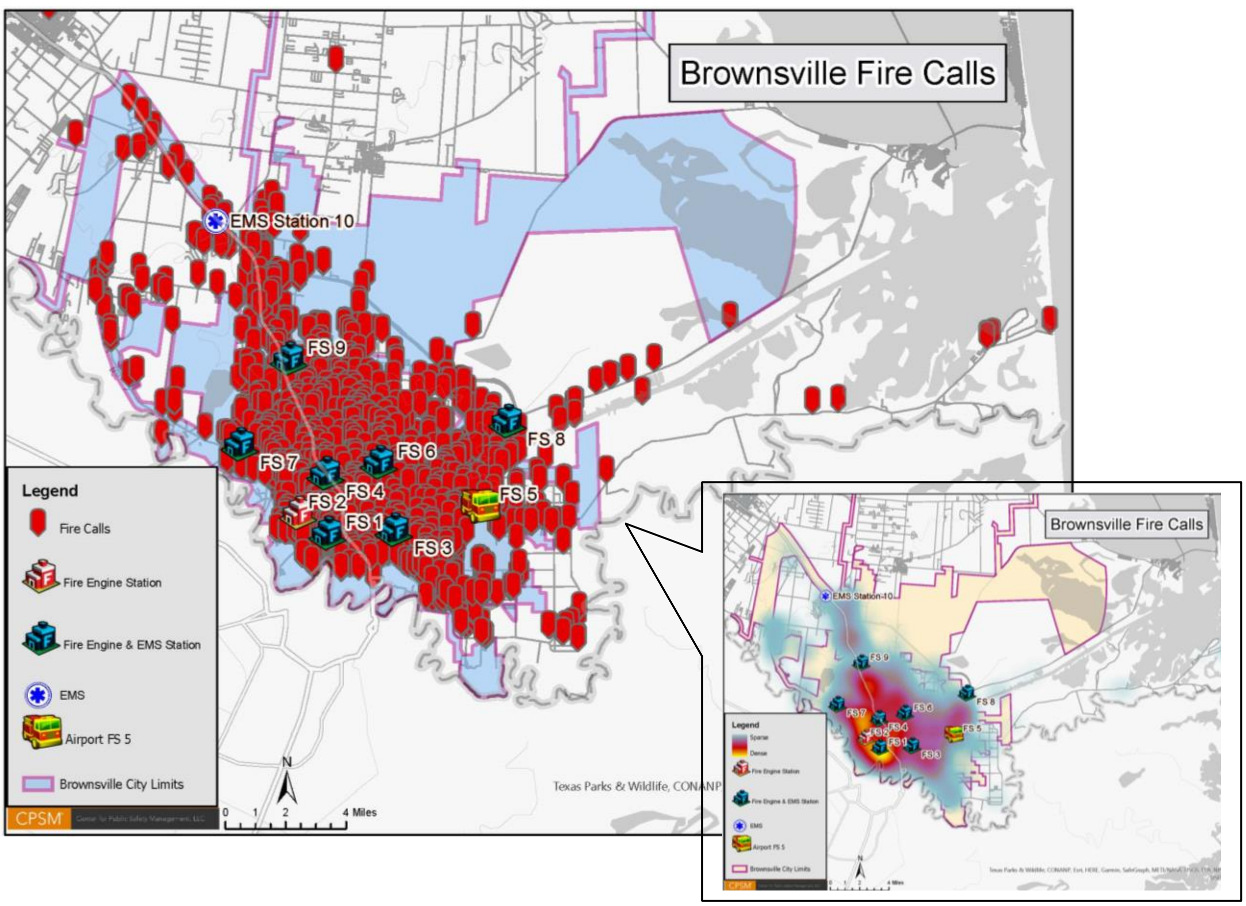
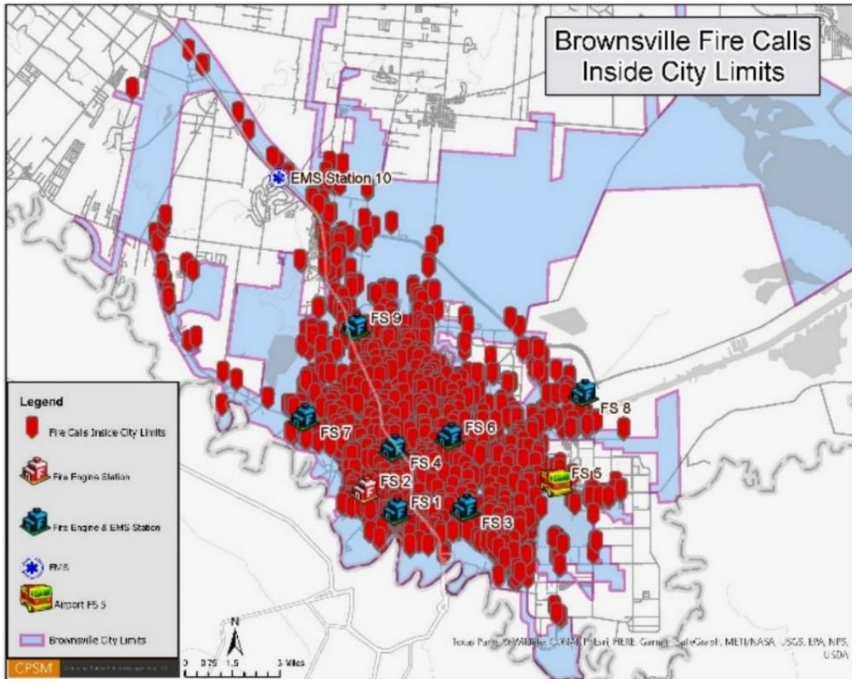


FIGURE 3-18: BFD Fire Incident Demand Inside/Outside City Limits, 2019–2020

BFD Fire Incident Demand Inside City



BFD Fire Incident Demand Outside City

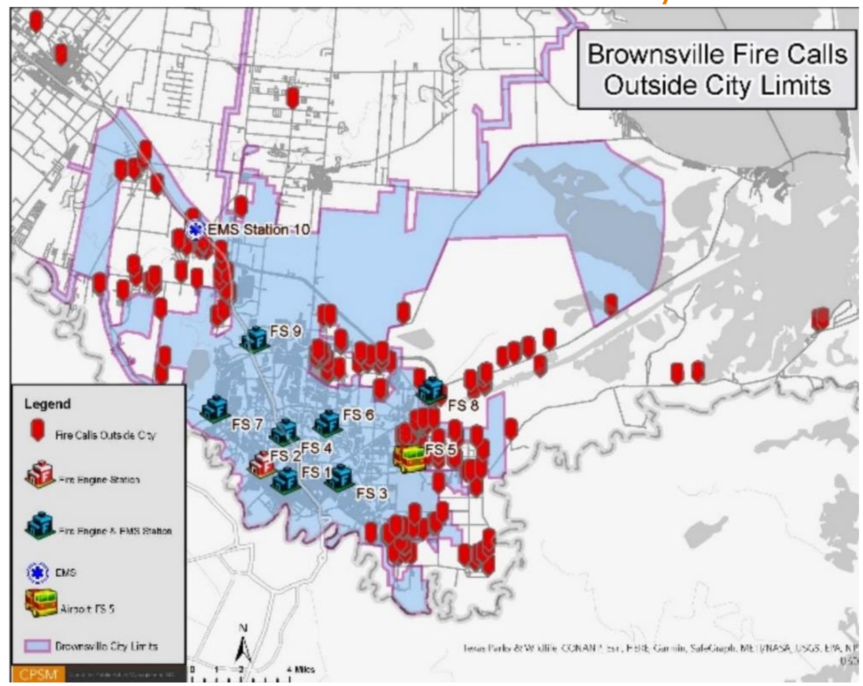


FIGURE 3-19: BFD Overall EMS Incident Demand and Heat Maps, 2019–2020

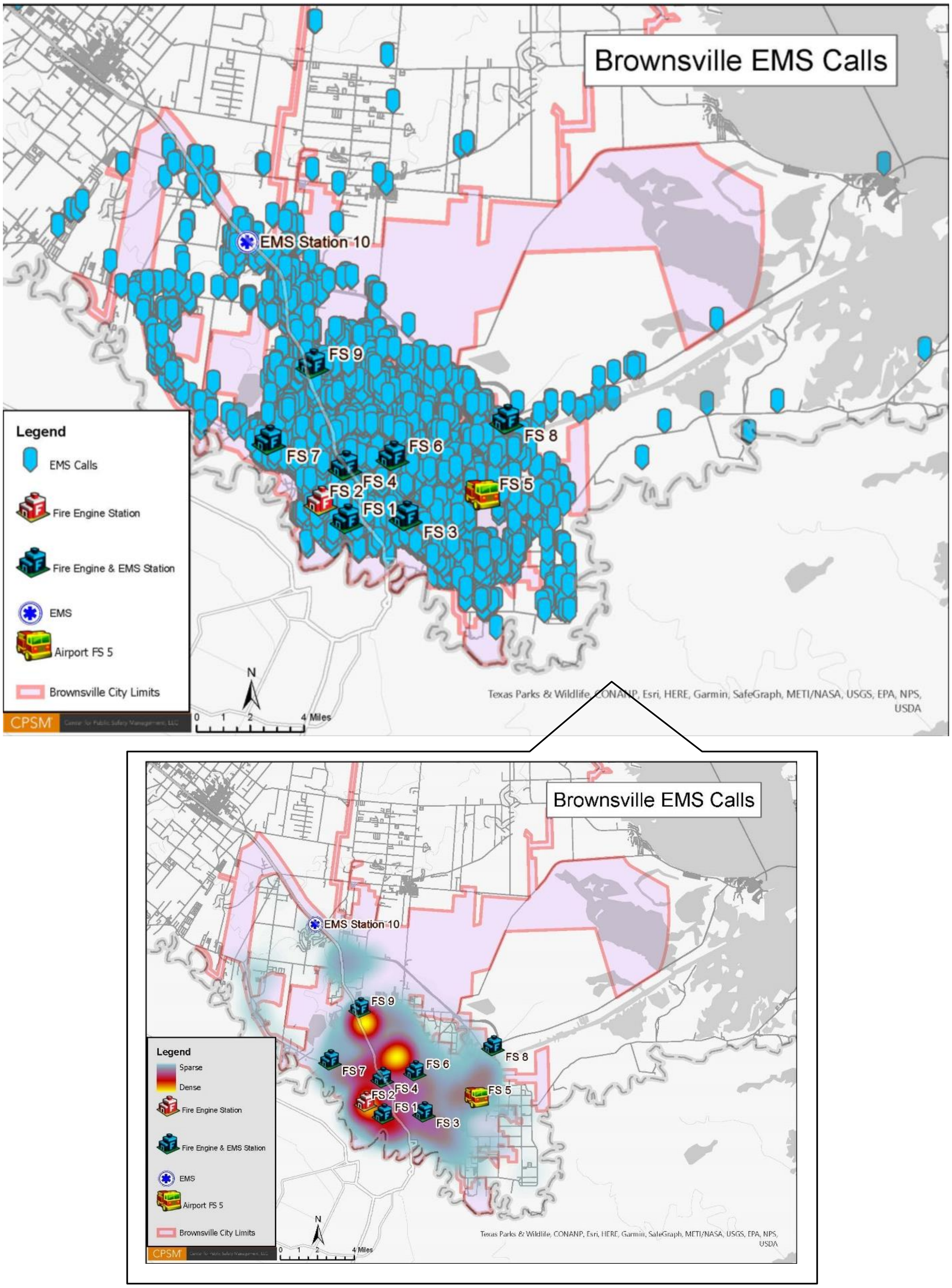
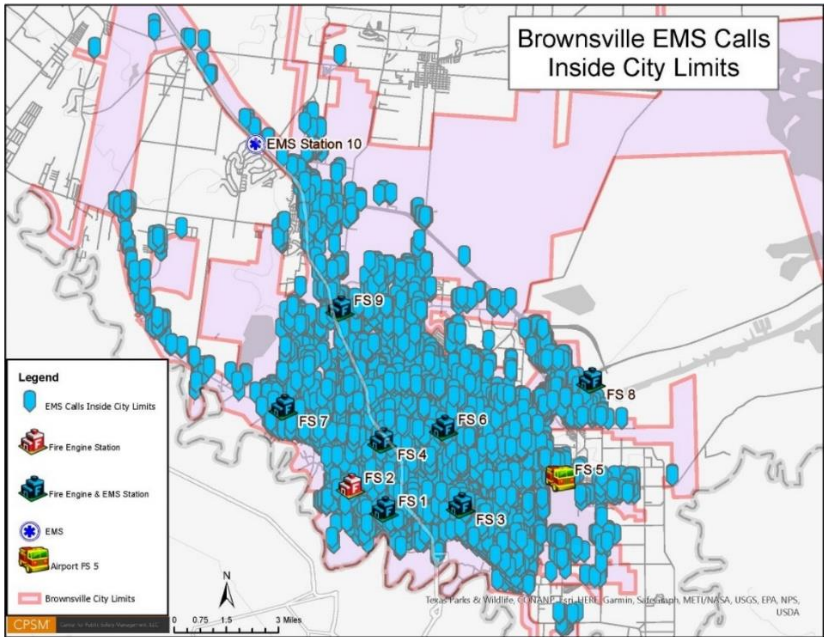
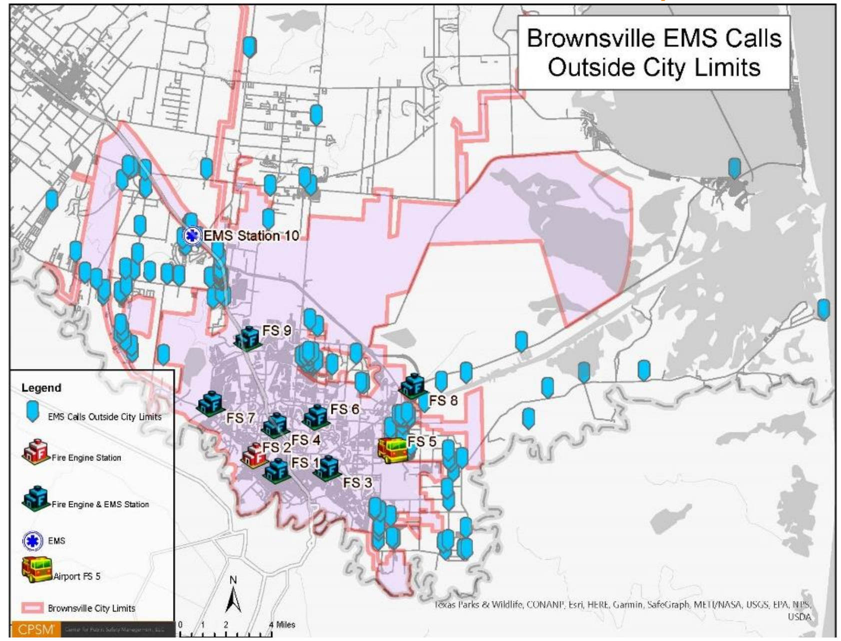


FIGURE 3-20: BFD EMS Incident Demand Inside/Outside City Limits 2019-2020

BFD EMS Incident Demand Inside City



BFD EMS Incident Demand Outside City



COMMUNITY LOSS AND SAVE INFORMATION

Fire loss is an estimation of the total loss from a fire to the structure and contents in terms of replacement. Fire loss includes contents damaged by fire, smoke, water, and overhaul. Fire loss does not include indirect loss, such as business interruption.

In a 2019 report published by the National Fire Protection Association on trends and patterns of U.S. fire losses, it was determined that home fires still cause the majority of all civilian fire deaths, civilian injuries, and property loss due to fire. Key findings from this report include:[34]

- Public fire departments responded to 1,318,500 fires in 2018, virtually the same as in 2017.
- Every 24 seconds, a fire department in the U.S. responds to a fire. A fire occurs in a structure at the rate of one every 63 seconds and a home fire occurs every 87 seconds.
- Seventy-four percent of all fire deaths occurred in the home.
- Home fires were responsible for 11,200 civilian injuries, or 74 percent of all civilian injuries, in 2018.
- An estimated $25.6 billion in property damage occurred as a result of fire in 2018, a significant increase, as this number includes a $12 billion loss in wildfires in Northern California.
- An estimated 25,500 structure fires were intentionally set in 2018, an increase of 13 percent over the year before.

For the two-year period of 2019 and 2020, the BFD reported the following community loss information as recorded from incidents the department responded to. For the size of the city, these losses are moderate overall. It is also important to remember that in the context of fire loss, a single major incident can result in millions of dollars in loss, which can skew the fire loss picture.

TABLE 3-5: Total Fire Loss Above and Below $25,000, by Year

Call Type	2019				2020			
	No Loss	Under $25,000	Above $25,000	Total	No Loss	Under $25,000	Above $25,000	Total
Outside fire	266	5	0	271	258	62	9	329
Structure fire	130	11	10	151	115	35	20	170
Total	**396**	**16**	**10**	**422**	**373**	**97**	**29**	**499**

TABLE 3-6: Content and Property Loss, Structure and Outside Fires, by Year

Call Type	2019				2020			
	Property Loss		Content Loss		Property Loss		Content Loss	
	Loss Value	Calls	Loss Value	Calls	Loss Value	Calls	Loss Value	Calls
Outside fire	$54,500	5	$0	0	$983,200	70	$126,899	46
Structure fire	$1,448,000	16	$129,000	17	$2,592,400	48	$1,082,445	45
Total	**$1,502,500**	**21**	**$129,000**	**17**	**$3,575,600**	**118**	**$1,209,344**	**91**

Note: The table includes only fire calls with a recorded loss greater than 0.

34. https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Fire-loss-in-the-United-States

RESILIENCY

Resiliency as defined by the Center for Public Safety Excellence (CPSE) in the Fire and Emergency Service Self-Assessment Manual (FESSAM), ninth edition, is: "an organization's ability to quickly recover from an incident or events, or to adjust easily to changing needs or requirements." Greater resiliency can be achieved by constant review and analysis of the response system and focuses on three key components:

- **Resistance:** The ability to deploy only resources necessary to control an incident and bring it to termination, which is achieved through the development and implementation of critical tasking and its application to the establishment of an effective response force for all types of incidents safely and effectively.
- **Absorption:** The ability of the agency to quickly add or duplicate resources necessary to maintain service levels during heavy call volume or incidents of high resource demand.
- **Restoration:** The agency's ability to quickly return to a state of normalcy.

Resistance is controlled by the BFD through staffing and response protocol, and with BFD resources dependent on the level of staffing and units available at the time of the alarm.

Absorption is accomplished through initial responding units available to respond by the BFD and through regional auto aid resources.

Restoration is managed by BFD unit availability as simultaneous calls occur, the availability of regional auto/mutual aid resources (the BFD generally does not utilize automatic aid and uses mutual aid on a limited basis), recall of staff during campaign events when warranted, and efficient work on incidents for a quick return to service.

The following tables and figure analyze BFD resiliency. In this analysis, CPSM included all calls that occurred inside and outside Brownsville in the two-year study period. BFD covers areas of Cameron County, Rancho Viejo, Olmito, and the port area under contract with the county, so responses outside of the city impact resiliency of the department to respond to calls inside the city.

For the total calls in the two-year analysis, there is significant variability in the number of calls from hour to hour. We tabulated the data for each of the 8,760 hours in 2019 and 8,784 hours in 2020 (leap year).

TABLE 3-7: BFD Annual Workload by District, by Year

District	2019			2020		
	Calls	Runs	Hours	Calls	Runs	Hours
Brownsville	27,108	35,200	31,101.0	25,041	32,364	29,531.3
Cameron County	1,283	1,800	1,692.8	1,918	2,689	2,493.0
Rancho Viejo	127	242	193.8	124	206	193.7
Olmito	89	133	111.8	116	157	126.3
Harlingen	33	41	45.5	43	47	60.0
Other	38	58	42.9	27	52	84.9
Total	**28,678**	**37,474**	**33,187.8**	**27,269**	**35,515**	**32,489.1**

Note for 2019: Other includes ten calls in Los Fresnos, eight calls in San Benito, five calls in S. Padre Island, four calls in Cameron Park,* three calls in Port Isabel, two calls in Boca Chica,* La Feria, and Laguna Heights, and one call in both Palm Valley and Rio Hondo. *Contracted ETJ.

TABLE 3-8: BFD Annual Workload by Station, Unit, and Year

Station	Unit	Unit Type	2019		2020	
			Total Hours	Total Runs	Total Hours	Total Runs
1	FB	Brush truck	135.8	98	148.5	115
	FE1	Engine	712.6	1,267	714.3	1,212
	M1	ALS unit	3,347.0	3,512	2,814.7	2,769
	Scout1	COVID quick resp.	0.0	0	178.0	302
	Truck1	Ladder truck 105-ft.	24.5	24	126.4	104
	Other	Other	44.9	65	115.6	193
		Total	**4,264.7**	**4,966**	**4,097.4**	**4,695**
2	FE2	Engine	596.4	1,031	588.7	980
	Other	Other	9.1	2	351.6	314
		Total	**605.5**	**1,033**	**940.4**	**1,294**
3	FE3	Engine	869.2	1,395	967.1	1,666
	M3	ALS unit	3,245.9	3,168	2,906.8	2,820
	Other	Other	1.5	2	1.0	4
		Total	**4,116.6**	**4,565**	**3,874.9**	**4,490**
4	FE4	Engine	785.4	1,398	861.0	1,479
	M4	ALS unit	3,717.7	3,628	3,320.7	2,981
		Total	**4,503.1**	**5,026**	**4,181.7**	**4,460**
5	FR1	ARFF	114.8	142	120.9	137
	FR2	ARFF	31.5	50	36.3	46
	M5	ALS unit	0.0	0	107.1	86
		Total	**146.3**	**192**	**264.3**	**269**
6	FE6	Engine	993.8	1,608	1,003.0	1,623
	M6	ALS unit	3,587.5	3,873	3,546.5	3,577
		Total	**4,581.2**	**5,481**	**4,549.5**	**5,200**
7	FE7	Engine	603.8	1,040	653.1	1,076
	M7	ALS unit	3,418.1	3,503	2,959.2	2,895
		Total	**4,021.9**	**4,543**	**3,612.3**	**3,971**
8	FE8	Engine	890.5	1,260	916.2	1,280
	M8	ALS unit	3,042.6	3,194	2,772.2	2,866
		Total	**3,933.1**	**4,454**	**3,688.4**	**4,146**
9	FE9	Engine	985.3	1,512	1,023.2	1,566
	FHR	Heavy rescue	210.8	304	226.0	300
	M9	ALS unit	3,919.0	3,861	3,643.0	3,325
	TU1	BLS unit	1,716.2	1,452	863.0	688
	Other	Other	46.6	41	63.3	49
		Total	**6,877.9**	**7,170**	**5,818.5**	**5,928**
10	M10	ALS unit	137.5	44	1,461.7	1,062
Total			**33,187.8**	**37,474**	**32,489.1**	**35,515**

TABLE 3-9: BFD Frequency of Overlapping Calls Requesting Fire Apparatus by Fire Zone, 2019

Fire Zone	Scenario	Number of Calls	Percent of All Calls	Total Hours
F1	No overlapped call	1,211	85.7	924.7
	Overlapped with one call	187	13.2	91.8
	Overlapped with two calls	14	1.0	3.7
	Overlapped with three calls	1	0.1	0.3
F2	No overlapped call	500	92.3	403.3
	Overlapped with one call	39	7.2	17.8
	Overlapped with two calls	3	0.6	0.1
F3	No overlapped call	1,151	84.8	1,014.3
	Overlapped with one call	188	13.9	90.3
	Overlapped with two calls	17	1.3	3.8
	Overlapped with three calls	1	0.1	0.3
F4	No overlapped call	1,015	88.0	848.9
	Overlapped with one call	128	11.1	58.9
	Overlapped with two calls	9	0.8	4.4
	Overlapped with three calls	1	0.1	0.1
F6	No overlapped call	1,226	86.5	1,044.0
	Overlapped with one call	171	12.1	71.9
	Overlapped with two calls	20	1.4	4.2
	Overlapped with three calls	1	0.1	0.4
F7	No overlapped call	778	92.3	642.7
	Overlapped with one call	63	7.5	30.5
	Overlapped with two calls	2	0.2	0.6
F8	No overlapped call	1,035	83.9	1,123.6
	Overlapped with one call	189	15.3	101.9
	Overlapped with two calls	10	0.8	3.1
F9	No overlapped call	1,283	85.4	1,126.0
	Overlapped with one call	194	12.9	95.8
	Overlapped with two calls	23	1.5	9.6
	Overlapped with three calls	2	0.1	0.6

TABLE 3-10: BFD Frequency of Overlapping Calls Requesting Ambulance, by EMS Zone, 2019

EMS Zone	Scenario	Number of Calls	Percent of All Calls	Total Hours
M1	No overlapped call	1,803	75.4	1,797.1
	Overlapped with one call	507	21.2	254.1
	Overlapped with two calls	70	2.9	26.9
	Overlapped with three calls	10	0.4	2.1
	Overlapped with four calls	1	0.0	0.1
M2	No overlapped call	350	91.1	397.6
	Overlapped with one call	31	8.1	18.6
	Overlapped with two calls	2	0.5	0.2
	Overlapped with three calls	1	0.3	0.6
M3	No overlapped call	1,991	67.2	2,249.5
	Overlapped with one call	789	26.6	472.8
	Overlapped with two calls	161	5.4	60.8
	Overlapped with three calls	19	0.6	4.7
	Overlapped with four calls	1	0.0	0.6
M4	No overlapped call	1,911	48.2	2,261.4
	Overlapped with one call	1,289	32.5	856.3
	Overlapped with two calls	566	14.3	252.6
	Overlapped with three calls	166	4.2	57.5
	Overlapped with four or more calls	30	0.8	8.0
M6	No overlapped call	2,310	57.5	2,533.8
	Overlapped with one call	1,222	30.4	683.6
	Overlapped with two calls	391	9.7	155.2
	Overlapped with three calls	80	2.0	23.6
	Overlapped with four or more calls	12	0.3	3.2
M7	No overlapped call	1,483	79.8	1,579.8
	Overlapped with one call	334	18.0	179.8
	Overlapped with two calls	38	2.0	13.1
	Overlapped with three calls	4	0.2	0.6
M8	No overlapped call	1,606	75.9	1,831.3
	Overlapped with one call	448	21.2	282.9
	Overlapped with two calls	60	2.8	22.8
	Overlapped with three calls	2	0.1	1.8
M9	No overlapped call	2,404	39.7	2,727.9
	Overlapped with one call	2,144	35.4	1,297.5
	Overlapped with two calls	1,104	18.2	444.3
	Overlapped with three calls	338	5.6	103.4
	Overlapped with four or more calls	64	1.2	15.6

TABLE 3-11: BFD Frequency Distribution of the Number of Calls, 2019

Calls in an Hour	Frequency	Percentage
0	816	9.3
1	1,385	15.8
2	1,548	17.7
3	1,401	16.0
4	1,226	14.0
5	939	10.7
6	594	6.8
7	387	4.4
8	237	2.7
9	123	1.4
10	52	0.6
11	31	0.4
12+	15	0.2
13	6	0.1
Total	**8,760**	**100.0**

TABLE 3-12: Availability of Station's Fire Suppression Units to Respond to Fire Calls, 2019

Fire Zone	Calls in Area	First Due			Percent		
		Responded	Arrived	First	Responded	Arrived	First
F1	1,179	861	840	832	73.0	71.2	70.6
F2	413	349	341	338	84.5	82.6	81.8
F3	1,154	995	983	981	86.2	85.2	85.0
F4	976	788	763	756	80.7	78.2	77.5
F6	1,221	1,012	985	975	82.9	80.7	79.9
F7	700	622	603	592	88.9	86.1	84.6
F8	1,046	871	850	830	83.3	81.3	79.3
F9	1,240	1,037	1,011	1,005	83.6	81.5	81.0
Total	**7,929**	**6,535**	**6,376**	**6,309**	**82.4**	**80.4**	**79.6**

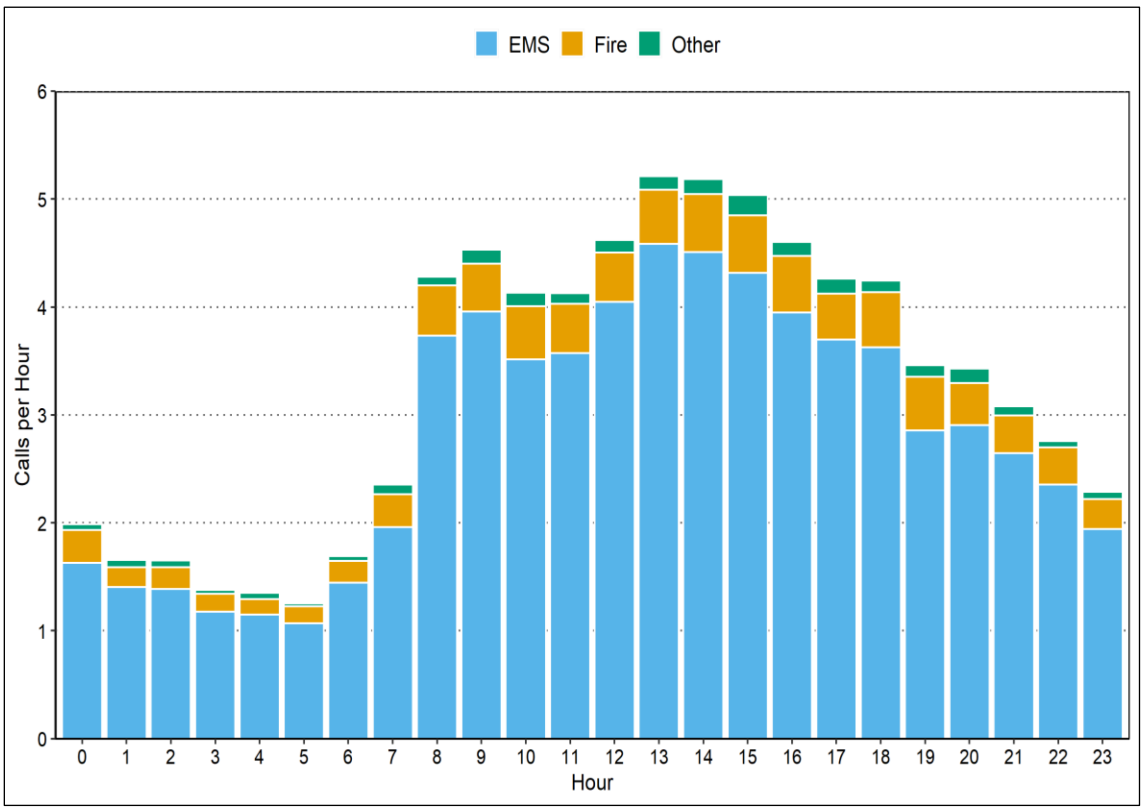
Note: For each station, we counted the number of calls requesting fire apparatus occurring within its fire zone. Then, we counted the number of fire calls where at least one fire suppression unit arrived. Next, we focused on the fire suppression units from the first due station to see if any responded, arrived, or arrived first.

TABLE 3-13: Availability of Station's Medic Units to Respond to EMS Calls

EMS Zone	Calls in Area	First Due			Percent		
		Responded	Arrived	First	Responded	Arrived	First
M1	2,288	1,473	1,450	1,448	64.4	63.4	63.3
M3	2,787	1,737	1,720	1,713	62.3	61.7	61.5
M4	3,868	1,847	1,781	1,772	47.8	46.0	45.8
M6	3,836	2,186	2,131	2,120	57.0	55.6	55.3
M7	1,780	1,148	1,131	1,129	64.5	63.5	63.4
M8	1,983	1,366	1,342	1,336	68.9	67.7	67.4
M9	5,824	3,518	3,409	3,392	60.4	58.5	58.2
Total	**22,366**	**13,275**	**12,964**	**12,910**	**59.3**	**58.0**	**57.8**

Note: For each station, we counted the number of calls requesting ambulance service occurring within its EMS zone. Then, we counted the number of EMS calls where at least one medic unit arrived. Next, we focused on the medic units from the first due station to see if any responded, arrived, or arrived first.

FIGURE 3-21: Calls by Hour of Day, 2019



Regarding the BFD's resiliency to respond to calls, analysis of these tables and figure tells us:

- The peak call time is consistently between 8:00 a.m. and 9:00 to 10:00 p.m. This is consistent with nationwide trends for response activity.
- In 2019, just 816 hours (9.3 percent) had no calls handled by the BFD. The most frequent number of calls in the same hour was two, which occurred 17.7 percent of the time followed

by three at 16.0 percent and one at 15.8 percent. During the year, the BFD was handling between one and five incidents an hour 74.2 percent of the time.

- During 21 hours (0.2 percent of all hours), 12 or more calls occurred; in other words, the BFD responded to 12 or more calls in an hour roughly once every 17 days.
- **The highest number of calls to occur in an hour was 13, which happened 7 times, followed by 12, which happened 15 times.**
- In 2019, the percent of time the first due BFD fire suppression unit was available to respond to fire calls in their first due district was 82.4 percent, arriving in their district on a call 80.4 percent of the time, and arriving first to calls in their district 79.6 percent of the time.
- In 2019, the percent of time the first due BFD EMS unit was available to respond to EMS calls in their first due district was 59.3 percent, arriving in their district on a call 58.0 percent of the time, and arriving first to calls in their district 57.8 percent of the time.

The BFD has resiliency in its deployment model largely due to the number of staffed resources (fire suppression units and medic units) it has in service on a daily basis. Although it does have mutual aid available to it when needed for major incidents, or during times of exceptionally high call activity, its mutual aid partners are located some distance from the city, which means they will have somewhat extended response times. Many of them also have limited or no career staffing, which can impact their availability to assist.

RISK CATEGORIZATION

A comprehensive risk assessment is a critical aspect of creating standards of cover and can assist the BFD in quantifying the risks that it faces. Once those risks are known, the department is better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned. In this component, the factors that drive the service needs are examined and then link directly to discussions regarding the assembling of an effective response force (ERF) and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking.

The risks that the department faces can be natural or man-made and may be affected by the changing demographics of the community served. With the information available from the CPSM data analysis, the BFD, the city, and public research, CPSM and the BFD can begin an analysis of the city's risks and can begin working towards recommendations and strategies to mitigate and minimize their effects. This section contains an analysis of the various risks considered within the BFD's service area.

Risk is often categorized in three ways: the probability the event will occur in the community, consequence of the event on the community, and the impact on the fire department. The following three tables look at the probability of the event occurring, which ranges from unlikely to frequent; consequence to the community, which is categorized as ranging from insignificant to catastrophic; and the impact to the organization, which ranges from insignificant to catastrophic.

TABLE 3-14: Event Probability

Probability	Chance of Occurrence	Description	Risk Score
Unlikely	2%-25%	Event may occur only in exceptional circumstances.	**2**
Possible	26%-50%	Event could occur at some time and/or no recorded incidents. Little opportunity, reason, or means to occur.	**4**
Probable	51%-75%	Event should occur at some time and/or few, infrequent, random recorded incidents, or little anecdotal evidence. Some opportunity, reason, or means to occur; may occur.	**6**
Highly Probable	76%-90%	Event will probably occur and/or regular recorded incidents and strong anecdotal evidence. Considerable opportunity, means, reason to occur.	**8**
Frequent	90%-100%	Event is expected to occur. High level of recorded incidents and/or very strong anecdotal evidence.	**10**

TABLE 3-15: Impact on BFD

Impact	Impact Categories	Description	Risk Score
Insignificant	Personnel and Resources	One apparatus out of service for period not to exceed one hour.	**2**
Minor	Personnel and Resources	More than one but not more than two apparatus out of service for a period not to exceed one hour.	**4**
Moderate	Personnel and Resources	More than 50 percent of available resources committed to incident for over 30 minutes.	**6**
Significant	Personnel and Resources	More than 75 percent of available resources committed to an incident for over 30 minutes.	**8**
Catastrophic	Personnel, Resources, and Facilities	More than 90 percent of available resources committed to incident for more than two hours or event which limits the ability of resources to respond.	**10**

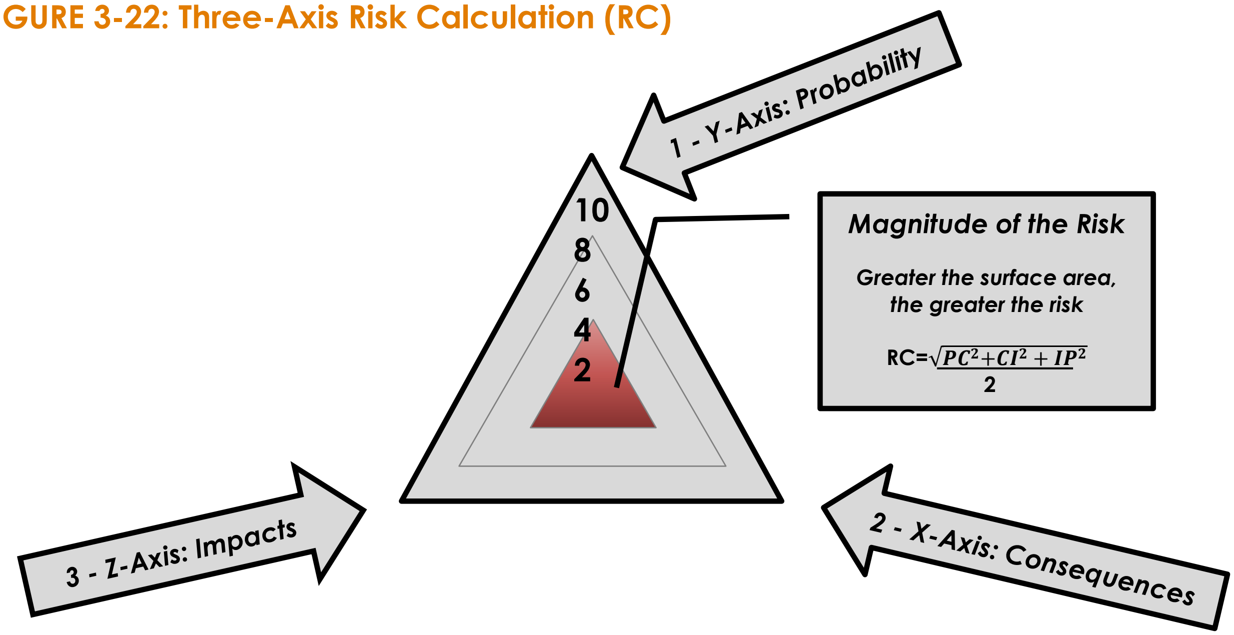
TABLE 3-16: Consequence to Community Matrix

Impact	Impact Categories	Description	Risk Score
Insignificant	Life Safety	▪ 1 or 2 people affected, minor injuries, minor property damage, and no environmental impact.	**2**
Minor	Life Safety Economic and Infrastructure Environmental	▪ Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment. Minor displacement of people for <6 hours and minor personal support required. ▪ Minor localized disruption to community services or infrastructure for <6 hours. Minor impact on environment with no lasting effects.	**4**
Moderate	Life Safety Economic and Infrastructure Environmental	▪ Limited number of people affected (11 to 25), no fatalities, but some hospitalization and medical treatment required. Localized displacement of small number of people for 6 to 24 hours. Personal support satisfied through local arrangements. Localized damage is rectified by routine arrangements. ▪ Normal community functioning with some inconvenience. Some impact on environment with short-term effects or small impact on environment with long-term effects.	**6**
Significant	Life Safety Economic and Infrastructure Environmental	▪ Significant number of people (>25) in affected area impacted with multiple fatalities, multiple serious or extensive injuries, and significant hospitalization. ▪ Large number of people displaced for 6 to 24 hours or possibly beyond. External resources required for personal support. Significant damage that requires external resources. Community only partially functioning, some services unavailable. Significant impact on environment with medium- to long-term effects.	**8**
Catastrophic	Life Safety Economic and Infrastructure Environmental	▪ Very large number of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalization; serious injuries with long-term effects. General and wide-spread displacement for prolonged duration; extensive personal support required. Extensive damage to properties in affected area requiring major demolition. ▪ Serious damage to infrastructure. Significant disruption to, or loss of, key services for prolonged period. ▪ Community unable to function without significant support. ▪ Significant long-term impact on environment and/or permanent damage.	**10**

This section also contains an analysis of the various risks considered in the City of Brownsville. In this analysis, information presented and reviewed in this section (All-Hazards Risk Assessment of the Community) have been considered. Risk is categorized as Low, Moderate, High, or Special.

Prior risk analysis has only attempted to evaluate two factors of risk: probability and consequence. Contemporary risk analysis considers the impact of each risk to the organization, thus creating a three-axis approach to evaluating risk as depicted in the following figure.
A contemporary risk analysis now includes probability, consequences to the community, and impact on the organization, in this case the BFD.

FIGURE 3-22: Three-Axis Risk Calculation (RC)



The following factors/hazards were identified and considered:

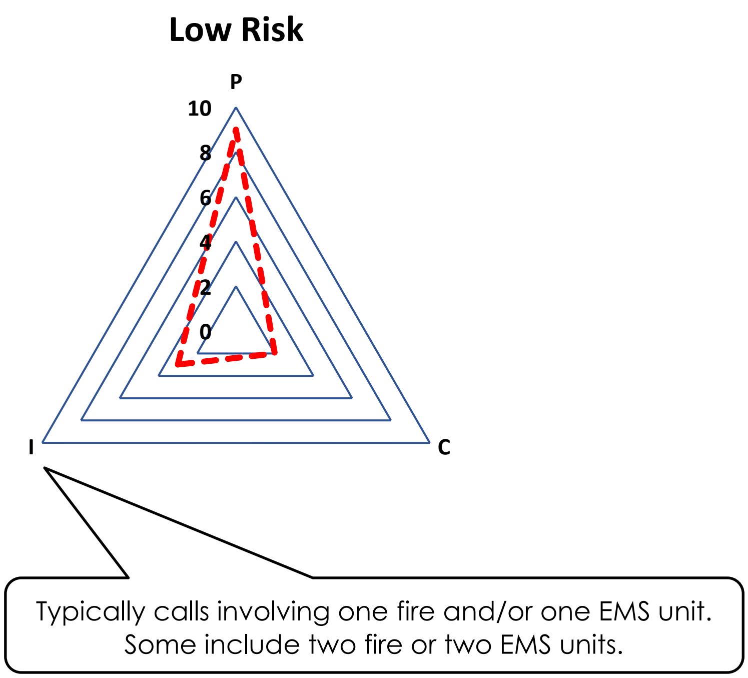
- **Demographic factors** such as age, socio-economic, vulnerability.
- **Natural hazards** such as flooding, snow and ice events, wind events, wild land fires.
- **Man-made hazards** such as rail lines, roads and intersections, target hazards.
- **Structural/building risks.**
- **Fire and EMS incident numbers and density.**

The assessment of each factor and hazard as listed below took into consideration the likelihood of the event, the impact on the city itself, and the impact on BFD's ability to deliver emergency services, which includes mutual aid capabilities as well. The list is not all inclusive but includes categories most common or that may present to the city and the BFD.

Low Risk

- Automatic fire/false alarms.
- Low acuity-BLS EMS incidents.
- Low-risk environmental event.
- Motor vehicle crash (MVC).
- Good intent/hazard/public service fire incidents with no life-safety exposure.
- Outside fires such as grass, rubbish, dumpster, vehicle with no structural/life-safety exposure.

FIGURE 3-23: Low Risk



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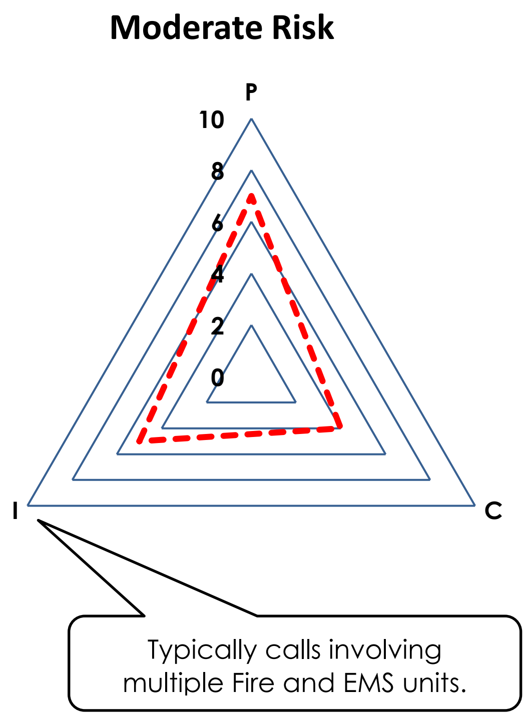
Moderate Risk

- Fire incident in a single-family dwelling where fire and smoke or smoke is visible, indicating a working fire.
- Suspicious substance investigation involving multiple fire companies and law enforcement agencies.
- ALS EMS incident.
- MVC with entrapment of passengers.
- Grass/brush fire with structural endangerment/exposure.
- Low angle rescue involving ropes and rope rescue equipment and resources.
- Surface water rescue.
- Good intent/hazard/public service fire incidents with life-safety exposure.
- Rail event with no release of product or fire, and no threat to life safety

FIGURE 3-24: Moderate Risk



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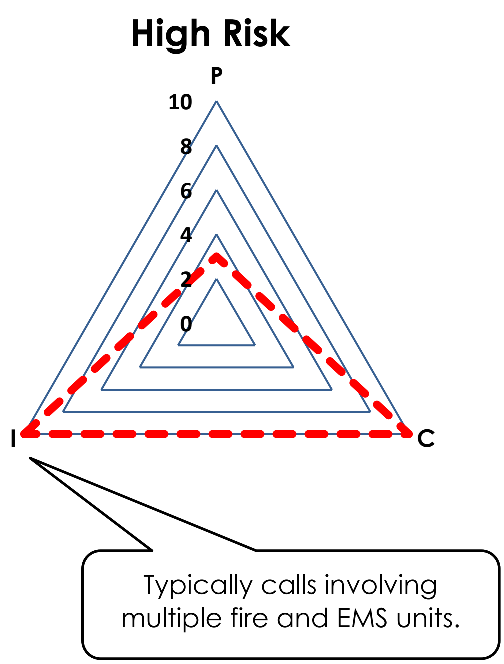
High Risk

- Working fire in a target hazard.
- Cardiac arrest.
- Mass casualty incident of more than 10 patients but fewer than 25 patients.
- Confined space rescue.
- Structural collapse involving life-safety exposure.
- High-angle rescue involving ropes and rope rescue equipment.
- Trench rescue.
- Suspicious substance incident with multiple injuries.
- Industrial leak of hazardous materials that causes exposure to persons or threatens life safety.
- Weather event such as a hurricane or tropical storm that creates widespread flooding, tornado, heavy winds, building damage, and/or life-safety exposure.

FIGURE 3-25: High Risk



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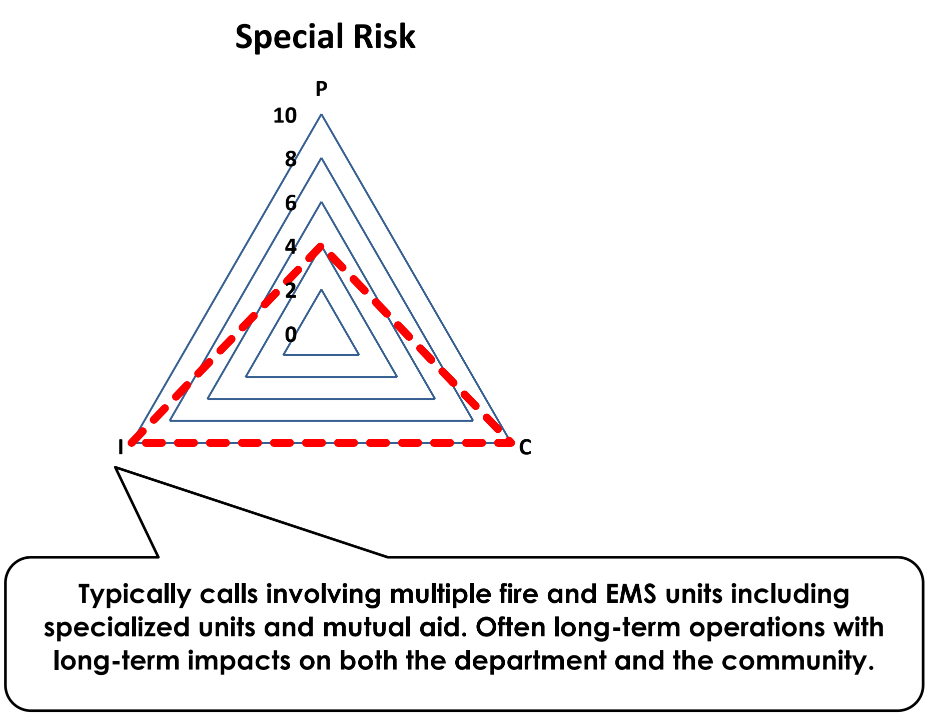
Special Risk

- Working fire in a structure of more than three floors.
- Fire at an industrial building or complex with hazardous materials.
- Fire in an occupied targeted hazard with special life-safety risks such as age, medical condition, or other identified vulnerabilities.
- Mass casualty incident of more than 25 patients.
- Rail or transportation incident that causes life-safety exposure or threatens life safety through the release of hazardous smoke or materials and evacuation of residential and business occupancies.
- Explosion in a building that causes exposure to persons or threatens life safety or outside of a building that creates exposure to occupied buildings or threatens life safety.
- Massive river/estuary flooding, fire in a correctional or medical institution, high-impact environmental event, pandemic.
- Mass gathering with threat of fire and threat to life safety or other civil unrest, weapons of mass destruction release.
- Fire, explosion, hazardous material release, complex technical rescue incident, or other significant incident in the port area.
- Fire, explosion, hazardous material release, complex technical rescue incident, or other significant incident at SpaceX Starbase.

FIGURE 3-26: Special Risk



SUMMARY AND CONCLUSIONS

- The city has several large development projects in the planning process and will continue to experience steady residential and commercial growth. The SpaceX Starbase project could accelerate the need for additional residential growth.
- The city has a high number of high-hazard occupancies that the BFD must protect.
- All the high-hazard risk locations pose challenges for BFD to conduct evacuations and/or fire attack.
- The city's large geographic size, along with the additional fire district area in Cameron County that is protected by the BFD, makes it difficult io meet benchmark response standards in certain areas of the city.
- More than one in four (27.5 percent) of Brownsville's residents live below the poverty line.
- Brownsville has a high transient population due to its location on the border and with three border crossings located in the city.
- The risk for a major transportation incident is high including ones involving trucks from Mexico that are permitted to carry much heavier loads from the port to the border.
- Although it is the primary first responder responsible for protecting the port area, the BFD has neither the training, equipment, or operational preparedness to handle a major fire (and to a lesser extent, a complex technical rescue operation) in the port or on a large maritime vessel.
- Although it is the primary first responder responsible for protecting SpaceX Starbase, the BFD has neither the training, equipment, or operational preparedness to handle a major fire (and to a lesser extent, a complex technical rescue operation) at those facilities.
- Several large, new LNG facilities are planned for the port area. These facilities which could be under construction in 2023, will present significant, new hazards and challenges the department must be prepared to handle.
- As reported by the BFD, one of the most dangerous chemical plants in the world is located across the border in Matamoros. A significant leak or other incident at this facility that results in a large release of hydrofluoric acid could have devastating consequences for Brownsville.
- The BFD does have good resiliency to handle multiple, simultaneous incidents.
- The city experiences a moderate level of fire loss for a community of its size.
- Due to its location, the BFD has limited mutual aid partners that it can summon help from when needed and these partners will have extended (probably 15 minutes-plus) response times into the city. This requires the BFD to be somewhat more self-sufficient than many departments.

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SECTION 4. FIRE OPERATIONS DEPLOYMENT AND PERFORMANCE

Fire, rescue, and emergency medical services (EMS) incidents, and the fire department's ability to respond to, manage, and mitigate them effectively, efficiently, and safely are mission-critical components of the emergency services delivery system. In fact, fire, rescue, and EMS operations provide the primary, and certainly most important, basis for the very existence of the fire department.

Nationwide, fire departments are responding to more EMS calls and fewer fire calls, particularly fire calls that result in active firefighting operations by responders. This is well documented in both national statistical data, as well as CPSM fire studies. Brownsville's experience is consistent with these trends, particularly in light of the fact that the much of the city is a new community. Improved building construction, code enforcement, automatic sprinkler systems, and aggressive public education programs have contributed to a decrease in serious fires and, more importantly, fire deaths among civilians.

These trends and improvements in the overall fire protection system notwithstanding, fires still do occur, and the largest percentage of those occur in residential occupancies where they place the civilian population at risk. Although they occur with less frequency than they did several decades ago, when they occur today, they grow much quicker and burn more intensely than they did in the past. As will be discussed later in this report, it is imperative that the fire department is able to assemble an *effective response force* (ERF) within a reasonable time period in order to successfully mitigate these incidents with the least amount of loss possible.

CURRENT STAFFING AND DEPLOYMENT OF FIRE RESOURCES

When exploring staffing and deployment of fire departments it is prudent to design an operational strategy around the actual circumstances that exist in the community and the fire and risk problems that are identified. The strategic and tactical challenges presented by the widely varied hazards that a department protects against need to be identified and planned for through a community risk analysis planning and management process as completed in this report. It is ultimately the responsibility of elected officials to decide the level of risk that is acceptable to their community. Once the acceptable level of risk has been decided, then operational service goals can be established. Whether looking at acceptable risk, or level of service goals, it would be imprudent, and probably very costly, to build a deployment strategy that is based solely on response times and emotion.

The staffing of fire and EMS companies is a never-ending focus of attention among fire service and governmental leadership. While NFPA 1710 and OSHA provide guidelines (and to some extent the law, specifically OSHA in OSHA states) as to the level of staffing and response of personnel, the adoption of these documents varies from state to state, and department to department. NFPA 1710 addresses the recommended staffing in terms of specific types of occupancies and risks. The needed staffing to conduct the critical tasks for each specific occupancy and risk are determined to be the Effective Response Force (ERF). The ERF for each of these occupancies is detailed in NFPA 1710 (2020 edition), section 5.2.4, Deployment.

One of the factors that has helped the fire service in terms of staffing is technology. The fire service continues to benefit from technological advances that help firefighters extinguish fires more effectively. More advanced equipment in terms of nozzles, personal protective gear, thermal imaging systems, advancements in self-contained breathing apparatus, incident command strategies, drones with infrared cameras, and devices used to track personnel air supply are some of the technologies and techniques that help firefighters extinguish fires faster and manage the fireground more effectively and safely. While some of these technologies do not reduce the staffing or workforce needed, they can have an impact on firefighter safety, property loss, and crew fatigue.

Even with the many advances in technology and equipment, the fireground is an unforgiving and dynamic environment where firefighters must complete critical tasks simultaneously. Lightweight wood construction, truss roofs, dwellings and buildings with basements, increased set-backs making accessibility to the building difficult, and large footprint commercial buildings and estate homes are examples of the challenges that firefighting forces are met with when mitigating structural fires. Newly constructed homes are larger than much of the older home stock. These homes tend to incorporate open floor plans, with large spaces that contribute to rapid fire spread. The challenge of rapid fire spread is exacerbated by the use of lightweight roof trusses, vinyl siding, and combustible sheathing. The result is that more personnel are required to mitigate the incidents safely and effectively in these structures. Providing adequate staffing through an Effective Response Force for these environments depends on many factors.

The operations necessary to successfully extinguish a structure fire, and do so effectively, efficiently, and safely, requires a carefully coordinated and controlled plan of action where certain operations such as venting ahead of the advancing interior hose line(s) must be carried out with a high degree of precision and timing. Multiple operations, frequently where seconds count, such as search and rescue operations and trying to cut off a rapidly advancing fire, must also be conducted simultaneously. If there are not enough personnel on the incident initially to perform all the critical tasks, some will, out of necessity, be delayed. This can result in an increased risk of serious injury, or death, to building occupants and firefighters, and increased property damage.

While staffing and deployment of fire services is not an exact science, CPSM has developed metrics it follows and recommends that communities consider when making recommendations about staffing and deployment of fire resources. While there are many benchmarks that communities and management use in justifying certain staffing levels, there are certain considerations that are data driven and presented through national consensus that serve this purpose as well. CPSM recommends that communities consider these factors when making decisions regarding staffing and deployment of fire resources.

Staffing is one component of these metrics and is linked to station location, what type of apparatus is responding, that is, the combination of engine, ladder, ambulance, or specialty apparatus. These joint factors help to determine what level of fire and EMS service is going to be delivered in terms of labor, response time, and resources.

Linked to these components of staffing and deployment are critical factors that drive various levels and models from which fire and EMS departments staff and deploy. These factors are:

All-Hazard Risk and Vulnerability of the Community: A fire department collects and organizes risk evaluation information about individual properties, and on the basis of the rated factors then derives a "fire risk score" for each property. The community risk and vulnerability assessment evaluates the community as a whole, and with regard to property, measures all property and the risk associated with that property and then segregates the property as either a high-, medium-, or low-hazard depending on factors such as the life and building content hazard, and the potential fire flow, staffing, and apparatus types required to mitigate an emergency in the specific property. Factors such as fire protection systems are considered in each building evaluation. Included in this assessment should be both a structural and nonstructural (weather, wildland-urban interface, transportation routes, etc.) analysis. All factors are then analyzed and the probability of an event occurring, the impact on the fire department, and the consequences on the community are measured and scored.

Population, Demographics, and Socio-economics of a Community: Population and population density drives calls for local government service, particularly public safety. The risk from fire is not the same for everyone, with studies telling us age, gender, race, economic factors, and what region in the country one might live in contribute to the risk of death from fire. Studies also tell us these same factors affect demand for EMS, particularly population increase and the more frequent use of hospital emergency departments as many uninsured or underinsured patients rely on EDs for their primary and emergent care, utilizing prehospital EMS transport systems as their entry point.

Call Demand: Demand is made up of the types of calls to which units are responding and the location of the calls. This drives workload and station siting considerations. Higher population centers with increased demand require resources.

Workload of Units: This factor involves the types of calls to which units are responding and the workload of each unit in the deployment model. This defines what resources are needed and where; it links to demand and station location, or in a dynamic deployed system, the area(s) in which to post units.

Travel Times from Fire Stations: Analyzes the ability to cover the fire management zone/response district in a reasonable and acceptable travel time when measured against national benchmarks such as NFPA 1710, 1720, and the ISO-FSRS engine and ladder company grading parameters. This metric links to demand, risk assessment, unit workload, and resiliency.

NFPA Standards, ISO, OSHA requirements (and other national benchmarking).

EMS Demand: Community demand; demand on available units and crews; hospital off-load wait times; demand on non-EMS transport units responding to calls for service (fire/police units); availability of crews in departments that utilize cross-trained EMS staff to perform fire suppression.

Critical Tasking: On-scene capabilities to control and mitigate emergencies is determined by staffing and deployment of certain resources for low-, medium-, and high-risk responses. Critical tasking is the individual or team level task that is required to be performed by on-scene personnel based on the type of incident the firefighting and EMS force is responding to. Critical tasks are to the greatest extent performed simultaneously for a more effective operation aimed at increased firefighter and the public's safety. Those risks/incidents requiring more critical tasks to be performed simultaneously drive a larger response force. An example of simultaneous critical tasking is a search and rescue crew and ventilation crew operating while a crew or crews are advancing attack lines.

Effective Response Force: The ability of the jurisdiction to assemble the necessary personnel on the scene to perform the critical tasks necessary in rapid sequence to mitigate the emergency. The speed, efficiency, and safety of on-scene operations are dependent upon the number of firefighters performing the tasks. If fewer firefighters are available to complete critical on-scene tasks, those tasks will require more time to complete and impact overall operations and the safety of firefighters and the public.

Innovations in Staffing and Deployable Apparatus: The fire department's ability and willingness to develop and deploy innovative apparatus (combining two apparatus functions into one to maximize available staffing, as an example). Deploying quick response vehicles (light vehicles equipped with medical equipment and some light fire suppression capabilities) on those calls (typically the largest percentage) that do not require heavy fire apparatus.

Community Expectations: The gathering of input and feedback from the community, then measuring, understanding, and developing goals and objectives to meet community expectations.

Ability to Fund: The community's understanding of, and its ability and willingness to fund fire and EMS services, while considering how budgetary revenues are divided up to meet all community's expectations.

While each component presents its own metrics of data, consensus opinion, and/or discussion points, aggregately they form the foundation for informed decision making geared toward the implementation of sustainable, data- and theory-supported, effective fire and EMS staffing and deployment models that fit the community's profile, risk, and expectations. The City of Brownsville had not completed a comprehensive analysis of these elements prior to this study. However, part of CPSM's analysis involved the completion of a community fire risk and target hazard analysis.

The BFD currently has an authorized staff of 214 personnel. Of these, 200 are sworn emergency response personnel, with 188 assigned to fire and EMS operations positions while the remainder perform a variety of administrative and support functions. The remaining 14 staff members are non-uniformed support personnel, who perform a variety of roles for the department.

The department was able to increase its authorized staffing by 19 positions approximately four years ago. It also received a *Staffing for Effective Fire and Emergency Response* (SAFER) grant that allowed 15 new personnel to be hired. However, the department has also experienced a high level of turnover the past several years primarily due to retirement of senior personnel.

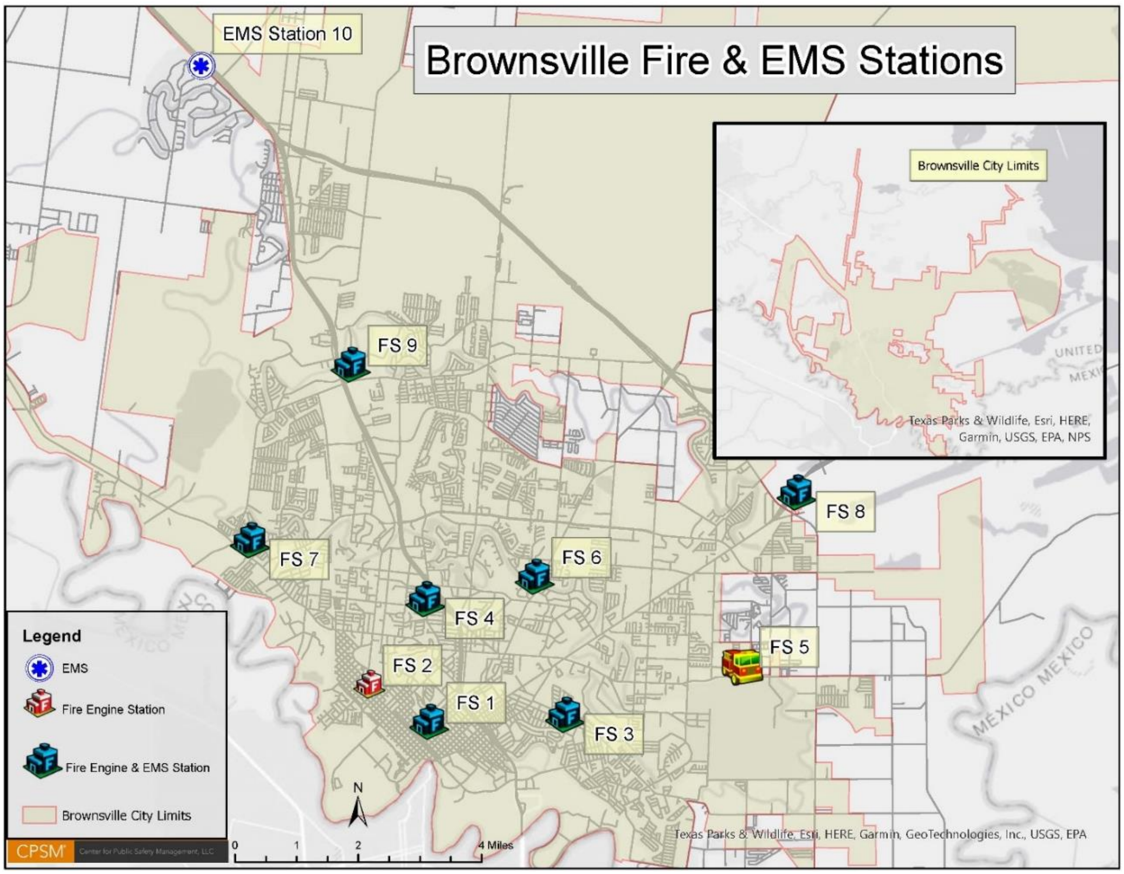
All the department's uniformed personnel, with the exception of a few very senior members who are nearing retirement and are exempt, are certified paramedics. All new personnel who are hired by the department are required to possess, or obtain, paramedic certification and maintain it for the duration of their tenure as a condition of employment. However, the time that it takes for personnel to obtain paramedic certification (upwards of 2,000 hours of training) creates staffing challenges for the department when trying to get newly hired personnel trained and into the field. In some instances the process can take around two full years.

The department delivers field operations and emergency response services through a clearly defined division of labor that includes a middle manager (assistant chief), first-line operational supervisors (lieutenants and captains), technical specific staff (drivers), and firefighter/paramedics. Currently the entire city is considered a single operational unit and is commanded each day by an Assistant Chief. Field personnel work a three-platoon, 56-hour workweek that is comprised of 24-hour long duty days. Personnel are on duty for 24 hours followed by 48 hours off duty. They work a 19-day cycle that includes a Kelly Day (extra day off to reduce the average number of hours in a cycle).

The BFD operates out of ten stations, primarily staffing eight engines, one ladder, one Airport Rescue Firefighting (ARFF) unit, eight EMS units, and two command vehicles (one for the Assistant Chief and one for EMS supervisor). The department also has one rescue truck, two brush trucks, one additional ARFF unit, one dive unit, one hazardous materials pickup truck with a trailer, one drone van, one Urban Search and Rescue (USAR) trailer, one high water vehicle, and several boats all of which are cross-staffed by on duty personnel when needed. The department also maintains two reserve fire suppression units (pumpers) and four reserve ambulances. Three new ambulances are scheduled for delivery in Fall 2022.

The following figure illustrates the locations of each BFD fire and EMS station.

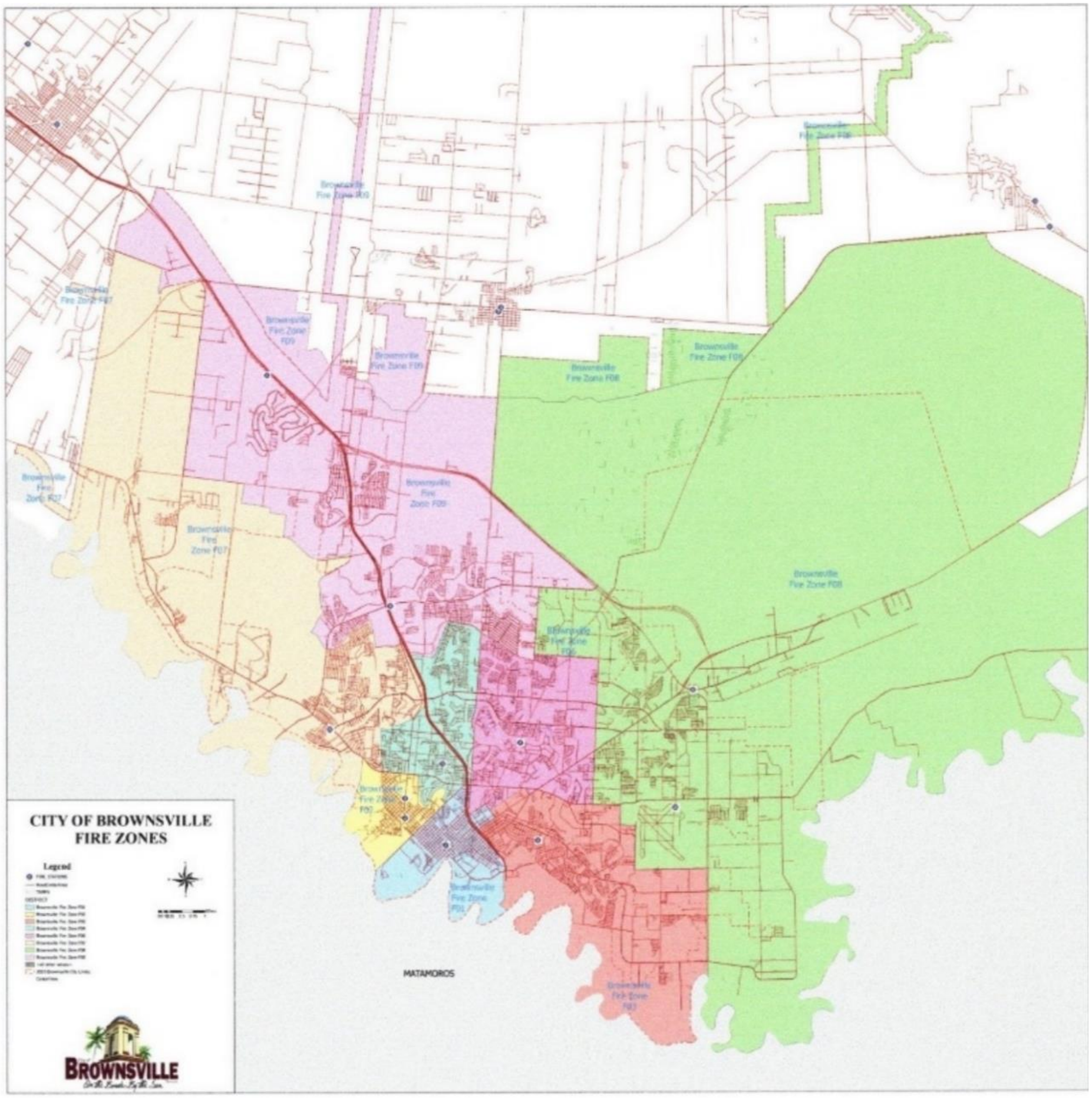
FIGURE 4-1: BFD Fire and EMS Station Locations



Note: Fire Station 2 only has an engine, no medic unit.
Fire Station 5 only protects Brownsville South Padre International Airport.
Station 10 only as a medic unit; no fire suppression unit.

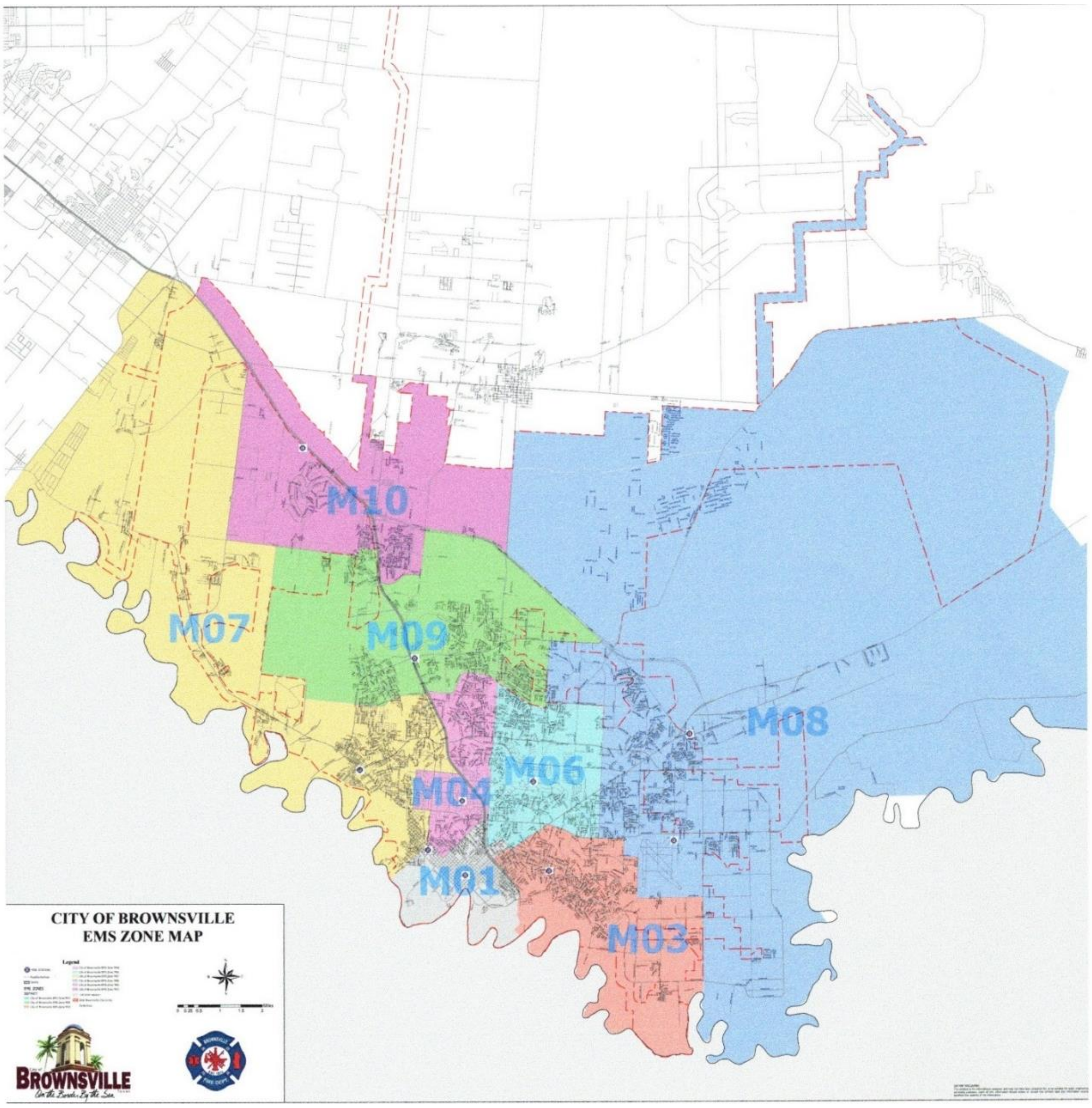
The following figure illustrates the first due district for each BFD station for fire suppression purposes.

FIGURE 4-2: BFD Fire Station First Due Fire Suppression Zones



The following figure illustrates the first due district for each BFD station for EMS (ambulance) deployment.

FIGURE 4-3: BFD Fire Station First Due EMS/Ambulance Zones



When fully staffed, each of the department's three operational shifts have 49 personnel assigned. This consists of one Assistant Chief, one EMS supervisor (lieutenant), three or four captains, six or seven lieutenants, eleven drivers, and 25 firefighters. Minimum on-duty staffing is 47 personnel, which includes 30 personnel for fire and 17 for EMS. It is important to note that all BFD personnel are cross-trained to perform both fire and EMS duties and can perform either or both functions on any incident. When the number of personnel on duty falls below the minimum, overtime is utilized to bring it back to 47. In order to reduce the need for overtime the department recently reduced minimum staffing at the airport ARFF station from four to two and is not staffing the rescue truck driver position at Station 9.

The following table illustrates how the on-duty staffing is normally deployed.

TABLE 4-1: Normal BFD Staffing/Deployment Model

Station	Address	Staffed Operations Units	Normal Staffing
Central Fire Station	1000 E. Adams St.	Engine 1 Truck 1 Medic 1 Shift Commander	1 Officer, 1 Driver, 1 Firefighter 1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics 1 Assistant Chief
Fire Station 2	536 W. St. Charles	Engine 2	1 Officer, 1 Driver, 1 Firefighter
Fire Station 3	814 Hortencia Blvd.	Engine 3 Medic 3	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics
Fire Station 4	605 Old Alice Rd.	Engine 4 Medic 4	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics
Fire Station 5 (Airport)	60 Vermillion Ave.	Rescue 1 Rescue 2	1 Officer, 1 Driver
Fire Station 6	1100 Old Port Isabel Rd.	Engine 6 Medic 6	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics
Fire Station 7	1863 Military Rd.	Engine 7 Medic 7	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics
Fire Station 8	1855 Captain David Foust Rd.	Engine 8 Medic 8	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics
Fire Station 9	62 E. Alton Gloor	Engine 9 Medic 9 EMS Supervisor	1 Officer, 1 Driver, 1 Firefighter 2 Firefighter/Paramedics 1 Lieutenant
EMS Station 10	500 Hildago Ave.	Medic 10	2 Firefighter/Paramedics

The table above depicts minimum staffing levels for the department. As discussed above, the BFD has only a few extra personnel on each shift to fill in for scheduled and unscheduled leave. The BFD, like many fire departments across the country, staffs through the constant-staffing level model, meaning that on each shift there is a minimum number of staffed positions to be filled. When a position is vacated by scheduled or unscheduled leave, and because it represents minimum staffing, the position is backfilled by overtime staffing.

The COVID-19 pandemic has created some unique staffing challenges for many fire departments, Brownsville included. As mentioned above, the BFD has taken steps to reduce the amount of overtime needed on a daily basis by reducing airport staffing from four personnel to two, and not staffing the rescue driver position. This has resulted in a net decrease of three positions that must be staffed each day. However, most days the department has multiple shifts filled by personnel working overtime just to fill vacancies created by personnel on regularly scheduled leave. In addition to the financial implications to the municipality of the need for personnel to work numerous overtime shifts, there is growing evidence to suggest there are very real health and safety implications for firefighters as well that could end up having tragic consequences.

Chief Don Abbott is a well-known fire service leader, author, and instructor who is regarded as a leading authority regarding MAYDAY facts in the fire service in North America. Chief Abbott's analysis of data submitted to him by career fire departments noted a 35 percent increase in MAYDAYS during a 13-week period from March through June 2020. This was during the initial surge of the COVID-19 pandemic as well as a period of social issues and related civil emergencies. Based upon interviews conducted with 156 personnel (primarily those firefighters who transmitted the MAYDAY) Chief Abbot identified some trends and indicators, several of which could have applicability to Brownsville:

- Lack of control over excessive overtime, relaxing the rules because of current civil, COVID, or related situations and conditions. There was one incident where a firefighter had a MAYDAY during his 71st straight hour of being on duty.
- There have been several MAYDAYS (39 percent) where crews were working short-handed.
- 81 percent occurred between 9:00 p.m. and 6:00 a.m.
- 77 percent occurred during an overtime shift; 43 percent were working more than a 24-hour shift.
- Average number of runs prior to MAYDAY (24-hour period) was 16 runs/or standby on protest rallies (low 9 runs / high 26 in 24 hours).
- 37 percent of the MAYDAY victims reported working short a crew member.
- 15 percent reported they didn't remember the dispatch information (address, reason for the run).
- 37 percent reported using more air than normal.
- The number one cause of a MAYDAY was becoming lost or separated from a hose line.
- 43 percent reported difficulty sleeping during their overtime shift.
- Overtime ranged from working 48 hours (36 percent); 60 hours (23 percent), and 72 hours (17 percent) straight.

The critical message here related to staffing practices—and personnel working large amounts of overtime to fill vacancies— is that while each community challenge is different, and Brownsville is no exception, the fact is that firefighters and medics require adequate rest (on AND off duty) to ensure they are physically and mentally prepared for duty. Thus, adequate staffing must be planned for in advance based upon the unique needs of the community.

Further discussions and recommendations regarding staffing and deployment will be made and developed later in this section of the report.

PRIMARY PUBLIC SAFETY ANSWERING POINT ANALYSIS

The 9-1-1 Public Safety Answering Point (PSAP) is the gateway into emergency response system. The City of Brownsville uses the Brownsville Police Department (BPD) 911-dispatch center as the primary PSAP for fire and EMS calls for service. As the primary PSAP, the police 911-dispatch center identifies the nature of the caller's situation then processes the call further as a fire or EMS incident, gathers pertinent caller information such as address, nature of complaint or the nature of the emergency, then generates an incident case and sends it to the fire/EMS dispatcher (if that position is not the one receiving the call) for dispatching of the incident to the proper unit(s). The dispatch center supplies ongoing updates to the responding units about caller updated information, or information provided in the computer-aided dispatch (CAD) records management system.

From a fire and EMS perspective, the communications center is measured on three critical points in the overall cascade of events linking the event to the incident response force. These are ***how the call is routed through the public safety network and its capabilities*** (wireline phone, wireless phone, E911capabilities, Voice over Internet Protocol (VoIP), mobile satellite services, telematics, and Text Telephone Devices (TTYs)), ***time to answer*** (the time it takes to answer an incoming call on the emergency phone line), ***and alarm processing time*** (the time it takes to process and create the event and then notify the emergency response unit(s)).

National Fire Protection Association (NFPA) *Standard 1710, Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2020 edition, includes national consensus standards for emergency communication PSAPS and dispatch centers. For the BFD, this refers to the BPD PSAP, which also serves as the communications center. Section 4.1.2.3 of this standard outlines several benchmarks for communications center operations for fire and EMS events. For the BFD, this measurement is applied to the BPD dispatch center and includes:

<u>Call answering time</u>: The call arrives at the PSAP and communications center by phone and is processed as outlined in the standard as follows:

- Ninety percent of events received on emergency lines shall be answered within 15 seconds, 95 percent of alarms shall be answered in 20 seconds, and no more than 40 seconds 99 percent of the time.

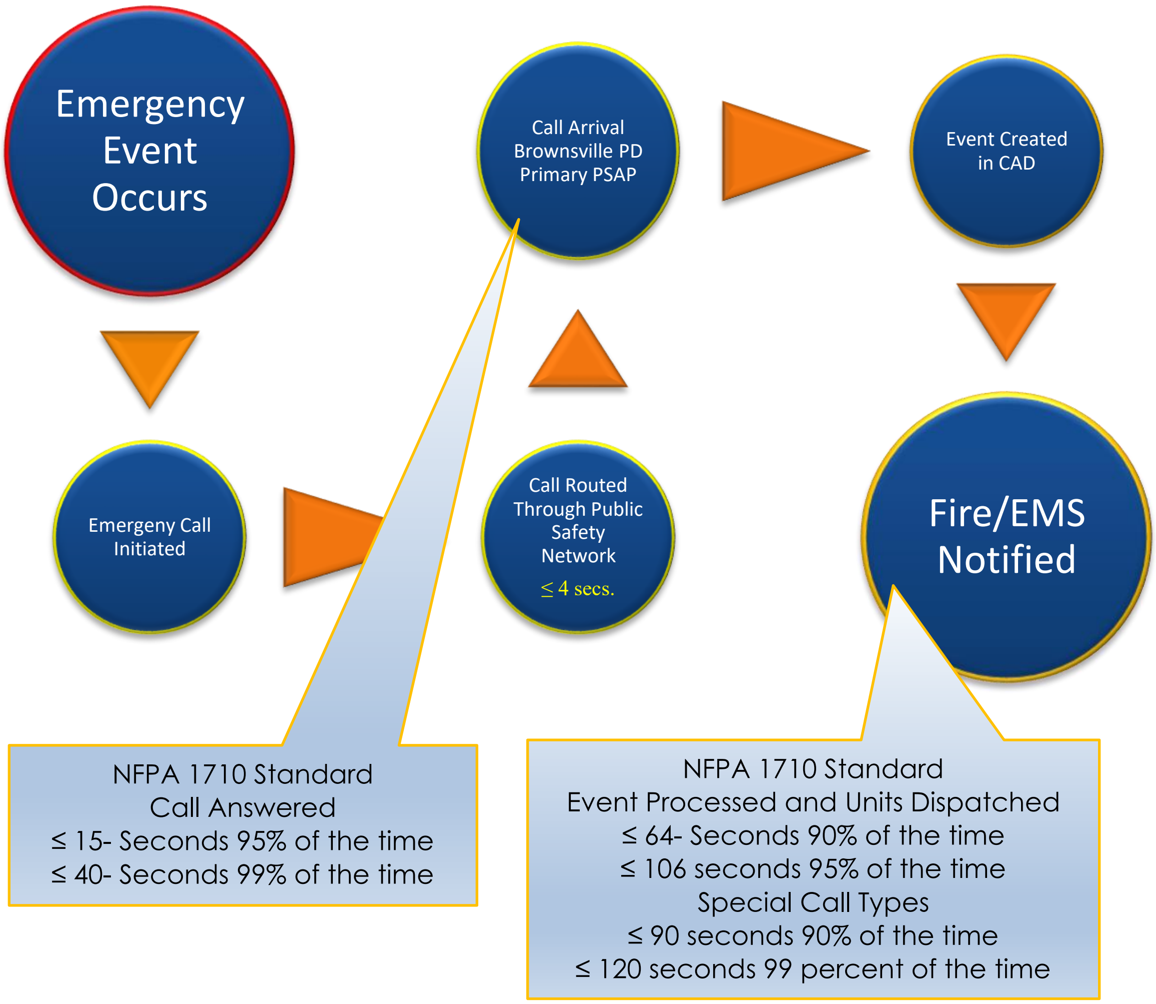
<u>Alarm processing time:</u> Event processing times at the BPD shall be completed in 64 seconds 90 percent of the time and not more than 106 seconds 95 percent of the time.

Alarm processing time for the following call types shall be completed within 90 seconds 90 percent of the time and within 120 seconds 99 percent of the time:

- *Calls requiring Emergency Medical Dispatch.*
- *Calls requiring language translation.*
- *Calls requiring TTY/TTD receipt of events.*
- *Calls of criminal activity that require information vital to emergency responder safety prior to dispatching units.*
- *Haz-mat incidents.*
- *Technical rescue incidents.*
- *Incomplete location.*
- *Calls received by text message to the communications center.*

The following figure illustrates the event timeline for a PSAP to receive, process, and dispatch the incident.

FIGURE 4-4: Event Timeline for 911 Call Receipt, Processing, and Dispatch



In the data provided by the city, 25 percent of responding BFD runs lacked a dispatch time. For these cases, the missing dispatch time was approximated by the en route time of the run. For this reason, turnout time is underestimated while dispatch time is overestimated. Nevertheless, the total response time remains unchanged.

The average BPD PSAP call processing time (dispatch time) for the two study years are:

- 2019: 5.1 minutes for EMS, 5.8 minutes for fire.
- 2020: 6.8 minutes for EMS, 6.8 minutes for fire.

These times are well above the NFPA standard.

The BPD PSAP currently uses Spillman as its computer-aided dispatch (CAD) system. However, at the time of this assessment the city was transitioning to a new Tyler Technologies CAD. The fire department uses Emergency Reporting as its records management system (RMS). It was reported that the Tyler CAD interfaces better with Emergency Reporting.

In February 2022, the BFD implemented an innovative pilot program where it details a paramedic on special assignment to the dispatch center to screen calls and, when appropriate, direct callers to other services that may be more suitable for their immediate needs other than an ambulance response and/or a trip to the hospital (or a refusal). This position is currently staffed Monday through Friday from 8:00 a.m. to 5:00 p.m. In the first four months that the program was in place the screening medic handled a total 2,215 screening calls, an average of 553.75 per month. The screening completed include 319 incidents where a modified 9-1-1 response was sent to evaluate the patient, 1,219 incidents where no dispatch of emergency resources turned out to be necessary, 119 calls that were canceled after dispatch once more information was obtained, and providing information to 558 callers without the need to dispatch emergency resources. **The BFD is to be commended for this innovative program which CPSM considers to be a Best Practice**.

911-Dispatch Recommendations:

- The BFD should work with the BPD to implement performance measures and compliance methodologies for call processing times in the 911-dispatch center to address those calls that are missing call processing data and to address the long call processing times. There should be a focus on closing the gap between the national standard and the current time to process and dispatch a fire or EMS call. (Recommendation No. 24.)
- The City of Brownsville and BFD should consider expanding the hours and making permanent the EMS screening program in the 911-dispatch center. (Recommendation No. 25.)

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As with many joint police and fire/EMS dispatch centers, particularly those that are operated by law enforcement agencies, the fire/EMS stakeholders often feel as though they are low priority stakeholders in the emergency communications process and that priority is always given to the needs of law enforcement. This is the case in Brownsville, where multiple stakeholders expressed concern about the level of training and experience of dispatchers due to turnover and retention challenges (which impact dispatch and communications centers throughout the United States), lack of input into operational procedures and issues including no current use of EMD, and a perception that the center is police-centric, with priority given to their needs and operations. While there have been some discussions in the past regarding a regional fire and EMS dispatch center for Cameron County, those talks have never advanced very far.

911-Dispatch Recommendations:

- The City of Brownsville should form an advisory board for the 911-dispatch center that is comprised of representatives of both the BFD and BPD. The advisory board should meet monthly to discuss issues such as staffing and turnover, dispatcher training, and the development of standard operating procedures for handling fire and EMS incidents. (Recommendation No. 26.)
- The City of Brownsville and BFD should, with potential partners, explore the feasibility of establishing a regional/county fire and EMS centric 911-dispatch and communications center. (Recommendation No. 27.)

BFD RESPONSE METRICS

There is no "right" amount of fire protection and EMS delivery. It is a constantly changing level based on such things as the expressed needs of the community, community risk, and population growth. So, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is identified to exist. The strategic and tactical challenges presented by the widely varied hazards that the department protects against need to be identified and planned for through a community risk analysis planning and management process as identified in this report. <u>It is ultimately the responsibility of elected officials to determine the level of risk that is acceptable to their community. Once the acceptable level of risk has been determined, then operational service objectives can be established.</u> Whether looking at acceptable risk, or level of service objectives, it would be imprudent, and probably very costly, to build a deployment strategy that is based solely upon response times.

Response times are typically the primary measurement for evaluating fire and EMS services. Response times can be used as a benchmark to determine how well a fire department is currently performing, to help identify response trends, and to predict future operational needs. Achieving the quickest and safest response times possible should be a fundamental goal of every fire department.

However, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four to six minutes of the onset. However, cardiac arrests occur very infrequently; on average they are 1 percent to 1.5 percent of all EMS incidents.[35] There are also other EMS incidents that are truly life-threatening and the time of response can clearly impact the outcome. These involve cardiac and respiratory emergencies, full drownings, obstetrical emergencies, allergic reactions, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls is limited.

An important factor in the whole response time question is what we term "**detection time**." This is the time it takes to detect a fire or a medical situation and notify 911 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are not present or inoperable, the detection times can be extended. Fires that go undetected and are allowed to expand in size become more destructive and are difficult to extinguish.

For the purpose of this analysis, ***response time*** is a product of three components: ***dispatch time***, ***turnout time***, and ***travel time***.

- <u>***Dispatch time***</u> is the time interval that begins when the alarm is received at the initial public safety answering point (PSAP) or communications center and ends when the response information begins to be transmitted via voice and/or electronic means to the emergency response facility or emergency response units or personnel in the field.
- <u>***Turnout time***</u> is the time interval that begins when the notification process to emergency response facilities and emergency response personnel and units begins by an audible alarm

35. Myers, Slovis, Eckstein, Goodloe et al. (2007). "Evidence-based Performance Measures for Emergency Medical Services System: A Model for Expanded EMS Benchmarking." *Pre-hospital Emergency Care*.

and/or visual announcement and ends at the beginning point of travel time. The fire department has the greatest control over these segments of the total response time.

- ***Travel time*** is the time interval that initiates when the emergency response unit is actually moving in response to the incident and ends when the unit arrives at the scene.
- ***Response time***, also known as **total response time**, is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit(s) arrives on the scene of the incident to initiate action.

For this study, and unless otherwise indicated, response times and travel times measure the first arriving unit only.

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2020 Edition:

- **Alarm processing time or dispatch time** should be less than or equal to 60 seconds 90 percent of the time.
- **Turnout time**, which can be controlled by the fire department, should be less than or equal to 60 seconds for EMS incidents, and 80 seconds (1.33 minutes) for fire and special operations 90 percent of the time. As noted above, turnout time is the segment of total response time that the fire department has the most ability to control through employee behavior and station layout (time to travel by foot from day/night areas to apparatus) primarily.
- **Travel time** shall be:
  - Less than or equal to 240 seconds for the first arriving engine company to a fire suppression incident 90 percent of the time.
  - Less than or equal to 360 seconds for the second arriving engine company to a fire suppression incident 90 percent of the time.
  - The initial first alarm assignment should be assembled on scene in 480 seconds 90 percent of the time for low/medium hazards and in 610 seconds for high-rise or high hazards.
  - For EMS incidents the standard (NFPA 1710) is less than or equal to 240 seconds for the first arriving engine company with automatic external (AED), defibrillator, or higher level capability; and 480 seconds or less travel time of an Advanced Life Support (ALS) unit at an EMS incident where the service is provided by the fire department provided a first responder with an AED or basic life support unit arrived in 240 seconds or less travel time.

It should be noted that NFPA 1710 response time criterion is a nationally accepted benchmark for service delivery but not necessarily a CPSM recommendation. However, CPSM was informed that the City of Brownsville desires to meet the NFPA 1710 recommended benchmarks as much as possible and that maintaining acceptable response times are an important priority for the city's leaders.

The following figures provide: 1) an overview of response time performance and identify responsibility of the key components of the emergency communications center and the fire and rescue department, and 2) an overview of the fire department incident cascade of events.

FIGURE 4-5: Response Time Performance Measures

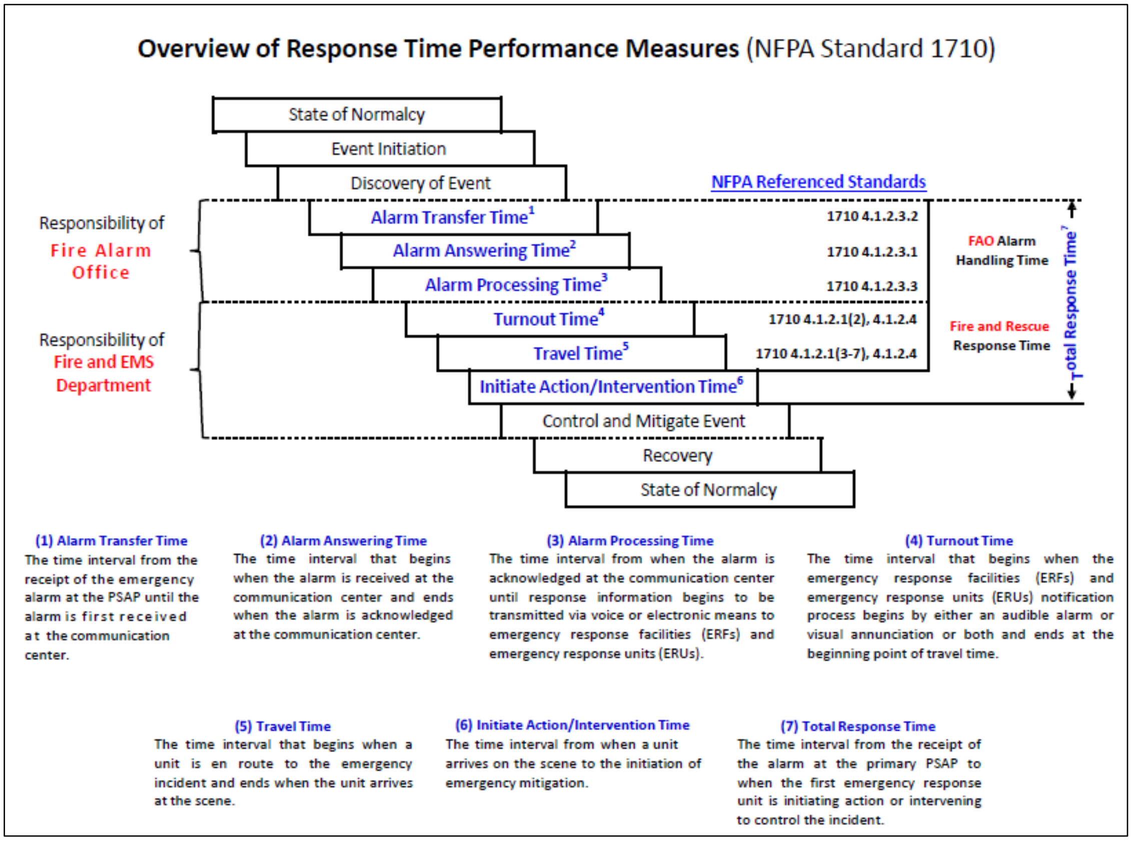
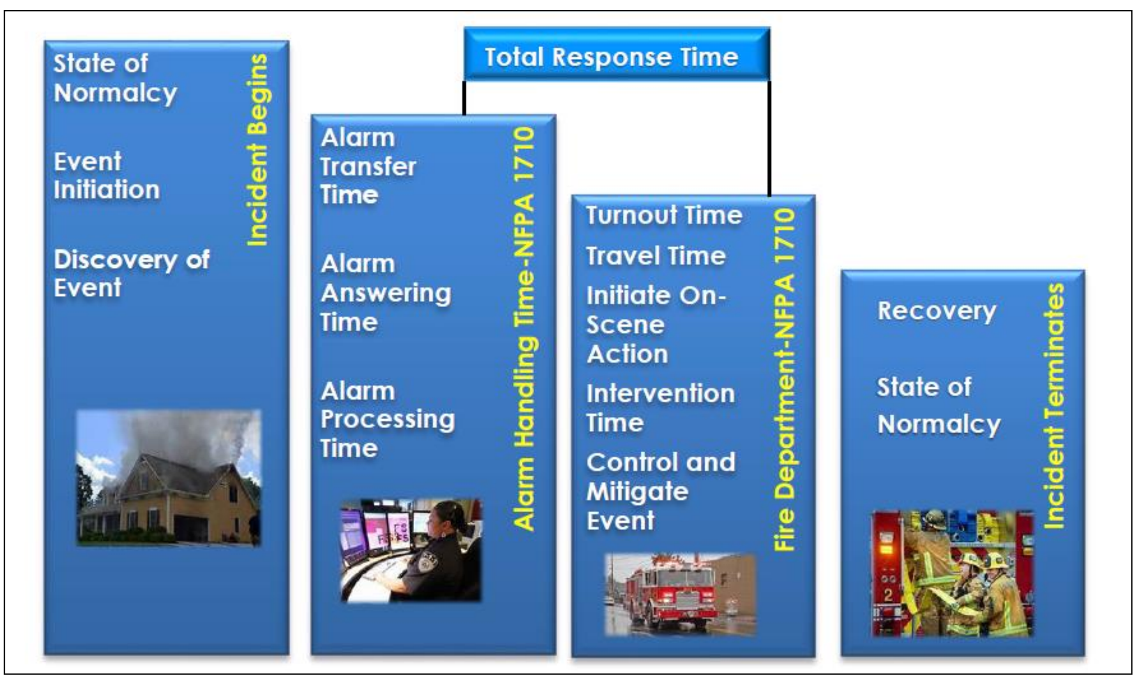


FIGURE 4-6: Incident Cascade of Events



Regarding response times for fire incidents, the criterion is linked to the concept of **"flashover."** This is the point in a fire at which super-heated gasses from a fire are released rapidly, causing the fire to burn freely and become so volatile that the fire reaches an explosive state (simultaneous ignition of all the combustible materials in a room). In this situation, usually after an extended period (often eight to twelve minutes after ignition but times as quickly as five to seven minutes), and a combination of the right conditions (fuel and oxygen), the fire expands rapidly and is much more difficult to contain. <u>When the fire does reach this extremely hazardous state, initial firefighting forces are often overwhelmed, larger and more destructive fire occurs, the fire escapes the room and possibly even the building of origin, and significantly more resources are required to affect fire control and extinguishment.</u>

Flashover occurs more quickly and more frequently today and is caused at least in part by the introduction of significant quantities of plastic- and foam-based products into homes and businesses (e.g., furnishings, mattresses, bedding, plumbing and electrical components, home and business electronics, decorative materials, insulation, and structural components). These materials ignite and burn quickly and produce extreme heat and toxic smoke.

NFPA 1710 outlines recommended organization and deployment of operations by career—and primarily career—fire and rescue organizations.[36] It is the benchmark standard that the U.S. Department of Homeland Security utilizes when evaluating applications for staffing grants under the Staffing for Adequate Fire and Emergency Response (SAFER) grant program.

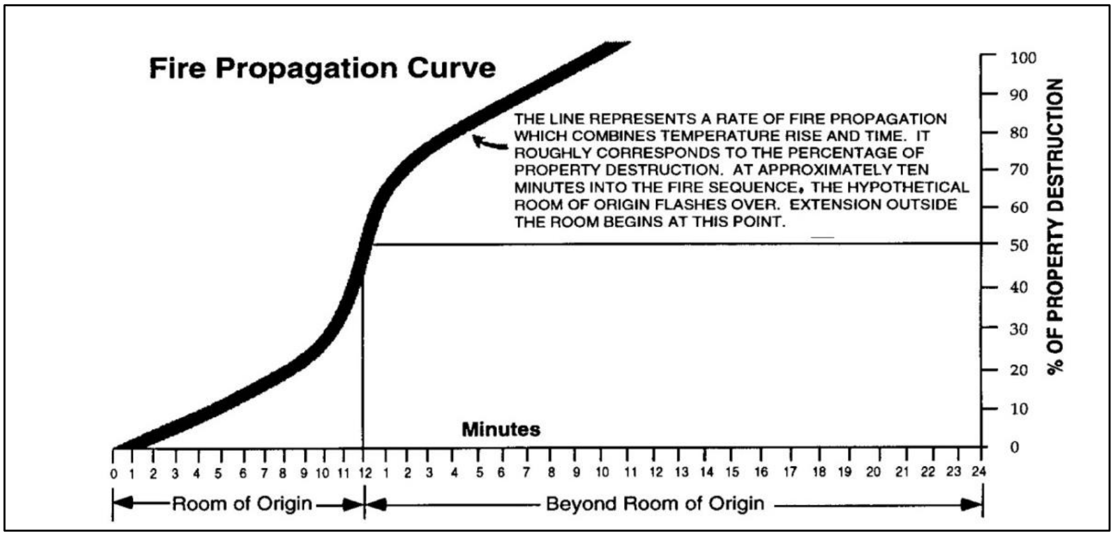
As a benchmark, paragraph 4.1.2.1(3) of NFPA 1710 recommends the first arriving engine at a fire suppression incident have **a travel time of 240 seconds or less**. Paragraph 4.1.2.1(4) recommends that other than for a high-rise incident, **the entire initial response of personnel be on scene within eight minutes (480 seconds) travel time.** It is also important to keep in mind that once units arrive on scene, they will need to get set up to commence operations. NFPA 1710 recommends that units be able to commence an initial attack within two minutes of arrival, 90 percent of the time.

Although trying to reach the NFPA benchmark for travel time may be laudable, the question is, at what cost? What is the evidence that supports such recommendations? NFPA 1710's travel times are established for two primary reasons: (1) the fire propagation curve; and (2) sudden cardiac arrest, where brain damage and permanent brain death occurs in four to six minutes.

The following figure shows the fire propagation curve relative to fire being confined to the room of origin or spreading beyond it and the percentage of destruction of property by the fire.

36. NFPA 1710 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of Texas. It is a valuable resource for establishing and measuring performance objectives for the City of Brownsville but should not be the sole determining factor when making local decisions about the city's fire and EMS services.

FIGURE 4-7: Fire Propagation Curve



Source: John C. Gerard and A. Terry Jacobsen, "Reduced Staffing: At What Cost?" *Fire Service Today* (September 1981), 15–21.

According to fire service educator Clinton Smoke, the fire propagation curve establishes that temperature rise and time within in a room on fire corresponds with property destruction and potential loss of life if present.[37] At approximately the eight- to ten-minute mark of fire progression, the fire flashes over (due to superheating of room contents and other combustibles) and extends beyond the room of origin, thus increasing proportionately the destruction to property and potential endangerment of life. The ability to quickly deploy adequate fire staff prior to flashover thus limits the fire's extension beyond the room or area of origin.

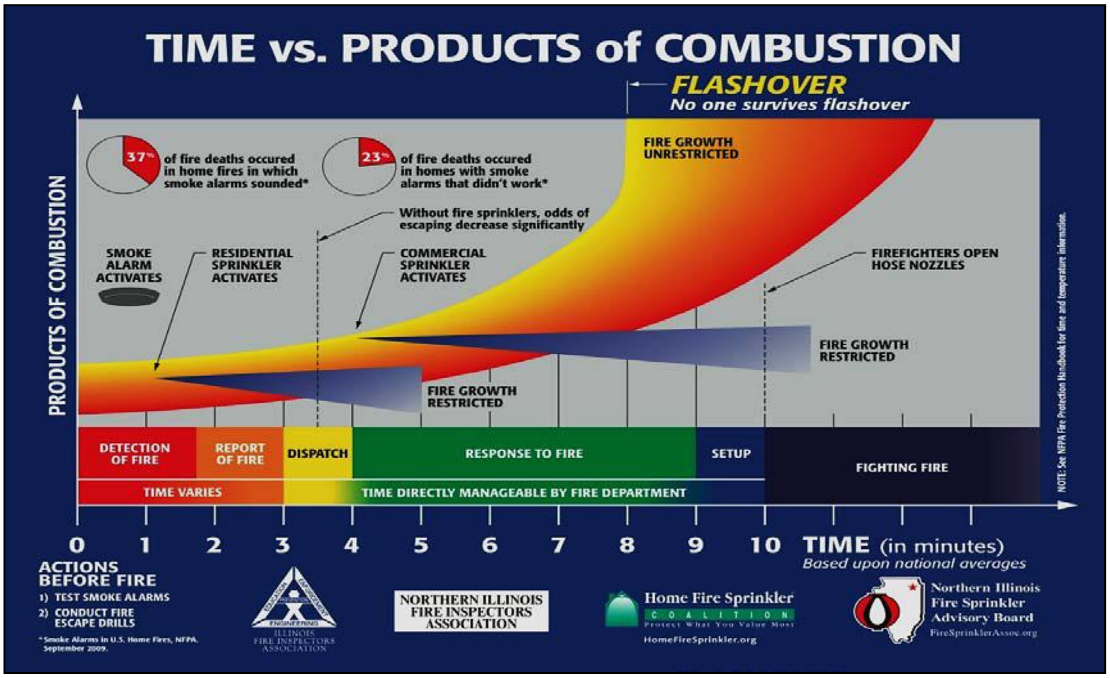
Regarding the risk of flashover, the authors of an International Association of Firefighters (IAFF) report conclude:

> *Clearly, an early aggressive and offensive initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Consequently, given that the progression of a structural fire to the point of "flashover" (the very rapid spreading of the fire due to super-heating of room contents and other combustibles) generally occurs in less than 10 minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.*[38]

The following figure illustrates the time progression of a fire from inception through flashover. Flashover occurs at eight to ten minutes (***or less dependent on fuel***), allowing the fire to extend beyond the room of origin. The time versus products of combustion curve shows activation times and effectiveness of residential sprinklers (approximately one minute), commercial sprinklers (four minutes), flashover (eight to ten minutes), and firefighters applying first water to the fire after notification, dispatch, response, and set up (ten minutes). It also illustrates that the fire department's response time to the fire is one of the only aspects of the timeline that the fire department can exert direct control over.

37. Clinton Smoke, *Company Officer*, 2nd ed. (Clifton Park, NY: Delmar, 2005).
38. *Safe Fire Fighter Staffing: Critical Considerations*, 2nd ed. (Washington, DC: International Association of Fire Fighters), 5.

FIGURE 4-8: Fire Growth from Inception to Flashover[39]



EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 and 1720 as response time benchmarking documents, EMS' focus is and should be directed to the evidence-based research relationship between clinical outcomes and response times. Much of the current research suggests response times have little impact on clinical outcomes outside of a small segment of call types. These include cerebrovascular accidents (stroke), injury or illness compromising the respiratory system, injury or illness compromising the cardiovascular system to include S-T segment elevation emergencies, and certain obstetrical emergencies. Each require rapid response times, rapid on-scene treatment and packaging for transport, and rapid transport to the hospital.

Paragraph 4.1.2.1(7) of NFPA 1710 recommends that for EMS incidents a fire unit with first responder or higher-level trained personnel and equipped with an AED should arrive on scene within four minutes of travel time (time after call is processed, dispatched, and the unit turns out). An advanced life support (ALS) unit should arrive on scene within eight minutes travel time, provided the fire department responded first with first responder or higher-level trained personnel and equipped with an AED. According the NFPA 1710, *"This requirement is based on experience, expert consensus, and science. Many studies note the role of time and the delivery of early defibrillation in patient survival due to heart attacks and cardiac arrest, which are the most time-critical, resource-intensive medical emergency events to which fire departments respond."*

The next figure illustrates the chance of survival from the onset of cardiac arrest, largely due to ventricular fibrillation in terms of minutes without emergency defibrillation delivered by the public or emergency responders. The chance of survival has not changed over time since this graphic was published by the American Heart Association in 2000.

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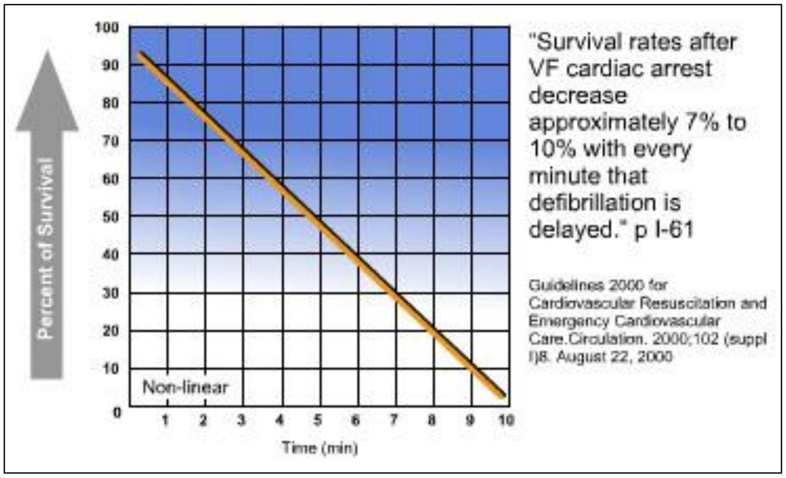
39. Source: Northern Illinois Fire Sprinkler Advisory Board.

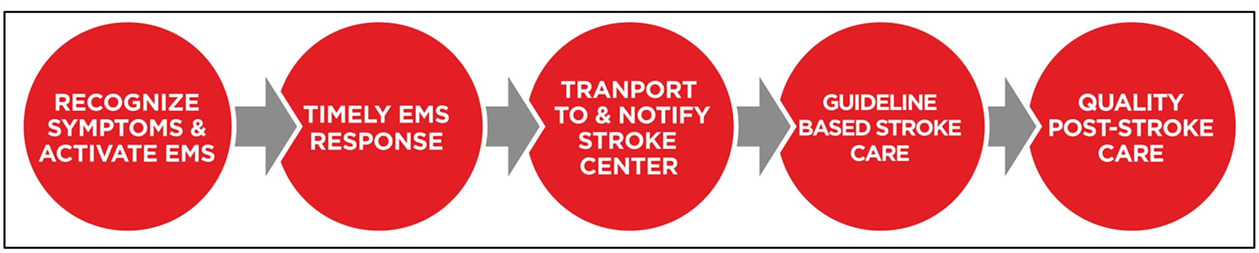
FIGURE 4-9: Cardiac Arrest Survival Probability by Minute



Typically, a low percentage of 911 patients have time-sensitive and advanced life support (ALS) needs. But, for those patients that do, time can be a critical issue of morbidity and mortality. For the remainder of those calling 911 for a medical emergency, though they may not have a medical necessity, they still expect rapid customer service. Response times for patients and their families are often the most important measurement of the EMS department. Regardless of the service delivery model, appropriate response times are more than a clinical issue; they are also a customer service issue and should not be ignored.

In addition, a true emergency is when an illness or injury places a person's health or life in serious jeopardy and treatment cannot be delayed. Examples include severe trauma with cardiovascular system compromise, difficulty breathing, chest pain with S-T segment elevation (STEMI), a head injury, or ingestion of a toxic substance.[40] The next figure illustrates the out-of-hospital chain of survival for a stroke emergency, which is a series of actions that, when put in motion, reduce the mortality of a stroke emergency.

FIGURE 4-10: Cerebrovascular Emergency (Stroke) Chain of Survival



Source: https://nhcps.com/lesson/acls-acute-stroke-care/

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequency of these types of calls is limited as compared to the routine, low-priority EMS incident responses. In some cases, these emergencies often make up no more than 5 percent of all EMS calls.[41]

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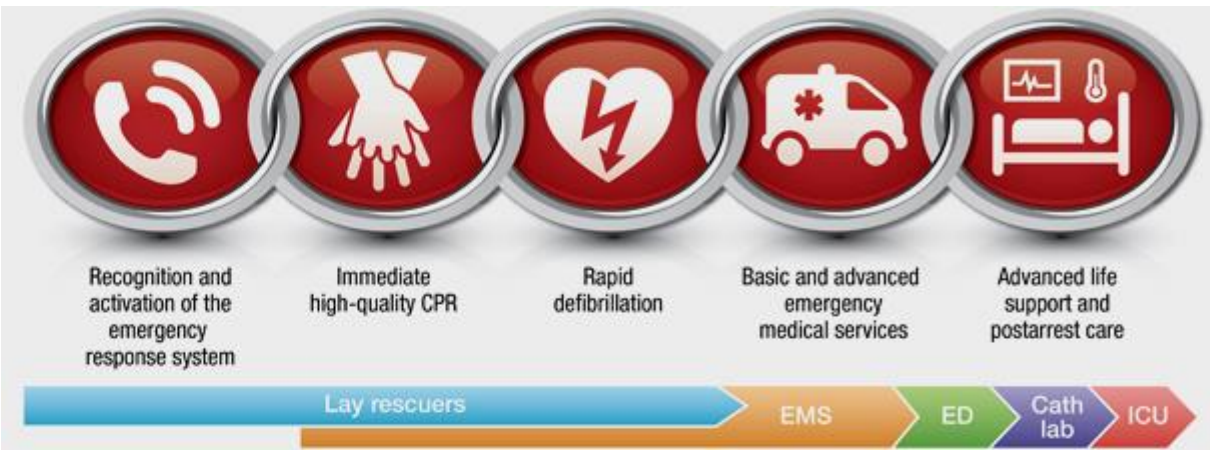
40. Mills-Peninsula Health Blog, Bruce Wapen, MD.

41. www.firehouse.com/apparatus/article/10545016/operations-back-to-basics-true-emergency-and-due-regard

Cardiac arrest is one emergency for which EMS response times were initially built around. The science tells us that the brain begins to die without oxygenated blood flow at the four- to six-minute mark. Without immediate cardiopulmonary resuscitation (CPR) and rapid defibrillation, the chances of survival diminish rapidly at the cessation of breathing and heart pumping activity. For every minute without CPR and/or defibrillation, chances of survival decrease 7 to 10 percent. Further, only 10 percent of victims who suffer cardiac arrest outside of the hospital survive.[42]

The following figure illustrates the out of hospital chain of survival, which is a series of actions that, when put in motion, reduce the mortality of sudden cardiac arrest. Adequate EMS response times coupled with community and public access defibrillator programs potentially can impact the survival rate of sudden cardiac arrest victims by deploying early CPR, early defibrillation, and early advanced life support care provided in the prehospital setting.

FIGURE 4-11: Sudden Cardiac Arrest Chain of Survival



From: "Out of Hospital Chain of Survival," http://cpr.heart.org/AHAECC/CPRAndECC/AboutCPRFirstAid/CPRFactsAndStats/UCM_475731_Out-of-hospital-Chain-of-Survival.jsp

The primary focus of the following part of this section is the dispatch and response time of the first arriving units for calls responded to with lights and sirens (Code 3).

In the provided data, 25 percent of responding BFD runs lacked a dispatch time. For these cases, the missing dispatch time was approximated by the en route time of the run. For this reason, turnout time is underestimated while dispatch time is overestimated. Nevertheless, the total response time remains unchanged.

In the analysis, CPSM included all calls within the Brownsville fire district to which at least one non-administrative BFD unit arrived. Calls with a total response time exceeding 30 minutes were excluded. In addition, non-emergency calls (priority levels are other than 1) were excluded. Finally, we focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time.

Based on the methodology above, for 28,678 calls in 2019 we excluded 62 mutual aid calls (outside Brownsville's fire district), 768 canceled calls, 11,384 non-emergency calls, 767 calls

42. American Heart Association. *A Race Against the Clock, Out of Hospital Cardiac Arrest*. 2014

where no units recorded a valid on-scene time, 553 calls where one or more segments of the first arriving unit's response time could not be calculated due to missing or faulty data, and 357 calls with a total response time exceeding 30 minutes. As a result, in this section, a total of 14,787 calls are included in the analysis. Using the same method, we obtained 13,939 calls for the same analysis for 2020.

The following tables provide the average and 90th percentile dispatch, turnout, travel, and total response time for the first arriving unit to each call in Brownsville's fire district.

TABLE 4-2: Average Response Time of First Arriving Unit, by Call Type and Year

Call Type	2019					2020				
	Time (Minutes)				Calls	Time (Minutes)				Calls
	Dispatch	Turnout	Travel	Total		Dispatch	Turnout	Travel	Total	
Breathing difficulty	2.7	0.6	8.8	12.2	995	4.1	0.8	9.5	14.3	1,030
Cardiac and stroke	3.0	0.7	8.4	12.0	868	3.7	0.7	9.0	13.4	810
Fall and injury	3.5	0.6	8.7	12.8	1,377	4.1	0.7	9.1	13.9	1,086
Illness and other	3.0	0.6	9.1	12.7	7,334	4.0	0.7	9.8	14.5	7,380
MVA	3.3	0.7	6.5	10.5	531	3.4	0.7	7.3	11.4	414
Overdose and psychiatric	3.8	0.7	9.3	13.8	918	4.3	0.7	10.0	14.9	678
Seizure and Unconsciousness	2.9	0.6	8.5	12.0	1,393	3.7	0.7	8.9	13.3	1,153
EMS Total	**3.1**	**0.6**	**8.9**	**12.6**	**13,416**	**3.9**	**0.7**	**9.5**	**14.1**	**12,551**
False alarm	2.9	0.7	8.4	12.0	601	3.1	0.6	8.9	12.6	562
Good intent	3.1	0.7	7.1	11.0	99	3.5	0.7	8.3	12.4	112
Hazard	3.2	0.6	8.3	12.1	165	3.1	0.6	8.2	11.9	161
Outside fire	2.4	0.5	7.4	10.3	118	2.5	0.6	8.0	11.0	148
Public service	4.8	0.6	8.3	13.8	296	6.0	0.7	9.1	15.8	302
Structure fire	2.3	0.5	6.9	9.7	92	2.9	0.6	5.6	9.1	103
Fire Total	**3.3**	**0.6**	**8.1**	**12.0**	**1,371**	**3.7**	**0.6**	**8.5**	**12.8**	**1,388**
Total	**3.1**	**0.6**	**8.8**	**12.5**	**14,787**	**3.9**	**0.7**	**9.4**	**14.0**	**13,939**

Analysis of this table tells us:

- The average dispatch time for all calls was 3.1 minutes in 2019, increasing significantly to 3.9 minutes in 2020.
- The average turnout time for all calls was 0.6 minutes in 2019, increasing slightly to 0.7 minutes in 2020.
- The average travel time for all calls was 8.8 minutes in 2019, increasing to 9.4 minutes in 2020.
- The average total response time for all calls was 12.5 minutes in 2019, increasing to 14.9 minutes in 2020.
- The average response time was 12.6 minutes for EMS calls in 2019 and 12.0 minutes for fire calls. In 2020, these increased to 14.1 for EMS and 12.8 for fire.
- The average response time in 2019 was 10.3 minutes for outside fires and 9.7 minutes for structure fires. In 2020, the time for outside fires increased to 11.0 minutes while the average response time to structure fires decreased to 9.1 minutes.

A more conservative and stricter measure of total response time is the 90th percentile measurement. Simply explained, for 90 percent of calls, the first unit arrived within a specified time, and if measured, the second and third unit. The next table includes the 90th percentile times for dispatch, turnout, travel, and total response time to each call type in Brownsville broken down by call type. The table shows a 90th percentile response time of 18.4 minutes in 2019 which means that 90 percent of the time a call had a response time of no more than 18.4 minutes. In 2020, the 90th percentile increased to 20.7 minutes.

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TABLE 4-3: 90th Percentile Response Time of First Arriving Unit, by Call Type and Year (Minutes)

Call Type	2019					2020				
	Dispatch	Turnout	Travel	Total	Calls	Dispatch	Turnout	Travel	Total	Calls
Breathing difficulty	4.4	1.0	13.9	17.6	995	7.4	1.2	14.8	21.0	1,030
Cardiac and stroke	4.8	1.1	13.3	17.4	868	6.5	1.1	14.0	19.6	810
Fall and injury	6.0	1.0	14.2	19.6	1,377	7.3	1.2	14.2	20.4	1,086
Illness and other	5.0	0.9	14.1	18.4	7,334	6.8	1.1	15.3	21.2	7,380
MVA	5.5	1.2	11.3	16.2	531	5.6	1.2	12.8	17.2	414
Overdose and psychiatric	6.8	1.0	14.7	21.5	918	7.7	1.1	15.9	22.3	678
Seizure and Unconsciousness	5.1	1.0	13.6	17.7	1,393	6.2	1.2	13.4	19.1	1,153
EMS Total	**5.1**	**1.0**	**13.9**	**18.4**	**13,416**	**6.8**	**1.1**	**14.9**	**20.8**	**12,551**
False alarm	5.3	1.1	12.7	17.2	601	5.2	1.2	13.8	18.1	562
Good intent	5.0	1.2	11.0	16.3	99	5.8	1.3	12.8	18.0	112
Hazard	5.3	1.1	13.9	19.1	165	5.8	1.1	13.0	17.9	161
Outside fire	4.1	1.0	12.6	16.1	118	4.2	1.1	14.4	17.7	148
Public service	11.2	1.1	14.1	22.7	296	14.0	1.2	14.8	24.6	302
Structure fire	3.5	1.0	10.3	13.0	92	5.2	1.3	8.6	12.6	103
Fire Total	**5.8**	**1.1**	**12.8**	**18.5**	**1,371**	**6.8**	**1.2**	**13.6**	**19.5**	**1,388**
Total	**5.2**	**1.0**	**13.9**	**18.4**	**14,787**	**6.8**	**1.1**	**14.8**	**20.7**	**13,939**

Observations from this table tell us:

- 90th percentile dispatch time was 5.2 minutes in 2019 increasing to 6.8 minutes in 2020. **Both fire and EMS dispatching times are well above the recommended NFPA benchmark, as we noted previously. At nearly seven minutes in 2020 for fire (and taking into account estimates due to missing data), this is inadequate and needs to be addressed.** ***This is out of the control of the BFD.***
- **90th percentile turnout time was 1.0 minutes in 2019, increasing slightly to 1.1 minutes in 2020.** Again, this time is estimated in the data. Remember, this is the one aspect of total response time on which the fire department has the most direct impact.

- Aggregate fire and EMS 90th percentile travel time was 13.9 minutes in 2019, increasing to 14.8 minutes in 2020, which are both well above the NFPA 1710 benchmark. **Both fire and EMS travel times are well above the recommended NFPA benchmark of 240 seconds, in fact, more than three times the recommended benchmark. This is totally inadequate and needs to be addressed. *This in the control of the BFD.***
- 90th percentile total response time for all calls was 18.4 minutes in 2019, significantly exceeding by nearly a factor of three, the NFPA 1710 benchmarks of 6.0 and 6.33 minutes, respectively. In 2020, the total response time increased by 2.3 minutes to 20.7 minutes. Travel times are dictated by the road network and accessibility to local streets, time of day when traffic congestion is heaviest, weather, and station location with respect to the incident. **Both fire and EMS total travel times are well above the recommended NFPA benchmark of approximately six minutes (360 seconds). This is totally inadequate and needs to be addressed. *Other than station location(s), this is out of the control of the BFD.* However, as will be illustrated in the next part of this section, the current BFD station configuration does not support the extended response times found in the data.**

Response Metrics Recommendation:

- The Brownsville Fire Department should aggressively take whatever steps are necessary to significantly improve dispatch and travel times for both fire and EMS incidents in order to reduce and improve overall response times to emergency incidents. (Recommendation No. 28.)

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The next table shows the workload of each BFD for 2019, and the amount of time they were deployed each day. The table tells us that:

- Among all engines, unit FE6 made the most runs (1,608 or an average of 4.4 runs per day) and had the highest total annual deployed time (993.8 hours or an average of 2.7 hours per day).
- EMS calls accounted for 54.1 percent of runs and 56.2 percent of total deployed time.
- Outside and structure fire calls accounted for 6.1 percent of runs and 10.6 percent of total deployed time.
- Among all ALS ambulances, unit M6 made the most runs (3,873 or an average of 10.6 runs per day) and had the second-highest total annual deployed time (3,587.0 hours or an average of 9.8 hours per day).
- EMS calls accounted for 96.2 percent of runs and 97.6 percent of total deployed time.
- Outside and structure fire calls accounted for 0.4 percent of runs and 0.2 percent of total deployed time.

The takeaway from these statistics is that no unit of the BFD is unreasonably busy when measured either by total number of runs or total time deployed each day. This is particularly true with regards to the very high travel times that the department's data shows. This level of activity should not impact response time to the extent that the data indicates. The busiest unit in the department, Medic 9, was committed to calls about 44 percent of the time. It also handled the most calls at 11.8 percent of the total.

TABLE 4-4: Workload by Unit

Station	Unit	Unit Type	Minutes per Run	Total Hours	Total Percent	Minutes per Day	Total Runs	Runs per Day
1	FB	Brush truck	83.1	135.8	0.4	22.3	98	0.3
	FE1	Engine	33.7	712.6	2.1	117.1	1,267	3.5
	M1	ALS unit	57.2	3,347.0	10.1	550.2	3,512	9.6
	Truck1	Ladder truck 105-foot	61.2	24.5	0.1	4.0	24	0.1
	Other	Other	41.4	44.9	0.1	7.4	65	0.2
		Total	**51.5**	**4,264.7**	**12.9**	**701.0**	**4,966**	**13.6**
2	FE2	Engine	34.7	596.4	1.8	98.0	1,031	2.8
	Other	Other	274.1	9.1	0.0	1.5	2	0.0
		Total	**35.2**	**605.5**	**1.8**	**99.5**	**1,033**	**2.8**
3	FE3	Engine	37.4	869.2	2.6	142.9	1,395	3.8
	M3	ALS unit	61.5	3,245.9	9.8	533.6	3,168	8.7
	Other	Other	44.6	1.5	0.0	0.2	2	0.0
		Total	**54.1**	**4,116.6**	**12.4**	**676.7**	**4,565**	**12.5**
4	FE4	Engine	33.7	785.4	2.4	129.1	1,398	3.8
	M4	ALS unit	61.5	3,717.7	11.2	611.1	3,628	9.9
		Total	**53.8**	**4,503.1**	**13.6**	**740.2**	**5,026**	**13.8**
5	FR1	ARFF	48.5	114.8	0.3	18.9	142	0.4
	FR2	ARFF	37.8	31.5	0.1	5.2	50	0.1
		Total	**45.7**	**146.3**	**0.4**	**24.0**	**192**	**0.5**
6	FE6	Engine	37.1	993.8	3.0	163.4	1,608	4.4
	M6	ALS unit	55.6	3,587.5	10.8	589.7	3,873	10.6
		Total	**50.2**	**4,581.2**	**13.8**	**753.1**	**5,481**	**15.0**
7	FE7	Engine	34.8	603.8	1.8	99.3	1,040	2.8
	M7	ALS unit	58.5	3,418.1	10.3	561.9	3,503	9.6
		Total	**53.1**	**4,021.9**	**12.1**	**661.1**	**4,543**	**12.4**
8	FE8	Engine	42.4	890.5	2.7	146.4	1,260	3.5
	M8	ALS unit	57.2	3,042.6	9.2	500.2	3,194	8.8
		Total	**53.0**	**3,933.1**	**11.9**	**646.5**	**4,454**	**12.2**
9	FE9	Engine	39.1	985.3	3.0	162.0	1,512	4.1
	FHR	Heavy rescue	41.6	210.8	0.6	34.6	304	0.8
	M9	ALS unit	60.9	3,919.0	11.8	644.2	3,861	10.6
	TU1	BLS unit	70.9	1,716.2	5.2	282.1	1,452	4.0
	Other	Other	68.2	46.6	0.1	7.7	41	0.1
		Total	**57.6**	**6,877.9**	**20.7**	**1,130.6**	**7,170**	**19.6**
10	M10	ALS unit	187.5	137.5	0.4	22.6	44	0.1
Total			**53.1**	**33,187.8**	**100.0**	**5,455.5**	**37,474**	**102.7**

The next table illustrates the duration of calls by type. Fifty percent of BFD calls lasted from one to two hours, and 3.9 percent lasted for two hours or more. This is an exceptionally high percentage of long calls, particularly in a city that has two hospitals within its borders.

TABLE 4-5: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	Two or More Hours	Total
Breathing difficulty	71	325	674	22	1,092
Cardiac and stroke	43	247	637	26	953
Fall and injury	186	456	945	40	1,627
Illness and other	1,282	2,905	4,475	194	8,856
MVA	375	474	657	78	1,584
Non-emergency transfer	361	1,596	4,876	485	7,318
Overdose and psychiatric	196	589	654	31	1,470
Seizure and unconsciousness	136	548	985	44	1,713
EMS Total	**2,650**	**7,140**	**13,903**	**920**	**24,613**
False alarm	669	264	67	20	1,020
Good intent	120	63	26	6	215
Hazard	145	175	77	14	411
Outside fire	68	110	69	24	271
Public service	507	387	187	86	1,167
Structure fire	33	45	43	30	151
Fire Total	**1,542**	**1,044**	**469**	**180**	**3,235**
Canceled	593	105	64	6	768
Mutual aid	8	19	28	7	62
Total	**4,793**	**8,308**	**14,464**	**1,113**	**28,678**

The above table also shows that the largest amount of fire responses (47.7.0 percent) lasted less than thirty minutes. This suggests that nearly half of fire incidents were relatively minor in nature. However, it can also suggest that a rapid and adequate response by the fire department mitigated the incident before it escalated into a larger, more serious situation. The second largest amount of fire responses (32.3 percent) lasted 30 minutes to an hour. Just 14.5 percent of fire incidents lasted between one and two hours, while 5.6 percent were two hours or longer in duration. This would indicate more significant events. Overall, the BFD has about 54.1 fire incidents per month—12.5 per week and 1.8 per day—that lasted longer than one hour.

The following table breaks down the BFD's workload by location.

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TABLE 4-6: Annual Workload by Location

Location	Calls	Percent Calls	Runs	Runs Per Day	Minutes Per Run	Total Hours	Percent Hours	Minutes Per Day
Brownsville	27,108	94.5	35,200	96.4	53.0	31,101.0	93.7	5,112.5
Cameron County*	1,283	4.5	1,800	4.9	56.4	1,692.8	5.1	278.3
Rancho Viejo*	127	0.4	242	0.7	48.1	193.8	0.6	31.9
Olmito*	89	0.3	133	0.4	50.4	111.8	0.3	18.4
Harlingen	33	0.1	41	0.1	66.6	45.5	0.1	7.5
Other	38	0.1	58	0.2	44.4	42.9	0.1	7.1
Total	**28,678**	**100.0**	**37,474**	**102.7**	**53.1**	**33,187.8**	**100.0**	**5,455.5**

Note: Other includes ten calls in Los Fresnos, eight calls in San Benito, five calls in S. Padre Island, four calls in Cameron Park,* three calls in Port Isabel, two calls in Boca Chica,* La Feria, and Laguna Heights, and one call in both Palm Valley and Rio Hondo. *Contracted ETJ.

The next table provides further detail on the workload associated with structure and outside fire calls. It includes the mutual aid to outside and structure fires outside the City of Brownsville.

TABLE 4-7: Structure and Outside Fire Runs by Location

District	Structure Fire Runs	Structure Fire Minutes per Run	Outside Fire Runs	Outside Fire Minutes per Run	Hours for Structure and Outside Fires	Percent of Structure and Outside Fire Workload
Brownsville	508	70.8	403	58.6	993.1	86.8
Cameron County	47	90.7	63	58.9	132.9	11.6
Olmito	0	NA	18	41.7	12.5	1.1
Rancho Viejo	0	NA	4	41.2	2.7	0.2
Cameron Park	0	NA	2	76.5	2.5	0.2
San Benito*	0	NA	1	58.1	1.0	0.1
Total	**555**	**72.5**	**491**	**57.9**	**333.2**	**100.0**

Note: * Mutual aid. Except for mutual aid runs, the runs within Brownsville and its ETJs match the number of runs described in other tables within this report. ***Referred to existing Table7- 5 in data report.***

The data contained in the tables above tell us:

- 95 percent of the total calls and an average of 96.4 runs per day occurred in the City of Brownsville.
- The City of Brownsville accounted for 86.8 percent of the structure and outside fires.
- 4.5 percent of the total calls and an average of 4.9 runs per day were in Cameron County.
- Cameron County accounted for 11.6 percent of structure and outside fire workload.
- 0.4 percent of the total calls and an average of 0.7 runs per day were in Rancho Viejo.
- Rancho Viejo accounted for 0.2 percent of structure and outside fire workload.
- 0.3 percent of the total calls and an average of 0.4 runs per day occurred in Olmito.
- Olmito accounted for 1.1 percent of structure and outside fire workload.

ASSESSING THE FIRE MANAGEMENT ZONES

Travel time is key to understanding how fire and EMS station location influences a community's aggregate response time performance. In fact, where these facilities are located is the single most important factor in determining overall response times. Travel time can be mapped when existing and proposed station locations are known. The location of responding units is one key factor in response time; reducing response times, which is typically a key performance measure in determining the efficiency of department operations, often depends on this factor. The goal of placement of a single fire station or creating a network of responding fire stations in a single community is to optimize coverage with short travel distances, when possible, while giving special attention to natural and man-made barriers and response routes that can create response-time problems.[43] This goal is generally budget-driven and based on demand intensity of fire and EMS incidents, response times, and identified risks.

As already discussed, the BFD responds from a total of nine stations (not including the airport station). Seven of those stations house fire suppression and EMS units. One has only a fire suppression unit, and one has only a medic unit.

In a FY 2011 Performance Measurement Data Report on Fire and EMS, ICMA tabulated survey information from 76 municipalities with populations ranging from 25,000 to 100,000 people. In this grouping the average fire station service area was 11 square miles.[44] The median service area for this grouping of communities was 6.67 square miles per fire station.[45] The BFD protects a community of 145.2 square miles (not including county areas). Based upon the city's area, this equates to a service area of 18.15 square miles for each of the eight current city stations from which fire suppression units are deployed.

NFPA and ISO have established different indices in determining fire station distribution. The ISO Fire Suppression Rating Schedule, section 560, indicates that first-due engine companies should serve areas that are within a 1.5-mile travel distance. The placement of fire stations that achieves this type of separation creates service areas that are approximately 4.5 square miles in size, depending on the road network and other geographical barriers (rivers, lakes, railroads, limited access highways, etc.). NFPA references the placement of fire stations in an indirect way. It recommends that fire stations be placed in a distribution that achieves the desired minimum response times. NFPA Standard 1710, section 4.1.2.1(3) and (6), suggests an engine placement that achieves a 240-second (four-minute) travel time for the first arriving unit. Using an empirical model called the "piece-wise linear travel time function" the Rand Institute has estimated that the average emergency response speed for fire apparatus is 35 mph. At this speed, the distance a fire engine can travel in four minutes is approximately 1.97 miles.[46] A polygon based on a 1.97-mile travel distance results in a service area that, on average, is 7.3 square miles.[47]

It is important to make several notes regarding the polygon models and the associated travel distances and times. First, the model often assumes that resources are distributed equally throughout the service area, but this is generally not the case. In addition, the road network, and geographical barriers such as a railroad or limited access highways, can impact the distance units can cover over the same amount of time. That said, the formulas do provide a useful

43. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2010 Edition, 122.
44. *Comparative Performance Measurement*, FY 2011 Data Report - Fire and EMS, ICMA Center for Performance Measurement, August 2012.
45. Ibid.
46. University of Tennessee Municipal Technical Advisory Service, *Clinton Fire Location Station Study*, Knoxville, TN, November 2012. p. 8.
47. Ibid., p.9

reference when attempting to benchmark travel distances and response times. Although there is overlap in the station coverage areas in the older downtown part of the city, this situation is common in densely developed urban areas where fire can spread rapidly, and being able to rapidly assemble an effective response force to handle all of the crucial tasks necessary for fire suppression is mission critical.

This section expands on the travel times outlined above, depicting how travel times of 240, 360, and 480 seconds look when mapped from the current fire station locations. Illustrating response time is important when considering the location from which assets should be deployed. When historic demand is coupled with risk analysis, a more informed decision can be made.

The following figures use GIS mapping to illustrate 240-second, 360-second, and 480-second travel time bleeds, using the existing street network from the current BFD stations.

The GIS data for streets includes speed limits for each street segment and allows for "U-turns" for dead-end streets and intersections, as well as other travel obstacles.

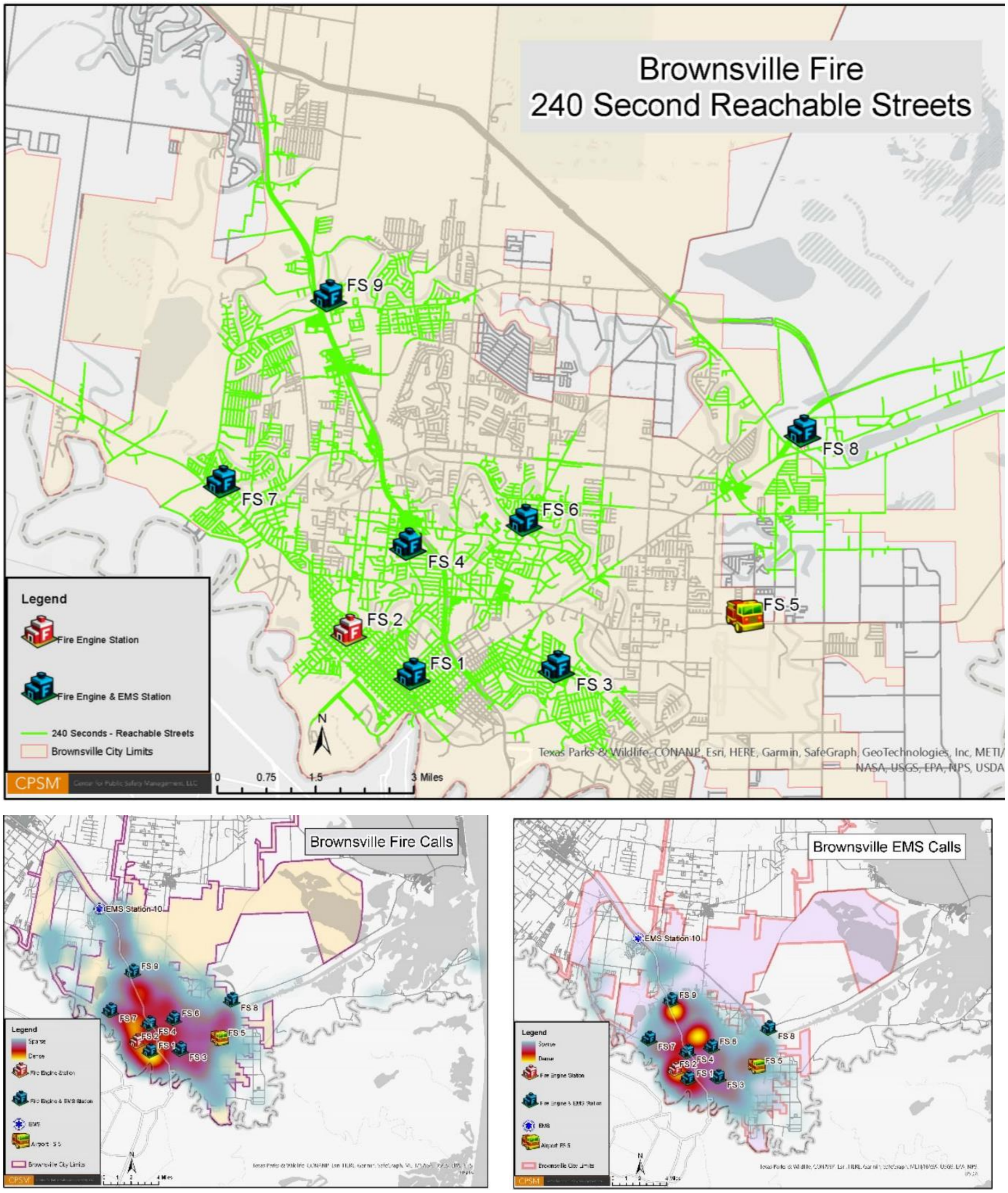
It is, however, important to note that while GIS-drawn, theoretical travel times do reflect favorably on the adequacy of station facilities and their corresponding locations within the city to support efficient fire and EMS response to the current built upon areas. Keep in mind, the benefits of favorable travel time findings are only meaningfully realized when apparatus can be predictably staffed for response and have aggressive turnout times.

It is important to understand that measuring and analyzing response times and response time coverage are measurements of performance. When we discussed community risk earlier, we identified that the BFD like all other fire departments in the nation is an all-hazards response agency. While different regions of the country respond to different environmental risks, the remaining hazards fire departments confront remain the same. Linking response data to community risks lays the foundation for future fire department planning in terms of fire station location, the need for additional fire stations, and staffing levels. Managing fire department response capabilities to the identified risks in a community focuses on three components::

- Having a full understanding of the total risk in the community and how each impacts the fire department in terms of resiliency, what the consequences are to the community and fire department should a specific risk or combination of two or more occur, and preparing for and understanding the probability that the risk may occur.
- Linking risk to the deployment of resources to effectively manage every incident. This includes assembling an Effective Response Force for the response risk in measurable times benchmarked against NFPA standards, deploying the appropriate apparatus (engines, ladders, heavy rescues, ambulances), and having an adequate and capable response force trained to combat a specific risk.
- Understanding that each element of response times plays a role in the management of community risk. Low response times of the initial arriving engine and low time to assemble an Effective Response Time on fire and other incidents is associated with positive outcomes.

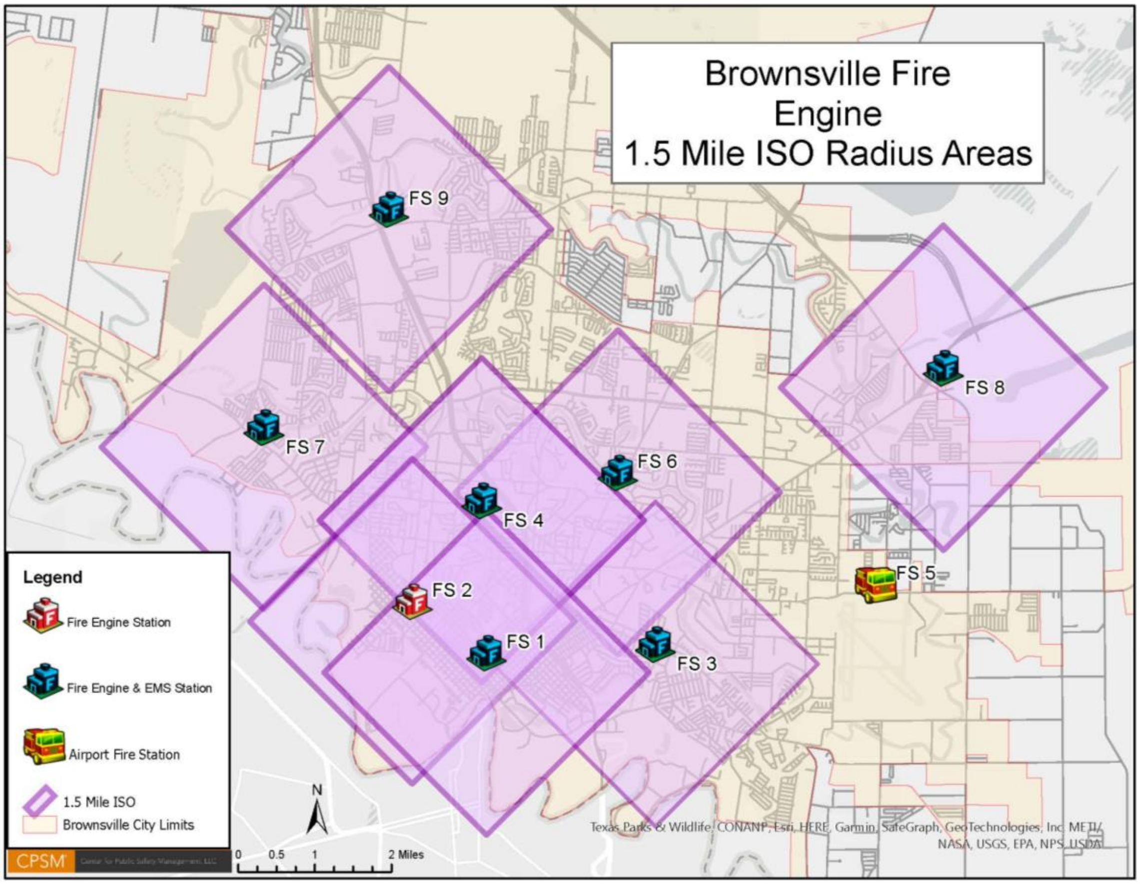
The next figure compares the 240-second response from the current BFD stations with a fire suppression capability. It also includes the fire and EMS demand maps for comparison. From this figure it can be seen that the BFD stations can cover significant areas of the city, particularly the older sections. However, there are significant gaps in coverage in various areas of the city. **Even with those gaps, the city should have much better compliance with the NFPA's recommended response time benchmarks than the data indicates.**

FIGURE 4-12: Travel Time of 240 Seconds from BFD Stations with Fire/EMS Demand



The next figure illustrates the 1.5-mile ISO-FSRS coverage diamond for engine company response to built-upon areas of the city. Coverage is similar but expanded using the diamonds. This is because the 1.5-mile diamonds are overlays and the response bleeds follow actual road patterns. The important aspect of the previous figure and the next figure is the similarity between actual road bleeds and the ISO-FSRS diamond overlay. As well it is important to understand that although the city does not have 240-second coverages to all of the fire management zone, the 240-second benchmark is at the 90th percentile, not the 100th percentile. Actual travel times were discussed earlier in this section; however, **the department's travel times do not come close to reflecting compliance with the NFPA 1710 benchmark at the 90th percentile.**

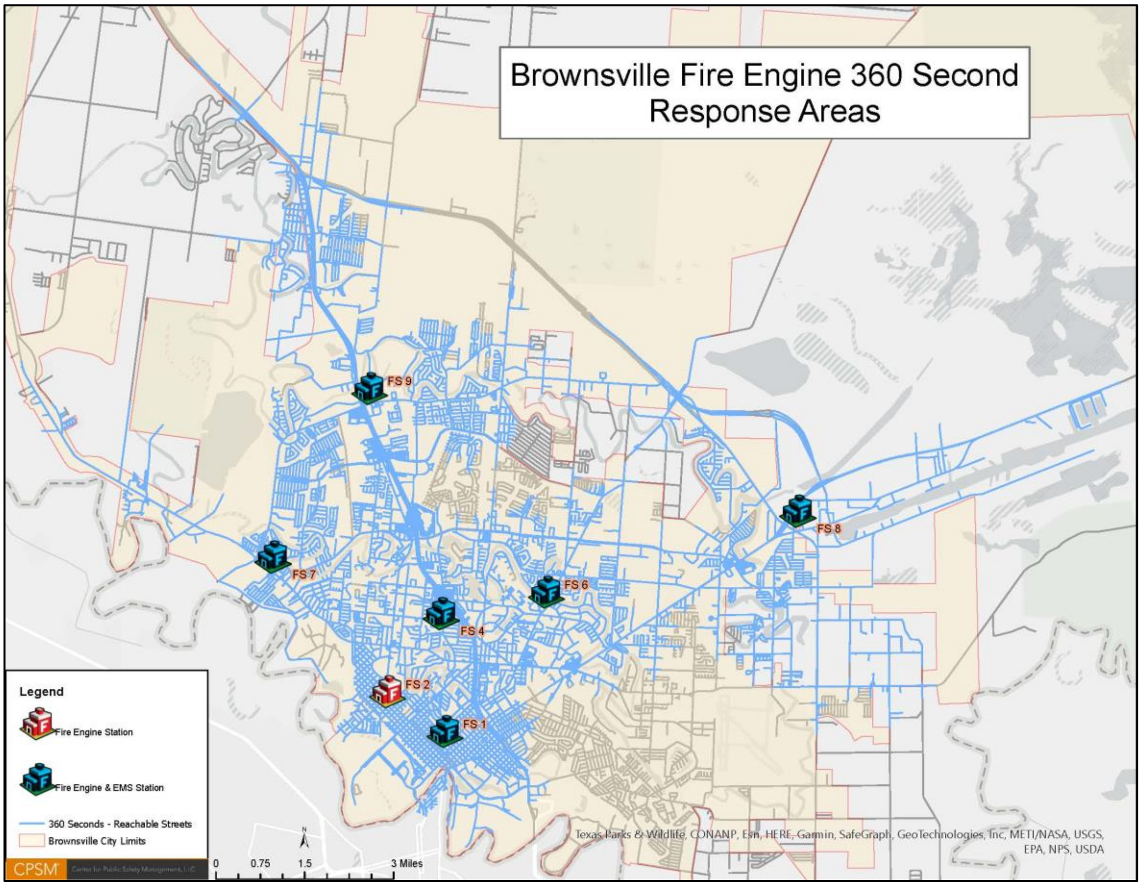
FIGURE 4-13: ISO-FSRS 1.5 Mile-Response Diamond for Engine Companies



The next figure looks at the 360-second response bleeds, which in the NFPA 1710 standard is the time benchmark for the second due engine to arrive on the scene in less than or equal to 360 seconds 90 percent of the time. This standard links to the two-in/two-out OSHA and NFPA 1500 standards (which will be discussed later), as well as the initial critical tasking and the early assembling of the Effective Response Force for the incident.

This figure tells us that much of the city is covered from Brownsville fire stations. However, there are large areas in the northern and southeastern sections of the city that are not covered even at 360 seconds.

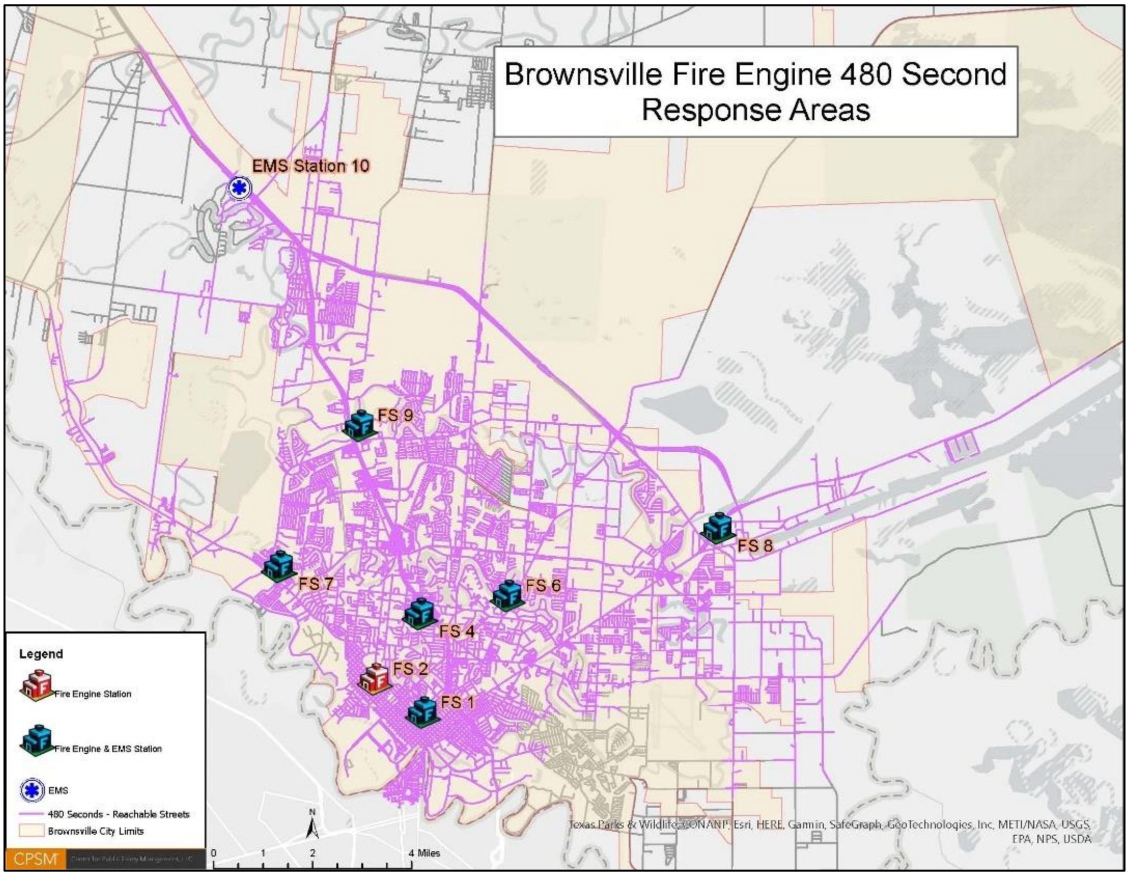
FIGURE 4-14: Travel Time of 360 Seconds from BFD Stations

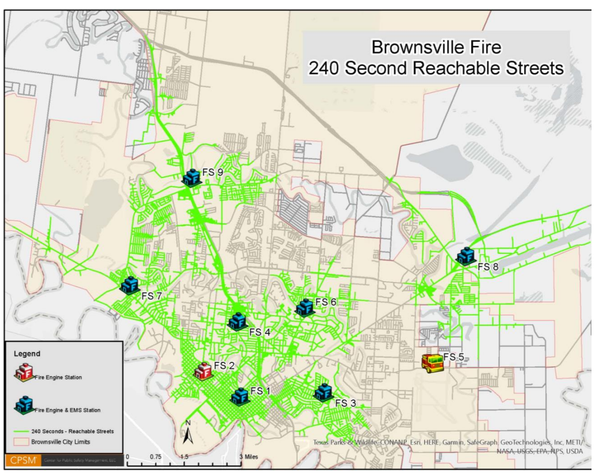


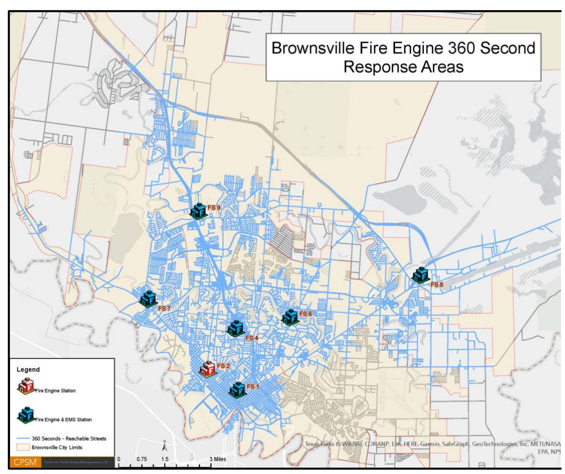
The next figure looks at the 480-second response bleeds, which in the NFPA 1710 standard is the time benchmark for the assembling of the initial first alarm assignment on scene in 480 seconds or less, 90 percent of the time for low/medium hazards. This standard links to the incident critical tasking and the assembling of the Effective Response Force for the incident.

This figure tells us that the fire management zone (City of Brownsville) is mostly covered with the existing Brownsville fire stations except for the southeast corner of the city. This map indicates that the BFD should be able to come close to meeting this portion of the standard benchmark at the 90th percentile.

FIGURE 4-15: Travel Time of 480 Seconds from BFD Stations





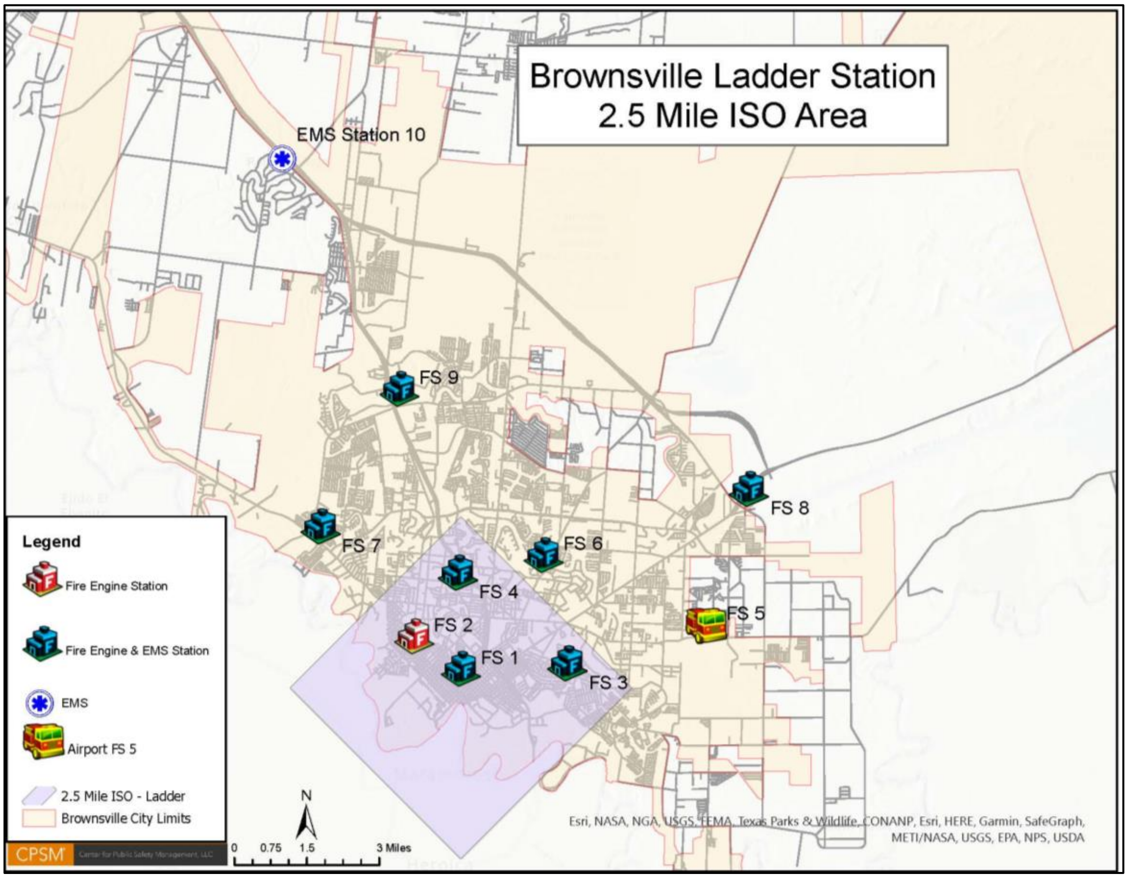


As these maps indicate, there are several areas of the city that are outside of the 240-, 360-, and even 480-second travel time benchmark. Some of these areas, particularly in the northern and northwestern areas of the city, are experiencing growth and development which will invariably increase requests for service into those neighborhoods.

One of the key decisions the leadership of the City of Brownsville will need to make going forward is if the city's goal is to continue to have the department meet recommended response time benchmarks for the first unit on location time. If so, there will likely need to be long-term revisions made to the deployment configuration to continue to attempt to achieve that target, particularly as the city continues to grow and develop.

The ISO Fire Suppression Rating Schedule also indicates that first-due ladder companies should serve areas that are within a 2.5-mile travel distance. The placement of fire stations that achieves this type of separation creates service areas that are approximately 6.25 square miles in size, depending on the road network and other geographical barriers. The next figure illustrates a polygon designating 2.5 square miles around Fire Station 1, from where the city's current ladder is deployed.

FIGURE 4-16: ISO-FSRS 2.5 Mile-Response Diamond for Ladder Companies



FIRE STATION RELOCATIONS

The appropriate deployment of resources is critical to any fire and rescue service being able to effectively, efficiently, and safely fulfill its core public safety and fire protection/emergency medical services mission(s) within the community that it serves. One of the most important risk management—or how much risk are we willing to assume—decisions that elected officials in every community must make on behalf of their constituents is how many fire and EMS resources: 1) do we need; 2) can we afford; and 3) how should they be stationed/positioned/deployed to provide maximum benefit to the community as a whole? These are never easy decisions, especially when one considers the fact that virtually any decisions on emergency service deployment that involve moving and/or relocating a resource, even for the considerable benefit of the community as a whole, may have a negative effect on at least a small percentage of the population.

As will be discussed later in this section of the report, three BFD facilities are in excess of 50 years old, with two—stations 1 and 2—approaching 100 years of age. These two stations in particular lack sufficient space and accommodations for assigned crews and apparatus. Both have probably reached the end of their useful lives as fire stations and planning should begin soon regarding their replacement, and in the case of Station 2, a potential relocation.

Station 5 is currently located on the airport property and is available to respond only to incidents within the airport itself. This limits its operational benefit and makes it a significantly underutilized resource. The area around the airport is one of the areas that are outside of the 240-second and even 360-second response times for the next nearest station.

In the northwest section of Brownsville the city has placed in a former volunteer fire company station an EMS-only station from which a medic unit is deployed. Due to the impending development of the Madeira project, and the fact that there is property within that development for public use, including an emergency services station, plans will need to be made for the deployment of an additional engine company in that area.

The following figure illustrates a what-if scenario where Station 2 is relocated to the area of Dana and Old Port Isabel Roads, Station 5 is also relocated to the airport perimeter near Vermillion and Boca Chica Boulevard so it can also be used for off-facility responses, and Station 10 has an engine company added. The Station 10 location is at the current EMS station location. A new station would be located slightly north/northwest of the current location. In this scenario these stations would be relocated to provide better overall deployment coverage to the city and reduce the areas of the city that are outside of the 240-second and 360-second response areas.

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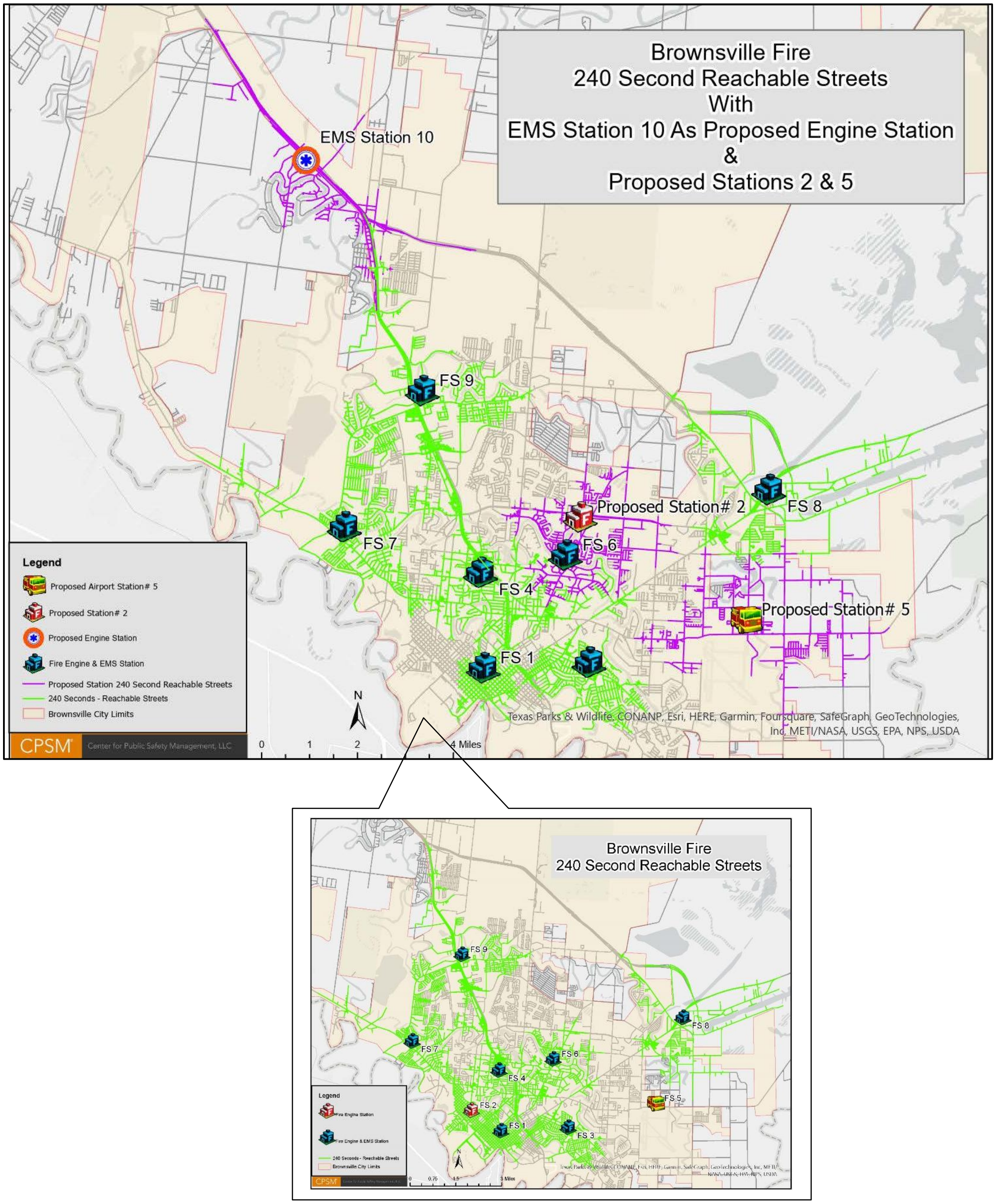
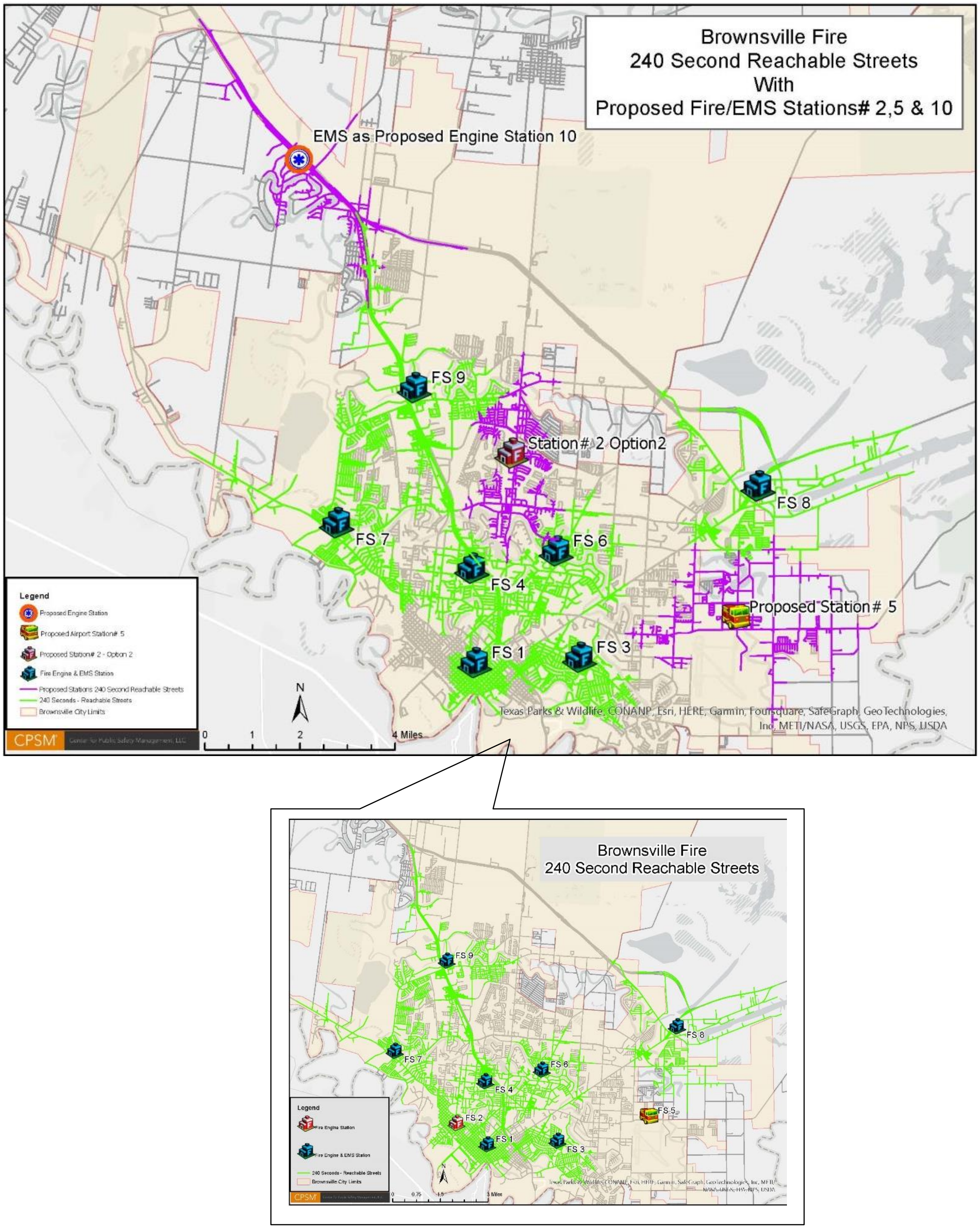
FIGURE 4-17: BFD Travel Time Bleeds with Relocated Stations 2 (Option 1) and 5, plus Station 10 Engine



This map indicates improved coverage around Station 5 and the airport area, as well as in the northern area of the city and in the vicinity of Station 10. However, the location places Stations 2 and 6 relatively close to each other, thus creating overlap in that area.

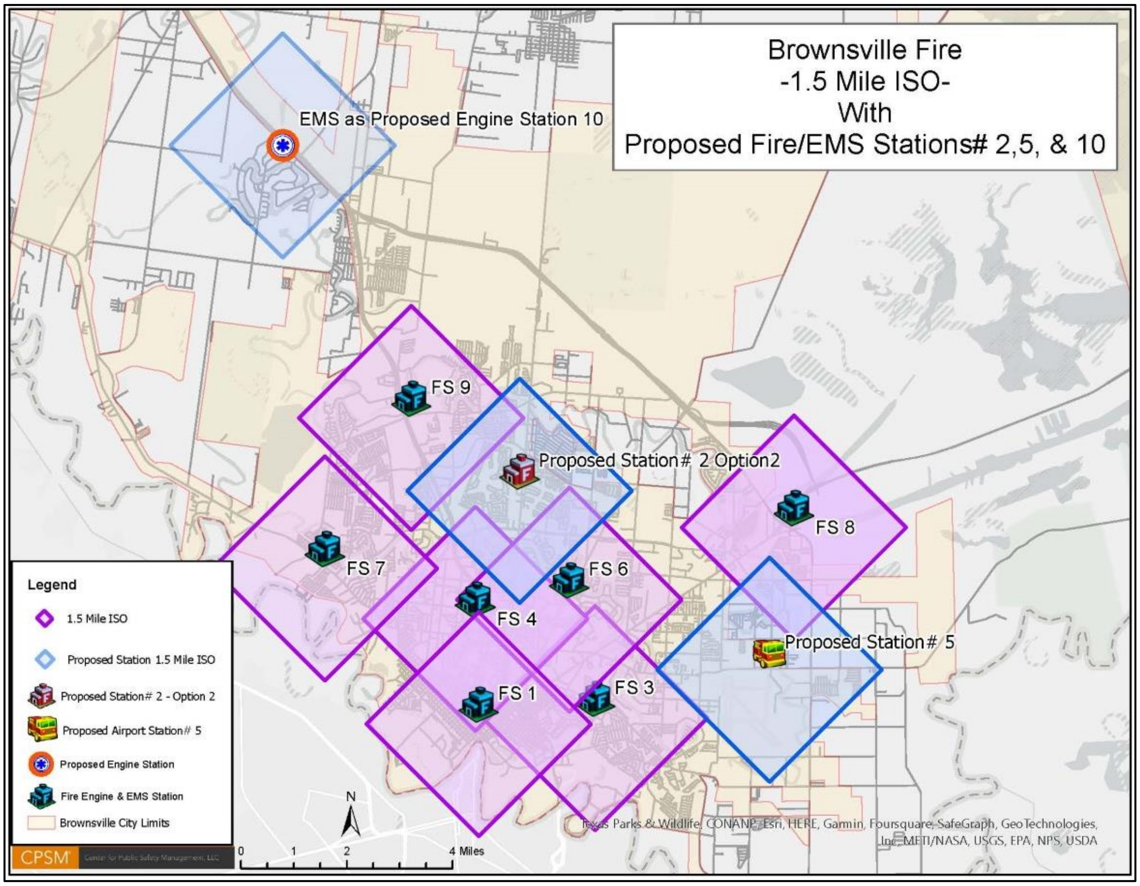
The next figure shows basically the same map; however, Station 2 is relocated farther north to the area of the west side of Paredes Line Rd. and just north of Event Center Blvd. This location provides better coverage to the currently underserved area. The station could even be moved farther north and east to provide even better coverage.

FIGURE 4-18: BFD Travel Time Bleeds with Relocated Stations 2 (Option 2) and 5, plus Station 10 Engine



The next figure shows the ISO 1.5-mile polygons for the proposed station configuration shown in the figure above.

FIGURE 4-19: ISO-FSRS 1.5-Mile Response Diamond for Engine Companies with Relocated Stations



NFPA 1710 AS A NATIONAL CONSENSUS STANDARD

National Fire Protection Association (NFPA) standards are consensus standards and are not mandated nor are they the law. Many cites and countries strive to achieve these standards to the extent possible without an adverse fiscal impact to the community. Cities and communities must decide on the level of service they can deliver based on several factors as discussed herein, including budgetary considerations. Questions of legal responsibilities are often discussed in terms of compliance with NFPA standards. Again, these are national consensus standards, representing best practices and applied science and research.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, 2020 edition (National Fire Protection Association, Quincy, Mass.), outlines organization and deployment of operations by career, and primarily career, fire and rescue organizations.[48] It serves as a benchmark to measure staffing and deployment of resources to

48. NFPA 1710 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of Texas. It is a valuable resource for establishing and measuring performance objectives for the City of Brownsville but should not be the only determining factor when making local decisions about the city's fire services.

certain structures and emergencies. NFPA 1710 was the first organized approach to defining levels of service, deployment capabilities, and staffing levels for substantially career departments. Research work and empirical studies in North America were used by NFPA committees as the basis for developing response times and resource capabilities for those services as identified by the fire department.[49] It is also the benchmark standard that the U.S. Department of Homeland Security utilizes when evaluating applications for staffing grants under the Staffing for Adequate Fire and Emergency Response (SAFER) grant program. The ability to get a sufficient number of personnel, along with appropriate apparatus, to the scene of a structure fire is critical to operational success and firefighter safety. Accomplishing this within the eight-minute time frame specified in NFPA 1710 is an important operational benchmark.

According to NFPA 1710, fire departments should base their capabilities on a formal all-hazards community risk assessment, as discussed earlier in this report, and taking into consideration:[50]

- Life hazard to the population protected.
- Provisions for safe and effective firefighting performance conditions for the firefighters.
- Potential property loss.
- Nature, configuration, hazards, and internal protection of the properties involved.
- Types of fireground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene.

According to NFPA 1710, if a community follows this standard, engine and ladder companies shall be staffed with a minimum of four on-duty members.[51] Additional staffing parameters in this standard for engine and ladder companies is based on geographical isolation and tactical hazards, and increases each to five or six as a minimum.[52] This staffing configuration is designed to ensure a fire department can complete the critical tasking necessary on building fires and other emergency incidents simultaneously rather than consecutively, and efficiently assemble an effective response force for each risk they may encounter. NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with the assembling of on-scene personnel to complete critical tasks as outlined in the standard.

Code of Federal Regulations, NFPA 1500, Two-In/Two-Out

Another consideration, and one that links to critical tasking and assembling an Effective Response Force, is that of two-in/two-out regulations. Essentially, prior to starting any fire attack in an immediately dangerous to life and health (IDLH) environment [with no confirmed rescue in progress], the initial two-person entry team shall ensure that there are sufficient resources on-scene to establish a two-person initial rapid intervention team (IRIT) located outside of the building.

This critical tasking model has its genesis with the Occupational Safety and Health Administration, specifically 29 CFR 1910.134(g)(4). The Texas Commission on Fire Protection establishes regulations for firefighters in Texas including the adoption of OSHA regulations and NFPA standards. Federal OSHA covers the issues not specifically covered by the Texas regulations. As such, the federal rule (29 CFR 1910.134(g)(4)) applies to the BFD.

49. NFPA, Origin and Development of the NFPA 1710, 1710-1
50. NFPA 1710, 5.2.1.1, 5.2.2.2
51. NFPA 1710, 5.2.3.1.1; 5.2.3.2.1
52. NFPA 1710, 5.2.3.1.2, 5.2.3.1.2.1.,5.2.3.2.2.,5.3.2.3.2.2.1

The BFD responds initially to reported structural fires with 15 personnel plus a command officer (Assistant Chief) and EMS supervisor. Under this response model, the BFD provides the minimum number of firefighters on the initial response in order to comply with CFR 1910.134(g)(4), regarding two-in/two-out rules and an initial rapid intervention team (IRIT). In most cases this will require a minimum of either two engines, or an engine and medic unit, on scene to commence operations.

CFR 1910.134: Procedures for interior structural firefighting. The employer shall ensure that:

(i) At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;

(ii) At least two employees are located outside the IDLH atmosphere; and

(iii) All employees engaged in interior structural firefighting use SCBAs.[53]

According to the standard, one of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

NFPA 1500, *Standard on Fire Department Occupational Health, Safety, and Wellness,* 2018 Edition has similar language as CFR 1910.134)g)(4) to address the issue of two-in/two-out, stating *the initial stages of the incident where only one crew is operating in the hazardous area of a working structural fire, a minimum of four individuals shall be required consisting of two members working as a crew in the hazardous area and two standby members present outside this hazard area available for assistance or rescue at emergency operations where entry into the danger area is required.*[54]

NFPA 1500 also speaks to the utilization of the two-out personnel in the context of the health and safety of the firefighters working at the incident. *The assignment of any personnel including the incident commander, the safety officer, or operations of fire apparatus, shall not be permitted as standby personnel if by abandoning their critical task(s) to assist, or if necessary, perform rescue, this clearly jeopardizes the safety and health of any firefighter working at the incident.*[55]

In order to meet CFR 1910.134(g)(4), and NFPA 1500, the BFD must utilize two personnel to commit to interior fire attack while two firefighters remain out of the hazardous area or immediately dangerous to life and health (IDLH) area to form the IRIT, while attack lines are charged, and a continuous water supply is established. As noted above, in most cases this will require a minimum of either two engines or an engine and medic unit to commence operations.

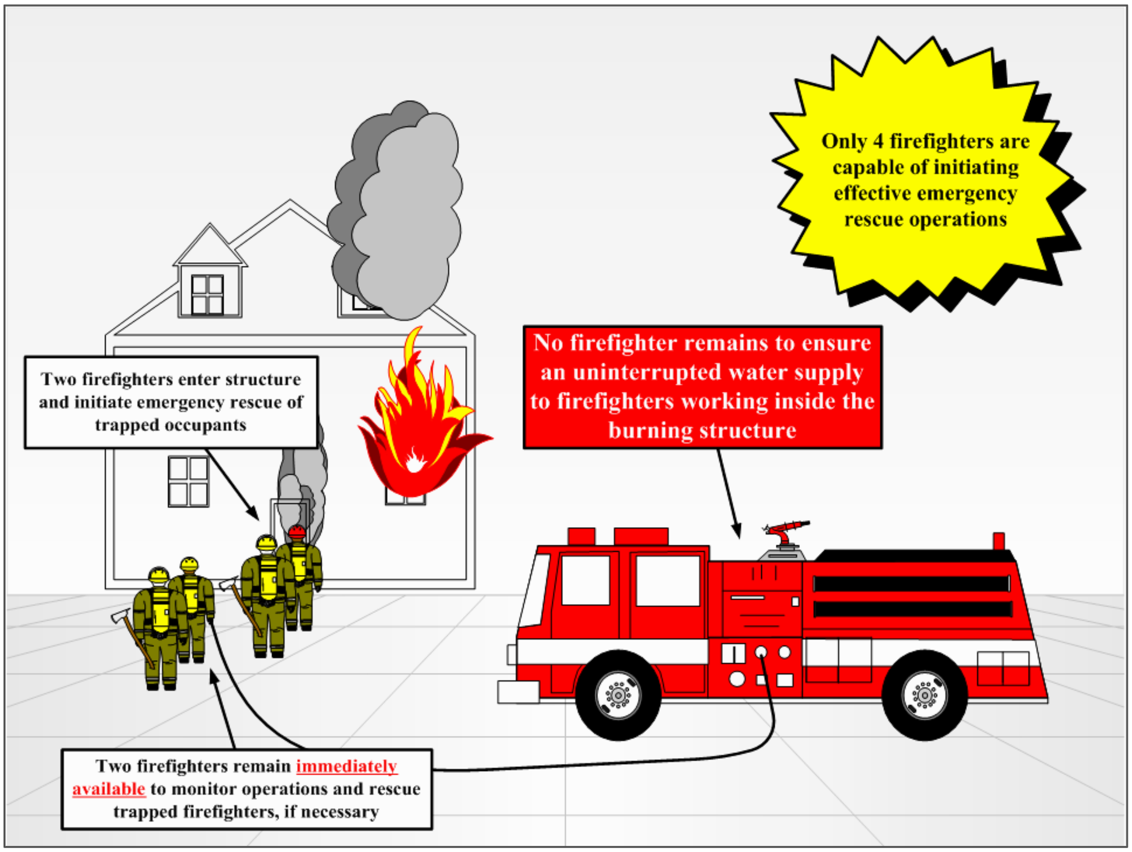
However, NFPA 1500 allows for fewer than four personnel under specific circumstances. It states, *Initial attack operations shall be organized to ensure that if on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with fewer than four personnel*.[56]

53. CFR 1910.134 (g) 4
54. NFPA 1500, 2018, 8.8.2.
55. NFPA 1500, 2018, 8.8.2.5.
56. NFPA 1500, 2018 8.8.2.10.

CFR 1910.134(g)(4) also states that nothing in section (g) is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.[57]

It is also important to note that the OSHA standard (and NFPA 1710) specifically references "interior firefighting." Firefighting activities that are performed from the exterior of the building are not regulated by this portion of the OSHA standard. However, in the end, the ability to assemble adequate personnel, along with appropriate apparatus, on the scene of a structure fire, is critical to operational success and firefighter safety.

FIGURE 4-20: Two-In/Two-Out Interior Firefighting Model



The OSHA requirement has two key provisions that allow considerable flexibility regarding staffing:

- One provision specifies that the four personnel who engage in interior firefighting are required at the incident (assembled) and are not a staffing requirement for the individual responding unit(s).
- The second provision is that an exception is provided when crews are performing rescue operations where there is the **potential** for serious injury or death of the occupants. In this case the standard allows the entry of two personnel to conduct the rescue activity without two firefighters outside immediately available to monitor operations and rescue trapped firefighters, if necessary.

57. CFR 190.134, (g).

It was consistently reported to CPSM that the BFD does try to follow the provisions of the OSHA Two-In/Two-Out regulation regarding waiting to initiate an interior fire attack until four personnel are assembled when there are no rescues to be made. The department is to be commended for this adherence.

FIRE OPERATIONS, EFFECTIVE RESPONSE FORCE, AND CRITICAL TASKING

With a population density estimated to be somewhere around 1,419.8 people per square mile (not counting the county islands that fall within the city's boundaries and which the city provides fire protection to), Brownsville is considered an urban community by the Census Bureau. Like many older communities that are still experiencing growth, the city has an assortment of commercial, industrial, and residential buildings it must protect including special hazards at the Port of Brownsville and SpaceX Starbase. If a fire grows to an area in excess of 2,000 square feet, or extends beyond the building of origin, it is most probable that additional personnel and equipment will be needed, as initial response personnel will be taxed beyond their available resources. From this perspective it is critical that BFD units respond quickly and initiate extinguishment efforts as rapidly as possible after notification of an incident. It is, however, difficult to determine in every case the effectiveness of the initial response in limiting the fire spread and fire damage. Many variables will impact these outcomes, including:

- The time of detection, notification, and ultimately response of fire units.
- The age and type of construction of the structure. Being primarily a community where the development has occurred over the past several decades, many of the buildings in Brownsville will be of lightweight construction. These buildings are prone to rapid fire spread and early collapse in a fire situation.
- The presence of any built-in protection (automatic fire sprinklers) or fire detection systems. Fortunately, the majority of the new commercial construction in Brownsville is equipped with automatic fire suppression systems.
- The contents stored in the structure and its flammability.
- The presence of any flammable liquids, explosives, or compressed gas canisters.
- Weather conditions and the availability of water for extinguishment.

Subsequently, in those situations in which there are extended delays in the extinguishment effort or the fire has progressed sufficiently upon arrival of fire units, there is actually very little that can be done to limit the extent of damage to the entire structure and its contents. In these situations, suppression efforts may need to focus on the protection of nearby or adjacent structures (exterior exposures) with the goal being to limit the spread of the fire beyond the building of origin, and sometimes the exposed building. This is often termed ***protecting exposures***. When the scope of damage is extensive, and the building becomes unstable, firefighting tactics typically move to what is called a ***defensive attack***, or one in which hose lines and more importantly personnel are on the outside of the structure and their focus is to merely discharge large volumes of water until the fire goes out. In these situations, the ability to enter the building is very limited and if victims are trapped in the structure, there are very few safe options for making entry.

Today's fire service is actively debating the options of interior firefighting vs. exterior firefighting. These terms are self-descriptive in that an ***interior fire attack*** is one in which firefighters enter a burning building in an attempt to find the seat of the fire and from this interior position extinguish the fire with limited amounts of water. An ***exterior fire attack***, also sometimes referred to as a ***transitional attack***, is a tactic in which firefighters initially discharge water from the exterior of the building, either through a window or door and knock down the fire before entry in the building is made. The concept is to introduce larger volumes of water initially from the outside of the building, cool the interior temperatures, and reduce the intensity of the fire before firefighters enter the building. A transitional attack is most applicable in smaller structures, typically single family, one-story detached units which are smaller than approximately 2,500 square feet in total floor area. For fires in larger structures, the defensive type, exterior attacks generally involve the use of master streams capable of delivering large volumes of water for an extended period of time.

Recent studies by UL have evaluated the effectiveness of interior vs. exterior attacks in certain simulated fire environments. These studies have found the exterior attack to be equally effective in these simulations.[58] This debate is deep-seated in the fire service and traditional tactical measures have always proposed an interior fire attack, specifically when there is a possibility that victims may be present in the burning structure. The long-held belief in opposition to an exterior attack is that this approach may actually push the fire into areas that are not burning or where victims may be located. The counterpoint supporting the exterior attack centers on firefighter safety.

The exterior attack limits the firefighter from making entry into those super-heated structures that may be susceptible to collapse. From CPSM's perspective, there is at least some likelihood that a single crew of three personnel will encounter a significant and rapidly developing fire situation. This situation can occur during times of high incident activity when other units may be committed on other emergencies, or, in fringe areas of the city where other units responding to the incident may have longer response times to arrive on the scene. It is prudent, therefore, that the BFD build at least a component of its training and operating procedures around the tactical concept of the exterior fire attack when the situation warrants such an approach.

Fire Operations Recommendations:

- The BFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack for when the fire scenario and the number of available units/responding personnel warrants this approach. (Recommendation No. 29.)
- In acknowledgement of the fact that the BFD operates in a minimal staffing mode and recognizing the potential for rapid fire spread particularly in the more densely developed areas of the city, the BFD should equip all its apparatus with the appropriate appliances and hose and develop standardized tactical operations that will enable arriving crews to quickly deploy high-volume fire flows of 1,200 to 1,500 gallons per minute (if the water supply will permit this), utilizing multiple hose lines, appliances, and master stream devices. This flow should be able to be developed within four to five minutes after arrival of an apparatus staffed with three personnel. (Recommendation No. 30.)

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58. "Innovating Fire Attack Tactics," U.L.COM/News Science, Summer 2013.

The ability to quickly develop an adequate and sustainable water supply is key to successful mitigation of almost every fire incident. Brownsville has an excellent municipal water supply system for fire department use.

The following table and figure show the fire call totals for 2019 and 2020, including the number of calls by type, average calls per day, and the percentage of total calls that fall into each call type category. During 2019, BFD responded to 28,678 calls. Of these, 3,235 were fire calls, of which 151 were structure fire calls and 271 were outside fire calls. Fire call types were 11.3 percent of the total calls for service, a lower percentage than we normally see in departments, even those that that are heavily involved in the provision of EMS services in their community. Actual fire calls (structural and outside) were just 1.4 percent of the overall calls for service (approximately 1.16 calls per day or one actual fire-type incident every 20.7 hours). The 422 actual fires represent 13.0 percent of the fire-related incidents. Hazardous conditions, false alarms, and public service calls represent the largest percentage of fire-type calls for service. This experience is typical in CPSM data and workload analyses of other fire departments.

During 2020, BFD responded to 27,269 calls. Of these, 3,575 were fire calls, of which 170 were structure fire calls and 329 were outside fire calls. Fire call types were 13.1 percent of the total calls for service, still a much lower percentage than we normally see in departments, even those that that are heavily involved in the provision of EMS services in their community. Actual fire calls (structural and outside) were just 1.8 percent of the overall calls for service (approximately 1.4 calls per day or one actual fire-type incident every 17.1 hours). The 499 actual fires represent 14.0 percent of the fire-related incidents. Hazardous conditions, false alarms, and public service calls represent the largest percentage of fire-type calls for service. This experience is typical in CPSM data and workload analyses of other fire departments.

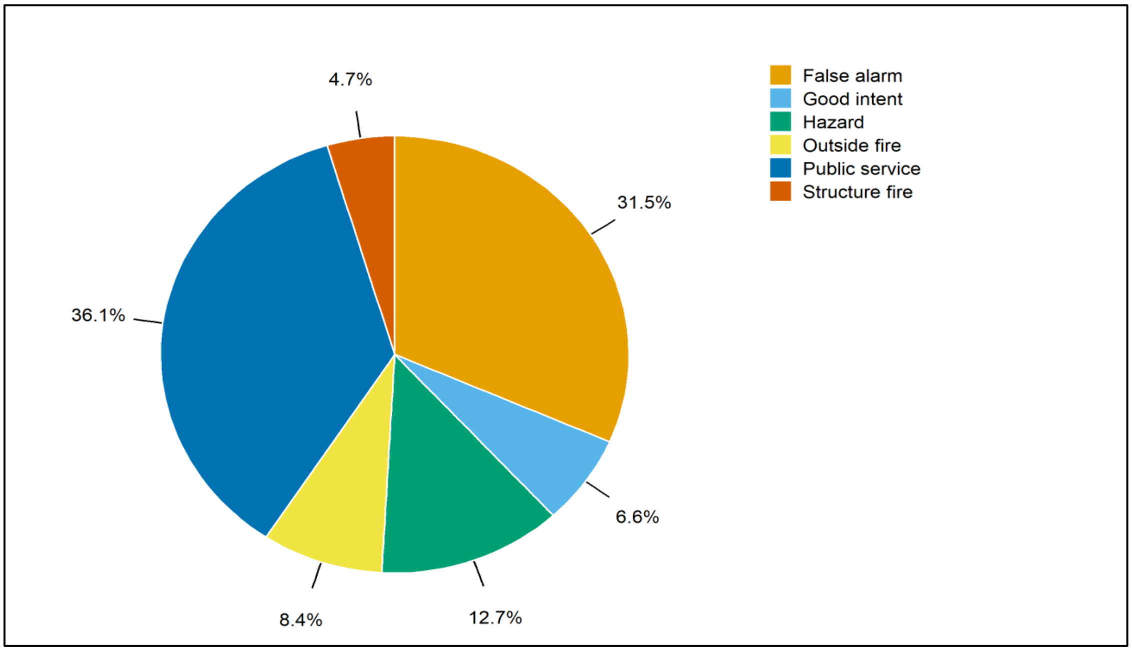
TABLE 4-8: Fire Calls by Type and Number, and Percent of All Calls, 2019–2020

Call Type	2019		2020	
	Total Calls	**Pct. Calls**	**Total Calls**	**Pct. Calls**
False alarm	1,020	3.6	1,011	3.7
Good intent	215	0.7	275	1.0
Hazard	411	1.4	355	1.3
Outside fire	271	0.9	329	1.2
Public service	1,167	4.1	1,435	5.3
Structure fire	151	0.5	170	0.6
Fire Total	**3,235**	**11.3**	**3,575**	**13.1**

Additional analysis of this information tells us:

- Fire call volume increased 11 percent from 3,235 in 2019 to 3,575 in 2020.
- Outside and structure fire calls combined increased 18 percent from 422 in 2019 to 499 in 2020.

FIGURE 4-21: Fire Calls by Type and Percentage, 2019



Further, the data in this table and figure tells us that:

- Fire calls for 2019 totaled 3,235 (11.3 percent of all calls), an average of 8.9 per day.
- Structure and outside fires combined for a total of 422 calls during the year, an average of 1.16 calls per day or one actual fire-type incident every 20.7 hours.
- A total of 151 structure fire calls accounted for 4.7 percent of the fire calls.
- A total of 271 outside fire calls accounted for 8.4 percent of the fire calls.
- Public service calls were the largest fire call category, with 36.1 percent of the fire calls.
- False alarms were the second largest fire call category, with 31.5 percent of the fire calls.

As currently staffed, the BFD should be able to handle most fires that occur in the city, particularly those that are limited in size and intensity, without the need for mutual aid. Fire incidents in larger structures often require additional personnel and resources to successfully mitigate. Critical staffing necessary to successfully mitigate various types on incidents will be discussed in detail later in this section of the report.

The achievability of the BFD being able to handle larger, more complex incidents without the need for mutual aid will be tied to the availability of resources and personnel to respond immediately at the time the incident is dispatched. Those capabilities will improve in the future should the city implement recommendations contained within this report to incrementally increase the number of personnel and resources that are deployed throughout the city. In either case, fires occurring when there are few other incidents in progress that will significantly reduce the immediately available number of personnel, and the fire department can arrive at the fire incident and take definitive action to mitigate the situation prior to flashover occurring, will impact how effectively and quickly incidents can be mitigated. If flashover has occurred, holding the fire to the building of origin is highly achievable as well.

To effectively respond to and mitigate requests for emergency services, an agency must have a thorough understanding of its community's risk factors, both fire and EMS. Once identified and understood, each category or level of risk is associated with the necessary resources and actions required to mitigate it. This is accomplished through a critical task analysis. The exercise of matching operational asset deployments to risk, or critical tasking, considers multiple factors including national standards, performance measures, and the safety of responders.

Critical tasks are those activities that must be conducted in a timely manner by responders at emergency incidents to control the situation and stop loss. Critical tasking for fire operations is the minimum number of personnel needed to perform the tasks required to effectively control a fire. *The same is true for EMS as there are specific patient care tasks that must be completed in succession and often together to support positive prehospital care.* The specific number of people required to perform all the critical tasks associated with an identified risk is referred to as an ***Effective Response Force (ERF)***. The goal is to deliver an ERF within a prescribed time frame. NFPA 1710, as a nationally recognized consensus standard on staffing and deployment for career fire departments, provides a benchmark for ERF.[59]

For a fire department to be effective, critical tasking must assign enough personnel so that all identified functions can be performed simultaneously. However, it is important to note that secondary support functions may be handled by initial response personnel once they have completed their primary assignment. Thus, while an incident may end up requiring a greater commitment of resources or a specialized response, a properly executed critical task analysis will provide adequate resources to immediately begin bringing the incident under control.

Regarding the implementation of an ERF and its aggregate effect on fireground operations, there has been much research done by a number of fire departments on the effects of various staffing levels. These studies have consistently confirmed that company efficiency and effectiveness decrease substantially and injuries increase when company staffing falls below four personnel. A comprehensive yet scientifically conducted, verified, and validated study titled *Multiphase Study on Firefighter Safety and the Deployment of Resources* was performed by the National Institute of Standards and Technology (NIST) and Worcester Polytechnic Institute (WPI), in conjunction with the International Association of Fire Chiefs, the International Association of Fire Fighters, and the Center for Public Safety Excellence. For the first time, quantitative evidence has been produced regarding the impact of crew size on accomplishing critical tasks. Additionally, continual research from UL has provided tactical insights that shed further light on the needs related to crew size and firefighter safety. This body of research includes:

- An April 2010 report on *Residential Fireground Field Experiments* from the National Institute of Standards and Technology (NIST).
- An April 2013 report on *High-Rise Fireground Field Experiments* from the National Institute of Standards and Technology (NIST-HR).
- A December 2010 report on the *Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction* (UL).

Additional collaborative efforts such as the Governor's Island and Spartanburg Burns continue to expand upon and reinforce the findings of NIST and UL.

59. It is important to note that compliance with NFPA 1710 has not been mandated in the State of Texas or by the federal government. It is considered a "best practice" that fire departments strive to achieve.

As stated, some of these studies' findings have a direct impact on the exercise of critical tasking. For example, as UL studied the impact of ventilation on fire behavior, it was able to obtain empirical data about the effect of water application on fire spread and occupant tenability. The research clearly indicates that the external application of a fire stream, especially a straight stream, does not "push fire" or decrease tenability in any adjacent rooms. Therefore, during the deployment of resources for the critical task of fire attack, consideration must be given to the option of applying water to the fire from the exterior when able. This approach enables a fire attack that can begin prior to the establishment of an Initial Rapid Intervention Team (IRIT) as well as decreases the time to getting water on the fire, which has the greatest impact on occupant survivability.

The NIST studies examined the impact of crew size and stagger on the timing of fireground task initiation, duration, and completion. Although each study showed crew size as having an impact on time-to-task, consideration must be given to what tasks were affected and to what extent. For example, four-person crews operating at a low-hazard structure fire completed all fireground tasks (on average) 5.1 minutes or 25 percent faster than three-person crews.

- Four-person firefighting crews were able to complete 22 essential firefighting and rescue tasks in a typical residential structure 30 percent faster than two-person crews and 25 percent faster than three-person crews.
- The four-person crews were able to deliver water to a similar sized fire 15 percent faster than the two-person crews and 6 percent faster than three-person crews, steps that help to reduce property damage and reduce danger/risks to firefighters. The latter time represents a 34-second difference.
- Four-person crews were able to complete critical search and rescue operations 30 percent faster than two-person crews and 6 percent faster than three-person crews. The latter time represents a 23-second difference. The "rescue time" difference from a four-person to a three-person crew is seven seconds.

When considering critical tasking for the deployment of an ERF for fire suppression operations, the BFD will be able to handle most incidents with just its own resources. For larger, more significant, or complex incidents, the department will need to consider resources from surrounding mutual aid partners.

It is also unlikely that the BFD would be capable of handling two simultaneous or significantly overlapping structure fires. It is also important to note that the impact of crew size as it relates to high-risk categories is greater than its low-risk implications and should be considered when staffing units that cover a greater amount of risk. As BFD's engine and truck companies are staffed with just three personnel, this will ultimately present some significant operational challenges and concerns (as it does in many other communities that utilize similar staffing models).

To be clear, there is no Texas or federal requirement that specifies staffing levels on fire apparatus. The closest thing that approaches a requirement for staffing levels is the OSHA 29 CFR 1910.134 standard (Two-in/Two-out).

The Center for Public Safety Excellence (CPSE) has also established benchmarks regarding staffing and deployment. CPSE sets standards for agencies seeking and achieving accreditation through the Commission on Fire Accreditation International (CFAI). CFAI uses standards set forth in the *Community Risk Assessment Manual: Standards of Cover*, 6th edition, to provide guidance in staffing and deployment to agencies desiring accreditation through Core Competencies.

Core Competency 2C.4 requires that "*the agency conduct a critical task analysis of each risk category and risk class to determine the first due and effective response force capabilities, and to have a process in place to validate and document the results.*" The process considers the number of personnel needed to perform the necessary emergency scene operations. Completion of the process also helps to identify any gaps in the agency's emergency scene practices.

From a practical standpoint, staffing engines and ladders with three personnel rather than four forces the company officer (captain or lieutenant) to be actively involved in hands-on tasks such as stretching a line, or raising a ladder, rather than performing size-up and other important initial fireground actions. Company officers are working supervisors. They form an integral part of their company, and it is often necessary for them to assume hands-on involvement in operations, particularly with companies that are minimally staffed, while simultaneously providing oversight and direction to their personnel. During structure fires and other dangerous technical operations, it is imperative that these officers accompany, and operate with, their crew to monitor conditions, provide situation reports, and assess progress toward incident mitigation. During structure fires they operate inside of the fire building. Company officers need to be able to focus on the completion of specific tasks that have been assigned to their respective companies, such as interior fire attack, rescue, ventilation, and/or water supply.

When engine companies are staffed with three rather than four personnel, the officer often needs to either function as the nozzle person while the other firefighter backs him/her up and helps with advancing the line, or, if the roles are reversed and the officer is assisting with line advancement they cannot monitor the conditions at the nozzle—and closest to the fire—as they should. Ideally, one firefighter should be the nozzle operator, the officer should be right alongside of, or behind the nozzle, providing direction and evaluating conditions, and the third firefighter can be further back assisting with advancing the line. This is particularly important for fires on the second and third floors of buildings where the lines must frequently be advanced up narrow and winding stairways. When short-staffed in fire conditions such as this, two companies often must be deployed to get a single line in service, which can then impact the completion of additional critical tasks.

CPSM advocates structural fire tactics and strategies that are both safe and effective, but sometimes staffing levels can make that dual goal difficult to achieve. Initiating offensive operations with fewer than four firefighters will place firefighters at a high level of risk; delaying operations until additional staffing arrives places occupants in greater danger and can increase property damage.

Ultimately, overall, on-duty fire department staffing is a local government decision. It is also important to note again that the OSHA standard (and NFPA 1500/1710/1720) specifically references "interior firefighting." Firefighting activities that are performed from the exterior of the building are not regulated by this portion of the OSHA standard. However, **<u>in the end, the ability to assemble adequate personnel, along with appropriate apparatus to the scene of a structure fire, is critical to operational success and firefighter safety</u>**. How and where personnel and resources are located and how quickly they can arrive on scene play major roles also.

All of these factors must be taken into consideration as Brownsville strives for consensus on the acceptable community fire safety risk level, affordable levels of expenditure for fire protection, and appropriate levels of staffing. The city will need to consider the cost-benefit of various deployment strategies, such as continuing the current staffing and deployment model, or adopting a modified one based upon options presented within this report.

For BFD, emergency responses are based on caller information provided to dispatchers at the Brownsville Police Department 911-dispatch center); responses depend on the nature and type of call for service. BFD details out its response procedures through a response plan in the dispatch center. This response plan covers both high- and low-frequency incidents that range from low to high risk. Structure fire responses represent the type of high-risk/(relatively) low-frequency incidents that present the greatest challenges to an organization.

The following table shows the workload of fire responses by number of units arriving to these incident types in 2019.

TABLE 4-9: Calls by Call Type and Number of Arriving Units, Fire, 2019

Call Type	Number of Units				Total Calls
	One	Two	Three	Four or More	
False alarm	769	15	4	2	790
Good intent	154	23	4	10	191
Hazard	357	29	8	9	403
Outside fire	197	38	15	9	259
Public service	891	169	6	5	1,071
Structure fire	66	19	10	51	146
Fire Total	**2,434**	**293**	**47**	**86**	**2,860**

A more in-depth analysis of the data in the above table tells us:

- On average, 1.3 units arrived per fire call.
- For fire calls, one unit arrived 85 percent of the time, two units arrived 10 percent of the time, three units arrived 1.6 percent of the time, and four or more units arrived 3.0 percent of the time.
- For outside fire calls, three or more units arrived 9 percent of the time.
- For structure fire calls, three or more units arrived 42 percent of the time.

For any given emergency to which BFD responds, there are critical tasks that must be completed. These tasks can range from the immediate rescue of trapped occupants within a burning structure to vehicle or water rescue when needed. A set of critical tasks have been developed in an effort to identify what resources are needed for each incident type. BFD has developed response matrixes detailing the initial levels of response for varying incident types. The following critical task analysis was performed independent of these policies; however, a comparison is provided.

The intent of the risk management process is for the department to develop a standard level of safety while strategically aligning its resources with requests for service. Thus, the critical tasking presented herein will consider the EFR in relation to either a low-, moderate-, or high-risk classification.

The following discussion and tables will outline how critical tasking and assembling an effective response force is first measured in NFPA 1710, and how the BFD is benchmarked against this standard for the building types existing in Brownsville. This discussion will cover critical tasking for the following incident types:

- Structure Fire–Low Risk.
- Structure Fire–Moderate Risk.
- Structure Fire–High Risk.
- Fire Alarm–Low Risk.
- Fire Alarm–Moderate Risk.
- Fire Alarm–High Risk.
- Motor Vehicle Crash–with Entrapment.
- Natural Gas Leak–Interior and Exterior.
- Hazardous Materials Incident.
- Technical Rescue Incident.

BFD utilizes a standard alarm assignment for most reported structure fire responses. An initial response to this type of incident includes the following:

- 3 engines.
- 1 ladder truck.
- 1 ambulance.
- 1 light and air unit.
- 1 Assistant Chief.
- 1 EMS supervisor.

This response places 16/17 personnel on the scene assuming that the BFD engines and truck are each staffed with three personnel.

A couple of notes of clarity are warranted here. First, the data supplied by the BFD for this analysis indicates that Truck One (the BFD's only ladder) responded to just 24 calls in 2019 and 104 calls in 2020. The CPSM team was informed that on many reported structure fires (there were most likely many more incidents dispatched as structure fires that ended up being some other type of incident than the actual numbers contained within this report) the ladder personnel respond in a pickup truck or utility vehicle rather than the ladder due to access issues. <u>This is **NOT** an advisable policy and will be discussed further later in this section</u>. Second, the air and light unit is a trailer that must be hooked up to a pickup truck to be taken to the scene. Its use is sporadic.

If the alarm is upgraded to a second alarm the following additional resources are dispatched:

- 2 engines.
- 1 Fire Marshal (not for firefighting duties).

This brings an additional 6 firefighting personnel to the scene, increasing staffing to 22/23 personnel. However, since they are not dispatched at the time of initial dispatch their arrival will be delayed. In addition, as noted, the Fire Marshal will most likely not be involved in firefighting operations.

A third alarm will have the following additional resources dispatched:

- 2 engines.
- 1 ambulance.
- 1 Deputy Chief.
- 1 Emergency Management Coordinator (not for firefighting duties)

This will bring staffing on the scene up to 31/32 personnel.

A fourth alarm brings the following resources to the scene:

- 1 engine (the last available fire suppression unit in the city).
- 1 Deputy Chief.

For a low-risk structure fire the initial full alarm assignment (ERF) to a structural fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used). The following table outlines the critical task matrix, and the subsequent figure illustrates it.

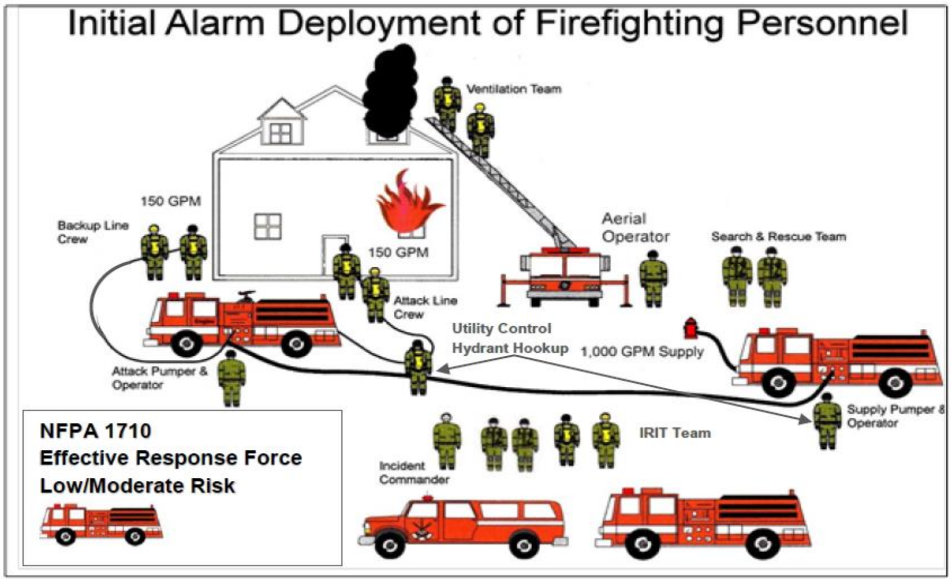
TABLE 4-10: Structure Fire in a Single-family Dwelling, Low Risk

Critical Task	Needed Personnel
Incident Command	1
Continuous Water Supply/Pump Operator	1
Fire Attack via Two Handlines	4
Hydrant Hook-Up, Forcible Entry, Utilities	2
Primary Search and Rescue	2
Ground Ladders and Ventilation	2
Aerial Operator (if Aerial is Used)	1
Establishment of an IRIT (Initial Rapid Intervention Team)	2
Effective Response Force	**16/17**
BFD Initial Response Provided	**16/17**

These tasks meet the minimum requirements of NFPA 1710 for the initial full alarm assignment to a typical low-risk, 2000 square-foot, two-story residential structure. These are the proverbial "bread and butter" structural fire incidents that fire departments respond to, and which are, by far, the most common type of structure fire. Personnel requirements for fires involving large, more complex structures such as commercial or industrial facilities or multifamily residential occupancies will require a significantly greater commitment of personnel.

This serves as a good benchmark for critical tasking that needs to be accomplished to mitigate the most common type of structural fire incident, which is the single-family dwelling. The next figure illustrates how the Effective Response Force integrates simultaneously to accomplish these fireground goals.

FIGURE 4-22: Initial Deployment of Firefighting Personnel/ERF Recommendation: Single-family Dwelling



For a moderate risk the initial full alarm assignment (ERF) to these structural fires include:

- A typical 1,200 square-foot apartment within a three-story, garden-style apartment building must provide for a minimum of 27 members (28 if an aerial device is used).
- A typical open-air strip center ranging from 13,000 square feet to 196,000 square feet in size must provide for a minimum of 27 members (28 if an aerial device is used).

The following table outlines the critical tasking matrix for this type of fire. This can also be typed as a commercial building fire response.

TABLE 4-11: Structure Fire, Moderate Risk

Critical Task	Needed Personnel
Incident Command	2
2 – Independent Water Supply Lines/Pump Operators	2
Fire Attack via Three Handlines	6
Support Firefighter for each Handline	3
2 - Search and Rescue Teams	4
2 - Ground Ladders and Ventilation Teams	4
Aerial Operator (if Aerial is Used)	1
Rapid Intervention Team (1 Officer/3 Firefighters)	4
EMS/Medical	2
Effective Response Force	**27/28**
BFD Initial Response Provided	**16/17**

It is important to remember that the effective response force personnel needs contained in NFPA 1710 are the minimum number of personnel that are needed to be able to accomplish the critical tasking identified. They are not all inclusive as to personnel needs. For instance, this tasking provides for two initial attack lines, not three, which are often needed for fires in multi-story dwellings. It also includes just two personnel on each line which requires the officer to either be on the nozzle, or, advancing the line as a back-up rather than monitoring conditions, supervising the application of the water and the coordination of other activities.

They may also include other clarifying factors. For instance, the low-hazard structure fire is based on a fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement and with no exposures. It does not consider factors such as lightweight construction, and the fact that in many parts of the country homes have basements, and often have multiple exposures close by. In addition, many of the new homes being constructed today are much larger than 2,000 square feet. Housing types such as townhouses and condominiums are also gaining popularity as "single-family" dwellings. All of these factors contribute to the knowledge that many experienced chief officers possess that the actual personnel needs are often higher depending upon the severity of the incident.

Personnel requirements for fires involving large, more complex structures such as commercial or industrial facilities or multifamily residential occupancies will require a significantly greater commitment of personnel which are acknowledged in NFPA 1710. For other types of specialized operations which can include incidents such as building collapses, hazardous materials incidents, technical rescue emergencies, maritime vessel fires, and aircraft incidents, the personnel needs can be very significant, with a large number of personnel needed to support the technical response personnel working to mitigate the incident.

For these reasons, many fire departments have adopted response protocols that dictate the initial dispatch and response of a full "box" to all of these types of incidents. A common configuration of this type of initial dispatch is:

- 4 Engines.
- 2 Ladder Trucks.
- 1 Rescue Truck.
- 1 EMS Unit.
- 2 Chief Officers.

Depending upon whether the fire suppression units are staffed with three or four personnel this response provides an initial response force of between 25 and 32 personnel (34 if the chiefs are part of a two-person command/safety team). Additional personnel such as special operations personnel, multiple EMS units, EMS supervisors, or safety officers are sometimes also included in the initial dispatch and response depending upon the nature of the incident and the department's resources.

It should be emphasized that the above suggested deployment of personnel for the effective response force is considered to be the minimum number of personnel required. Experienced chief officers know that the actual personnel needs are often higher depending upon the severity of the incident. Based upon those considerations while also operating all units with three personnel, consideration should be given to an initial response to all reported **low- and moderate-risk structure fires of:**

- **4 engines.**
- **2 ladder trucks (or 1 ladder truck and 1 heavy rescue truck).**

- **1 ambulance.**
- **2 assistant chiefs.**
- **1 EMS supervisor.**

The two ladder trucks, heavy rescue truck, and two assistant chiefs are developed later in this section. If all units are staffed as will be recommended, this would provide an initial response of **27 personnel**.

The following table identifies critical tasking for fires involving high-risk structures such as hospitals, nursing homes, and assisted living facilities. **It would also include shipboard fires in the port area and the SpaceX Starbase complex.**

TABLE 4-12: Structure Fire, High Risk

Critical Task	Needed Personnel
Incident Command	2
2 – Independent Water Supply Lines/Pump Operators	2
Investigation/Initial Fire Attack Line	3
Backup Line	3
Secondary Attack Line	3
3 - Search/Rescue Teams	6
2 – Ground Ladder and Ventilation Teams	4
Water Supply/Fire Department Connection	2
Aerial Operators (if Aerials are Used)	2
Safety/Accountability	2
Rapid Intervention Team (1 Officer/3 Firefighters)	4
EMS/Medical	4
Effective Response Force	**35/37**
BFD Initial Response Provided	**16/17**

Based upon needed personnel for establishment of an ERF, and due to Brownsville's unique risks while also operating all units with three personnel, consideration should be given to an initial response for all reported **high-risk** structure fires, and **moderate structure fires in targeted hazards** of:

- **6 engines (or 5 engines and 1 heavy rescue truck).**
- **2 ladder trucks.**
- **2 ambulances.**
- **2 Assistant Chiefs.**
- **1 EMS supervisor.**

The two ladder trucks, heavy rescue truck, and two assistant chiefs are developed later in this section. If all units are staffed as will recommended, this would provide an initial response of **37 personnel**. In the future, consideration could be given to replacing one of the engines with a rescue unit which would increase the number of personnel to **38**.

While these initial responses may be viewed by some as excessive, there is an old adage regarding staffing and apparatus that *"it is better to have them responding and not need them, then to need them and not have them."* If the first arriving units determine that the incident is minor in nature, units that will not be needed can quickly be returned.

Since they are relatively rare occurrences, for fires that require additional resources and personnel, Brownsville should consider the following option for **second (or greater) alarms**:

- **4 engines.**
- **2 ladder trucks.**
- **2 ambulances**
- **2 additional chief officers.**

This option would require response of ladder trucks from nearby mutual aid departments. This option would provide at least 24 additional personnel, assuming the fire units are all staffed with three personnel. Additional personnel returning to work on a recall of off-duty personnel could staff additional units and respond if necessary. It is anticipated that additional Brownsville and mutual aid chief officers would also respond who could assist at the fire or provide city coverage.

It should be stressed that the large responses of apparatus that CPSM is recommending for establishing an ERF based upon the hazard of the occupancy type (low-, medium-, and high-hazard) is intended for instances where the caller(s) are reporting visible smoke or fire within or from the building. As part of a risk management strategy, for incidents within structures such as an appliance, a heater, a sparking electrical outlet, an odor or smoke, etc. consideration should be given to the initial dispatch of a "Tactical Box" comprised of:

- **2 engines.**
- **1 ladder truck.**
- **1 ambulance**
- **1 Assistant Chief.**

If additional information is received indicating an active fire in progress, the assignment can then be upgraded to a "Full Box."

Fires involving high-rise structures, which are generally considered to be any building more than six stories in height or more than 75 feet tall, present fire departments with significant operational challenges, particularly in buildings that are not equipped throughout with automatic fire suppression systems. The City of Brownsville has only a few buildings that meet this classification. The city also has multiple additional buildings that are between four and six stories in height, which can present some of the same challenges in an emergency as a high-rise building.

The 2020 edition of NFPA 1710 recommends a minimum of 42/43 personnel on the initial response for fires involving high-rise buildings. These personnel should arrive on location within a 10-minute (610 seconds) travel time. Some chief officers with considerable high-rise fire experience suggest that the actual number of personnel needed for a significant high-rise fire will be around 100 firefighters within about 30 minutes.

Since Brownsville only has a couple of buildings where the highest floor is greater than 75 feet above the lowest level, this part of the standard is not examined here; however, through mutual aid the number of personnel can be assembled should a fire occur in one of these buildings. It is also recommended that the initial dispatch be the same as is noted above for high-risk structure fires.

The BFD dispatches a single engine company to fire alarm activations regardless of the type of occupancy. These types of responses need to be considered in the context of risk assessment and management. On one hand, consideration must be given to the potential risks, hazards, and even investigative complexity associated with various types of occupancies. Conversely, data and experience show that these system activations are rarely for an actual fire incident, and of those that are, they often backed up by a phone call reporting a fire.

The following tables provide comparisons between BFD practice and recommended responses.

TABLE 4-13: Fire Alarm System, Low Risk

Critical Task	Needed Personnel
Incident Command	1
Investigation	3
Effective Response Force	**4**
BFD Response Provided	**3**

Based upon needed personnel for an ERF for a low-risk fire alarm system, consideration should be given to maintaining the current initial response of:

- **1 engine.**

TABLE 4-14: Fire Alarm System, Moderate Risk

Critical Task	Needed Personnel
Incident Command	1
Pump Operator	1
Investigation	4
Forcible Entry/Ventilation (if necessary)	2
Effective Response Force	**8**
BFD Response Provided	**3**

Based upon needed personnel for an ERF for a moderate-risk fire alarm system, consideration should be given to increasing the current initial response to:

- **1 engine.**
- **1 ladder truck.**

TABLE 4-15: Fire Alarm System, High-Risk/High-Rise

Critical Task	Needed Personnel
Incident Command	1
Pump Operator	1
Water Supply/Fire Department Connection	1
Investigation	4
Search and Rescue (if necessary)	2
Annunciator Panel	2
Effective Response Force	**11**
BFD Response Provided	**3**

Based upon needed personnel for an ERF for a high-risk/ high rise fire alarm system, consideration should be given to an initial response of:

- **2 engines.**
- **1 ladder truck.**
- **1 Assistant Chief.**

BFD response to a motor vehicle accident with potential/reported entrapment includes the following resources:

- 2 engines.
- 2 ambulances.
- 1 Assistant Chief.
- 1 EMS supervisor

TABLE 4-16: Motor Vehicle Crash with Entrapment

Critical Task	Needed Personnel
Incident Command	1
Pump Operator	1
Scene Protection Line	2
Hazard Abatement	2
Patient Extrication	2
Patient Evaluation/Care	4
Effective Response Force	**12**
BFD Response Provided	**12**

Based upon needed personnel for an ERF for a motor vehicle crash with entrapment, consideration should be given to maintaining the current initial response. In the future, consideration could be given to adding the heavy rescue truck onto these assignments.

BFD response to both interior and exterior gas leaks includes the following resources:

- 1 engine.

TABLE 4-17: Natural Gas Leak, Interior and Exterior

Critical Task	Needed Personnel
Incident Command	1
Investigation/Air Monitoring	2
Pump Operator/Water Supply (If needed)	1
Protection Line (If needed)	2
Forcible Entry, Utility Control, Ventilation	2
Search and Rescue (If needed)	2
Establishment of an IRIT (Initial Rapid Intervention Team)	2
Effective Response Force	**12**
BFD Response Provided	**3**

Based upon needed personnel for an ERF for a natural gas leak, consideration should be given to an initial response of:

- **2 engines.**
- **1 truck (or heavy rescue truck).**
- **1 Assistant Chief.**

BFD initial response to a possible hazardous materials incident includes the following resources:

- 1 engine.
- 1 ambulance.
- 1 Assistant Chief.
- 1 HazMat truck.
- 1 HazMat trailer.

TABLE 4-18: Hazardous Materials Incident

Critical Task	Needed Personnel
Incident Command/Safety	2
Entry Team (Haz. Mat. Technician)	2
Back-up Team (Haz. Mat. Technician)	2
Decontamination Personnel	4
Research (Haz. Mat. Technician)	1
Support Personnel	6
Medical	2
Effective Response Force	**19**
BFD Response Provided	**9-11**

Based upon needed personnel for an ERF for a hazardous materials incident, consideration should be given to an initial response of:

- **2 engines.**
- **1 ladder truck.**
- **1 heavy rescue truck.**
- **1 Assistant Chief.**
- **1 EMS supervisor.**
- **HazMat truck and trailer (minimum of five HazMat Technicians).**

BFD initial response to a technical rescue incident depends upon the type of incident that has been reported. For most it consists of:

- 1 engine.
- 1 ladder truck.
- 1 heavy rescue truck.
- 1 ambulance.
- 1 Assistant Chief.

TABLE 4-19: Technical Rescue Incident

Critical Task	Needed Personnel
Incident Command	1
Rescue Team (Technical Rescue Technician)	4
Back-up Team (Technical Rescue Technician)	4
Support	8
Safety	1
Accountability	2
Medical	2
Effective Response Force	**22**
BFD Response Provided	**12**

Based upon needed personnel for an ERF for a technical rescue incident, consideration should be given to an initial response of:

- **3 engines.**
- **1 ladder truck.**
- **1 heavy rescue truck.**
- **2 ambulances.**
- **1 Assistant Chief.**
- **1 EMS supervisor.**

Although risk management processes and appropriate call screening are important parts of determining the appropriate number of resources that should be initially dispatched to various types of emergency incidents, it is also important that enough personnel and resources be initially available to handle all critical tasks in a timely manner should they need to be performed. For this reason, it is the widespread practice in the fire service to send multiple resources to incidents that ultimately end up not being utilized if the incident turns out to be a minor one that is easily mitigated. Even today, within reason, this remains a prudent approach. It is in support of this concept that CPSM recommends modifications to the BFD's initial dispatch of resources to various incidents, particularly reported structure fires.

Fire Operations Recommendation:

- CPSM recommends the BFD, to the extent possible and if practical and depending on available resources, increase its response resources to strip mall/commercial, apartment, and high-rise fire responses that at a minimum align more closely with the NFPA 1710 standard, or even the enhanced responses suggested in this section. (Recommendation No. 31.)

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Critical tasks by specific call type in fire-based EMS departments are not always as well defined as those critical tasks in the fire discipline. That notwithstanding, critical tasking in EMS is typical of that in the fire service in that there are certain critical tasks that need to be completed either in succession or simultaneously. EMS on-scene service delivery is based primarily on a focused scene assessment, patient assessment, and then followed by the appropriate basic and advanced clinical care through established medical protocols. EMS critical tasking is typically developed (in fire-based EMS Standards of Cover documents) in accordance with the U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services (CMS) as:

- Basic Life Support (BLS), which is an emergency response by a ground transport unit (and crew) and the provision of medically necessary supplies and services occurs.
- Advanced Life Support, Level 1 (ALS1), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including the provision of an ALS assessment or at least one ALS intervention.
- Advanced Life Support, Level 2 (ALS2), which is the transportation by ground ambulance vehicle and the provision of medically necessary supplies and services including:
  - *At least three separate administrations of one or more medications by intravenous push/bolus or by continuous infusion (excluding crystalloid fluids) or*
  - *Two ground ambulance transport, medically necessary supplies and services, and the provision of at least one of the ALS2 procedures listed below:*
    - *Manual defibrillation/cardioversion.*
    - *Endotracheal intubation.*
    - *Central venous line.*
    - *Cardiac pacing.*
    - *Chest decompression.*
    - *Surgical airway.*
    - *Intraosseous line.*

- Specialty Care Transport (SCT), which is *the interfacility transportation of a critically injured or ill beneficiary by a ground ambulance vehicle, including the provision of medically necessary supplies and services, at a level of service beyond the scope of the EMT-Paramedic*.

The following tables provide the critical tasking for the BDAS continuum of care. As indicated above, the critical tasking is based on the current CMS ground transport definition of ambulances services.

TABLE 4-20: BLS Critical Tasking

Critical Task	# Responders
Primary Patient Care Incident Command	1
Secondary Patient Care Vehicle Operations	1
Effective Response Force	**2**

Resource Deployment

1 Transport Ambulance

TABLE 4-21: ALS1 Critical Tasking

Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care Vehicle Operations	1
Effective Response Force	**3**

Resource Deployment

1 Transport Ambulance
1 EMS Supervisor

TABLE 4-22: ALS2 Critical Tasking

Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	1
Tertiary Patient Care Provider	2
Vehicle Operations	1
Effective Response Force	**6**

Resource Deployment

1 Transport Ambulance
1 EMS Supervisor
1 BFD Fire Unit

TABLE 4-23: SCT Critical Tasking

Critical Task	# Responders
Primary Patient Care Incident Command	1
Secondary Patient Care Vehicle Operations	1
Effective Response Force	**2**

Resource Deployment

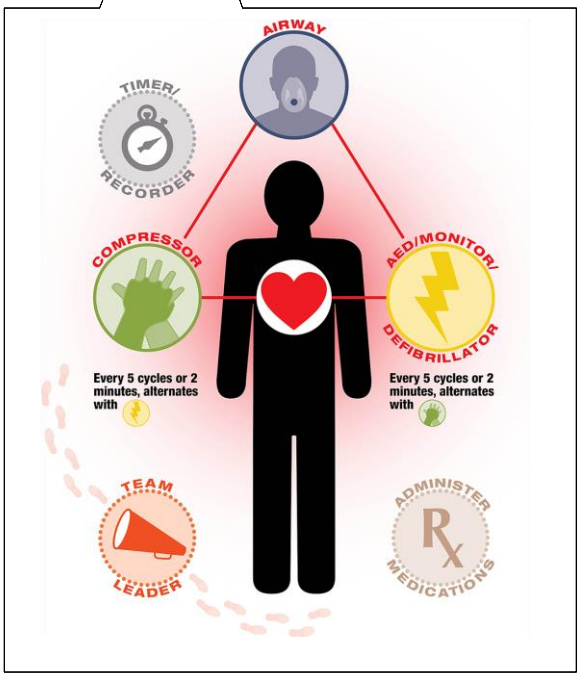
1 Critical Care Transport Ambulance

TABLE 4-24: Pulseless/Non-Breathing Critical Tasking

Critical Task	# Responders
Incident Command	1
Primary Patient Care	1
Secondary Patient Care	1
Tertiary Patient Care Provider	2
Vehicle Operations	1
Effective Response Force	**6**

Resource Deployment

1 Transport Ambulance
1 EMS Supervisor
1 BFD Fire Unit



Although the BFD's dispatch and operational procedures specify the dispatch and response of the ladder truck on reported structure and marine fires and certain technical rescue incidents, as was mentioned previously, the CPSM team was informed that in reality it only responds to a limited number of calls. The low response numbers in the data report support these reports.

In most fire departments ladder companies are tasked with the following responsibilities:

- Forcible entry.
- Search and rescue.
- Ventilation (including roof top ventilation).
- Ground aerial ladder.
- Utility control.

- Overhaul and salvage.
- Elevated master stream.

Responding to structural fire incidents (or potential fire incidents) with just the engines as opposed to a combination of engines and ladders limits the department's tactical options by not having aerial ladder or even longer ground ladder capabilities immediately available on scene. On the fireground this can impact the ability to perform rescues, access roofs, and deliver elevated water streams, including on residential occupancies, particularly newer ones of lightweight construction. Because of the myriad responsibilities they are assigned on the fireground, ladder or truck companies are often directed to "split" their personnel into two "crews." However, this cannot be accomplished with a unit staffed with just three personnel.

Fire Operations Recommendations:

- The Brownsville Fire Department should adopt a response procedure that includes the immediate response of the ladder truck (Truck 1) from Central Fire Station on every reported structure fire regardless of occupancy type. (Recommendation No. 32.)
- The Brownsville Fire Department should develop a funding plan to increase staffing on the ladder truck (Truck 1) from three to four personnel (three total added personnel) to increase its operational capabilities on emergency incidents and add to the BFD's ability to more effectively assemble an Effective Response Force. (Recommendation No. 33.)

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Looking ahead, if the City of Brownsville adopts the recommendation in this report to relocate Station 2 into a new facility in the northern part of the city, a possibility that the BFD should consider moving forward is to combine a pumper and aerial ladder functions into a 75-foot or 100-foot single axle "Quint." A quint is a fire service apparatus that serves the dual purpose of an engine and a ladder truck. This type of fire apparatus offers five functions: pump, water tank, fire hose, aerial device, and ground ladders. Combining an engine/pumper and aerial ladder into a single unit can satisfy operational needs that the department cannot meet unless it staffs two separate pieces of apparatus.

For fire incidents, if this unit is first due, it would function as an engine; for all other incidents it would function as a ladder truck company handling those mission critical duties including search and rescue and ventilation. Although quints are often touted as multifunctional vehicles—and in many respects they are—for any specific incident they are one company and can therefore perform only one job or function, that is engine **or** truck. The acquisition and deployment of this type of unit would double the number of the city's ladder truck companies with their specialized mission critical duties. This unit should also be staffed with four personnel rather than three.

Converting an engine to a quint does have several disadvantages that include:

- Possible slower response times with a larger, heavier apparatus responded.
- Using what will still basically be a $1 million-plus ladder truck to respond to EMS calls.
- In departments that have used quints to function as both an engine and a truck depending upon the incident, the important truck company duties often get neglected.

Fire Operations Recommendations:

- The Brownsville Fire Department should consider the future acquisition of a "quint" apparatus that has a 75-foot or 100-foot aerial ladder and is configured to also fully function as a fire pumper to be assigned to a replacement Station 2 in the northern section of the city. Along with Truck 1 it should respond on every reported structure fire. (Recommendation No. 34.)
- The Brownsville Fire Department should staff this unit (Truck 2) with four personnel to increase its operational capabilities on emergency incidents and add to the BFD's ability to more effectively assemble an Effective Response Force. If adopted, this recommendation adds an additional three personnel to the department. (Recommendation No. 35.)

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As noted previously, the BFD delivers field operations and emergency response services through a clearly defined division of labor that includes a middle manager (Assistant Chiefs), first-line operational supervisors (captains and lieutenants), technical specific staff (drivers), and firefighter/paramedics. At the time of the CPSM assessment the entire city is considered a single operational unit that is supervised by an Assistant Chief. There is also a single EMS supervisor on duty who oversees EMS operations. The Assistant Chief's duties include coordination of all on-shift response personnel and supervision of response crews, ensuring coverage is balanced across the city, and assuming command of larger incidents. Typically, agencies staff with one chief officer for every five or six response units.

Within the City of Brownsville are a total of ten fire suppression companies (8 engines, 1 ladder, 1 ARFF unit), each of which is supervised by a company-level officer (captain or lieutenant). However, the on-duty Assistant Chief is responsible for directly supervising all of these company officers. Under the National Incident Management System (NIMS) a proper span of control is between three and seven personnel/units, with five considered optimal. In Brownsville this number is being far exceeded.

It is CPSM's belief that the Brownsville Fire Department should be divided into two operational divisions of five stations each, with each division commanded by an Assistant Chief. This will allow for a proper span of control.

The addition of a second Assistant Chief on each shift will expand the supervisory capacity for both field and administrative oversight. Adding a second Assistant Chief will improve overall shift management. Greater attention can be given to the needs of response crews, including training, communications, and the like. In addition, a second Assistant Chief will improve effective response force coverage by reducing the span of control for the incident commander on significant emergency incidents. The second chief on structure fires can take command on the interior of the structure, take the rear of the building, perform safety or accountability functions, etc.

It should also be noted that the recommended span of control is also being exceeded in Brownsville for the shift EMS supervisors. The span of control will grow even more expansive if new/relocated stations 2 and 5 are eventually assigned medic units.

A critical component of the incident command system is the establishment of the role of safety officer to monitor conditions at fires and emergency incident scenes to ensure that appropriate safety procedures are being followed. <u>The incident safety officer is an important member of the incident command team</u>. The safety officer works directly under and with the incident commander to help recognize and manage the risks that personnel take at emergencies.

The concept of a command team recognizes that there is a shared responsibility for the proper and safe performance of personnel operating on the emergency scene. The fact is that one of the roles that the safety officer needs to play is that of challenging and confirming the incident commander's actions. The safety officer should be included in the development and monitoring of the incident action plan. In simple terms, the incident commander and the safety officer command team provide a system of checks and balance designed to keep all personnel on the emergency scene safe. Once the incident action plan is established, the safety officer monitors the plan for effectiveness and efficiency.

Fire departments in the Phoenix, Ariz., metro area are leaders in this regard and place a high priority on the assignment of a qualified officer to fill the safety officer position during a wide range of incidents. According to Phoenix Regional Standard Operating Procedures *"Incident Safety Officer System,"* for most incidents, the safety officer provides the following functions:

- Incident recon.
- Assess the risk/benefit of operations.
- Assess and address safety concerns on the incident scene.
- Communicate and report safety issues to command.
- Intervene as necessary to provide for safety.

During larger-scale incidents, the safety officer reviews the incident action plan and specific details of the safety plan. As appropriate, the safety officer confirms that a safety plan is in effect, reviews it, and provides recommendations. The incident commander may request that the safety officer develop a proposed safety plan and recommendations for command.

Beyond the specific emphasis on safety, the role of incident commander is a dynamic position and highly stressful position that has numerous critical responsibilities that must be handled simultaneously, and in a time critical manner.

In the Phoenix area, multiple fire departments utilize Field Incident Technicians (FITs) or Battalion Safety Officers (BSOs) paired with a Battalion Chief as part of a permanent incident management team. These are company-level officers, so in the case of Brownsville, these would be captains, who would work in tandem with the command-level officer, an Assistant Chief. This is a concept that the BFD should consider adopting to provide for more effective, efficient, and safer incident command operations.

When teamed with a Battalion Chief, in addition to normal safety officer functions, the FIT/BSO also fulfills the following roles and responsibilities:

- Incident recon.
- Assesses the risk/benefit of operations.
- Assists with managing the incident.
- Defines, evaluates, and recommends changes to the incident action plan.
- Provides direction relating to tactical priorities and specific critical fireground factors.
- Becomes the Incident Safety Officer.
- Assesses and addresses safety concerns on the incident scene.
- Communicates and reports safety issues to command.

- Intervenes as necessary to provide for safety.
- Manages personnel accountability on the incident.
- Evaluates the need for additional resources.
- Assigns logistics responsibilities.
- Assists with the tactical worksheet for control and accountability.
- Evaluates the fireground organization and span of control.
- Assists with personnel air management.
- Manages crew work/rest cycles and rehab.
- Other duties as necessary.

In addition, when not operating on the incident scene these personnel can:

- Conduct training within their division on their shift.
- Assist the Assistant Chief with other administrative duties.

Fire Operations Recommendations:

- In order to reduce the span of control to a recommended and manageable level the BFD should be divided into two divisions on each shift, each commanded by an Assistant Chief who would be in charge of five stations. The addition of another assistant chief on each shift will significantly improve fire ground operations and administrative functions at the shift level, while simultaneously reducing the span of control to an acceptable level. (Recommendation No. 36.)
- In order to provide for more effective, efficient, and safe overall incident management, and to enhance critical incident scene safety for all personnel, the BFD should implement the position of Field Incident Technician/Division Safety Officer, at the rank of captain, to function as a part of an integrated command team with each Assistant Chief. (Recommendation No. 37.)
- Once the city is divided into two divisions, a second EMS supervisor should be deployed to each shift, placing one in each division. Again this will reduce the span of control to an acceptable level. (Recommendation No. 38.)

FIRE PREPLANNING

An important part of risk management in the fire service is pre-fire planning surveys by fire companies of large, high hazard, and complex buildings in each fire response zone. Conducting pre-fire surveys by fire companies can have significant impact on both potentially reducing structural fire loss and on reducing firefighter injuries. By improving firefighters' understanding of complex building layouts, standpipe locations, etc. as well as by identifying any structural changes and possible code violations, suppression ground activities can be improved and potential firefighter injuries avoided.

The process of identifying target hazards and pre-incident planning are basic preparedness efforts that have been key functions in the fire service for many years. In this process, critical structures are identified based on the risk they pose. Then, tactical considerations are established for fires or other emergencies in these structures. Consideration is given to the activities that take place (manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped, imprisoned, etc.), and other specific aspects relating to the construction of the facility or any hazardous or flammable materials that are regularly found in the building. Target hazards are those occupancies or structures that are unusually dangerous when considering the potential for loss of life or the potential for property damage. Typically, these occupancies include hospitals, nursing homes, and high-rise and other large structures. Also included are arenas and stadiums, industrial and manufacturing plants, and other buildings or large complexes.

NFPA's 1620, *Recommended Practice for Pre-Incident Planning*, identifies the need to utilize both written narrative and diagrams to depict the physical features of a building, its contents, and any built-in fire protection systems. Information collected for pre-fire/incident plans includes, but is certainly not limited to, data such as:

- The occupancy type.
- Floor plans/layouts.
- Building construction type and features.
- Fire protection systems (sprinkler system, standpipe systems, etc.).
- Utility locations.
- Hazards to firefighters and/or firefighting operations.
- Special conditions in the building.
- Apparatus placement plan.
- Fire flow requirements and/or water supply plan.
- Forcible entry and ventilation plan.

The information contained in pre-incident fire plans allows firefighters and officers to have a familiarity with the building/facility, its features, characteristics, operations, and hazards, thus enabling them to conduct firefighting and other emergency operations more effectively, efficiently, and safely. Pre-incident fire plans should be reviewed regularly and tested by periodic table-top exercises and on-site drills for the most critical occupancies.

The Brownsville Fire Department has an active, ongoing pre-fire planning program that has resulted in the development of plans for a significant number of the identified target hazard structures in the city. Each station is required to do 20 preplans per month, or approximately 240 preplans per year. The preplans have traditionally been completed on paper but with the new CAD system they are going to loaded into computers and the CAD system so they will be more readily available to personnel on the incident scene.

An increasingly important part of fire department risk identification, assessment, and management is the identification of unsafe structures in the city that could pose an increased, and often unnecessary, risk to firefighters during a fire situation. Once these buildings have been identified they should be marked as being unsafe. In the event of a fire, unless the fire is still a small, incipient fire that can be extinguished quickly and safely, operations at these structures should be limited to exterior, defensive operations.

Fire Preplanning Recommendation:

- CPSM recommends that as a planning objective, the BFD should continue to make preplan development a high priority until such time as plans have been developed for all high- and medium-hazard occupancies located in the city, placing a high priority on those identified structures that are not protected by automatic sprinkler systems. Further, the BFD should compile an inventory of the locations of vacant and unsafe structures throughout the city and mark them accordingly with regard to offensive- or defensive-only fire suppression operations. (Recommendation No. 39.)

FIRE AUTOMATIC AND MUTUAL AID

Mutual aid is an essential component of almost every fire department's operation. Except for the largest cities, no municipal fire department can, or should, be expected to have adequate resources to respond to and safely, effectively, and efficiently mitigate large-scale and complex incidents. Mutual aid is shared between communities when their day-to-day operational fire, rescue, and EMS capabilities have been exceeded, and this ensures that the citizens of the communities are protected even when local resources are overwhelmed.

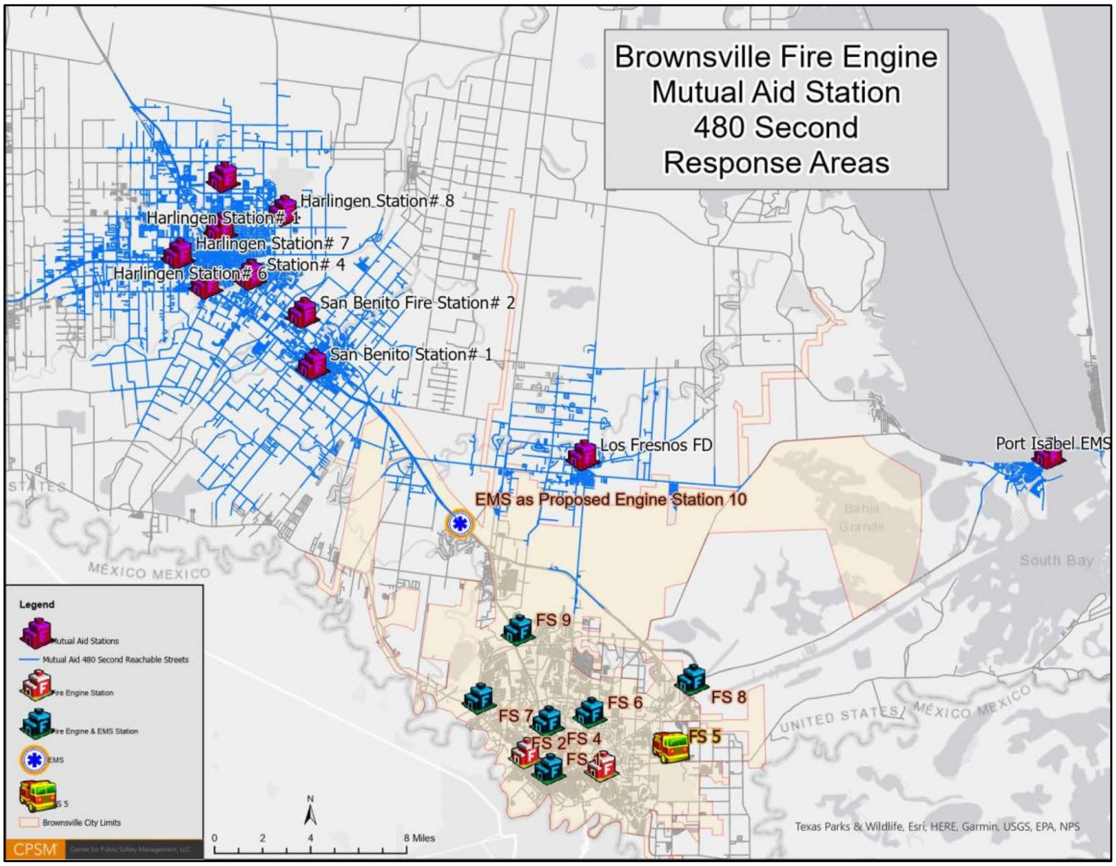
Automatic aid is an extension of mutual aid, where the resources from adjacent communities are dispatched to respond at the same time as the units from the jurisdiction where the incident is occurring. There are two basic principles for automatic aid, the first being that all jurisdictional boundaries are essentially erased, which allows for the closest, most-appropriate unit to respond to an incident, regardless of which jurisdiction it belongs to. The second is to provide, immediately and at the time of initial dispatch, the additional personnel or resources that may be needed to mitigate the reported incident.

Automatic and mutual aid is generally provided without charge among the participants.

- The BFD participates in limited automatic and mutual aid with its surrounding departments. This is primarily because of the city's somewhat isolated location and the fact most of its mutual aid partners would have somewhat extended response times. In addition, several of its surrounding departments are all-volunteer units—or combination departments with limited on-duty career staffing—whose availability and capabilities are often limited.

The following figure illustrates the location of BFD stations, with the location of the closest mutual aid stations along with 480-second response time bleeds. Other than the Los Fresnos Fire Department, no mutual aid is anywhere close to the city, which has significant impacts on the BFD's ability to utilize mutual or automatic aid to assemble an Effective Response Force. The most likely resource these departments would provide to Brownsville would be ladder trucks for major/multiple alarm fires.

FIGURE 4-23: Brownsville and Mutual Aid Stations



Auto and Mutual Aid Recommendation:

- The BFD should include mutual aid from neighboring departments on its box assignments/run cards—primarily for ladder trucks—when appropriate for major/multiple alarm incidents that occur within the city. (Recommendation No. 40.)

SPECIALIZED FIRE-TECHNICAL RESPONSE CAPABILITIES

Specialized response capabilities include hazardous materials (HazMat), high-angle rope rescue, trench collapse, building collapse, complicated heavy auto extrication, elevated rescue with an aerial platform, and confined space rescue. There are no provisions in NFPA 1710, ISO-FSRS, or other national benchmarks that require a fire department deliver all these services. What is required in the NFPA standard is *an organizational statement that sets forth the criteria for the various types of special operations response and mitigation activities to which the fire department is required to respond.*

Large municipal fire departments often build these assets into their day-to-day staffing and deployable resources. In some cases, separate companies are created and staffed to manage the HazMat and technical rescue service deliverables. Some cities assign these functions to ladder and/or rescue companies to include auto extrication. And in some communities, such as Brownsville, engine companies carry auto extrication equipment for light to medium extrication incidents and are trained in certain aspects of HazMat and technical rescue incidents, more as supportive assets in large scale incidents. Brownsville also has increased risk from heavily overloaded trucks traversing the overweight corridor to the Mexican border.

By virtue of its position as the largest fire department in the area, along with the wide range of complex and specialized incidents it may experience that would require much more specialized training, skills, and capabilities, the BFD has multifaceted specialized technical incident operational capabilities. The special operations teams represent a group of firefighter personnel that in addition to their firefighting duties and training have elected to diversify and train to meet the challenges and dangers of specific rescue environments. The following are the various specialty/technician certifications that BFD personnel have achieved:

- **High-angle Rescue** – Texas Commission on Fire Protection (TCFP) Technician Level-response and rescue.
- **Technical Rescue** including confined space and structural collapse. TCFP Technician Level-response and rescue.
- **Haz-Mat Response** – TCFP Technician Level; response, rescue, detection, mitigation.
- **Urban Flooding & Swift Water** – Technician Level-response, rescue, and recon.
- **Dive Team/Water Rescue** – Open-water SCUBA and commercial diver tender certifications; response, rescue, and recovery.
- **Airport Rescue Firefighting** (required for personnel stationed at the airport).
- **Unmanned Aerial Operations** – FAA Part 107 certified pilots; response, recon, and command and control via live stream capabilities to command staff.
- **Tactical Medic** – Certified tactical paramedic-law enforcement response with tactical teams, provide advanced life support under hostile environments.
- **Wildland Firefighter** – TCFP Wildland Fire Protection; response, containment, and extinguishment.
- **Alternate Response All-terrain/Mass Crowd Event Vehicles** – The BFD utilizes on-duty uniformed personnel to operate and respond in any combination of three ALS/BLS all-terrain mini ambulances and two ALS/BLS traditional 4x4 ATVs.

The department's special operations capabilities are scattered throughout the city, although most of its equipment is stored at stations 1 and 9. These capabilities include high-angle, confined space, and trench collapse technical rescue capabilities, in addition to normal vehicle extrication. There is also a marine rescue unit with dive capabilities. The department also has a certified level-A hazardous materials response team. All these special operations capabilities are available for response to assist on incidents throughout Cameron and surrounding counties.

Because of the specialized, often complex, and dangerous, nature of special operations, it is imperative that the personnel who engage in these endeavors are well-trained and given opportunities to maintain their skills at the highest level possible. This requires training on a regular basis.

Despite the department having these capabilities, its special operations resources do have some shortcomings. First, the city's heavy rescue truck, which was traditionally staffed with just a driver, has not had that position filled as the department tries to manage overtime costs. While the vehicle is still available to respond, if needed, it is only in fair condition and a lot of the equipment is carried on trailers rather than on a single vehicle. While trailers are fine for some equipment, it would be better if most of the special operations equipment—including technical rescue, hazardous materials, and water rescue—were carried on a single vehicle. In addition, a city the size of Brownsville would be well served by having a staffed (with four personnel) and highly trained heavy rescue company with special operations capabilities available to respond to a wide range of emergencies in the city. The following figure shows a special hazards unit operated by the Providence, Rhode Island, Fire Department.

FIGURE 4-24: Typical Special Hazards Unit

Photo credit: Michael Delaney/Providence Journal

One special operations discipline where the BFD is severely lacking is in the area of shipboard firefighting. The chances for significant shipboard fires are high within the large port area, in facilities within the port, and in large vessels undergoing dismantling. A significant fire on a ship can be a complicated, high-risk, personnel-intensive incident that will quickly utilize all the city's firefighting resources. Although the BFD had shipboard firefighting training in the past, it has been many years since that training took place, and most of the personnel who were trained are no longer with the department. Obtaining in-depth training (including hands-on/practical training) on shipboard firefighting for all BFD personnel should be a top training priority for the city and department.

In addition to a lack of shipboard firefighting training, the BFD lacks the equipment to handle many of the possible incidents that could occur in the port area, including major fires in the flammable liquid transloading and storage facilities (7,100,000 barrels, or nearly 300,000,000 gallons, potentially on site).

Other than the ARFF unit at the airport, the city and the port have no foam pumper, no large storage cache of foam, and no way to develop the large quantities of water and foam solution that would be required to mitigate a large tank, transloading facility, or truck/train incident on the highway/rails. There is also just a single tugboat that serves the port that has limited firefighting capabilities. There is no dedicated fire boat. This is an area where the City of Brownsville, the BFD, and the Port of Brownsville need to work collaboratively to assess their risks (the port is undertaking a comprehensive risk assessment) and seek funding, including grants, to fund necessary training and equipment needs. The following figures illustrate some of the equipment that should be considered for incident mitigation in the port area.

FIGURE 4-25: Typical Fire Boat, Wilmington, Delaware

This boat is equipped with a 12,000 gallon per minute (GPM) fire pump and carries 300 gallons of foam concentrate.

FIGURE 4-26: Typical Foam Pumper

This unit is equipped with a 4,000 GPM fire pump, 300 GPM foam pump, and carries 2,000 gallons of foam concentrate.

FIGURE 4-27: Typical Foam Tender

This foam tender carries 4,000 gallons of foam concentrate.

FIGURE 4-28: Typical High-Capacity Foam Monitor Trailer

This is a mobile large-volume discharging platform capable of delivering up to 6,000 GPM of water or foam solution for fire suppression or gas dispersion. It can be equipped with optional chemical delivery system for the application of dry chemicals to extinguish three-dimensional fires or gas pressure fires.

FIGURE 4-29: Large Diameter Hose Tender

Trailer equipped to carry 3,000 feet of 7.25 inch large diameter hose, 1,000 pounds of Purple K extinguishing agent, and various water supply fittings and adapters.

Specialized Response Recommendations:

- The city of Brownsville and the BFD should develop a funding plan over the next one to three year period to replace the current heavy rescue truck with a contemporary rescue/special hazards apparatus. The planning for this vehicle's personnel should include the organization of a Special Operations/Hazards Unit as a response company staffed with four personnel. This unit should continue to be deployed from Station 9. All personnel assigned to this station should be certified to the technician level in multiple special hazards disciplines, thus making it the Special Operations Station. (Recommendation No. 41.)
  - The City of Brownsville and BFD should seek to make this a joint endeavor with funding also coming from both the Port of Brownsville and SpaceX Starbase.
- In conjunction with the Port of Brownsville, the BFD should make it a high priority to provide all personnel with intensive hands-on shipboard firefighting training. (Recommendation No. 42.)

- In conjunction with the Port of Brownsville, the BFD should work to obtain funding, including through grants, for the purpose of obtaining firefighting apparatus and equipment that would be needed to handle significant fire incidents in the port area. This includes the following recommended major equipment acquisitions: (Recommendation No. 43.)
- A fireboat.
- A foam pumper to be deployed from Station 8.
- A foam tender to be deployed from Station 5.
- One or more high-capacity foam monitor trailers to be stored at fire stations, or the port area, for quick response.
- One or more large diameter hose trailers to be stored at fire stations, or in the port area, for quick response.

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SECTION 5. EMS OPERATIONS DEPLOYMENT AND PERFORMANCE

BROWNSVILLE PROVIDER BACKGROUND

Emergency medical services (EMS) in Brownsville are provided by the Brownsville Fire Department (BFD), which serves an area of approximately 242 square miles and 186,738 residents in the City of Brownsville, and the extended territorial jurisdictions (ETJs) including the contracted areas in Cameron County, Boca Chica, Cameron Park, Olmito, and Rancho Viejo, and other surrounding communities, upon mutual aid request. The department operates eight advanced life support (ALS) ambulances 24/7.

The department provides reliable 911 response and inter-facility services to support local medical facilities. BFD also provides Mobile Integrated Healthcare/CP (MIH/CP) services and has recently been approved by the Centers for Medicare and Medicaid Services (CMS) for participation in the new Emergency Triage, Treatment and Transport (ET3) service delivery model, an innovative new payment model that reimburses ambulance providers for services other than ambulance transport to an emergency department. Although BFD has been approved by CMS for this model, it has not yet operationalized the model.

In 2019, BFD responded to 24,613 EMS calls (86 percent of all BFD responses), an average of 67.4 calls per day. In 2020, BFD's EMS response volume decreased by 7.2 percent to 22,836 EMS responses. Most EMS agencies experienced similar EMS response volume decreases due to the public health emergency caused by COVID-19. However, BFD's EMS response volume in 2021 also decreased by another 3.7 percent to 21,993 responses for the year. We believe these two years of response volume decreases are related to the ongoing COVID-19 pandemic, and BFD's EMS response volume will 'normalize' to a growth rate of between 2 percent and 3 percent annually, concurrent with the population growth occurring in Brownsville.

BROWNSVILLE AMBULANCE WORKLOAD

The workload of BFD units is measured in two ways: *runs* and *deployed time*. The deployed time of a run is measured from the time a unit is dispatched through the time the unit has completed a response and is available for another response. Because multiple ambulances respond to some calls, there are more ambulance runs (31,615) than EMS calls (24,613) and the average deployed time per run varies from the average duration per call.

The total deployed time for BFD's ambulances on the 31,615 ambulance runs was 29,389 hours, an average of 0.930 hours, or 55.8 minutes per ambulance response.

Another method for measuring workload is *Unit Hour Utilization (UHU)*. UHU is a measure of activity, essentially measuring the amount of on-duty time that an EMS response unit is assigned on a response.

A Unit Hour is defined as one unit, fully staffed, equipped and available for a response. For example, one unit on-duty, 24 hours per pay, 365 days per year equates to 8,760-unit hours (1 x 24 x 365). The UHU is then derived by dividing the number of *responses* by the total number of *unit hours*.

For the period of the analysis, BFD staffed seven primary ambulance units 24 hours per day, 7 days per week, plus one peak ambulance nine hours per day, generally from 8:00 a.m. to 5:00 p.m., 7 days per week. This staffing resulted in 64,605 staffed unit hours.

Recently, BFD transitioned an ambulance it was staffing for a nine-hour day-shift peak ambulance to a full 24/7 resource. For the purposes of this analysis, we used the staffing levels for 2019–2021, with a reference to the new utilization based on the transition from the peak staffed ambulance to the 24/7 resource.

In **2019**, using the Unit Hours of BFD's ambulances, we derive a Unit Hour staffing of 64,605 hours ((7 [ambulances] x 8,760 [hours each per year]) + (1 [ambulance] x 9 [hours per day] x 365 [days])). Dividing the number of responses into the number of Unit Hours, we derive a response UHU of **0.384**. This essentially means that a BFD ambulance is on an EMS response 38.4 percent of the time it is on duty.

TABLE 5-1: 2019 BFD EMS UHU-Responses

Station	Unit	Unit Type	Staffed Unit Hours	Responses	UHU - Responses
1	M1	ALS Unit	8,760	3,512	0.401
3	M3	ALS Unit	8,760	3,168	0.362
4	M4	ALS Unit	8,760	3,628	0.414
6	M6	ALS Unit	8,760	3,873	0.442
7	M7	ALS Unit	8,760	3,503	0.400
8	M8	ALS Unit	8,760	3,194	0.365
9	M9	ALS Unit	8,760	3,861	0.441
10	M10	ALS Unit	3,285	44	0.013
Total			**64,605**	**24,783**	**0.384**

In **2020**, BFD responded to 22,836 EMS calls. Using the similar staffing pattern reveals a *response* UHU of 0.353 (64,605 staffed unit hours ÷ 22,836 responses).

A limitation of the UHU calculation is that it generally presumes that an ambulance response will last one hour. However, as referenced earlier, a BFD ambulance is typically committed on an EMS call for an average of 55.8 minutes. Therefore, we can also use a *time* analysis to more clearly indicate the percentage of time that BFD ambulances are committed on EMS responses.

The next table reveals that in **2019**, the total time that BFD ambulances were committed on EMS calls was 24,415.3 hours. Using the 64,605 annual staffed Unit Hours for the ambulances, we can calculate the percentage of time that BFD ambulances were committed on EMS responses as **0.378, or, in essence, 37.8 percent of their on-duty time**.

TABLE 5-2: 2019 BFD EMS UHU-Deployed

Station	Unit	Unit Type	Staffed Unit Hours	Deployed Minutes per Run	Total Deployed Hours	UHU - Deployed
1	M1	ALS Unit	8,760	57.2	3,347.0	0.382
3	M3	ALS Unit	8,760	61.5	3,245.9	0.371
4	M4	ALS Unit	8,760	61.5	3,717.7	0.424
6	M6	ALS Unit	8,760	55.6	3,587.5	0.410
7	M7	ALS Unit	8,760	58.5	3,418.1	0.390
8	M8	ALS Unit	8,760	57.2	3,042.6	0.347
9	M9	ALS Unit	8,760	60.9	3,919.0	0.447
10	M10	ALS Unit	3,285	187.5	137.5	0.042
Total			**64,605**	**58.9**	**24,415.3**	**0.378**

In 2020, a similar analysis of deployed time reveals a utilization of **0.364** (64,605 staffed unit hours ÷ 23,532 deployed hours).

Updated data from BFD provided to CPSM regarding BFD's staffing patterns and response volume for **2021** reveals that M10 was converted from an ambulance staffed part-time, to an ambulance staffed 24 hours/day, 7 days per week. BFD also reported that its 2021 response volume was 22,993 EMS calls.

Using the new staffing and response volume from BFD, we calculate the UHU workload for BFD's ambulances in 2021 as 0.314.

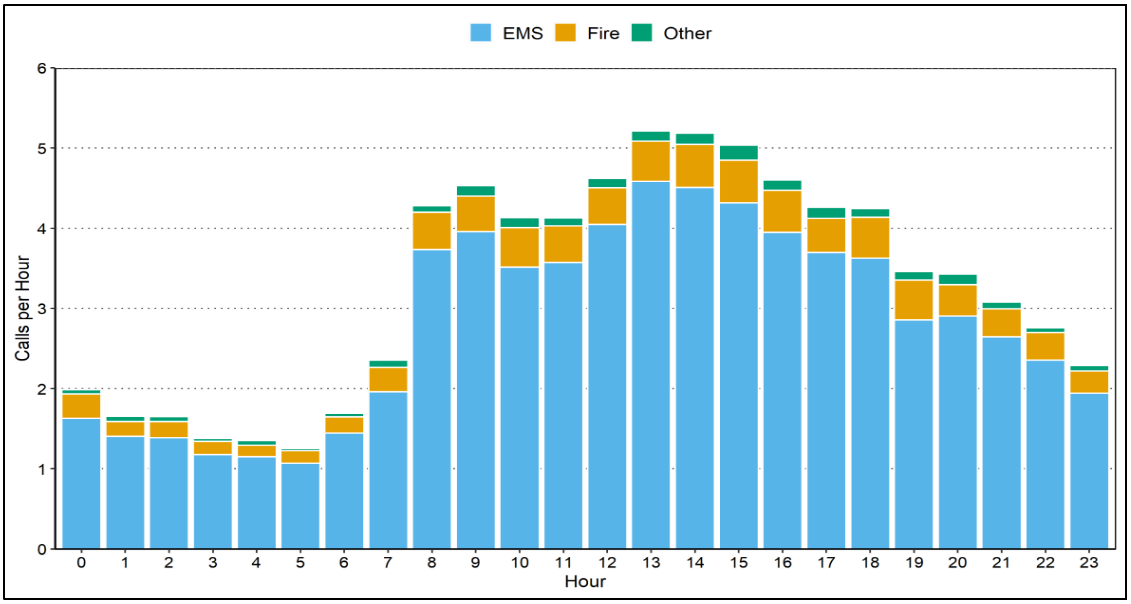
The three-year trend shows a *decrease* in EMS response volume, with an *increase* in staffed ambulances. This is a relatively unusual pattern, as in many communities, EMS response volumes tend to increase with growing population. As a result of the decreasing response volume, and added ambulance unit hours, BFD's ambulance utilization has been decreasing over the past three years as illustrated in the following table.

TABLE 5-3: 2019 BFD UHU: 2019, 2020, and 2021

	Ambulance Responses	Staffed Unit Hours	Unit Hour Utilization
2019	24,783	64,605	0.384
2020	22,381	64,605	0.346
2021	21,993	70,080	0.314

EMS calls tend to follow a predictable pattern, with more responses occurring during the day, when people are more active, and fewer responses overnight, when most people are sleeping. The next figure illustrates BFD's average response volume by time of day. This figure illustrates that between hours of 8:00 a.m. and 8:00 p.m., there are nearly double the number of calls than during overnight hours.

FIGURE 5-1: Average Response Volume By Time of Day



The following table shows *EMS response volume* differences between the hours of 8:00 a.m. and 8:00 p.m. compared to the hours of 8:00 p.m. to 8:00 a.m.

TABLE 5-4: EMS Average Response Volume by Time Period

8:00 a.m. to 8:00 p.m.	8:00 p.m. to 8:00 a.m.	% Difference
277	121	56.3%

This analysis demonstrates that there are more than twice as many EMS responses between the hours of 8:00 a.m. and 8:00 p.m. than there are between 8:00 p.m. and 8:00 a.m. To balance both workload and system performance, BFD should reallocate ambulance unit hours to decrease ambulance unit hours at night and increase ambulance unit hours during the day. We recommend that BFD explore options that flexibly deploy ambulances to match these demand patterns.

Ambulance Workload Recommendations:

- BFD's leadership should closely monitor response volume trends and adjust staffed unit hours to prevent overstaffing for current ambulance workloads. (Recommendation No. 44.)
- BFD should explore options to flexibly deploy ambulances to match predictable EMS response demand patterns; specifically, adding ambulance resources between 8:00 a.m. and 8: 00 p.m. and reducing resources between 8:00 p.m. and 8:00 a.m. (Recommendation No. 45.)

BFD AMBULANCE RESPONSE TIMES

A detailed response time analysis for BFD is included in the accompanying data analysis report. To derive the total response times for BFD, we analyze three specific time segments:

- **Dispatch time** is the difference between the time a call is received and the earliest time an agency is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and the types of resources to dispatch.
- **Turnout time** is the difference between the earliest dispatch time and the earliest time an agency's unit is en route to a call's location.
- **Travel time** is the difference between the earliest en route time and the earliest arrival time. Response time is the total time elapsed between receiving a call to arriving on scene.

CPSM uses two response time measures to evaluate EMS response times, *average* and *fractile*. The average time represents the response time internal at which half of the responses are LESS than that interval, and half are LONGER than that interval. It is a level of performance, but not necessarily a level of reliability.

The 90th percentile measure is a measure of reliability. A 90th percentile analysis determines the response interval in which 90 percent of the EMS response times fall under that interval. In other words, the response time interval in which only 10 percent of the EMS response time was longer than that 90th percent interval.

For BFD EMS responses, the ***average*** times for each segment are depicted in the next table.

TABLE 5-5: BFD EMS Average Response Times

Call Type	Average Time in Minutes			
	Dispatch	Turnout	Travel	Total
EMS Total	3.1	0.6	8.9	12.6

For BFD's EMS responses, note that the ***90th percentile*** times for each segment are depicted in the next table.

TABLE 5-6: BFD EMS 90th Percentile Response Times

Call Type	90th Percentile Time in Minutes			
	Dispatch	Turnout	Travel	Total
EMS Total	5.1	1.0	13.9	18.4

In both measures, the dispatch times are extended, and the turnout times are not unreasonable. However, travel times are extended but generally consistent with other peer systems.

However, the average and fractile dispatch times of 3.1 minutes and 5.1 minutes, respectively, are *significantly longer* than we find in other, similar systems. Since dispatch time contributes to the overall response times for an EMS response, the extended dispatch time could have an impact on patient outcomes in time-sensitive, critical EMS responses. BFD dispatch services are provided by the Brownsville Police Department (BPD); therefore, we would strongly recommend that BFD and the police department critically evaluate and enhance the dispatch process to try and reduce the call processing times for EMS calls.

Ambulance Response Time Recommendation:

- BFD and BPD should evaluate the EMS dispatching process to try and reduce the call processing times for EMS calls. (Recommendation No. 46.)

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FUTURE AMBULANCE STAFFING NEEDS

BFD has experienced a response volume *decrease* over the past two years. Response volume decreases in 2020 were not unusual in many communities due to factors associated with the COVID-19 pandemic. For BFD, however, this trend continued into 2021, which is slightly unusual, since EMS response volumes for many communities returned to a relatively normal level post-pandemic.

TABLE 5-7: BFD EMS Workload Trends 2019, 2020, and 2021

Measure	2019	2020	2021
Population	182,271	186,783	191,453
EMS Responses	24,613	22,836	21,993
Ambulance Response UHU	0.350	0.350	0.350
Ambulance Unit Hours Needed Per Year	70,323	65,246	62,837
Ambulances Needed	8	7	7
Ambulance Personnel (@7.3 FTEs/Ambulance)	56	52	50

Based on community demographics, population growth and recent response volume trends, we projected anticipated response volumes for BFD over the next five years as depicted in the next table.

TABLE 5-8: BFD EMS Projected Workload, 2022–2028

Measure	2022	2023	2024	2025	2026	2027	2028
Population	196,239	201,145	206,173	211,328	216,611	222,026	227,577
EMS Responses	22,543	23,106	23,684	24,276	24,883	25,505	26,143
Ambulance Response UHU	0.350	0.350	0.350	0.350	0.350	0.350	0.350
Ambulance Unit Hours Needed	64,408	66,018	67,669	69,360	71,094	72,872	74,694
Ambulances	7	8	8	8	8	8	9
Ambulance Personnel	51	53	54	55	57	58	60

Based on the ideal UHU for BFD units, we anticipate that the current deployment of eight ambulances will be sufficient for EMS response needs until 2028, at which time an additional ambulance will likely be necessary to balance workload and maintain appropriate response times.

BROWNSVILLE AMBULANCE TRANSPORT BILLING OVERVIEW

Revenue for BFD's ambulance operations are essentially generated from two sources: revenue collected from fees charged for ambulance service and taxes. The difference between the revenue generated from ambulance fees, and the cost-of-service delivery, is subsidized by taxpayers. Maximizing ambulance service revenue results in a decreased need for publicly funded tax subsidy.

Service Fees

Fees for ambulance services provided by BFD are established by the City of Brownsville through a local ordinance. Ambulance fees have not been revised since 2010, and the current fees are substantially below "Usual, Customary and Reasonable" (UCR) fees for the region. The following table shows the current fees established by the city compared to the UCR fees for the similar services as found on FairHealth, a well-respected and well-utilized database for analyzing regional medical fees.

TABLE 5-9: BFD EMS Ground Transport Fees Compared to Regional UCR Fees

Service	HCPCS	BFD	FairHealth
Advanced Life Support (ALS) - Emergency	A0427	$450	$1,199
ALS - Non-Emergency	A0426	$450	$850
Basic Life Support (BLS) - Emergency	A0429	$350	$850
BLS - Non-Emergency	A0428	$350	$1,500
Courtesy Assistance Fee	N/A	$25	N/A
Additional Personnel	N/A	$150	N/A
Treatment, No Transport - Refusal	N/A	$75	N/A
No Transport, with Treatment	A0998	$150	$200
Specialty Care Treatment, or Transport	A0434	$530	$4,925
Mileage (per mile)	A0425	$10	$25
Wait Time (per hour)	A0420	$100	N/A

Cities often set fees below UCR to prevent complaints regarding fees from the citizens who use ambulance services. However, it also significantly reduces the amounts which may be eligible for insurance reimbursement, and places increased financial burden on the city through a greater need for funds allocated to ambulance service from the city budget.

Medicare and Medicaid pay ambulance fees based on a fee schedule, with little to no financial impact on the patient.

Patients who lack insurance coverage generally do not pay the ambulance fee at all—this is reflected in the small amounts collected from private pay patients in the table follows. In FY 2020-21, 40.2 percent of transports provided by BFD were billed as private pay, meaning the patient did not have insurance. Of the $2.3 million billed, only $182,530 was collected; a 7.9 percent collection rate. This is not unusual for safety-net medical care providers, such as ambulance services.

Commercial insurers generally pay a percentage of UCR for services provided in regional geographic areas. If fees are set below market rates, insurers can then pay smaller amounts; many insurers pay the lesser of the UCR or the billed amount. If the billed amount is less than

UCR, the insurers will pay less than the UCR for BFD's services. In essence, by charging below-market rates, the city is using tax dollars to subsidize the commercial insurers.

Ambulance Billing Revenue Analysis

A summary of the payer mix and billed and collected fees provided by BFD's billing department are shown in the following table. According to this analysis, Brownsville appears to have a relatively challenging payer mix, which likely impacts potential revenue for ambulance services in the community. The *Bill Patient* percentage is higher than we see in most communities, and the *Medicare*, *Medicaid*, and *Insurance* payer classes are significantly lower. While this could be a true reflection of the patient demographic, it could also reflect the Revenue Cycle Management (RCM) process.

TABLE 5-10: BFD EMS Payer Mix

Payer Source	Services	%	Billed	Average Patient Charge	Collected	% of Overall Collected	% Collection Rate by Payer	Collected per Service
Medicare	4,667	22.0%	$2,185,557	$468.30	$963,457	34.7%	44.1%	$206.44
Medicaid	2,077	9.8%	$1,032,676	$497.20	$422,519	15.2%	40.9%	$203.43
Insurance	5,959	28.0%	$2,911,747	$488.63	$1,210,151	43.6%	41.6%	$203.08
Bill Patient	8,553	40.2%	$2,318,565	$271.08	$182,530	6.6%	7.9%	$21.34
Total	**21,256**	**100.0%**	**$8,448,545**	**$397.47**	**$2,778,657**	**100.0%**	**32.9%**	**$130.72**

The below-market rate ambulance fees are resulting in an Average Patient Charge (APC) of $397.47. Of that average bill, BFD is collecting an average of $204.32 from insurers. These amounts are exceptionally low, resulting in increased need for tax subsidy to offset revenue losses from ambulance billing.

For comparison, MedStar, the public EMS agency in Fort Worth, Texas charges the average FairHealth determined UCR, and collects significantly more than the amount per transport than BFD collects.

TABLE 5-11: MedStar-Fort Worth EMS Fees

Charged and Collected	2021
Average Patient Charge	$1,651.12
Average Collected per Transport	$430.81

Revising ambulance rates to be more aligned with the regional UCR as determined by FairHealth would result in substantial fee-for-service revenue enhancement, reducing the amount of taxpayer subsidy required for ambulance operations. Further, Texas Medicaid is in the process of revising the Ambulance Supplemental Payment Program (ASPP), a supplemental payment available to public ambulance agencies, from cost-based reimbursement to a reimbursement based on the difference between the Average Commercial Reimbursement (ACR) and the average Medicaid reimbursement. Increasing BFD's average ACR will likely enhance the ASPP payment received by the City of Brownsville.

Ambulance Service Fees Recommendation:

- The City of Brownsville should consider raising ambulance service fees to be at least the median of FairHealth regional fees for ambulance services. (Recommendation No. 47.)

EMS Membership/Subscription Programs

Many EMS agencies offer membership programs to help minimize the financial impact of ambulance bills that are not covered by insurance. Most membership/subscription programs allow people to pay an annual fee, typically per household, that either waives financial responsibility for the remaining balance after insurance pays its allowed portion of the ambulance bill, or provides a significant discount for services not covered by insurance. This would be a valuable option to offer Brownsville residents, especially if ambulance rate increases are implemented.

Examples of membership subscription programs follow:

City of Longview

https://www.longviewtexas.gov/2425/Ambulance-Subscription-Program

The City of Longview through the Emergency Medical Services provided by the Fire Department is committed to providing quality, affordable emergency ambulance care as a service to all residents of Longview. Since 2009, the Longview Fire Department has offered an EMS Subscription Program to Longview residents in an attempt to help offset the rising cost of out-of-pocket medical expenses. With the typical cost associated with EMS transports averaging $800 to $1,000 per response, the program limits any out-of-pocket EMS expenses to $70/year. For the Longview resident, that $70 annual fee is the maximum out-of-pocket expense for EMS transport to either of Longview's two hospitals. The single fee covers those who are eligible living in the subscribed household.

City of Bedford

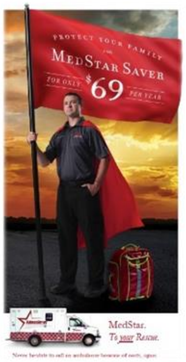
https://bedfordtx.gov/698/Ambulance-Subscription-Program

Ambulance Subscription Program

The City of Bedford offers Bedford residents an ambulance subscription service to help offset the high costs of emergency ambulance transportation. Insurance companies routinely do not pay the entire amount of ambulance transportation, leaving the patient with the responsibility of paying the balance of the bill. The purpose of the subscription service is to cover the amount not covered by your insurance provider or Medicare. For $60 per year (per family), you will never have to worry about paying an ambulance bill. Medicaid recipients or persons not covered under a primary insurance policy are not eligible for this program.

The completed application form and enrollment fee can be mailed or brought in-person to Fire Administration at Station 1, located at 1816 Bedford Rd. For more information, please call 817-952-2500.

MedStar



https://www.medstar911.org/medstar-starsaver-memberships/

MedStarSaver Membership

*A MedStarSaver membership is available to anyone who lives or works in the MedStar service area. This membership can protect **your entire household** with unlimited emergency transports for the full year of your active membership for only $69 per year. The membership covers any relative who permanently resides in your household, who is included in your application!*

City of Hurst

https://www.hursttx.gov/about-us/departments/fire-ems/ambulance-subscription

The City of Hurst is offering citizens an ambulance subscription service to help offset the high costs of emergency ambulance transportation. Insurance companies routinely do not pay the entire amount of ambulance transportation, leaving the patient with the responsibility of paying the balance of the bill. The purpose of the subscription service is to cover the amount not covered by your insurance provider or Medicare. If a person does not have health care insurance, this program covers emergency medical services delivered prior to hospital arrival. For $60 per year per family, you will never have to worry about paying an ambulance bill. Medicaid Recipients are not eligible for this program.

Subscription Program Recommendation:

- BFD should consider creating an EMS subscription program to defray out-of-pocket ambulance costs for residents. (Recommendation No. 48.)

Revenue Cycle Management

BFD currently conducts in-house ambulance billing with a staff of seven full-time employees. Ambulance billing, like healthcare billing in general, can be very challenging. Maximizing ambulance reimbursement often requires exceptional processes from field staff, hospital partners, and billing staff. In-house billing services for an agency such as BFD are relatively rare due to the complex processes necessary to assure effective RCM.

There are several well-respected, national ambulance billing firms that do an exceptional job of ambulance billing. Their exclusive focus on billing processes such as electronic data exchange with hospitals, detailed analysis of potential insurance coverage, and even assisting patients with applications for Medicaid, typically enhance revenue generation for EMS agencies. These firms also make significant investments in assuring they are up to date on new processes to enhance revenue generation, while at the same time ensuring a humane billing experience for the patients. These firms also offer training and education to field staff to help them improve documentation that could help enhance insurance reimbursement, reducing ambulance fee burden to the patient.

Typically, ambulance billing services contract fees are based on a percentage of revenue collected, which generally range from 3 percent to 6 percent. Based on the revenue analysis provided by BFD, contracting with an outside billing agency would likely cost between $84,000 and $166,000 annually. According to financial data supplied by BFD, expenses for the BFD billing department with seven full-time employees were in excess of $350,000. Contracting with an outside agency could offer significant cost savings and would likely result in enhanced revenue generation.

Ambulance Billing Recommendation:

- BFD should evaluate options for outsourcing its billing services to reduce costs and enhance revenue generation. (Recommendation No. 49.)

911-DISPATCH CONSIDERATIONS (PRIORITY MEDICAL DISPATCH)

Dispatch services for BFD are provided by the Brownsville Police Department (BPD). BPD is not currently providing Emergency Medical Dispatch (EMD) services to 911 callers. EMD is an evidence-based, structured process for call intake, prioritization, and most importantly, the provision of Pre-Arrival Instructions (PAI) for 911 callers.

Numerous studies have demonstrated that implementation of EMD provides the following significant benefits:

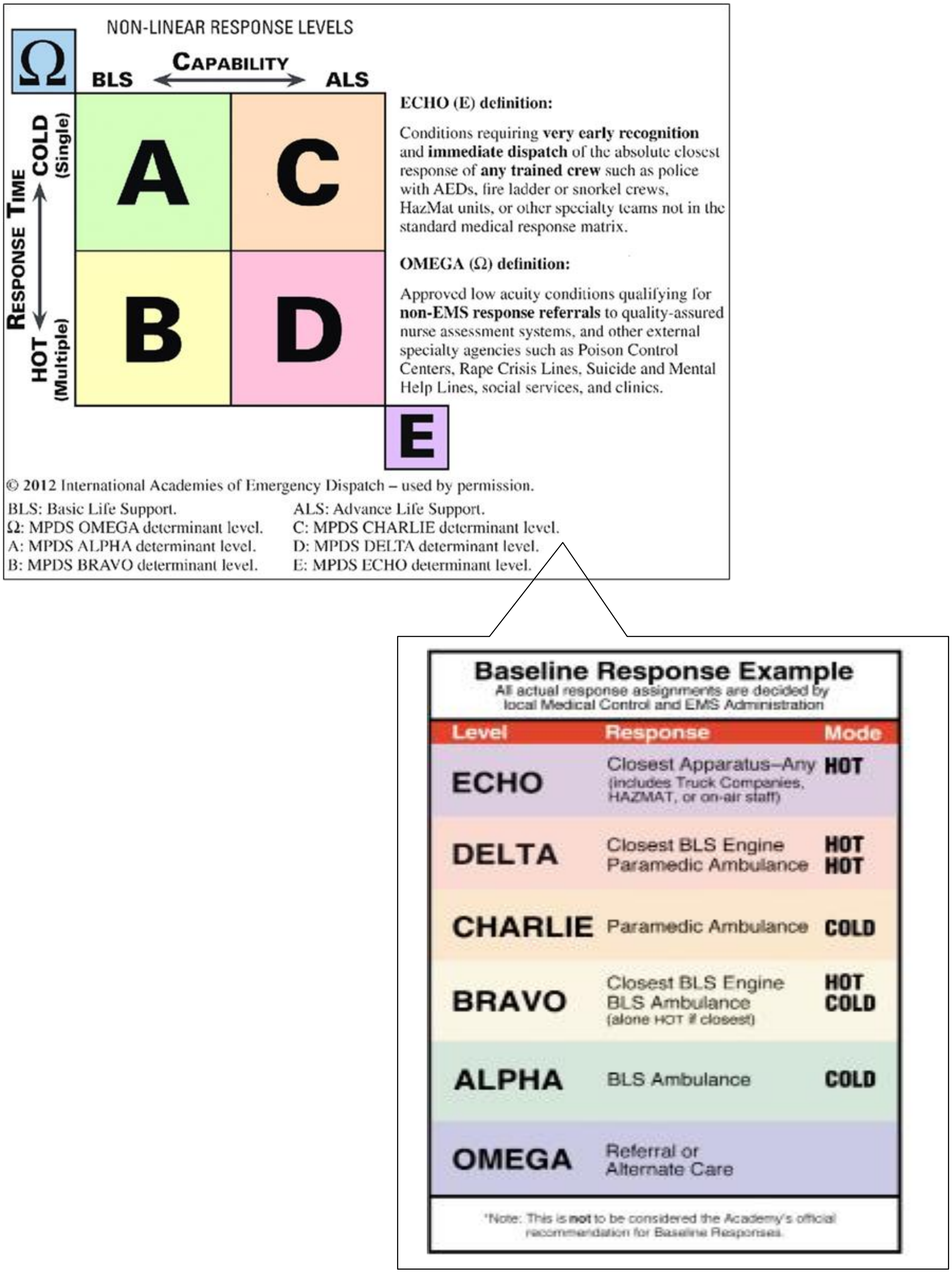
- The provision of evidence-based medical instructions to callers for life-threatening conditions such as CPR, airway management, and bleeding control.
- Structured call-taking process that reduces call processing time, enhances call-taking quality, and reduces response times.
- Assignment of response determinants, based on the medical need of the patient.
- Determination of response priorities that help assure that more serious medical calls receive the highest priority response.
- Determination of response modes to limit the use of dangerous lights and siren (L&S) response vehicle operation to only those responses in which a HOT response may make a difference in the patient's outcome.

The most widely used EMD program is the Medical Priority Dispatch System (MPDS®), a system that helps emergency communication centers to eliminate the impractical and dangerous practice of freelance call taking. This system is a highly respected EMD system and is used by most progressive dispatch agencies.

The MPDS includes 36 evidence-based protocols and over 300 response determinants that can be used by local communities and EMS medical directors to tailor response plans to medical emergencies. These response determinants are alpha-numeric codes that inform the responding units specifically what type of medical call they are responding to. If approved by local protocol, the MPDS system can also be used to assign response priorities and modes of response, as well as make determinations regarding the response configuration for the EMS response.

An example of a response matrix based on MPDS EMD response determinants follows.

FIGURE 5-2: Medical Priority Dispatch System Response Determinants



Implementation of the MDPS would dramatically enhance the EMS call-taking services provided by BPD by providing life-saving instructions to callers for a medical emergency, reduce call processing times, and enable BFD and its medical director, to assign response plan configurations to EMD response determinants that prioritize EMS responses and reduce the use of L&S responses.

Priority Medical Dispatch Recommendation:

- BPD and BFD should work together to implement an evidence-based emergency medical dispatch system to enhance 911 call taking and EMS response. (Recommendation No. 50.)

AMBULANCE OPERATION MODES

For EMS, the purpose of using lights & siren (L&S) is to improve patient outcomes by decreasing the time to care at the scene or to arrival at a hospital for additional care. However, only a small percentage of medical emergencies have better outcomes due to use of L&S. More than a dozen studies show that the average time saved with L&S response or transport ranges from 42 seconds to 3.8 minutes. Alternatively, L&S response increases the chance of an EMS vehicle crash by 50 percent and almost triples the chance of crash during patient transport. Emergency vehicle crashes cause delays to care and injuries to patients, EMS practitioners, and the public. These crashes also increase emergency vehicle resource use through the need for additional vehicle responses, have long-lasting effects on the reputation of an emergency organization, and increases stress and anxiety among emergency services personnel.

In 2009, there were 1,579 ambulance crash injuries; most EMS vehicle crashes occur when driving with lights and siren. When compared with other similar-sized vehicles, ambulance crashes are more often at intersections, more often at traffic signals, and more often with multiple injuries, including 84 percent involving three or more people.

Although L&S response is currently common to medical calls, few (6.9 percent) of these result in a potentially lifesaving intervention by emergency practitioners. Some agencies have used an evidence-based or quality improvement approach to reduce their use of L&S during responses to medical calls to 20 percent to 33 percent, without any discernable harmful effect on patient outcome. Additionally, many EMS agencies transport very few patients to the hospital with L&S.

EMD protocols have been proven to safely and effectively categorize requests for medical response by types of call and level of medical acuity and urgency. Emergency response agencies have successfully used these EMD categorizations to prioritize the calls that justify a response with L&S. Physician medical oversight, formal quality improvement programs, and collaboration with responding emergency services agencies to understand outcomes is essential to effective, safe, consistent, and high-quality EMD.

In most settings, L&S response or transport saves less than a few minutes during an emergency medical response, and there are few time-sensitive medical emergencies where an immediate intervention or treatment in those minutes is lifesaving. These time-sensitive emergencies can usually be identified through utilization of high-quality dispatcher call prioritization using approved EMD protocols. For many medical calls, a prompt response by EMS practitioners without L&S provides high-quality patient care without the risk of L&S-related crashes.

EMS care is part of the much broader spectrum of acute health care, and efficiencies in the emergency department, operative, and hospital phases of care can compensate for any minutes lost with non-L&S response or transport.

Ambulance Operation Recommendation:

- BFD should evaluate and identify processes to reduce vehicle operations with lights and siren (L&S). Ideally, L&S responses in Brownsville should be less than 50 percent, and L&S transports should be less than 5 percent. Every L&S transport should receive a medical QA review to determine if the L&S transport was clinically appropriate. (Recommendation No. 51.)

EMS CLINICAL PERFORMANCE AND QUALITY IMPROVEMENT

There are many methods to evaluate the performance of an EMS agency. The most important clinical measure is to evaluate the EMS agency's compliance with evidence-based clinical bundles. Developing, monitoring, and evaluating clinical bundles for high-acuity medical or trauma conditions can give the EMS agency, the medical oversight team, and the community the objective data upon which to evaluate the clinical performance of the agency.

Examples of clinical bundles for medical care related to cardiac arrest, airway management, ST Elevation Myocardial Infarction (STEMI), and stroke patients are shown here.

TABLE 5-12: Clinical Performance Bundle Dashboard

Clinical Bundle Performance Dashboard							
Agency:							
Cardiac Arrest	**Goal**	**May-22**	**Jun-22**	**Jul-22**	**Aug-22**	**Sep-22**	**Current Avg.**
% of recognizable Out-of-Hospital Cardiac Arrests (OHCA) cases correctly identified by Dispatch							
Median time between 9-1-1 call and OHCA recognition							
% of recognized 2nd party OHCA cases that received tCPR							
Median time between 9-1-1 Access to tCPR hands on chest time for OHCA cases							
% of cases with time to tCPR < 180 sec from first key stroke							
% of cases with CCF ≥ 90%							
% of cases with compression rate 100-120 cpm 90% of the time							
% of cases with compression depth that meet appropriate depth benchmark 90% of the time							
% of cases with mechanical CPR device placement with < 10 sec pause in chest compression							
% of cases with Pre-shock pause < 10 sec							
% arrive at E/D with ROSC							
% discharged alive							
% neuro intact at discharge (Good or Moderate Cognition)							
% of cases with bystander CPR							
% of cases with bystander AED use							

Ventilation Management	**Goal**	**May-22**	**Jun-22**	**Jul-22**	**Aug-22**	**Sep-22**	**Current Avg.**
% of cases with etCO2 use for non-invasive ventilation management (CPAP, BVM) when equipped							
% of cases with etCO2 use for invasive ventilation management (KA, ETT, Cric)							
% of successful ventilation management as evidenced by etCO2 waveform throughout the case							
% of successful King Airway placement							
% of successful endotracheal tube placement							

Stroke	**Goal**	**May-22**	**Jun-22**	**Jul-22**	**Aug-22**	**Sep-22**	**Current Avg.**
% of suspected Stroke patients w/BGL measured							
% of suspected Stroke patients w/CSS measured							
% of suspected Stroke patients w/positive CSS scores receiving Los Angeles Motor Score (LAMS) measured							
% of suspected stroke patients with stroke facility notified of suspected stroke within 10 minutes of EMS patient contact							
% of suspected stroke patients w/LAMS scores 4 - 5 transported to Comprehensive Stroke Center							

BFD recently changed its patient care reporting platform to ESO Solutions. ESO has the capability to report clinical dashboards like the examples shown above. BFD should take advantage of this feature to generate clinical process data to identify areas that may benefit from additional education and training.

EMS Quality Improvement Recommendation:

- BFD should develop a process for clinical process dashboard development and reporting to identify opportunities for improvement. (Recommendation No. 52.)

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BFD reports that clinical quality assurance is generally conducted by a paramedic assigned to light-duty who reviews patient care reports. Based on the EMS response and patient contact volume, BFD should have a specially trained quality improvement coordinator to conduct robust clinical outcomes. The Clinical Quality Improvement Coordinator position description and personnel selection should be conducted in close consultation with BFD's Medical Director.

EMS Quality Improvement Recommendation:

- Working closely with its Medical Director, BFD should create a dedicated position for a Clinical Quality Coordinator and select a suitable candidate for this position. (Recommendation No 53.)

SERVICE DELIVERY INNOVATION

Emergency Triage, Treatment, and Transport (ET3) Model

The Centers for Medicare and Medicaid Service (CMS) announced a revolutionary new reimbursement model for ambulance services in February 2019. The Emergency Triage, Treatment, and Transport (ET3) Model is a significant demonstration project that reimburses ambulance agencies for services such as transport to alternate destinations, and treatment in place without transport through the use of a Qualified Healthcare Practitioner (QHP), either on-scene or through telehealth.

Very few ambulance agencies were forward thinking enough to apply for this model, but BFD was one of the few.

The COVID-19 pandemic delayed BFD's implementation of the ET3 model in Brownsville, however, at the current time, CMS has made it clear to approved ET3 model participants that the extended window for ET3 implementation is rapidly drawing to a close.

Proving to CMS that the ET3 model for EMS reimbursement is a more valuable economic model, both for the ambulance agency and CMS is vital, so it is important that as many of the approved ET3 model agencies implement their model as soon as possible. We would strongly recommend that BFD implement the ET3 model as soon as practically possible.

Additionally, the Texas Health and Human Services Commission (HHSC) recently promulgated rules regarding the implementation of an ET3-like model for the state's Medicaid population. The opportunity for reimbursement by both Medicare and Medicaid is an exceptional opportunity for BFD to generate more revenue for the services provided to beneficiaries of these payers.

ET3 Recommendation:

- BFD should make it a priority to implement its ET3 Model as soon as practically possible. (Recommendation No. 54.)

Mobile Integrated Healthcare/Community Paramedicine Model

BFD also conducts a Mobile Integrated Healthcare/Community Paramedic (MIH/CP) program.

EMS-based MIH programs are significant innovations in EMS care delivery, and quite possibly, the true future of EMS agencies. The MIH program seeks to *prevent* 9-1-1 calls and preventable EMS transports by navigating patients to the right medical care, at the right time, and in the right setting. MIH/CP programs help fill gaps in the local healthcare delivery systems and enhance patient experience of care while reducing expenditures for acute care utilization.

The BFD's current staffing model is to provide an MIH/CP credentialed medic through the Office of the Medical Director during weekday hours. Effective MIH/CP programs are able to generate data regarding the patient's experience of care and the change in acute care utilization during and post-enrollment in the MIH/CP program. Generating this data often leads payers to consider paying for these services.

MIH Recommendation:

- BFD should investigate ways to enhance its MIH program offerings so as to develop sustainable economic models for its MIH operations to enhance revenues to the agency. (Recommendation No. 55.)

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SECTION 6. CONCLUSION AND STRATEGIC PLANNING OBJECTIVES

The current state of the fire and EMS delivery system in Brownsville, from the operational perspective of the BFD, which includes external factors such as available staffing, risk, future city development, available funding, and demand for service is, as analyzed and observed by CPSM:

- The BFD is a highly functional fire and EMS organization that strives to provide an exceptional level of service to the community and the region.
- The BFD command staff work as a team to provide critical, and it appears effective, leadership to the department. Members of the department work as a team to produce a high-quality, effective, and efficient response that serves the city well.
- From all accounts, once they arrive on the scene of an emergency, BFD personnel perform their duties in an exceptional manner and can be counted upon to complete assignments given to them effectively and efficiently. They are to be commended for their efforts and given the support they need to continue to try to be successful.
- The City of Brownsville has an ISO rating of Class 2, ***the second-highest rating achievable***. This rating was most recently designated in April 2022.

The above opinions of the CPSM team notwithstanding, the BFD is confronted by many of the challenges that are facing fire service organizations across America. As the fire services has entered into an all-hazards environment, the public has come to expect increased knowledge, skill, and ability from their firefighters, as well as a higher level of service and responsiveness.

- With the BFD's current deployment model, there are still significant areas of the city that are outside of a 240-second travel time for the first responding unit as recommended by NFPA 1710. Although these areas are not as heavily developed as the core of the city, they are experiencing growth and development that will increase call volume and ultimately further impact the achievement of response time benchmarks. The most recent ISO evaluation also noted these gaps in coverage areas.
- With the current minimum fire staffing level of 30 personnel on duty at a time (28 for response outside of the airport), the department's eight engine companies and one ladder truck operate at what is considered to be understaffed to achieve enough staffing to confront a moderate-, high-, and special-risk incident with an Effective Response Force. In its most recent ISO evaluation, the BFD received deficiency in *Credit for Company Personnel*, receiving 12.78 out of 15.00 possible points.
- When responding to any incident with the potential for personnel to encounter an IDLH, units with staffing of three personnel have fewer tactical fire options until the arrival of additional personnel and resources.
- When units respond with just three personnel, the officers must assist with tasks such as stretching a line and therefore cannot properly perform duties such as initial size-up. In addition, the crews of two companies may need to be combined to accomplish tasks that a single engine should be able to perform, such as advancing a line to the upper floors of a building.

- The city averages about 1.4 actual fires per day. Although a limited number of these fires are significant, as detailed in this report, the city does have a high level of risk.
- With the current staffing on all companies, the BFD would be unable to meet NFPA 1710 recommended minimum personnel benchmarks for a second fire without the need for mutual aid if simultaneous moderate risk or higher structure fires occur. As identified, mutual and automatic aid responds from a distance.
- The current staffing levels necessitate the city to send a higher number of resources (engines and ladders) to assemble an Effective Response Force within an appropriate amount of time. This increases the potential liability for a traffic incident during a response.
- Call processing (at dispatch), turnout (in the station), and travel times are much higher than recommended NFPA 1710 benchmarks.
- The heaviest demand for both fire and EMS services are concentrated in the areas closest to downtown Brownsville.
- The city is the seat of Cameron County government, which also has a major presence in the city, including the county courthouse and the county jail.
- The city is also the host to a federal building and U.S. Courthouse for the Southern District of Texas.
- 20.5 percent of the population of the city falls into higher risk categories of 65 years old or older (12.4 percent) and under age 5 (8.1 percent).
- More than one in four Brownsville residents (27.5 percent) live below the poverty line.
- By virtue of its location on the border with Mexico, the city has a high transient and undocumented population.
- The BFD enjoys strong support from many city stakeholders. All these stakeholders believe the department should be properly staffed.
- Funding needs were prominently mentioned by many of the BFD stakeholders as a major obstacle for them moving forward. Conversely, the city has fiscal challenges that could impact its ability to provide the desired level of service.
- The city will need to make major investments in fire department capital needs (facilities and equipment) over the next several years.
- The city should also attempt to incrementally provide additional staffing as recommended in this report.
- The city provides fire and EMS services to the Port of Brownsville and SpaceX Starbase yet receives little in the way of funding for providing this service.

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STRATEGIC PLANNING FOR THE FUTURE OF THE FIRE AND EMS DELIVERY SYSTEM

Fire and rescue operations and service delivery can be dramatically improved in those departments that commit resources to goal-setting, master planning, risk assessment, and performance measurement. A number of tools and resources are available to guide management in these efforts from organizations such as the U.S. Fire Administration (USFA), National Fire Protection Association (NFPA), International Association of Fire Chiefs (IAFC), International Association of Fire Fighters (IAFF), Center for Public Safety Excellence (CPSE), U.S. Department of Transportation (USDOT), the Texas Commission on Fire Protection, and Texas Department of Health, Division of Emergency Medical Services (EMS). A 2006 Volunteer Fireman's Insurance Service (VFIS) report notes:

> ***"No business is successful without some type of strategic planning—making sure that the business will survive. The ESO is no different. Strategic Plans in business (and ESOs) lay the groundwork for effective organizational management and performance."***[60]

Strategic planning is an organization's process of defining its direction and making decisions relative to the optimization of limited resources. A strategic plan also contains tools that can guide the implementation of the strategy. Strategic planning became prominent in corporations during the 1960s and remains an important aspect of organizational planning. In this case, the City of Brownsville will need to consider the recommendations that were defined within the recently completed fire department analysis and involve as many stakeholders as possible in developing paced action that will lead toward successful implementation of these recommendations.

The development of a long-range fire protection and prevention comprehensive strategic plan involves three key steps:

- The first step is to generate an assumption of what the community will look like at the end of the planning process.
- Second, the department needs to realistically assess the strengths and weaknesses of the existing fire protection and EMS delivery systems to include codes, standards, and ordinances relating to fire prevention efforts, public safety education programs, and emergency response capability.
- The third and final step is to project the needed capabilities and capacity of the fire protection system and its fire department component as the community changes.[61]

This process helps to ensure that an adequate level of resources, including staffing and equipment, are allocated to meet the community's needs for the services delivered by the fire department as efficiently as possible. A strategic plan also assists the department in matching resources with available revenues.

Defining clear goals and objectives for any organization through a formal strategic planning document establishes a resource that any member of the organization, or those external to the

60. http://www.msfa.org/content/recruit/file/CEO%20MANUAL%20ARIAL%20-%20disc.pdf
61. Starling, *Managing the Public Sector*, 287.

organization, can view and determine in what direction the organization is heading, and as well how the organization is planning to get there.

Strategy has many definitions, but generally involves setting goals, determining actions to achieve the goals, and mobilizing resources to execute the actions. A strategy describes how the ends (goals) will be achieved by the means (resources). In Brownsville, the City Council, Mayor, and City Manager are tasked with determining strategy. Strategy can be planned (intended) or can be observed as a pattern of activity (emergent) as the organization adapts to its environment or competes. It is our observation that the strategy currently in place in Brownville is planned and intended in that it appears to be proactive to the needs of a growing community. However, due to the growth occurring in the city, coupled with financial challenges, there is some reactive activity as well. The city struggles to provide services to keep pace with its growth. Through this section of the report, it is our goal to assist Brownsville, to the extent possible, with maintaining a planned, or intended, strategic posture.

Strategic implementation is analytical in nature and involves identifying how to best reach a goal or desired outcome. In a strategic plan, it is essential that clear and achievable goals and objectives for each program area are developed. Each program area must then (1) define its goals; (2) translate the goals into measurable indicators of goal achievement; (3) collect data on the indicators for those who have utilized the program; and (4) compare the data on program participants and controls in terms of goal criteria. Objectives should be **SMART**, an acronym that stands for **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, and **T**imely. Additionally, these goals should ideally link back to the fiscal planning processes.

Performance measures should be easily understood and easily calculated. Suggested performance measures for the fire and rescue services often have a range depending on local factors. The point of the performance measures is to identify the community's expectations in a quantifiable way, and to use the measurement of the fire and rescue department's performance against these objectives to identify areas that may need improvement or require additional resources.

The recommendations contained in this document form the framework for action and indicate where change is necessary. This document provides guidance relative to how to pace and implement those recommendations. The strategic implementation process considers the intricacies of the organizational environment including the following:

- **Inputs**: Information utilized to formulate recommendations.
- **Outputs**: Development of a plan of implementation.
- **Outcomes**: Results that require evaluation.

Inputs

Data is gathered from a variety of sources, such as interviews with key fire service personnel, review of pertinent data and documents on the community, service demand, desired service level, standard of cover selected, organizational performance, and observations gathered through field visits. Inputs are then collected to help support an understanding of the environment and its opportunities and risks. Other inputs include an understanding of the values of stakeholders. These values may be captured in an organization's mission statement, and in the observed organizational culture which provides an emergent perspective on the actual values present within an organization. The inputs gathered during the organizational analysis form the basis for each of the recommendations that have been developed.

Outputs

The output of strategic planning includes documentation and communication describing the organization's strategy and how it should be implemented, sometimes referred to as the strategic plan. The strategy may include a diagnosis of the competitive situation, a guiding policy for achieving the organization's goals, and specific action plans to be undertaken for the implementation of the recommendations listed. A strategic plan may cover multiple years. It is a flexible document that should be updated periodically.

Outcomes

The strategic planning process produces outputs, as described above; the implementation of the strategic plan produces outcomes. Ultimately, implementation of the recommendations contained in this report will produce significant change and place the organization on an intended path. Change within a public sector organization typically produces some level of initial skepticism and discomfort; change puts personnel in an unfamiliar situation. As the process of implementing change moves forward, each action often elicits a reaction. Therefore, the team working to implement desired organizational change should be ready to address unanticipated outcomes, which often manifest themselves as barriers to continued change. The process of implementing change should be considered a learning process.

There is no "right" amount of fire protection and EMS delivery for a community. It is a dynamic model based on such things as the expressed needs of the community, community risk, population growth, and ability/willingness of the community to fund the desired level of service. Providing the right amount of fire protection and EMS service, and by extension the number and status of personnel for a fire department, is based on several factors. First, the community must decide how to manage its level of risk based upon what resources it can afford to commit, and thereby avoid making the community vulnerable to an undesirable event. Fire departments also calculate risk levels for the community and their personnel in the form of a Community Risk Reduction Analysis, and Standards of Coverage (SOC). It is the responsibility of elected officials to translate community needs into reality through direction, oversight, and the budgetary process. It is their unenviable task to maximize fire and emergency medical services within the reality of the community's ability and willingness to pay, particularly in today's economic environment.

In formulating our recommendations CPSM has relied on several widely accepted references for benchmarks and standards, industry best practices, as well as experience drawn from projects across the United States. These references include:

- The 10th Edition of the *Quality Improvement for Fire and Emergency Services* manual by the Center for Public Safety Excellence, Inc., of Chantilly Virginia
- *Managing Fire and Emergency Services*, International City-County Management Association, 777 N. Capitol Street NE, Washington, DC (2012 edition).
- National Fire Protection Association standards for deployment, EMS, safety, etc.

When considering ways to enhance the fire and EMS delivery system in Brownsville to keep pace with the evolving needs of the city, understanding the associated financial challenges, while still providing the outstanding service that the BFD's stakeholders now enjoy, we would be remiss if we did not at least mention several recommendations in the areas of staffing and deployment. It is also important to reemphasize that all BFD fire units are currently "barebones" staffed with three personnel.

Planning Objectives

The City of Brownsville and BFD should develop a 5-, 10-, and 15-year strategic master plan for the fire department which integrates with existing city land-use, master, and capital improvement plans.

The strategic plan should create a "Standards of Cover" that outlines what service levels are expected when a call for service is received. Response areas should include urban, suburban, and the unincorporated areas and be based on nationally accepted response benchmarks. Response time metrics should include emergency and non-emergency response profiles.

High-priority items to be considered for the short-term part of the strategic plan should include:

- Implementing the department's ET3 Model as soon as practically possible.
- Enhancing the department's MIH program and developing additional, sustainable economic models for the MIH operations to enhance revenues to the agency.

The capital improvement component of the strategic plan should include a detailed plan and timeline for:

- Construction of station 10.
- Replacement of stations 1, and 2.
- Potential relocation of stations 1, 2, and 5.
- Objectives and a timeline for the continued replacement of fire apparatus commensurate with its use and in accordance with NFPA and industry recommendations.
- Objectives for equipment replacement to meet existing NFPA standards on equipment replacement. This should include but not be limited to firefighter PPE, SCBA, cardiac monitors, and other high-cost items.
- Objectives to fund the purchase of items such as a second set of PPE for all firefighters and additional portable radios to ensure that all on-duty personnel—including fire and EMS—are equipped with a radio to ensure interoperability and emergency scene accountability.

As part of the development of the strategic master plan over a three-year period, the City of Brownsville and BFD should undertake a deployment modification and work to increase staffing levels particularly on the specialized units. Under this this recommendation the BFD would be staffed on each shift as follows:

- Eight (8) engines each staffed with three (3) personnel.
- One (1) ladder truck staffed with four (4) personnel.
- One (1) rescue truck staffed with four (4) personnel.
- One ARFF unit staffed with two (2) personnel.
- Two (2) command teams each consisting of one (1) Assistant Chief and (1) captain/training officer/field incident technician/division safety officer.
- Eight (8) ALS ambulances each staffed with two (2) personnel.
- Two (2) ALS supervisors.

This staffing plan would be accomplished as detailed here.

Year One

- Increase staffing on Truck 1 from three (3) personnel to four (4). Ensure that the truck itself responds to all reported structure fires and other types as emergencies as recommended previously in this report.
- Conduct a comprehensive training needs assessment to determine the number of permanent staff personnel that are needed in the Training Division to accomplish the myriad training and other responsibilities that must be handled.
- Expand the hours and make permanent the EMS screening program in the 911-dispatch center.

Year Two

- Divide the city into two divisions, each with an Assistant Chief and an EMS supervisor.

To provide for more effective, efficient, and safe overall incident management, and to enhance critical incident scene safety for all personnel, the BFD should create the position of Field Incident Technician/Division Safety Officer at the rank of captain. The position would form an integrated command team with each Assistant Chief. These personnel will serve not only as a field incident technician, but also as a division safety officer and training officer. The on-scene, training, and administrative duties of the position would be as follows:

- Conduct training within their division on their shift.
- Assist the Assistant Chief with other administrative duties.
- Incident Recon.
- Assess the risk/benefit of operations.
- Assess and address safety concerns on the incident scene.
- Communicate and report safety issues to command.
- Intervene as necessary to provide for safety.
- Assist with managing the incident.
- Define, evaluate, and recommend changes to the incident action plan.
- Provide direction relating to tactical priorities and specific critical fireground factors.
- Serve as the Incident Safety Officer.
- Manage personnel accountability on the incident.
- Evaluate the need for additional resources.
- Assign logistics responsibilities.
- Assist with the tactical worksheet for control and accountability.
- Evaluate the fireground organization and span of control.
- Assist with personnel air management.

- Manage crew work/rest cycles and rehab.
- Other incident scene duties as necessary.
- Provide additional permanent staffing to the Training Division as determined by the needs assessment.

Year Three

- Hire a minimum of 12 personnel to provide staffing on the heavy rescue truck of four (4) personnel.
  - Station 9 should then be designated as the special operations station. ALL personnel assigned there must be trained in special operations and certified in multiple disciplines. For incidents requiring special operations capability the entire station should respond as a task force, which would provide a minimum of nine (9) special operations personnel (three on the engine, four on heavy rescue, and two on the medic unit).

CPSM believes that the size and operations of the port, including both the building and disassembly/scrapping of large maritime vessels, makes the likelihood of a significant shipboard fire relatively high. CPSM recommends as a planning objective that BFD should make it a priority to provide comprehensive training for all personnel on shipboard firefighting. This should be accomplished in collaboration with the Port of Brownsville.

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As part of the strategic master plan the following factors relative to the replacement and possible relocation of stations should be given due consideration:

Fire Station 2

There appears there are few sites available for construction of a new facility near the existing station. The existing site does not offer sufficient footprint for construction of a contemporary fire and EMS facility.

Relocating the station to the northern part of the city fills in a gap in the department's ability to achieve 240-second benchmark travel time for the first due engine and does so in an area that is poised for significant commercial and industrial growth and development.

If this station is relocated to the area recommended, consideration should be given to deploying a quint apparatus from the station; the quint should be staffed with four (4) personnel along with a medic unit staffed with two (2) personnel.

Relocating station 2 will create a gap in the 240-second travel time area covered in current station 2's area.

Central Fire Station

There are also limited options for relocation of a station in downtown Brownsville without looking at the potential redevelopment of an entire city block.

If the Central Fire Station is moved southwest of the current station, it may enable the engine and medic unit from that station to fill the gap in relocated station's 2's current area while still providing 240-second travel time coverage to the remainder of the central station's first due district. This would be possible due to the current overlapping of the response polygons and bleed times near the downtown area where stations are located closer together.

The station should be designed and constructed to also house all the department's administrative, fire prevention, and emergency management functions, including the EOC.

Fire Station 5

The area around the airport and existing station 5 is another area where there is currently a gap in the 240-second response time benchmark for the first due unit. As currently configured the apparatus and personnel at station 5 are available only to respond on the airport. As the BFD's newest station at just 20 years old it may be difficult to justify a replacement. However, in order to achieve improved response times a station should be deployed in this area.

- Option 1 – Relocate the station to the airport perimeter where city fire and EMS units could respond out the same as any other station while the ARFF function could continue to respond to the airport.
- Option 2 – Expand the existing station to allow the deployment of additional resources for off-airport responses. The challenge here would be to obtain clearance for the non-ARFF engine and medic unit to easily respond off the property and have unhindered access to return without compromising airport security. If this clearance can be accomplished, this would be the preferred option in CPSM's view.

No matter the option chosen, all personnel assigned to this station should be ARFF-certified.

Staffing at the station should be seven (7) personnel on duty at all times: three (3) on the engine, two (2) on the medic unit, and two (2) dedicated to the ARFF. When there is an Alert 1 at the airport, all personnel would respond. This would provide a much-improved initial response.

Fire Station 10

This station, which is planned for within the Madeira development, should have an engine staffed with three (3) personnel deployed along with the current medic unit staffed with two (2).

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Over the long term (10 to 12 years), if the City of Brownsville and BFD adopt these recommendations, the BFD would be staffed on each shift as follows:

- Ten (10) engines each staffed with three (3) personnel.
- Two (2) ladder trucks/quints each staffed with four (4) personnel.
- One (1) rescue truck/special hazards unit staffed with four (4) personnel.
- One ARFF unit staffed with two (2) personnel.
- Two (2) command teams each consisting of one (1) Assistant Chief and (1) captain/training officer/field incident technician/division safety officer.
- Ten (10) ALS ambulances each staffed with two (2) personnel.
- Two (2) EMS supervisors

Supplemental Funding

At the time of this assessment, the BFD operates under a contract with the Cameron County Emergency Services District #1 (CCESD) to provide fire and emergency services to certain designated unincorporated areas of the county. This includes the Port of Brownsville and the SpaceX Starbase complex. Under the current contract, which is renewed annually (the current contract runs through September 30, 2022), the City of Brownsville is paid $419,234.13 for fire services and $365,832.67 for EMS services. The BFD provides monthly reports to the CCESD regarding the number and types of incidents to which the department responds. According to BFD administration, the level of funding it is allocated each year is based on a formula that relies primarily on the number of fire and EMS calls that were responded to in the county areas.

CPSM has been asked to provide information regarding the funding for fire protection response services to the Port of Brownsville, which relies primarily on the BFD for fire suppression and EMS response. Currently, funding for these services comes through the city's agreement with the CCESD.

There are multiple significant risks on the port property, which include:

- Tank farm storage capacity totaling approximately 7.1 million barrels (298,200,000 gallons) of product, most of it flammable, combustible, or otherwise hazardous. These facilities have multiple transloading operations to move product to and from ships, tanks, rail cars, and trucks. While some tank and transloading facilities have built-in automatic fire suppression systems, many do not. There is no large stockpile of firefighting foam available either in the port area or the city.
- Numerous and dangerous confined spaces are located throughout the port area; these confined spaces are both water- and land-based. Many spaces are located deep inside of ships. The port terrain presents challenges, thus access to many locations for emergencies is limited.
- A major port tenant builds offshore oil rigs and more recently large oceangoing liquified natural gas (LNG) vessels. The nature and complexity of these operations can create multiple significant hazards and challenges in an emergency for both firefighting and technical rescue/hazardous material operations.
- Several port tenants conduct maritime vessel recycling operations where decommissioned ships are cut up and sold for scrap. At the time of this assessment the former *USS Kitty Hawk* had just arrived to be dismantled. The very nature of this operation creates a significant fire potential (several fires were observed burning on this property during a tour of the port), risk for hazardous materials incidents or releases, with personnel working daily in a variety of confined spaces, many of them deep within the ship but others high above ground.
- The port property has multiple large footprint buildings that are several thousand square feet in size, and although considered single story have the ceiling height of multistory structures. Some of these buildings have processes and storage that are combustible and hazardous. Larger footprint buildings pose additional building risks to the BFD in terms of mass storage of commodities and hazardous/combustible materials utilized in work processes, and considerable waterflow requirements based on the size of the building footprint, commodities stored, and mercantile processes being conducted.
- New buildings are typically built of fire resistive, or non-combustible structural members and are sprinklered, but contain internally combustible accessories, materials, storage, processes, and internal structures. However, many of the older building are not protected by sprinklers.

While the life-safety hazard normally will not require extensive rescue by firefighting forces (in terms of the number of people on premises at one time to be rescued), the scope and complications of the larger footprint to be covered by initial attack lines and in a search and rescue undertaking raise these types of structures to a high-hazard building risk.

- The port property has other commercial and mercantile properties, although not large footprint buildings, which pose building and property risk due to the on-site storage (petroleum products, vehicles, hazardous materials) as well as business processes and storage in the interior of property buildings that are combustible and hazardous. Not all of these buildings have fire protection systems. These buildings are of medium- to high-risk based on building/property content. These occupancies also support heavy vehicles that move product to and from these properties, posing traffic and hazard risks.
- There is significant rail traffic within the port property. The Brownsville and Rio Grande International Railway (BRG) serves more than 45 miles of track within the port. In 2021, BRG handled 65,865 railcars, many of them carrying hazardous materials. The railroad recently completed an expansion of its Palo Alto yard bringing capacity to 398 cars. Future planned expansions will increase capacity to 658 cars. The BRG interchanges with Kansas City Southern de México Railroad for operations south of the border, with Union Pacific and Burlington Northern Santa Fe (BNSF) Railway serving northern routes to the rest of the United States.
  - While these railroads have limited grade crossings, there are some, and these pose a traffic risk. They also travel through parts of the city while transporting flammables, combustibles, and other hazards that the BFD needs to be prepared to handle and mitigate in an emergency.
- To facilitate the movement of cargo to and from Mexico, the Port of Brownsville issues permits online to shippers allowing them to load trucks to the legal weight limits of Mexico (125,000 pounds; 45,000 pounds more than the U.S. limit). This provides the most efficient and cost-effective movement of cargo by trucks to destinations in Mexico. However, this does mean that trucks carrying much greater quantities of hazardous materials than the U.S. allowed weight limit are traveling the roads between the port and the border crossings.

Proposed additions to port property include:

- Rio Grande LNG transloading facility. If this facility comes to fruition (construction is expected to start in the first quarter of 2023) it will occupy 900 acres within the port and handle 27 million metric tons per year of LNG, making it the largest LNG terminal in North America. Completion is anticipated in about three years. This facility will have its own on-site firefighting personnel and equipment.
- Texas LNG has proposed a second LNG facility that would be located adjacent to the Rio Grande LNG. This facility would occupy 625 acres and handle 3.6 million metric tons of product per year.
- Expansion of warehousing capacity with the construction of a new industrial park adjacent to the current port facilities (but still on port property).
- Increasing the depth of the shipping channel from 42 feet to 52, feet which will allow access to the port by much larger maritime vessels.

Based on CPSM's data analysis, the calls for service on port property are low. However, the risk level as well as the value of the port property—which supports over 50,000 jobs—is high. According to information provided by the city, the port's property valuation is approximately

$10.3 billion. By comparison, the entire city of Brownsville has a total valuation of $7.9 billion. While the current contract arrangement may be good for the port, and the remainder of the fire departments that contract with the CCESD, it does not serve the city or the BFD well as they will be responsible for the mitigation of any significant incidents that occur in the port area. As compared to the city as a whole, the firefighting force and resources required to mitigate an incident, whether fire or other hazard, is exacerbated by the building, property, and transportation risks that currently exists on port property (as described above).

The Port of Brownsville is governed by the Brownsville Navigation District, which is a duly established political subdivision of the State of Texas. The district is guided by an elected Board of Commissioners that establishes the policies, rules, rates, and regulations of the port and approves all contractual obligations. As an established political subdivision of the state, it is essentially its own municipality (it has its own police department).

Given this, CPSM recommends that the City of Brownsville negotiate directly with the Brownsville Navigation District to contract for the provision of fire and EMS services to the port area.

CPSM provides the following information/alternatives should the city decide to enter into direct discussions with the District regarding a contract:

- Move to a risk-based fee formula.
- Building risk. This can be based on square footage and height, materials stored in the building (combustibles and hazards) or on site and used in the business processes, and any associated life-safety risk. The Fire Marshal can classify the building and premise risk as Low, Medium, High, or Special Hazard Risk, A Fire Protection Parcel Fee can be applied according to the level of risk.
- Transportation risk. This should be based on road, rail, marine traffic. Risk is based on combustibles and hazards being transported as well as the number of trips a day originating from and delivered to the port property utilizing port and city roads (where BFD would respond). Rail includes the risk of at grade crossings. Marine vessel risk is based on commodities (combustibles/hazards) stored on vessel and/or on-loaded or off-loaded. All transportation risks include a life-safety risk. The Fire Marshal can classify the transportation risk as Low, Medium, High, or Special Hazard Risk and a Fire Protection Transportation Fee can be applied according to risk and frequency of movement.
- An alternative consideration is a formula that includes total square miles of built-upon land in the city, which has a value, and assigning a like value or values by property type to the port property, which derives a value where a fee or tax-like structure could be applied to support the fire protection services.

The city and BFD should seek to form collaborative partnerships with the port, including seeking grant funding, for the acquisition of needed equipment, supplies, training, and even personnel. Items that could be funded this way include, but are certainly not limited to:

- Fire boat.
- Foam pumper, foam tender, hose carts, and large caliber monitors.
- Shipboard firefighting training for BFD personnel including appropriate training props to allow regular refresher training.
- Technical rescue equipment.

The SpaceX Starbase facility presents some of the same concerns as the port area because of the potential for serious and highly complex incidents occurring there. However, as they are located in an unincorporated area of the county, it is not as clear that the city could negotiate directly with them. However, they could form collaborative partnerships with them as recommended above.

- The city and BFD should attempt to form collaborative partnerships with SpaceX for the acquisition of needed equipment, supplies, training, and even personnel**.**

Accreditation

An available best practice that involves a comprehensive assessment of a fire services agency is the accreditation program managed by the Center for Public Safety Excellence (CPSE). The Commission of Fire Accreditation International (CFAI) provides an analytical self-assessment process to evaluate eleven categories of the agency's performance. During this process, the department examines 250 separate performance indicators, many of which are considered core or required competencies of a fire services agency. The eleven categories include:

- Governance and Administration.
- Assessment and Planning.
- Goals and Objectives.
- Financial Resources.
- Community Risk Reduction Programs.
- Physical Resources.
- Human Resources.
- Training and Competency.
- Essential Resources.
- External System Relationship.
- Health and Safety.

The accreditation process prompts a department to undertake a critical self-analysis of its performance at varying levels to ensure continuous self-improvement. It is an extremely comprehensive review that is conducted via an agency-scheduled and agency-controlled process. An agency must be reaccreditation every five years, which ensures that the standards are being maintained.

The accreditation process stages and time periods are:

- Registered Agency Status
  - This status is valid for three years and has a $600 fee. During this status, the agency becomes familiar with the accreditation process; attends accreditation and required training; assigns a staff person as an accreditation manager; and begins the self-assessment process.
  - Registered agency status can be renewed as many times as needed.

- Applicant Agency Status
  - This status is valid for 18 months and may be extended for 12 months if needed. A volunteer mentor is appointed for the agency to help guide it through the process. This stage has a fee based on population (based on current population this would be $6,650).
  - Agencies complete the following required documents that will be reviewed by the accreditation peer team during the Candidate Agency Status phase:
    - Community Risk Assessment–Standard of Cover.
    - Community-Driven Strategic Plan.
    - Self-Assessment Manual.
- Candidate Agency Status
  - Required three documents as outlined above are completed.
  - CFAI peer team conducts on-site visit and verifies/validates the three documents.
  - Accreditation report presented to CFAI review panel for consideration.
  - Includes travel costs for peer review team.
- Accredited Agency
  - Agency receives accreditation status.
  - Annual compliance report required.

The CPSE fire accreditation process provides a well-defined, internationally recognized benchmark system to measure fire and emergency services. As a best practice, the accreditation process:

- Includes a comprehensive agency self-assessment.
- Involves the community in the strategic planning phase.
- Raises the internal bar of the organization as it explores opportunities to improve.
- Exhibits international achievement for the agency and local government.
- Assists local governments to justify their expenditures by demonstrating a direct link to services, particularly for emergency services, where local officials desire criteria to assess performance and efficiency.

Accreditation Recommendations:

- CPSM recommends the BFD consider, as a near-term planning objective, becoming a registered agency for accreditation under the Commission of Fire Accreditation International, and over mid-term, completing the three required documents (Community Risk Assessment-Standard of Cover; Community Driven Strategic Plan; and Self-Assessment Manual) as it works toward becoming an accredited agency. (Recommendation No. 56.)
- CPSM recommends as a planning objective that once the BFD accomplishes some of the pressing strategic plan recommendations contained in this report, it should, with support from the City of Brownsville, consider undertaking the accreditation process. (Recommendation No. 57.)

SECTION 7. DATA ANALYSIS

This data analysis examines all calls for service for the Brownsville Fire Department between January 1, 2019, and December 31, 2020, as recorded in the Brownsville Police Department's computer-aided dispatch (CAD) system, and the BFD's National Fire Incident Reporting System (NFIRS). The analysis results are presented for the 2019 calendar year. The results for 2020 are compared with those for the prior year in Attachment I.

This analysis is made up of five parts. The first part focuses on call types and dispatches. The second part explores the time spent and the workload of individual units. The third part presents an analysis of the busiest hours in the year studied. The fourth part provides a response time analysis of the studied agency's units. The fifth and final part analyzes the workload of medical transport.

The Brownsville Fire Department is a multiservice fire department, primarily serving an area of approximately 242 square miles and 186,700 residents. It provides fire prevention, fire suppression, emergency medical services (EMS), and technical rescue to the City of Brownsville, the extended territorial jurisdictions (ETJs including the contracted areas in Cameron County, Boca Chica, Cameron Park, Olmito, and Rancho Viejo), and other surrounding communities (upon mutual aid request). The department operates out of nine fire stations and a separate EMS station. It utilizes eight frontline engines, eight ALS medic units, two brush trucks, two airport rescue trucks, four rescue boats, a ladder truck, a utility truck, a hazmat response unit, a heavy rescue unit, a fleet of five all-terrain alternate response and transport units, an EMS commander unit, and a shift commander unit.

In 2019, the BFD responded to 28,678 calls, of which 86 percent were EMS calls. The total combined workload (deployed time) for BFD units was 33,187.8 hours. The average response time was 12.5 minutes. The 90th percentile response time was 18.4 minutes.

In 2020, the BFD responded to 27,269 calls, of which 84 percent were EMS calls. The total combined workload for BFD units was 32,489.1 hours. The average response time was 14.0 minutes. The 90th percentile response time was 20.7 minutes.

§ § §

METHODOLOGY

In this report, CPSM analyzes calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit (i.e., a unit responding to a call). Thus, a call may include multiple runs.

CPSM collected the following data sets for the analysis:

- Computer-aided dispatch (CAD) data stored as multiple linked files.
- NFIRS fire call records exported from the department's system and supplemented by the Public Data Release available from the U.S. Fire Administration.
- Electronic Patient Care Reporting (EPCR) data that was limited to describing the primary nature of each medical call and to the times associated with ambulance transports.

The analysis focuses on calls that BFD responded to in 2019 and 2020. After we linked the CAD and NFIRS data, we classified the calls in a series of steps. We first used the NFIRS incident type to identify canceled calls, motor vehicle accidents (MVA), and fire category call types. Calls identified by NFIRS as EMS calls along with any calls that lacked a matching NFIRS record were categorized using the incident descriptions within the EPCR records.

We received records for a total of 57,797 calls in 2019 and 2020. We removed 1,440 calls that had no responding BFD unit, of which 1,414 were canceled calls. In addition, we removed all runs that did not have at least an en route or arrival time. This led us to exclude another 293 calls. Finally, we excluded 117 calls to which BFD administrative units were the only responders; however, the workload of administrative units is documented in Attachment II. The 55,947 calls that remained for this analysis are summarized in the following table.

TABLE 7-1: Total Received and Studied Calls by Type and Year

Year	Total Calls	
	Received	Studied
2019	29,416	28,678
2020	28,381	27,269
Total	**57,797**	**55,947**

AGGREGATE CALL TOTALS AND RUNS

From this point, we focus on the 28,678 calls in 2019. We will draw a comparison between 2019 and 2020 in Attachment I. In 2019, BFD responded to 28,678 calls, of which 86 percent were EMS-related calls. During the year, there were 151 structure fire calls and 271 outside fire calls within the Brownsville fire district.

Calls by Type

Table 7-2 shows the number of calls that BFD responded to by call type, average calls per day, and the percentage of calls that fall into each call type category. Figures 7-1 and 7-2 show the percentage of calls that fall into each EMS (Figure 7-1) and fire (Figure 7-2) type category.

TABLE 7-2: Calls by Type

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	1,092	3.0	3.8
Cardiac and stroke	953	2.6	3.3
Fall and injury	1,627	4.5	5.7
Illness and other	8,856	24.3	30.9
MVA	1,584	4.3	5.5
Non-emergency transfer	7,318	20.0	25.5
Overdose and psychiatric	1,470	4.0	5.1
Seizure and unconsciousness	1,713	4.7	6.0
EMS Total	**24,613**	**67.4**	**85.8**
False alarm	1,020	2.8	3.6
Good intent	215	0.6	0.7
Hazard	411	1.1	1.4
Outside fire	271	0.7	0.9
Public service	1,167	3.2	4.1
Structure fire	151	0.4	0.5
Fire Total	**3,235**	**8.9**	**11.3**
Canceled	768	2.1	2.7
Mutual aid	62	0.2	0.2
Total	**28,678**	**78.6**	**100.0**

FIGURE 7-1: EMS Calls by Type

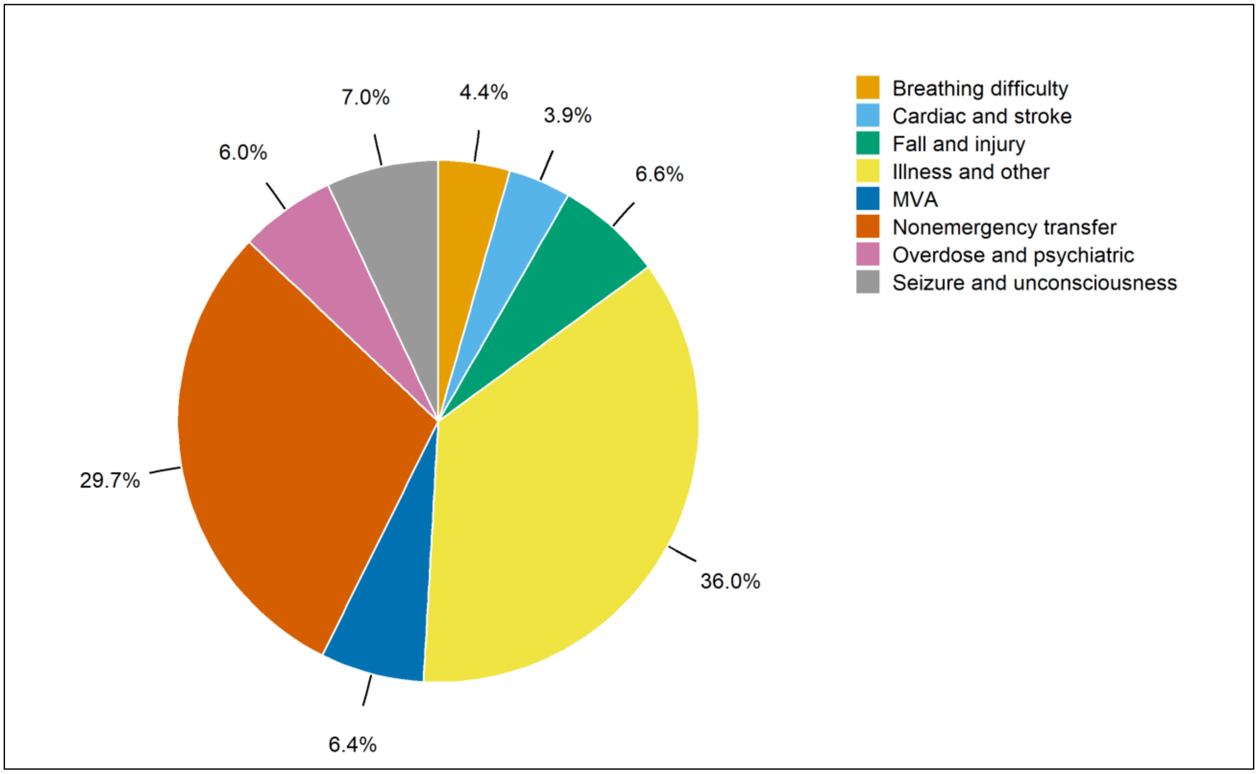
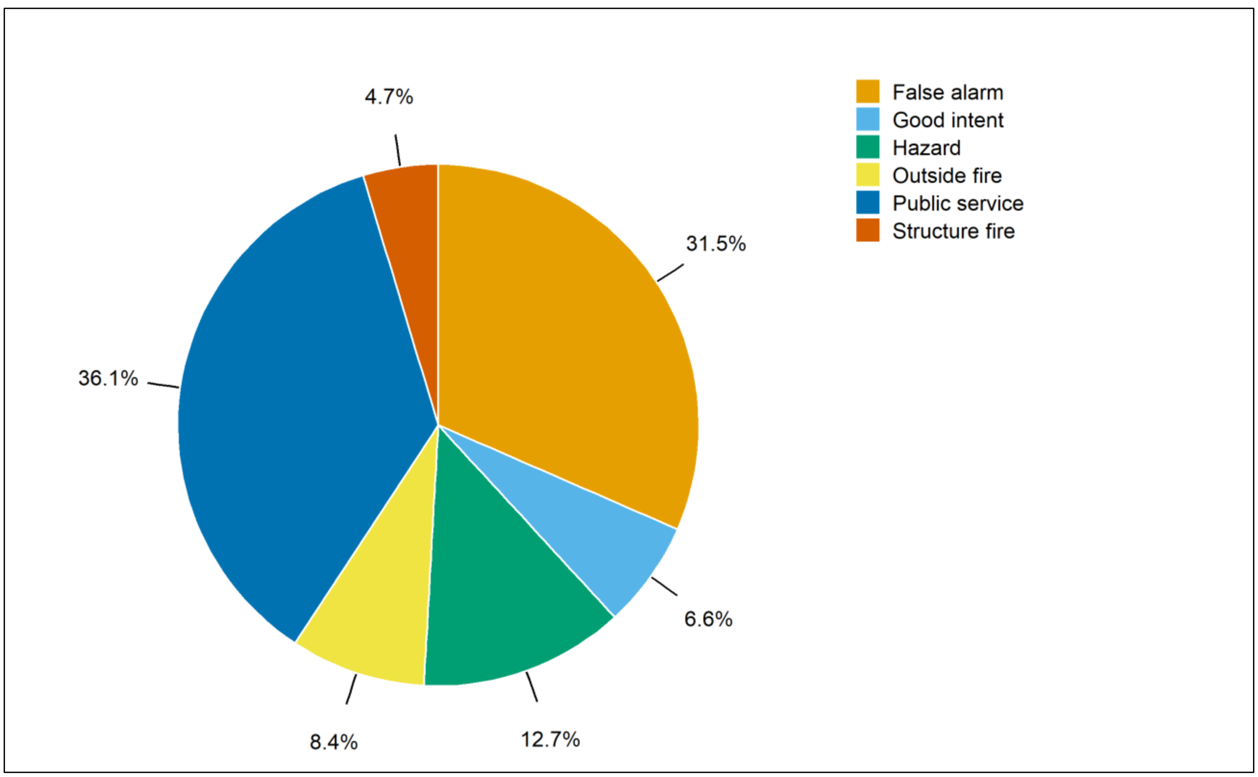


FIGURE 7-2: Fire Calls by Type



Observations:

- In 2019, BFD responded to an average of 78.6 calls per day, including 2.1 canceled (2.7 percent) and 0.2 mutual aid (0.2 percent) calls per day.
- EMS calls for the year totaled 24,613 (86 percent of all calls), an average of 67.4 calls per day.
  - Illness and other calls were the largest category of EMS calls at 31 percent of total calls (36 percent of EMS calls).
  - Nonemergency transfers were the second-largest category of EMS calls at 26 percent of total calls (30 percent of EMS calls).
  - Motor vehicle accidents (MVA) made up 6 percent of total calls (6 percent of EMS calls).
  - Cardiac and stroke calls made up 3 percent of total calls (4 percent of EMS calls).
- Fire calls for the year totaled 3,235 (11 percent of all calls), or an average of 8.9 calls per day.
  - False alarm calls made up 4 percent of total calls (32 percent of fire calls).
  - Structure and outside fire calls combined made up 1.5 percent of total calls (13 percent of fire calls), or an average of 1.2 calls per day.

Calls by Type and Duration

The following table shows the duration of calls by type using four duration categories: less than 30 minutes, 30 minutes to one hour, one to two hours, and two or more hours.

TABLE 7-3: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	Two or More Hours	Total
Breathing difficulty	71	325	674	22	1,092
Cardiac and stroke	43	247	637	26	953
Fall and injury	186	456	945	40	1,627
Illness and other	1,282	2,905	4,475	194	8,856
MVA	375	474	657	78	1,584
Non-emergency transfer	361	1,596	4,876	485	7,318
Overdose and psychiatric	196	589	654	31	1,470
Seizure and unconsciousness	136	548	985	44	1,713
EMS Total	**2,650**	**7,140**	**13,903**	**920**	**24,613**
False alarm	669	264	67	20	1,020
Good intent	120	63	26	6	215
Hazard	145	175	77	14	411
Outside fire	68	110	69	24	271
Public service	507	387	187	86	1,167
Structure fire	33	45	43	30	151
Fire Total	**1,542**	**1,044**	**469**	**180**	**3,235**
Canceled	593	105	64	6	768
Mutual aid	8	19	28	7	62
Total	**4,793**	**8,308**	**14,464**	**1,113**	**28,678**

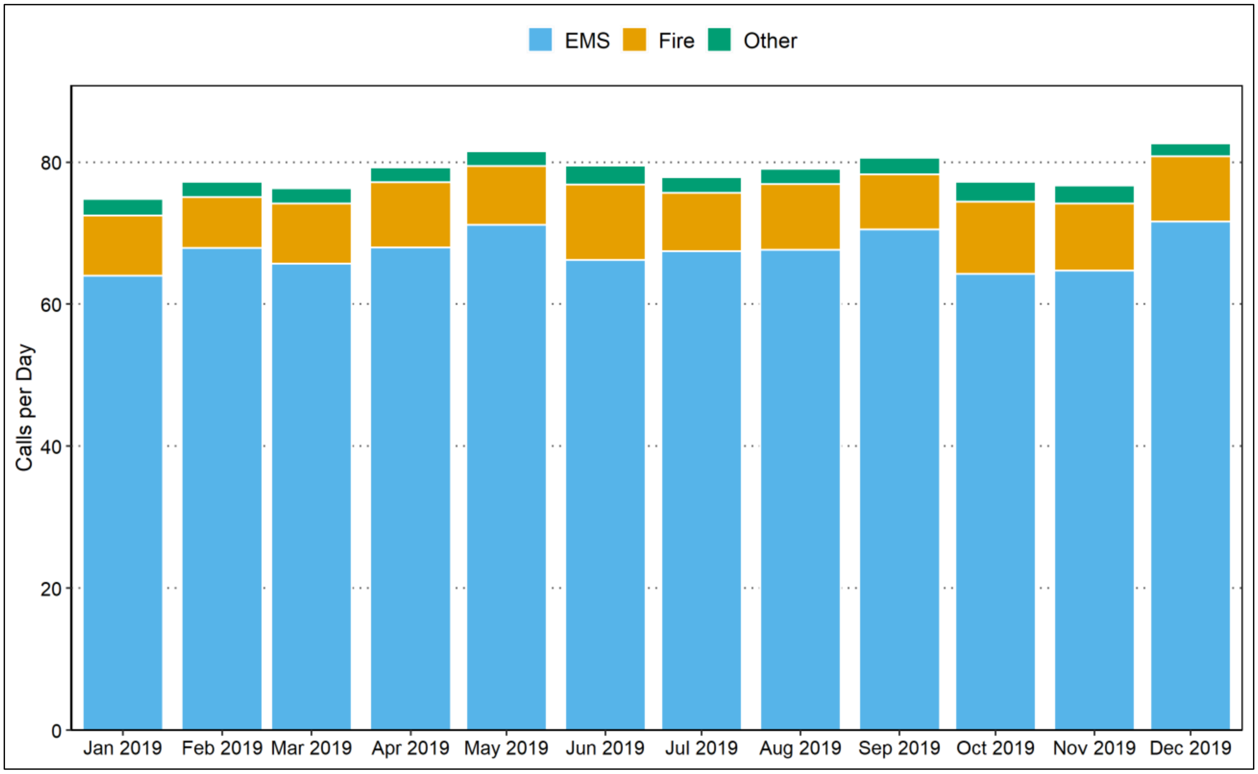
Observations:

- On average, there were 40.6 EMS calls per day that lasted more than one hour.
- On average, there were 1.8 fire calls per day that lasted more than one hour.
- A total of 9,790 EMS calls (40 percent) lasted less than one hour, 13,903 EMS calls (56 percent) lasted one to two hours, and 920 EMS calls (4 percent) lasted two or more hours.
- A total of 2,586 fire calls (80 percent) lasted less than one hour, 469 fire calls (14 percent) lasted one to two hours, and 180 fire calls (6 percent) lasted two or more hours.
- A total of 178 outside fire calls (66 percent) lasted less than one hour, 69 outside fire calls (25 percent) lasted one to two hours, and 24 outside fire calls (9 percent) lasted two or more hours.
- A total of 78 structure fire calls (52 percent) lasted less than one hour, 43 structure fire calls (28 percent) lasted one to two hours, and 30 structure fire calls (20 percent) lasted two or more hours.

Average Calls by Month and Hour of Day

Figure 7-3 shows the monthly variation in the average daily number of calls handled by BFD in 2019. Similarly, Figure 7-4 illustrates the average number of calls received each hour of the day.

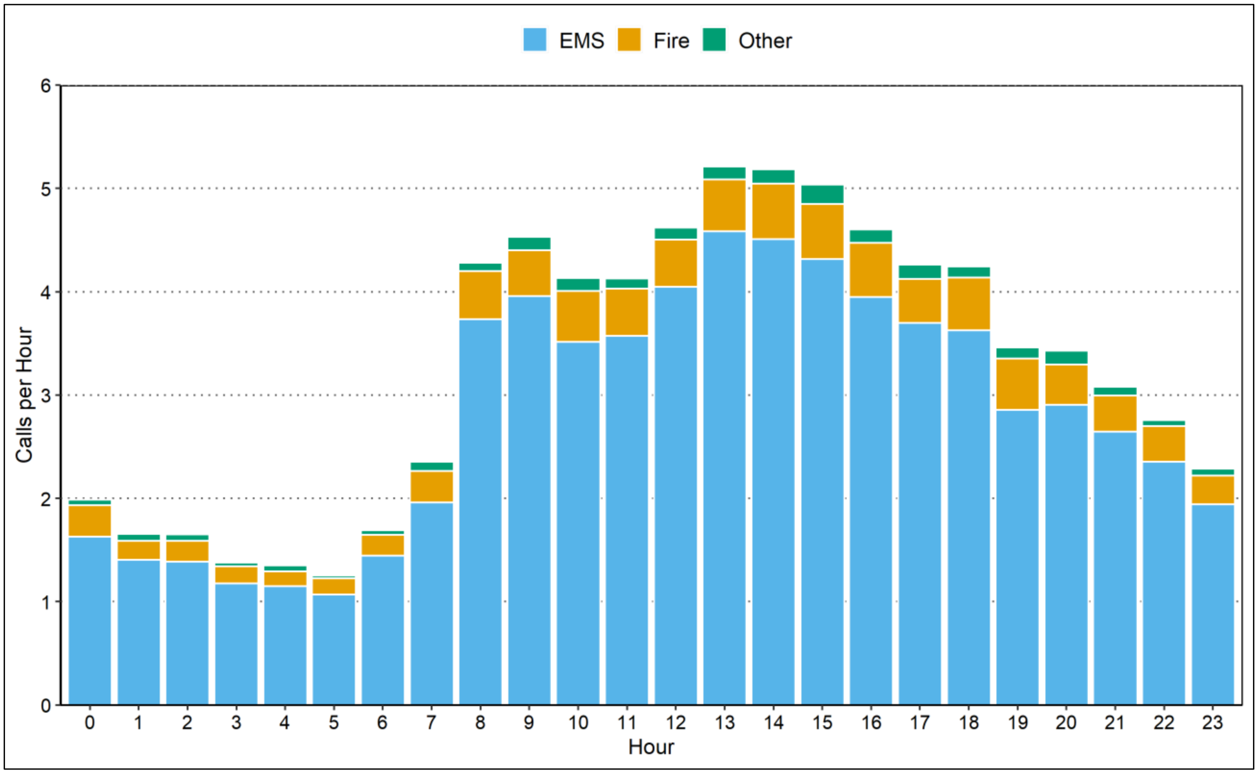
FIGURE 7-3: Calls per Day by Month



Observations:

- EMS calls per day ranged from 64.0 in January 2019 to 71.6 in December 2019.
- Fire calls per day ranged from 7.2 in February 2019 to 10.7 in June 2019.
- Other calls per day ranged from 1.8 in December 2019 to 2.8 in October 2019.
- Total calls per day ranged from 74.8 in January 2019 to 82.6 in December 2019.

FIGURE 7-4: Average Calls by Hour of Day



Observations:

- Average EMS calls per hour ranged from 1.07 between 5:00 a.m. and 6:00 a.m. to 4.59 between 1:00 p.m. and 2:00 p.m.
- Average fire calls per hour ranged from 0.14 between 4:00 a.m. and 5:00 a.m. to 0.54 between 2:00 p.m. and 3:00 p.m.
- Average other calls per hour ranged from 0.02 between 5:00 a.m. and 6:00 a.m. to 0.19 between 3:00 p.m. and 4:00 p.m.
- Average total calls per hour ranged from 1.25 between 5:00 a.m. and 6:00 a.m. to 5.21 between 1:00 p.m. and 2:00 p.m.

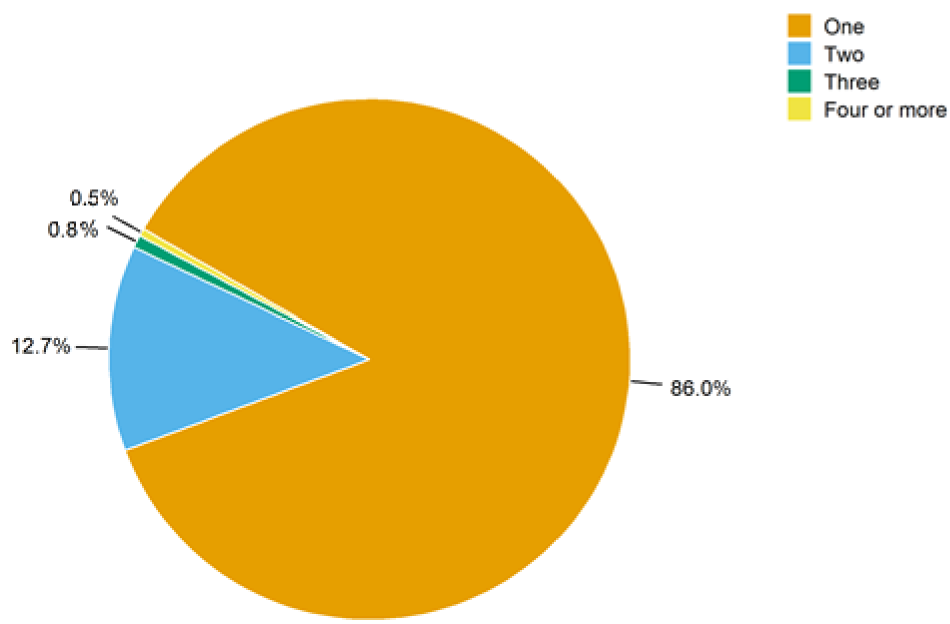
Units Arriving at Calls

In this section, we limit ourselves to calls where a unit from BFD arrives. For this reason, there are fewer calls in Table 7-4 than in Table 7-2. For 2019, Table 7-4 and Figure 7-5 detail the number of calls with one, two, three, and four or more BFD units arriving at a call, broken down by call type.

TABLE 7-4: Calls by Call Type and Number of Arriving Units

Call Type	Number of Units				Total Calls
	One	Two	Three	Four or More	
Breathing difficulty	906	161	7	0	1,074
Cardiac and stroke	677	251	5	2	935
Fall and injury	1,204	369	5	3	1,581
Illness and other	7,499	930	19	5	8,453
MVA	724	636	105	34	1,499
Nonemergency transfer	6,740	364	18	0	7,122
Overdose and psychiatric	1,242	156	4	0	1,402
Seizure and unconsciousness	1,443	237	0	0	1,680
EMS Total	**20,435**	**3,104**	**163**	**44**	**23,746**
False alarm	769	15	4	2	790
Good intent	154	23	4	10	191
Hazard	357	29	8	9	403
Outside fire	197	38	15	9	259
Public service	891	169	6	5	1,071
Structure fire	66	19	10	51	146
Fire Total	**2,434**	**293**	**47**	**86**	**2,860**
Canceled	226	27	1	0	254
Mutual aid	50	4	0	0	54
Total	**23,145**	**3,428**	**211**	**130**	**26,914**
Total-Percentage	**86.0**	**12.7**	**0.8**	**0.5**	**100.0**

FIGURE 7-5: Calls by Number of Arriving Units



Observations:

Overall

- On average, 1.2 units arrived at all calls; for 86 percent of calls, only one unit arrived.
- Overall, four or more units arrived at 0.5 percent of calls.

EMS

- On average, 1.2 units arrived per EMS call.
- For EMS calls, one unit arrived 86 percent of the time, two units arrived 13 percent of the time, and three or more units arrived 1 percent of the time.

Fire

- On average, 1.3 units arrived per fire call.
- For fire calls, one unit arrived 85 percent of the time, two units arrived 10 percent of the time, three units arrived 1.6 percent of the time, and four or more units arrived 3.0 percent of the time.
- For outside fire calls, three or more units arrived 9 percent of the time.
- For structure fire calls, three or more units arrived 42 percent of the time.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of BFD's units is measured in two ways: runs and deployed time. The deployed time of a run is measured from the time a unit is dispatched through the time the unit is cleared. Because multiple units respond to some calls, there are more runs (37,474) than calls (28,678) and the average deployed time per run varies from the average duration per call.

Runs and Deployed Time

Deployed time, also referred to as deployed hours, is the total time spent by BFD units deployed on all runs. Table 7-5 shows the total deployed time, both overall and broken down by type of run, for all non-administrative BFD units in 2019. Table 7-6 and Figure 7-6 present the average deployed minutes by hour of day.

TABLE 7-5: Annual Runs and Deployed Time by Run Type

Run Type	Minutes per Run	Total Hours	Percent of Hours	Minutes per Day	Total Runs	Runs per Day
Breathing difficulty	56.6	1,309.8	3.9	215.3	1,389	3.8
Cardiac and stroke	56.1	1,282.8	3.9	210.9	1,373	3.8
Fall and injury	53.1	1,996.6	6.0	328.2	2,257	6.2
Illness and other	53.0	9,593.5	28.9	1,577.0	10,854	29.7
MVA	45.6	2,323.4	7.0	381.9	3,060	8.4
Non-emergency transfer	64.7	9,335.4	28.1	1,534.6	8,658	23.7
OD	50.7	1,537.3	4.6	252.7	1,820	5.0
Seizure and UNC	54.7	2,010.2	6.1	330.4	2,204	6.0
EMS Total	**55.8**	**29,389.2**	**88.6**	**4,831.1**	**31,615**	**86.6**
False alarm	27.7	534.7	1.6	87.9	1,159	3.2
Good intent	29.6	199.9	0.6	32.9	405	1.1
Hazard	38.4	384.1	1.2	63.1	600	1.6
Outside fire	57.9	473.0	1.4	77.8	490	1.3
Public service	45.1	1,155.2	3.5	189.9	1,536	4.2
Structure fire	72.5	670.8	2.0	110.3	555	1.5
Fire Total	**43.2**	**3,417.8**	**10.3**	**561.8**	**4,745**	**13.0**
Canceled	17.7	304.7	0.9	50.1	1,032	2.8
Mutual aid	55.7	76.1	0.2	12.5	82	0.2
Other Total	**20.5**	**380.8**	**1.1**	**62.6**	**1,114**	**3.1**
Total	**53.1**	**33,187.8**	**100.0**	**5,455.5**	**37,474**	**102.7**

Note: OD=Overdose and psychiatric; UNC=Unconsciousness.

Observations:

Overall

- The total deployed time for the 2019 calendar year was 33,187.8 hours. The daily average was 90.9 hours for all BFD units combined.
- There were 37,474 runs, including 1,032 runs dispatched for canceled calls and 82 runs dispatched for mutual aid calls. The daily average was 102.7 runs.

EMS

- EMS runs accounted for 89 percent of the total workload.
- The average deployed time for EMS runs was 55.8 minutes. The deployed time for all EMS runs averaged 80.5 hours per day.

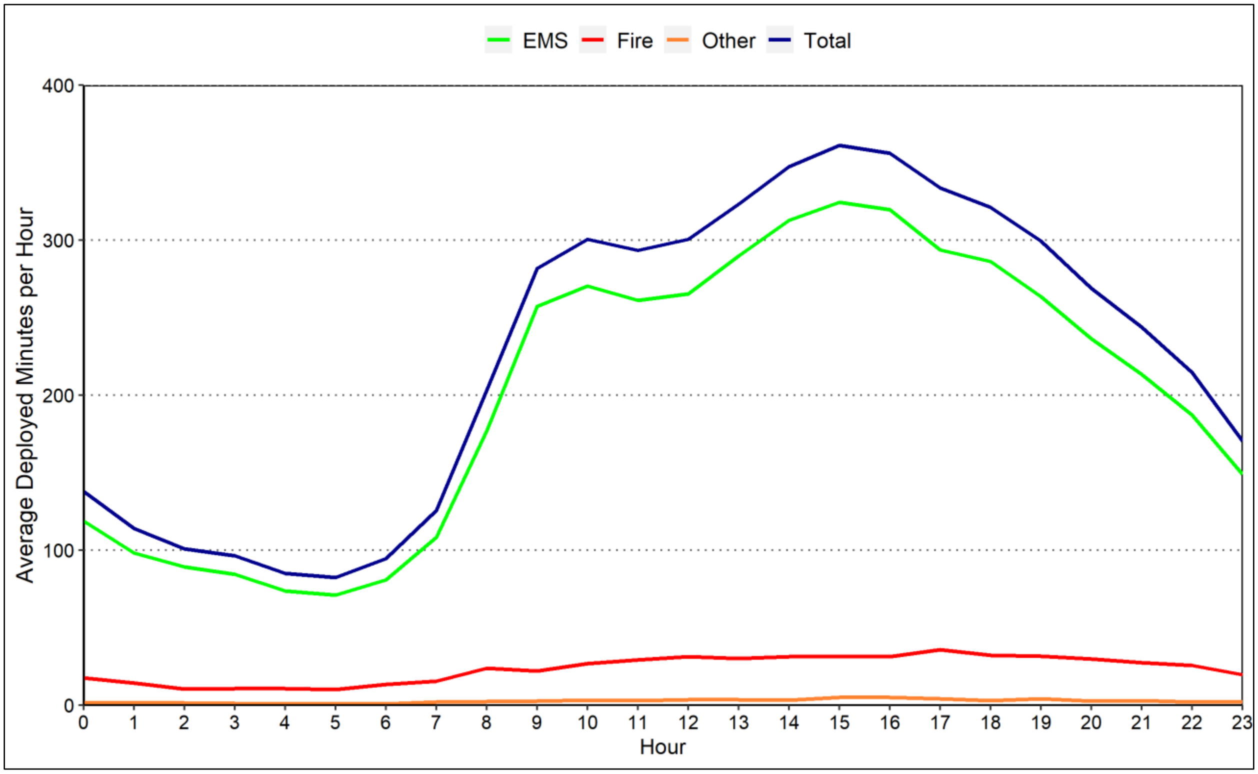
Fire

- Fire runs accounted for 10 percent of the total workload.
- The average deployed time for fire runs was 43.2 minutes. The deployed time for all fire runs averaged 9.4 hours per day.
- There were 1,045 runs for structure and outside fire calls combined, with a total workload of 1,143.8 hours. This accounted for 3 percent of the total workload.
- The average deployed time for outside fire runs was 57.9 minutes per run, and the average deployed time for structure fire runs was 72.5 minutes per run.

TABLE 7-6: Deployed Minutes by Hour of Day

Hour	EMS	Fire	Other	Total
0	118.8	17.6	1.4	137.8
1	98.1	14.3	1.6	114.1
2	89.1	10.4	1.5	101.0
3	84.4	10.7	1.2	96.4
4	73.6	10.6	0.7	84.9
5	71.0	10.0	1.2	82.2
6	80.7	13.2	0.7	94.6
7	108.2	15.5	1.9	125.6
8	177.0	23.8	2.3	203.2
9	257.1	21.9	2.6	281.6
10	270.4	26.8	3.3	300.5
11	261.1	29.3	3.0	293.4
12	265.4	31.4	3.6	300.4
13	289.7	30.0	3.6	323.2
14	312.8	31.2	3.3	347.3
15	324.4	31.6	5.0	361.0
16	319.7	31.2	5.0	355.9
17	293.8	35.8	4.0	333.6
18	286.1	32.1	2.9	321.2
19	263.6	31.6	4.1	299.3
20	236.5	29.7	2.6	268.8
21	213.3	27.4	2.9	243.7
22	187.0	25.5	2.0	214.5
23	149.0	19.5	2.0	170.4
Daily Average	**4,831.1**	**561.8**	**62.6**	**5,455.5**

FIGURE 7-6: Average Deployed Minutes by Hour of Day



Observations:

- Hourly deployed time was highest during the day from 10:00 a.m. to 8:00 p.m., averaging more than 293 minutes.
- Average deployed time peaked between 3:00 p.m. and 4:00 p.m., averaging 361 minutes.
- Average deployed time was lowest between 5:00 a.m. and 6:00 a.m., averaging 82 minutes.

Workload by Unit

The following table provides a summary of each BFD unit's workload for the year.

TABLE 7-7: Workload by Unit

Station	Unit	Unit Type	Minutes per Run	Total Hours	Total Percent	Minutes per Day	Total Runs	Runs per Day
1	FB	Brush truck	83.1	135.8	0.4	22.3	98	0.3
	FE1	Engine	33.7	712.6	2.1	117.1	1,267	3.5
	M1	ALS unit	57.2	3,347.0	10.1	550.2	3,512	9.6
	Truck1	Ladder truck 105'	61.2	24.5	0.1	4.0	24	0.1
	Other	Other	41.4	44.9	0.1	7.4	65	0.2
		Total	**51.5**	**4,264.7**	**12.9**	**701.0**	**4,966**	**13.6**
2	FE2	Engine	34.7	596.4	1.8	98.0	1,031	2.8
	Other	Other	274.1	9.1	0.0	1.5	2	0.0
		Total	**35.2**	**605.5**	**1.8**	**99.5**	**1,033**	**2.8**
3	FE3	Engine	37.4	869.2	2.6	142.9	1,395	3.8
	M3	ALS unit	61.5	3,245.9	9.8	533.6	3,168	8.7
	Other	Other	44.6	1.5	0.0	0.2	2	0.0
		Total	**54.1**	**4,116.6**	**12.4**	**676.7**	**4,565**	**12.5**
4	FE4	Engine	33.7	785.4	2.4	129.1	1,398	3.8
	M4	ALS unit	61.5	3,717.7	11.2	611.1	3,628	9.9
		Total	**53.8**	**4,503.1**	**13.6**	**740.2**	**5,026**	**13.8**
5	FR1	ARFF	48.5	114.8	0.3	18.9	142	0.4
	FR2	ARFF	37.8	31.5	0.1	5.2	50	0.1
		Total	**45.7**	**146.3**	**0.4**	**24.0**	**192**	**0.5**
6	FE6	Engine	37.1	993.8	3.0	163.4	1,608	4.4
	M6	ALS unit	55.6	3,587.5	10.8	589.7	3,873	10.6
		Total	**50.2**	**4,581.2**	**13.8**	**753.1**	**5,481**	**15.0**
7	FE7	Engine	34.8	603.8	1.8	99.3	1,040	2.8
	M7	ALS unit	58.5	3,418.1	10.3	561.9	3,503	9.6
		Total	**53.1**	**4,021.9**	**12.1**	**661.1**	**4,543**	**12.4**
8	FE8	Engine	42.4	890.5	2.7	146.4	1,260	3.5
	M8	ALS unit	57.2	3,042.6	9.2	500.2	3,194	8.8
		Total	**53.0**	**3,933.1**	**11.9**	**646.5**	**4,454**	**12.2**
9	FE9	Engine	39.1	985.3	3.0	162.0	1,512	4.1
	FHR	Heavy rescue	41.6	210.8	0.6	34.6	304	0.8
	M9	ALS unit	60.9	3,919.0	11.8	644.2	3,861	10.6
	TU1	BLS unit	70.9	1,716.2	5.2	282.1	1,452	4.0
	Other	Other	68.2	46.6	0.1	7.7	41	0.1
		Total	**57.6**	**6,877.9**	**20.7**	**1,130.6**	**7,170**	**19.6**
10	M10	ALS unit	**187.5**	**137.5**	**0.4**	**22.6**	**44**	**0.1**
Total			**53.1**	**33,187.8**	**100.0**	**5,455.5**	**37,474**	**102.7**

Tables 7-8 and 7-9 provide a more detailed view of workload, showing each unit's runs broken out by run type (Table 7-8) and its daily average deployed time by run type (Table 7-9).

TABLE 7-8: Total Runs by Run Type and Unit

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Cancel	Mutual Aid	Total
1	FB	9	3	4	1	59	11	9	2	0	98
	FE1	709	115	39	65	33	132	54	120	0	1,267
	M1	3,395	4	2	1	1	61	15	28	5	3,512
	Truck1	0	3	4	1	2	1	13	0	0	24
	Other	21	1	25	1	2	12	0	3	0	65
	Total	**4,134**	**126**	**74**	**69**	**97**	**217**	**91**	**153**	**5**	**4,966**
2	FE2	596	104	27	51	32	113	44	63	1	1,031
	Other	0	0	0	0	0	2	0	0	0	2
	Total	**596**	**104**	**27**	**51**	**32**	**115**	**44**	**63**	**1**	**1,033**
3	FE3	842	103	54	79	49	105	42	121	0	1,395
	M3	3,042	3	15	8	3	46	15	36	0	3,168
	Other	2	0	0	0	0	0	0	0	0	2
	Total	**3,886**	**106**	**69**	**87**	**52**	**151**	**57**	**157**	**0**	**4,565**
4	FE4	763	173	25	70	43	172	51	100	1	1,398
	M4	3,505	4	6	5	4	57	9	34	4	3,628
	Total	**4,268**	**177**	**31**	**75**	**47**	**229**	**60**	**134**	**5**	**5,026**
5	FR1	115	6	0	13	4	2	1	0	1	142
	FR2	27	5	0	13	2	3	0	0	0	50
	Total	**142**	**11**	**0**	**26**	**6**	**5**	**1**	**0**	**1**	**192**
6	FE6	870	184	44	82	44	217	54	113	0	1,608
	M6	3,724	7	5	7	4	71	13	31	11	3,873
	Total	**4,594**	**191**	**49**	**89**	**48**	**288**	**67**	**144**	**11**	**5,481**
7	FE7	564	118	23	48	45	95	39	107	1	1,040
	M7	3,403	2	5	11	2	36	12	23	9	3,503
	Total	**3,967**	**120**	**28**	**59**	**47**	**131**	**51**	**130**	**10**	**4,543**
8	FE8	692	115	33	48	67	152	40	111	2	1,260

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Cancel	Mutual Aid	Total
	M8	3,041	6	10	10	6	51	13	44	13	3,194
	Total	**3,733**	**121**	**43**	**58**	**73**	**203**	**53**	**155**	**15**	**4,454**
9	FE9	944	190	38	55	65	114	42	60	4	1,512
	FHR	119	9	38	25	18	12	73	10	0	304
	M9	3,746	3	8	5	4	42	16	22	15	3,861
	TU1	1,433	0	0	0	0	2	0	2	15	1,452
	Other	30	1	0	1	1	6	0	2	0	41
	Total	**6,272**	**203**	**84**	**86**	**88**	**176**	**131**	**96**	**34**	**7,170**
10	M10	**23**	**0**	**0**	**0**	**0**	**21**	**0**	**0**	**0**	**44**
Total		**31,615**	**1,159**	**405**	**600**	**490**	**1,536**	**555**	**1,032**	**82**	**37,474**

Note: See Table 7-7 for unit type.

TABLE 7-9: Deployed Minutes per Day by Run Type and Unit

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Cancel	Mutual Aid	Total
1	FB	1.8	0.1	0.7	0.0	15.6	2.6	1.3	0.2	0.0	22.3
	FE1	68.5	9.4	2.7	5.7	3.6	13.4	9.5	4.2	0.0	117.1
	M1	535.9	0.5	0.3	0.0	0.1	9.4	1.5	1.6	0.9	550.2
	Truck1	0.0	0.3	0.1	0.0	0.3	0.9	2.5	0.0	0.0	4.0
	Other	2.7	0.1	1.1	0.1	1.1	2.2	0.0	0.1	0.0	7.4
	Total	**608.9**	**10.4**	**4.9**	**5.9**	**20.7**	**28.5**	**14.8**	**6.1**	**0.9**	**701.0**
2	FE2	58.3	6.3	2.2	5.9	4.3	10.5	8.3	2.2	0.1	98.0
	Other	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.5
	Total	**58.3**	**6.3**	**2.2**	**5.9**	**4.3**	**12.0**	**8.3**	**2.2**	**0.1**	**99.5**
3	FE3	86.9	8.6	4.0	8.7	8.9	8.6	11.9	5.2	0.0	142.9
	M3	518.5	0.4	0.6	0.9	0.1	7.5	1.7	3.9	0.0	533.6
	Other	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	Total	**605.7**	**9.0**	**4.5**	**9.6**	**9.1**	**16.1**	**13.6**	**9.1**	**0.0**	**676.7**
4	FE4	72.5	12.6	2.5	7.5	4.3	17.0	9.7	2.6	0.3	129.1

Station	Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Cancel	Mutual Aid	Total
	M4	593.5	0.8	0.5	0.2	0.6	9.9	1.2	3.7	0.6	611.1
	Total	**666.1**	**13.4**	**3.0**	**7.7**	**4.9**	**27.0**	**10.9**	**6.3**	**0.9**	**740.2**
5	FR1	16.6	0.4	0.0	1.0	0.5	0.2	0.1	0.0	0.1	18.9
	FR2	2.8	0.4	0.0	1.1	0.6	0.3	0.0	0.0	0.0	5.2
	Total	**19.4**	**0.8**	**0.0**	**2.1**	**1.0**	**0.5**	**0.1**	**0.0**	**0.1**	**24.0**
6	FE6	91.9	14.1	4.3	9.1	5.9	21.5	11.5	5.0	0.0	163.4
	M6	575.7	0.4	0.4	0.6	0.3	8.6	0.9	1.6	1.3	589.7
	Total	**667.6**	**14.4**	**4.7**	**9.7**	**6.2**	**30.1**	**12.4**	**6.6**	**1.3**	**753.1**
7	FE7	54.3	8.0	1.9	4.9	7.4	9.6	9.9	3.1	0.2	99.3
	M7	550.5	0.3	0.2	1.1	0.1	4.3	2.1	1.9	1.4	561.9
	Total	**604.8**	**8.3**	**2.1**	**5.9**	**7.5**	**13.9**	**12.0**	**5.0**	**1.6**	**661.1**
8	FE8	81.6	9.3	4.0	5.8	11.0	19.0	9.9	5.5	0.3	146.4
	M8	482.6	0.3	1.0	0.5	1.2	6.3	2.5	3.8	1.9	500.2
	Total	**564.2**	**9.6**	**5.0**	**6.3**	**12.2**	**25.2**	**12.4**	**9.4**	**2.2**	**646.5**
9	FE9	103.4	14.5	3.3	7.2	10.0	11.9	8.8	2.3	0.6	162.0
	FHR	13.3	0.5	2.4	1.8	1.3	1.0	13.8	0.4	0.0	34.6
	M9	628.7	0.4	0.6	0.4	0.1	6.5	3.1	2.3	2.1	644.2
	TU1	278.1	0.0	0.0	0.0	0.0	0.8	0.0	0.5	2.8	282.1
	Other	4.3	0.4	0.0	0.5	0.4	2.0	0.0	0.0	0.0	7.7
	Total	**1,027.9**	**15.8**	**6.4**	**9.9**	**11.9**	**22.3**	**25.7**	**5.4**	**5.4**	**1,130.6**
10	M10	**8.4**	**0.0**	**0.0**	**0.0**	**0.0**	**14.2**	**0.0**	**0.0**	**0.0**	**22.6**
Total		**4,831.1**	**87.9**	**32.9**	**63.1**	**77.8**	**189.9**	**110.3**	**50.1**	**12.5**	**5,455.5**

Note: See Table 7-7 for unit type.

Observations:

- Station 9 made the most runs (7,170 or an average of 19.6 runs per day) and had the highest total annual deployed time (6,877.9 hours or an average of 18.8 hours per day).
  - EMS calls accounted for 87.5 percent of runs and 90.9 percent of total deployed time.
  - Outside and structure fire calls accounted for 3.1 percent of runs and 3.3 percent of total deployed time.
- Station 6 made the second-most runs (5,481 or an average of 15.0 runs per day) and had the second-highest total annual deployed time (4,581.2 hours or an average of 12.6 hours per day).
  - EMS calls accounted for 83.8 percent of runs and 88.6 percent of total deployed time.
  - Outside and structure fire calls accounted for 2.1 percent of runs and 2.5 percent of total deployed time.
- Among all engines, unit FE6 made the most runs (1,608 or an average of 4.4 runs per day) and had the highest total annual deployed time (993.8 or an average of 2.7 hours per day).
  - EMS calls accounted for 54.1 percent of runs and 56.2 percent of total deployed time.
  - Outside and structure fire calls accounted for 6.1 percent of runs and 10.6 percent of total deployed time.
- Among all engines, unit FE9 made the second most runs (1,512 or an average of 4.1 runs per day) and had the second-highest total annual deployed time (985.3 hours or an average of 2.7 hours per day).
  - EMS calls accounted for 62.4 percent of runs and 63.8 percent of total deployed time.
  - Outside and structure fire calls accounted for 7.1 percent of runs and 11.6 percent of total deployed time.
- Among all ALS ambulances, unit M6 made the most runs (3,873 or an average of 10.6 runs per day) and had the second-highest total annual deployed time (3,587.0 or an average of 9.8 hours per day).
  - EMS calls accounted for 96.2 percent of runs and 97.6 percent of total deployed time.
  - Outside and structure fire calls accounted for 0.4 percent of runs and 0.2 percent of total deployed time.
- Among all ALS ambulances, unit M9 made the second most runs (3,861 or an average of 10.6 runs per day) and had the highest total annual deployed time (3,919.0 hours or an average of 10.7 hours per day).
  - EMS calls accounted for 97.0 percent of runs and 97.6 percent of total deployed time.
  - Outside and structure fire calls accounted for 0.5 percent of runs and less than 0.5 percent of total deployed time.

Workload by Location

Table 7-10 breaks down the BFD's workload by location. Table 7-11 provides further detail on the workload associated with structure and outside fire calls. Table 7-11 includes the mutual aids to outside and structure fires outside the Brownsville location.

TABLE 7-10: Annual Workload by Location

Location	Calls	Percent Calls	Runs	Runs Per Day	Minutes Per Run	Total Hours	Percent Hours	Minutes Per Day
Brownsville	27,108	94.5	35,200	96.4	53.0	31,101.0	93.7	5,112.5
Cameron County*	1,283	4.5	1,800	4.9	56.4	1,692.8	5.1	278.3
Rancho Viejo*	127	0.4	242	0.7	48.1	193.8	0.6	31.9
Olmito*	89	0.3	133	0.4	50.4	111.8	0.3	18.4
Harlingen	33	0.1	41	0.1	66.6	45.5	0.1	7.5
Other	38	0.1	58	0.2	44.4	42.9	0.1	7.1
Total	**28,678**	**100.0**	**37,474**	**102.7**	**53.1**	**33,187.8**	**100.0**	**5,455.5**

Note: Other includes ten calls in Los Fresnos, eight calls in San Benito, five calls in S. Padre Island, four calls in Cameron Park,* three calls in Port Isabel, two calls in Boca Chica,* La Feria, and Laguna Heights, and one call in both Palm Valley and Rio Hondo. *Contracted ETJ.

TABLE 7-11: Structure and Outside Fire Runs by Location

District	Structure Fire Runs	Structure Fire Minutes per Run	Outside Fire Runs	Outside Fire Minutes per Run	Hours for Structure and Outside Fires	Percent of Structure and Outside Fire Workload
Brownsville	508	70.8	403	58.6	993.1	86.8
Cameron County	47	90.7	63	58.9	132.9	11.6
Olmito	0	NA	18	41.7	12.5	1.1
Rancho Viejo	0	NA	4	41.2	2.7	0.2
Cameron Park	0	NA	2	76.5	2.5	0.2
San Benito*	0	NA	1	58.1	1.0	0.1
Total	**555**	**72.5**	**491**	**57.9**	**333.2**	**100.0**

Note: * Mutual aid. Except for mutual aid runs, the runs within Brownsville and its ETJs match the number of runs described in Table 7-5.

Observations:

Brownsville

- There were 27,108 calls or 95 percent of the total calls.
- There were 35,200 runs, including 960 runs dispatched for canceled calls. The daily average was 96.4 runs.
- Total deployed time for the year was 31,101.0 hours or 94 percent of the total annual workload. The daily average was 85.2 hours for all units combined.

Cameron County

- There were 1,283 calls or 4.5 percent of the total calls.
- There were 1,800 runs, including 56 runs dispatched for canceled calls. The daily average was 4.9 runs.
- Total deployed time for the year was 1,692.8 hours or 5.1 percent of the total annual workload. The daily average was 4.6 hours for all units combined.

Rancho Viejo

- There were 127 calls or 0.4 percent of the total calls.
- There were 242 runs, including 10 runs dispatched for canceled calls. The daily average was 0.7 runs.
- Total deployed time for the year was 193.8 hours or 0.6 percent of the total annual workload. The daily average was 31.9 minutes for all units combined.

Olmito

- There were 89 calls or 0.3 percent of the total calls.
- There were 133 runs or 0.4 runs per day.
- Total deployed time for the year was 111.8 hours or 0.3 percent of the total annual workload. The daily average was 18.4 minutes for all units combined.

Other

- There were 71 calls or 0.2 percent of the total calls.
- There were 99 runs, including 6 runs dispatched for canceled calls and 81 runs dispatched for mutual aid calls. The daily average was 0.3 runs.
- Total deployed time for the year was 88.4 hours or 0.3 percent of the total annual workload. The daily average was 14.5 minutes for all units combined.

ANALYSIS OF BUSIEST HOURS

In this analysis, we included all 28,678 calls inside and outside the Brownsville fire district in 2019. There is significant variability in the number of calls from hour to hour (for example, see Figure 7-4). One special concern relates to the resources available for hours with the heaviest workload. We tabulated the data for each of the 8,760 hours in the year. Table 7-12 shows the number of hours in the year in which there were zero to 13 calls during the hour. Table 7-13 shows the ten one-hour intervals which had the most calls during the year.

TABLE 7-12: Frequency Distribution of the Number of Calls by Year

Calls in an Hour	Frequency	Percentage
0	816	9.3
1	1,385	15.8
2	1,548	17.7
3	1,401	16.0
4	1,226	14.0
5	939	10.7
6	594	6.8
7	387	4.4
8	237	2.7
9	123	1.4
10	52	0.6
11	31	0.4
12+	15	0.2
13	6	0.1
Total	**8,760**	**100.0**

TABLE 7-13: Top Ten Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
1/29/2019, 9:00 a.m. to 10:00 a.m.	13	21	13.9
4/10/2019, 2:00 p.m. to 3:00 p.m.	13	20	16.5
1/9/2019, 1:00 p.m. to 2:00 p.m.	13	19	16.3
5/9/2019, 4:00 p.m. to 5:00 p.m.	13	18	13.3
8/8/2019, 1:00 p.m. to 2:00 p.m.	13	14	11.7
6/25/2019, midnight to 1:00 a.m.	13	14	8.2
11/11/2019, 3:00 p.m. to 4:00 p.m.	12	20	19.1
8/5/2019, 2:00 p.m. to 3:00 p.m.	12	20	14.7
12/19/2019, 4:00 p.m. to 5:00 p.m.	12	18	16.6
10/30/2019, 1:00 p.m. to 2:00 p.m.	12	17	15.0

Note: Total deployed hours is a measure of the total time spent responding to calls received in the hour. The deployed time from these calls may extend into the next hour or hours. The number of runs and deployed hours includes all BFD units.

Observations:

- During 21 hours (0.2 percent of all hours), 12 or more calls occurred; in other words, the BFD responded to 12 or more calls in an hour roughly once every 17 days.
  - The highest number of calls to occur in an hour was 13, which happened six times.
- The busiest hour with the most calls and runs was from 9:00 a.m. to 10:00 a.m. on January 29, 2019. The hour's 13 calls involved 21 individual dispatches resulting in 13.9 hours of deployed time. These 13 calls included four non-emergency transfer calls, three illness and other calls, two cardiac and stroke calls, two seizure and unconsciousness calls, one hazard call, and one public service call.

In 2019, fire suppression units were requested for 9,462 calls. Ambulances were requested for 23,751 calls. This includes 4,535 calls where both ambulances and fire apparatus were requested. The calls requesting fire units or ambulances were identified by the "type" field recorded within CAD data.

For this section, we refer to these 9,462 calls as "fire request" calls and similarly to 23,751 "ambulance" calls. Table 7-14 examines the frequency of overlapping calls requesting fire suppression units in each fire zone. Table 7-15 does the same for calls requesting an ambulance in each EMS zone.

TABLE 7-14: Frequency of Overlapping Calls Requesting Fire Apparatus by Fire Zone

Fire Zone	Scenario	Number of Calls	Percent of All Calls	Total Hours
F1	No overlapped call	1,211	85.7	924.7
	Overlapped with one call	187	13.2	91.8
	Overlapped with two calls	14	1.0	3.7
	Overlapped with three calls	1	0.1	0.3
F2	No overlapped call	500	92.3	403.3
	Overlapped with one call	39	7.2	17.8
	Overlapped with two calls	3	0.6	0.1
F3	No overlapped call	1,151	84.8	1,014.3
	Overlapped with one call	188	13.9	90.3
	Overlapped with two calls	17	1.3	3.8
	Overlapped with three calls	1	0.1	0.3
F4	No overlapped call	1,015	88.0	848.9
	Overlapped with one call	128	11.1	58.9
	Overlapped with two calls	9	0.8	4.4
	Overlapped with three calls	1	0.1	0.1
F6	No overlapped call	1,226	86.5	1,044.0
	Overlapped with one call	171	12.1	71.9
	Overlapped with two calls	20	1.4	4.2
	Overlapped with three calls	1	0.1	0.4
F7	No overlapped call	778	92.3	642.7
	Overlapped with one call	63	7.5	30.5
	Overlapped with two calls	2	0.2	0.6
F8	No overlapped call	1,035	83.9	1,123.6
	Overlapped with one call	189	15.3	101.9
	Overlapped with two calls	10	0.8	3.1
F9	No overlapped call	1,283	85.4	1,126.0
	Overlapped with one call	194	12.9	95.8
	Overlapped with two calls	23	1.5	9.6
	Overlapped with three calls	2	0.1	0.6

TABLE 7-15: Frequency of Overlapping Calls Requesting Ambulance by EMS Zone

EMS Zone	Scenario	Number of Calls	Percent of All Calls	Total Hours
M1	No overlapped call	1,803	75.4	1,797.1
	Overlapped with one call	507	21.2	254.1
	Overlapped with two calls	70	2.9	26.9
	Overlapped with three calls	10	0.4	2.1
	Overlapped with four calls	1	0.0	0.1
M2	No overlapped call	350	91.1	397.6
	Overlapped with one call	31	8.1	18.6
	Overlapped with two calls	2	0.5	0.2
	Overlapped with three calls	1	0.3	0.6
M3	No overlapped call	1,991	67.2	2,249.5
	Overlapped with one call	789	26.6	472.8
	Overlapped with two calls	161	5.4	60.8
	Overlapped with three calls	19	0.6	4.7
	Overlapped with four calls	1	0.0	0.6
M4	No overlapped call	1,911	48.2	2,261.4
	Overlapped with one call	1,289	32.5	856.3
	Overlapped with two calls	566	14.3	252.6
	Overlapped with three calls	166	4.2	57.5
	Overlapped with four or more calls	30	0.8	8.0
M6	No overlapped call	2,310	57.5	2,533.8
	Overlapped with one call	1,222	30.4	683.6
	Overlapped with two calls	391	9.7	155.2
	Overlapped with three calls	80	2.0	23.6
	Overlapped with four or more calls	12	0.3	3.2
M7	No overlapped call	1,483	79.8	1,579.8
	Overlapped with one call	334	18.0	179.8
	Overlapped with two calls	38	2.0	13.1
	Overlapped with three calls	4	0.2	0.6
M8	No overlapped call	1,606	75.9	1,831.3
	Overlapped with one call	448	21.2	282.9
	Overlapped with two calls	60	2.8	22.8
	Overlapped with three calls	2	0.1	1.8
M9	No overlapped call	2,404	39.7	2,727.9
	Overlapped with one call	2,144	35.4	1,297.5
	Overlapped with two calls	1,104	18.2	444.3
	Overlapped with three calls	338	5.6	103.4
	Overlapped with four or more calls	64	1.2	15.6

Tables 7-16 and 7-17 examine the availability of each BFD station's fire suppression units and ambulances to respond to calls within the station's first due fire and EMS service zones, respectively. Here we focus on calls where at least one unit eventually arrived and ignore calls where no unit arrived. BFD's fire suppression units arrived at 7,929 out of 9,462 calls that requested a fire apparatus. Similarly, BFD's ALS and BLS medic units arrived at 22,366 out of 23,751 calls that requested an ambulance.

TABLE 7-16: Availability of Station's Fire Suppression Units to Respond to Fire Calls

Fire Zone	Calls in Area	First Due			Percent		
		Responded	Arrived	First	Responded	Arrived	First
F1	1,179	861	840	832	73.0	71.2	70.6
F2	413	349	341	338	84.5	82.6	81.8
F3	1,154	995	983	981	86.2	85.2	85.0
F4	976	788	763	756	80.7	78.2	77.5
F6	1,221	1,012	985	975	82.9	80.7	79.9
F7	700	622	603	592	88.9	86.1	84.6
F8	1,046	871	850	830	83.3	81.3	79.3
F9	1,240	1,037	1,011	1,005	83.6	81.5	81.0
Total	**7,929**	**6,535**	**6,376**	**6,309**	**82.4**	**80.4**	**79.6**

Note: For each station, we counted the number of calls requesting fire apparatus occurring within its fire zone. Then, we counted the number of fire calls where at least one fire suppression unit arrived. Next, we focused on the fire suppression units from the first due station to see if any responded, arrived, or arrived first.

TABLE 7-17: Availability of Station's Medic Units to Respond to EMS Calls

EMS Zone	Calls in Area	First Due			Percent		
		Responded	Arrived	First	Responded	Arrived	First
M1	2,288	1,473	1,450	1,448	64.4	63.4	63.3
M3	2,787	1,737	1,720	1,713	62.3	61.7	61.5
M4	3,868	1,847	1,781	1,772	47.8	46.0	45.8
M6	3,836	2,186	2,131	2,120	57.0	55.6	55.3
M7	1,780	1,148	1,131	1,129	64.5	63.5	63.4
M8	1,983	1,366	1,342	1,336	68.9	67.7	67.4
M9	5,824	3,518	3,409	3,392	60.4	58.5	58.2
Total	**22,366**	**13,275**	**12,964**	**12,910**	**59.3**	**58.0**	**57.8**

Note: For each station, we counted the number of calls requesting ambulance service occurring within its EMS zone. Then, we counted the number of EMS calls where at least one medic unit arrived. Next, we focused on the medic units from the first due station to see if any responded, arrived, or arrived first.

RESPONSE TIME

In this part of the analysis, we present response time statistics for different call types. We separate response time into its identifiable components. *Dispatch time* is the difference between the time a call is received and the time a unit is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and the types of resources to dispatch. *Turnout time* is the difference between dispatch time and the time a unit is en route to a call's location. *Travel time* is the difference between the time en route and arrival on scene. *Response time* is the total time elapsed between receiving a call to arriving on scene.

In the provided data, 25 percent of responding BFD runs lacked a dispatch time. For these cases, the missing dispatch time was approximated by the en route time of the run. For this reason, turnout time is underestimated while dispatch time is overestimated. Nevertheless, the total response time remains unchanged.

In the analysis, we included all calls within the Brownsville fire district to which at least one non-administrative BFD unit arrived. Calls with a total response time exceeding 30 minutes were excluded. In addition, non-emergency calls (priority levels are other than 1) were excluded. Finally, we focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time.

Based on the methodology above, for 28,678 calls in 2019, we excluded 62 mutual aid calls (outside Brownsville's fire district), 768 canceled calls, 11,384 non-emergency calls, 767 calls where no units recorded a valid on-scene time, 553 calls where one or more segments of the first arriving unit's response time could not be calculated due to missing or faulty data, and 357 calls with a total response time exceeding 30 minutes. As a result, in this section, a total of 14,787 calls are included in the analysis. Using the same method, we obtained 13,939 calls for the same analysis for 2020. 2020's response time analysis is compared with that of 2019 in Attachment I.

Response Time by Type of Call

Table 7-18 breaks down the average and 90th percentile turnout, travel, and total response times by call type for all 2019 calls in the Brownsville fire district. A 90th percentile means that 90 percent of calls had response times at or below that number. For example, Table 7-18 shows an overall 90th percentile response time of 18.4 minutes, which means that 90 percent of the time, a call had a response time of no more than 18.4 minutes. Figures 7-7 and 7-8 illustrate the same information.

TABLE 7-18: Average and 90th Percentile Response Time of First Arriving Unit, by Call Type

Call Type	Average, Minutes				90 Percentile, Minutes				Number of Calls
	Dispatch	Turnout*	Travel	Total	Dispatch	Turnout*	Travel	Total	
Breathing difficulty	2.7	0.6	8.8	12.2	4.4	1.0	13.9	17.6	995
Cardiac and stroke	3.0	0.7	8.4	12.0	4.8	1.1	13.3	17.4	868
Fall and injury	3.5	0.6	8.7	12.8	6.0	1.0	14.2	19.6	1,377
Illness and other	3.0	0.6	9.1	12.7	5.0	0.9	14.1	18.4	7,334
MVA	3.3	0.7	6.5	10.5	5.5	1.2	11.3	16.2	531
OD	3.8	0.7	9.3	13.8	6.8	1.0	14.7	21.5	918
Seizure and UNC	2.9	0.6	8.5	12.0	5.1	1.0	13.6	17.7	1,393
EMS Total	**3.1**	**0.6**	**8.9**	**12.6**	**5.1**	**1.0**	**13.9**	**18.4**	**13,416**
False alarm	2.9	0.7	8.4	12.0	5.3	1.1	12.7	17.2	601
Good intent	3.1	0.7	7.1	11.0	5.0	1.2	11.0	16.3	99
Hazard	3.2	0.6	8.3	12.1	5.3	1.1	13.9	19.1	165
Outside fire	2.4	0.5	7.4	10.3	4.1	1.0	12.6	16.1	118
Public service	4.8	0.6	8.3	13.8	11.2	1.1	14.1	22.7	296
Structure fire	2.3	0.5	6.9	9.7	3.5	1.0	10.3	13.0	92
Fire Total	**3.3**	**0.6**	**8.1**	**12.0**	**5.8**	**1.1**	**12.8**	**18.5**	**1,371**
Total	**3.1**	**0.6**	**8.8**	**12.5**	**5.2**	**1.0**	**13.9**	**18.4**	**14,787**

Note: OD=Overdose and psychiatric; UNC=Unconsciousness. *For 25 percent of calls, turnout time is underestimated at 0 seconds, which overestimated dispatch time. Total response time is unaffected.

FIGURE 7-7: Average Response Time of First Arriving Unit, by Call Type – EMS

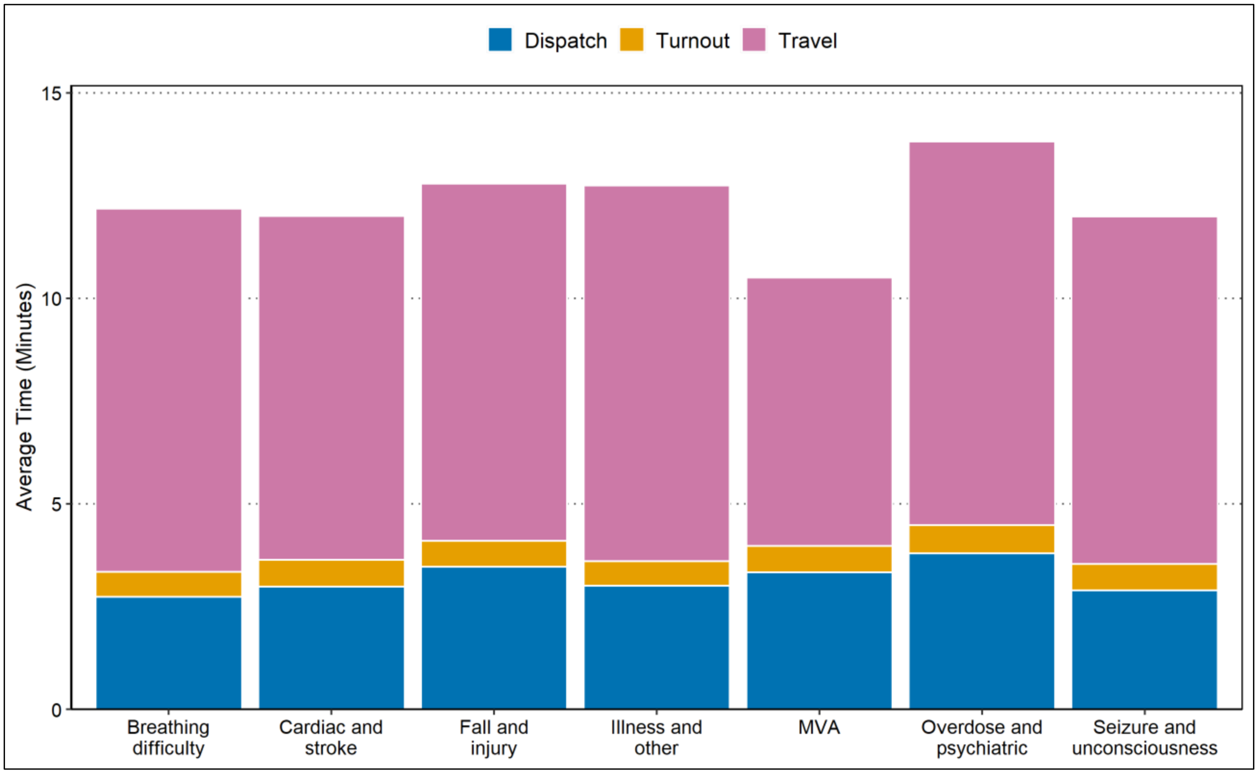
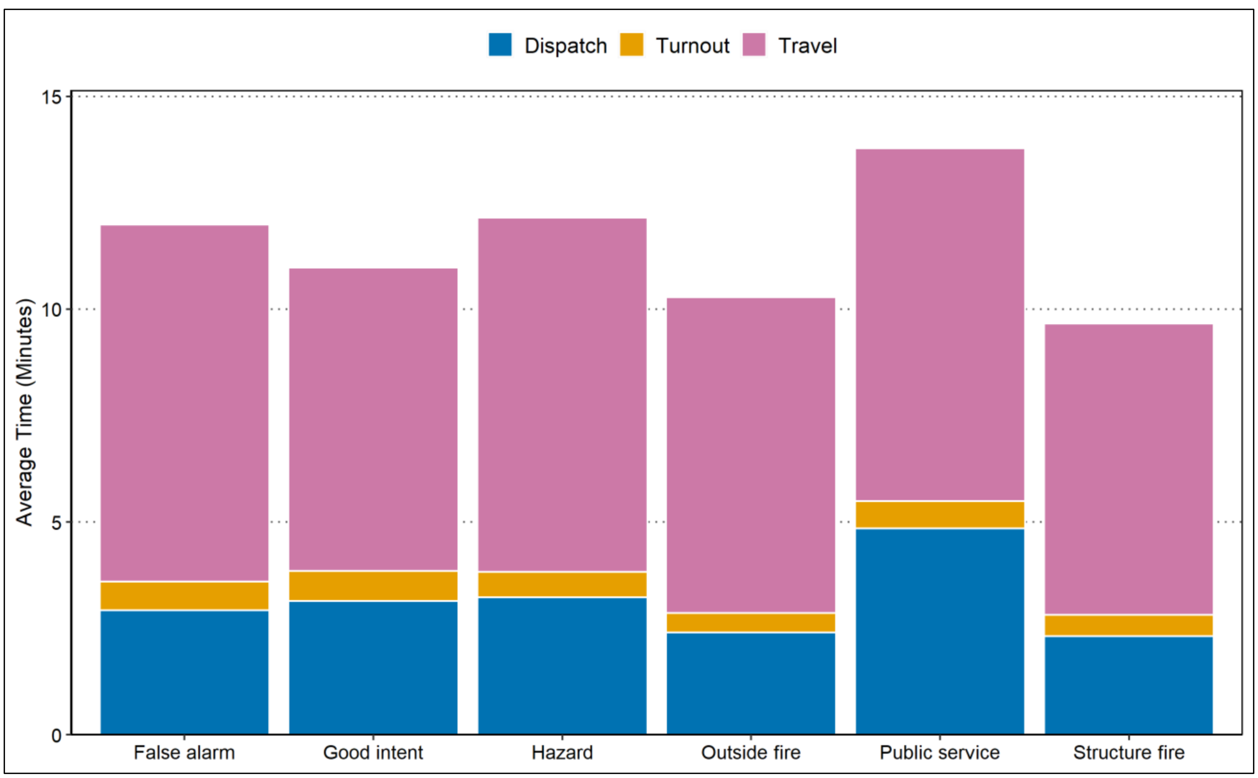


FIGURE 7-8: Average Response Time of First Arriving Unit, by Call Type – Fire



Observations:

- The average dispatch time was 3.1 minutes.
- The average turnout time was 0.6 minutes.
- The average travel time was 8.8 minutes.
- The average total response time was 12.5 minutes.
- The average response time was 12.6 minutes for EMS calls and 12.0 minutes for fire calls.
- The average response time was 10.3 minutes for outside fires and 9.7 minutes for structure fires.
- The 90th percentile dispatch time was 5.2 minutes.
- The 90th percentile turnout time was 1.0 minutes.
- The 90th percentile travel time was 13.9 minutes.
- The 90th percentile total response time was 18.4 minutes.
- The 90th percentile response time was 18.4 minutes for EMS calls and18.5 minutes for fire calls.
- The 90th percentile response time was 16.1 minutes for outside fires and 13.0 minutes for structure fires.

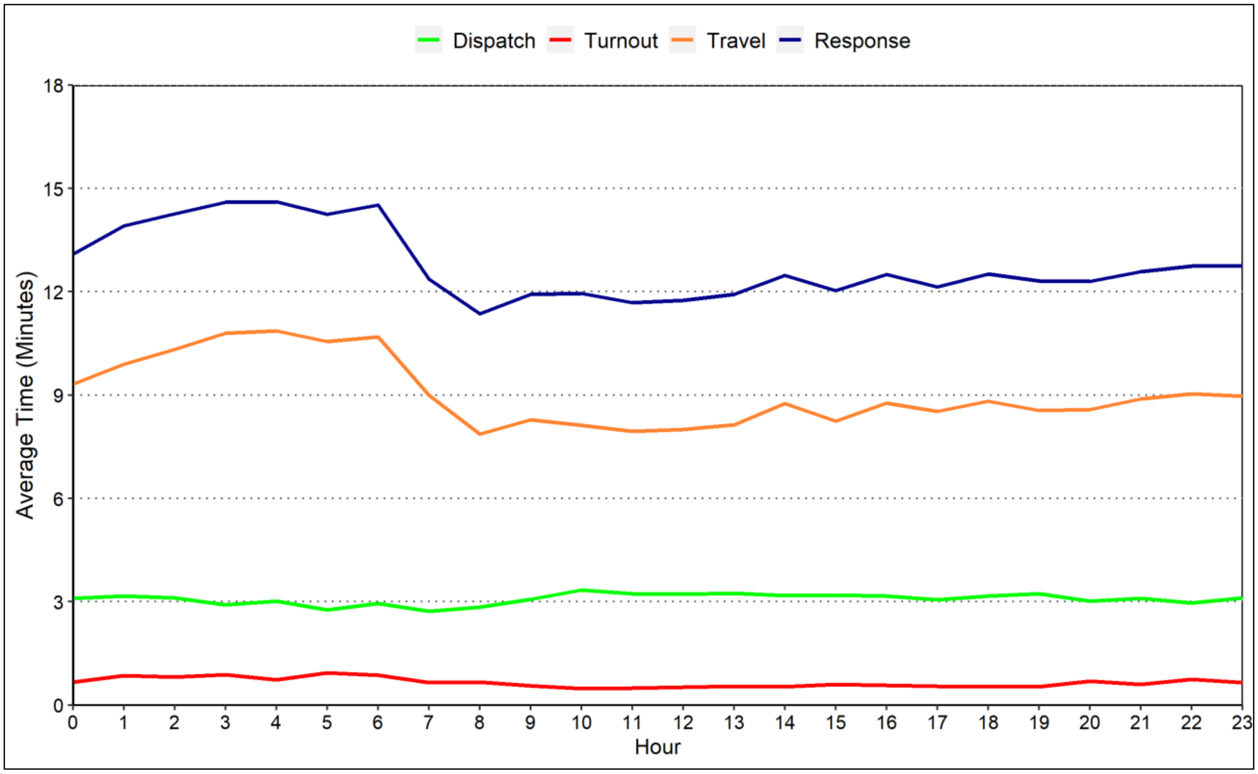
Table 7-19 shows the average response time by the time of day. The table also shows 90th percentile response times. Figure 7-9 shows the average response time by the time of day.

TABLE 7-19: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day

Hour	Minutes					Number of Calls
	Dispatch	Turnout*	Travel	Response Time	90th Percentile Response Time	
0	3.1	0.7	9.3	13.1	18.3	474
1	3.2	0.9	9.9	13.9	19.9	395
2	3.1	0.8	10.3	14.3	20.0	397
3	2.9	0.9	10.8	14.6	20.1	329
4	3.0	0.7	10.9	14.6	21.1	305
5	2.8	0.9	10.6	14.2	19.7	307
6	3.0	0.9	10.7	14.5	20.2	382
7	2.7	0.7	9.0	12.4	18.3	426
8	2.8	0.7	7.9	11.4	17.2	686
9	3.1	0.6	8.3	11.9	17.2	727
10	3.3	0.5	8.1	11.9	17.2	783
11	3.2	0.5	8.0	11.7	17.3	796
12	3.2	0.5	8.0	11.8	17.2	801
13	3.2	0.5	8.1	11.9	17.2	777
14	3.2	0.5	8.8	12.5	18.3	804
15	3.2	0.6	8.2	12.0	17.9	803
6	3.2	0.6	8.8	12.5	18.4	781
17	3.1	0.6	8.5	12.1	18.6	725
18	3.2	0.5	8.8	12.5	18.0	742
19	3.2	0.5	8.6	12.3	17.9	702
20	3.0	0.7	8.6	12.3	18.1	743
21	3.1	0.6	8.9	12.6	18.7	683
22	3.0	0.7	9.0	12.7	18.9	642
23	3.1	0.7	9.0	12.7	18.0	577
Total	**3.1**	**0.6**	**8.8**	**12.5**	**18.4**	**14,787**

Note: *For 25 percent of calls, turnout time is underestimated at 0 seconds, which overestimates dispatch time. Total response time is unaffected.

FIGURE 7-9: Average Response Time of First Arriving Unit, by Hour of Day



Observations:

- Average dispatch time was between 2.7 minutes (7:00 a.m. to 8:00 a.m.) and 3.3 minutes (10:00 a.m. to 11:00 a.m.).
- Average turnout time was between 0.5 minutes (10:00 a.m. to 11:00 a.m.) and 0.9 minutes (5:00 a.m. to 6:00 a.m.).
- Average travel time was between 7.9 minutes (8:00 a.m. to 9:00 a.m.) and 10.9 minutes (4:00 a.m. to 5:00 a.m.).
- Average response time was between 11.4 minutes (8:00 a.m. to 9:00 a.m.) and 14.6 minutes (4:00 a.m. to 5:00 a.m.).
- The 90th percentile response time was between 17.2 minutes (8:00 a.m. to 9:00 a.m.) and 21.1 minutes (4:00 a.m. to 5:00 a.m.).

Response Time Distribution

Here, we present a more detailed look at how response times to calls are distributed. The cumulative distribution of total response time for the first arriving unit to EMS calls is shown in Figure 7-10 and Table 7-20. Figure 7-10 shows response times for the first arriving unit to EMS calls as a frequency distribution in whole-minute increments, and Figure 7-11 shows the same for the first arriving unit to outside and structure fire calls.

The cumulative percentages here are read in the same way as a percentile. In Figure 7-10, the 90th percentile of 18.4 minutes means that 90 percent of EMS calls had a response time of 18.4 minutes or less. In Table 7-20, the cumulative percentage of 31 for the first arriving unit at outside and structure fires, for example, means that 31 percent of outside and structure fire calls had a response time under 8 minutes.

FIGURE 7-10: Cumulative Distribution of Response Time, First Arriving Unit, EMS

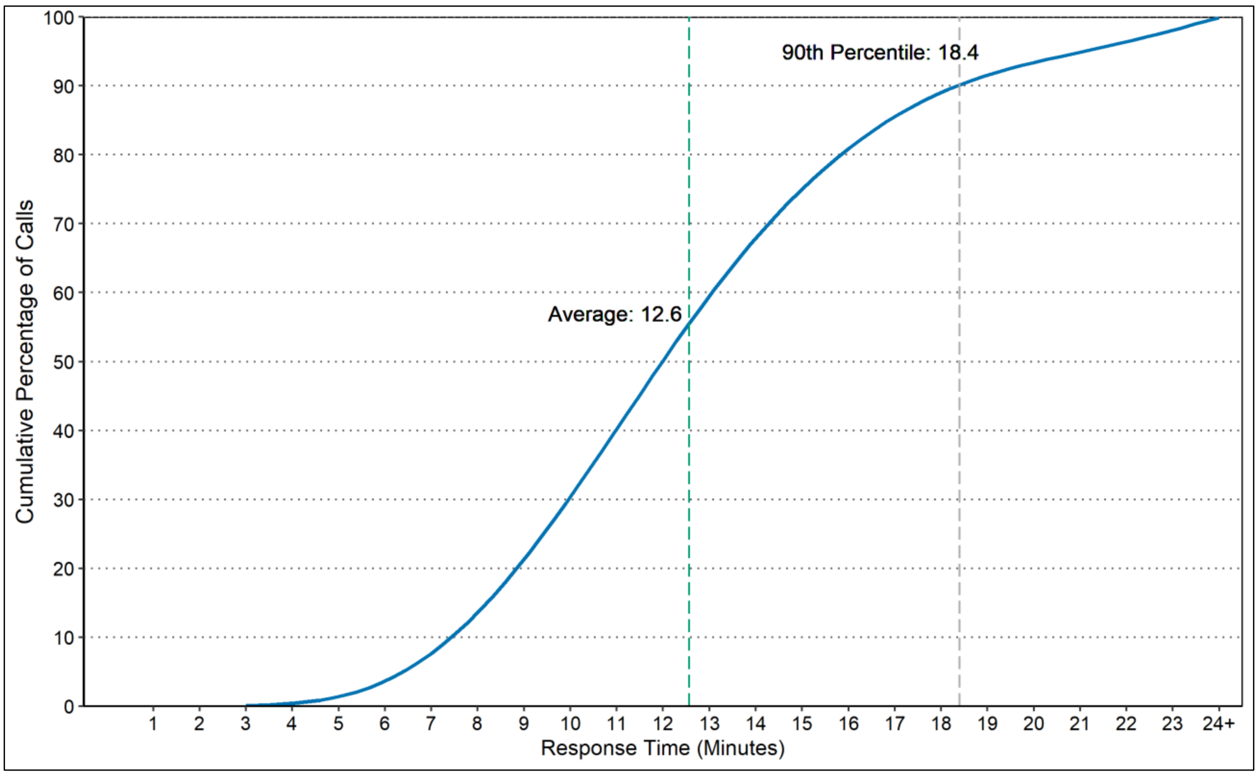


FIGURE 7-11: Cumulative Distribution of Response Time, First Arriving Unit, Outside and Structure Fires

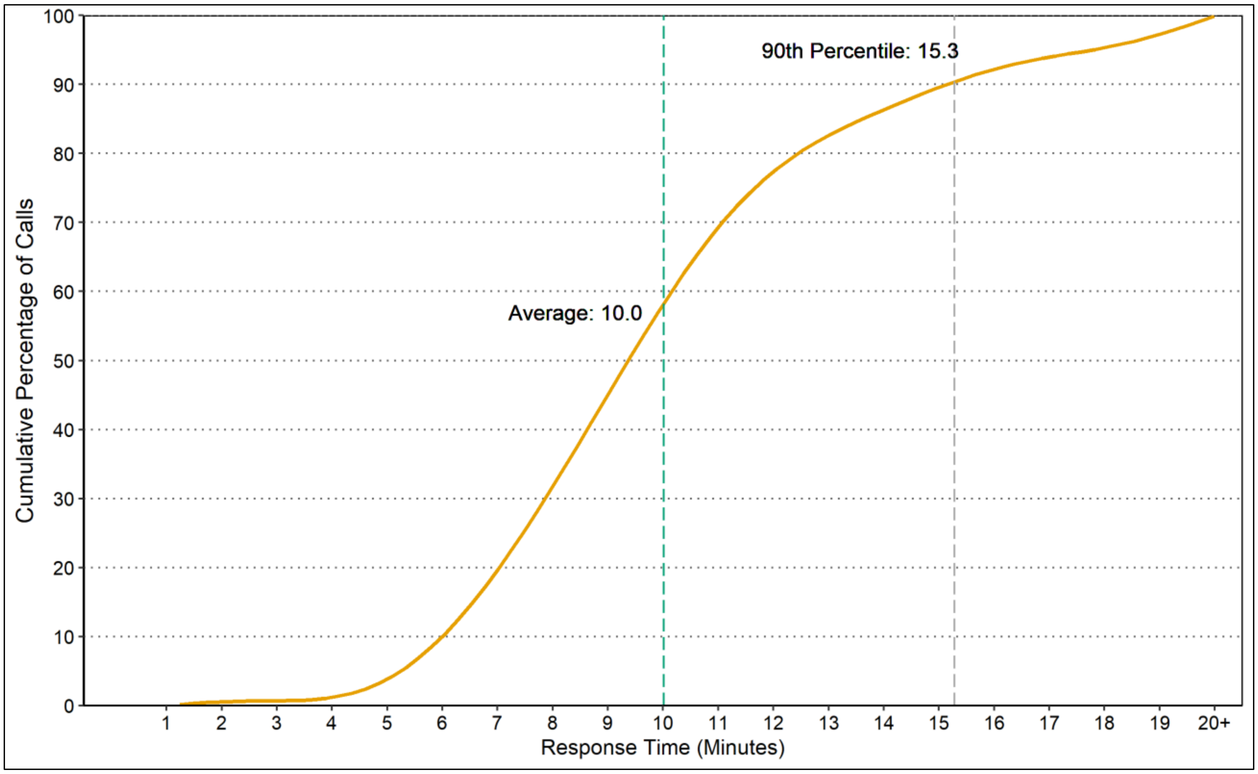


TABLE 7-20: Cumulative Distribution of Response Time, First Arriving Unit

Response Time (Minutes)	EMS		Outside and Structure Fires	
	Frequency	Cumulative Percentage	Frequency	Cumulative Percentage
1	1	0.0	0	0.0
2	3	0.0	1	0.5
3	16	0.1	1	1.0
4	42	0.5	1	1.4
5	125	1.4	4	3.3
6	293	3.6	13	9.5
7	523	7.5	23	20.5
8	783	13.3	22	31.0
9	1,074	21.3	30	45.2
10	1,237	30.5	27	58.1
11	1,308	40.3	26	70.5
12	1,292	49.9	12	76.2
13	1,288	59.5	14	82.9
14	1,166	68.2	9	87.1
15	919	75.1	3	88.6
16	795	81.0	8	92.4
17	598	85.4	4	94.3
18	458	88.9	3	95.7
19	366	91.6	1	96.2
20	284	93.7	1	96.7
21	196	95.2	4	98.6
22	145	96.2	2	99.5
23	119	97.1	0	99.5
24+	385	100.0	1	100.0

Observations:

- For 13 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 31 percent of outside and structure fire calls, the response time of the first arriving unit was less than 8 minutes.

TRANSPORT CALL ANALYSIS

In this section, we present an analysis of unit activity that involved transporting patients, the variations by hour of day, and the average time for each stage of transport service. We identified transport calls by requiring that at least one responding unit had recorded both a "beginning to transport" time and an "arriving at the hospital" time. Based on these criteria, we note that 236 non-EMS (fire & other) calls that resulted in transports are included in this analysis.

Transport Calls by Type

The following table shows the number of calls by call type broken out by transport and non-transport calls.

TABLE 7-21: Transport Calls by Call Type

Call Type	Number of Calls			Conversion Rate
	Non-transport	Transport	Total	
Breathing difficulty	162	930	1,092	85.2
Cardiac and stroke	139	814	953	85.4
Fall and injury	376	1,251	1,627	76.9
Illness and other	2,502	6,354	8,856	71.7
MVA	951	633	1,584	40.0
Non-emergency transfer	662	6,656	7,318	91.0
Overdose and psychiatric	399	1,071	1,470	72.9
Seizure and unconsciousness	340	1,373	1,713	80.2
EMS Total	**5,531**	**19,082**	**24,613**	**77.5**
Fire & Other Total	**3,829**	**236**	**4,065**	**5.8**
Total	**9,360**	**19,318**	**28,678**	**67.4**

Observations:

- 67 percent of calls involved transporting one or more patients
- 78 percent of EMS calls involved transporting one or more patients.
- On average, 53 EMS calls per day involved transporting one or more patients.

Average Transport Calls per Hour

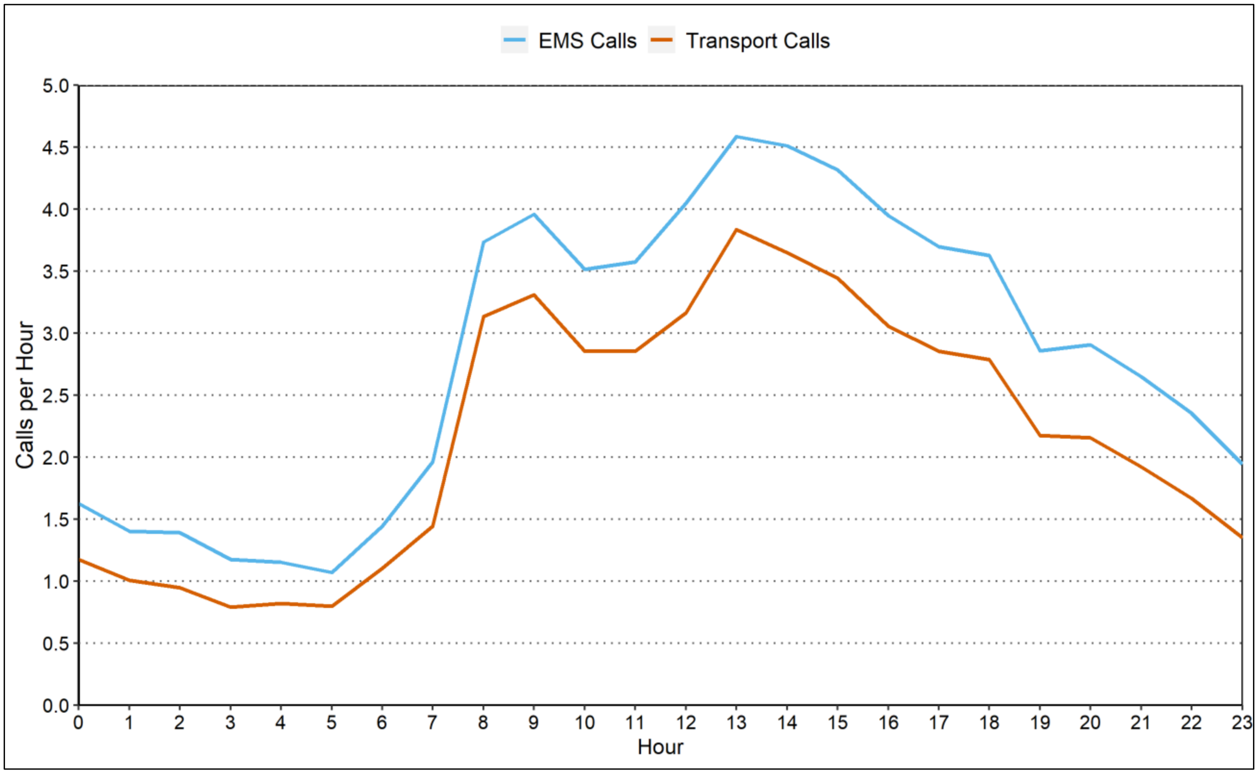
Table 7-22 and Figure 7-12 show the average number of EMS calls received each hour of the day over the 2019 calendar year. In Table 7-22, the conversion rate measures the percent of EMS calls that transported one or more patients.

TABLE 7-22: EMS Transport Calls per Hour, by Time of Day

Hour	EMS Calls	Transport	EMS Calls per Day	Transport per Day	Conversion Rate
0	594	428	1.6	1.2	72.1
1	512	368	1.4	1.0	71.9
2	507	346	1.4	0.9	68.2
3	429	288	1.2	0.8	67.1
4	420	299	1.2	0.8	71.2
5	391	291	1.1	0.8	74.4
6	527	403	1.4	1.1	76.5
7	716	526	2.0	1.4	73.5
8	1,363	1,144	3.7	3.1	83.9
9	1,445	1,208	4.0	3.3	83.6
10	1,282	1,041	3.5	2.9	81.2
11	1,304	1,041	3.6	2.9	79.8
12	1,477	1,155	4.0	3.2	78.2
13	1,674	1,399	4.6	3.8	83.6
14	1,646	1,332	4.5	3.6	80.9
15	1,575	1,257	4.3	3.4	79.8
16	1,441	1,115	3.9	3.1	77.4
17	1,349	1,042	3.7	2.9	77.2
18	1,324	1,017	3.6	2.8	76.8
19	1,043	794	2.9	2.2	76.1
20	1,060	787	2.9	2.2	74.2
21	966	701	2.6	1.9	72.6
22	859	608	2.4	1.7	70.8
23	709	492	1.9	1.3	69.4
Total	**24,613**	**19,082**	**67.4**	**52.3**	**77.5**

Note: The conversion rate is measured by dividing the number of EMS transports by the number of EMS calls. For example, between midnight and 1:00 a.m., there were 428 EMS transports out of 594 EMS calls. This gives a conversion rate of 428 / 594 = 0.721, or 72.1 percent.

FIGURE 7-12: Average Transport Calls by Hour



Observations:

- Hourly EMS calls per day were highest during the day from noon to 4:00 p.m., averaging between 4.0 and 4.6 calls per day.
- Average hourly EMS calls per day peaked between 1:00 p.m. and 2:00 p.m., averaging 4.6 calls per day.
- Average hourly EMS calls per day was lowest between 5:00 a.m. and 6:00 a.m., averaging 1.1 calls per day.
- Hourly transport calls per day were highest during the day from noon to 4:00 p.m., averaging between 3.2 calls per day and 3.8 calls per day.
- Average hourly transport calls per day peaked between 1:00 p.m. and 2:00 p.m., averaging 3.8 calls per day.
- Average hourly transport calls per day was lowest between 3:00 a.m. and 4:00 a.m., averaging 0.8 calls per day.
- Average hourly transport conversion rates per day peaked between 8:00 a.m. and 9:00 a.m., averaging 84 percent per day.
- Average hourly transport conversion rates per day was lowest between 3:00 a.m. and 4:00 a.m., averaging 67 percent per day.

Calls by Type and Duration

Table 7-23 shows the average duration of transport and non-transport EMS calls by call type.

TABLE 7-23: Transport Call Duration by Call Type

Call Type	Non-transport		Transport	
	Average Duration	Number of Calls	Average Duration	Number of Calls
Breathing difficulty	38.6	162	70.6	930
Cardiac and stroke	37.0	139	74.7	814
Fall and injury	34.0	376	74.1	1,251
Illness and other	33.6	2,502	71.9	6,354
MVA	45.0	951	84.6	633
Non-emergency transfer	45.9	662	78.9	6,656
Overdose and psychiatric	34.0	399	68.0	1,071
Seizure and unconsciousness	41.6	340	72.1	1,373
EMS Total	**37.8**	**5,531**	**74.8**	**19,082**
Fire & Other Total	**39.3**	**3,829**	**84.2**	**236**
Total	**38.4**	**9,360**	**74.9**	**19,318**

Note: The duration of a call is defined as the longest deployed time of any of the units responding to the same call.

Observations:

- The average duration was 37.8 minutes for non-transport EMS calls.
- The average duration was 74.8 minutes for EMS calls where one or more patients were transported to a hospital.

Transport Time Components

Table 7-24 gives the average deployed time for an ambulance on a transport call, along with three major components of the deployed time: on-scene time, travel to hospital time, and at-hospital time.

The on-scene time is the interval from the unit arriving on-scene time through the time the unit departs the scene for the hospital. Travel to hospital time is the interval from the time the unit departs the scene to travel to the hospital through the time the unit arrives at the hospital. At-hospital time is the time it takes for patient turnover at the hospital.

This table analyzes times by run. Normally, the number of runs will exceed the number of calls as a call may have multiple runs. In addition, average times may differ slightly from similar averages measured per call.

TABLE 7-24: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Time Spent per Run, Minutes				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	16.1	12.0	31.4	69.1	933
Cardiac and stroke	15.9	11.7	34.9	72.3	817
Fall and injury	16.2	12.2	31.6	70.2	1,263
Illness and other	15.6	12.7	30.7	69.6	6,388
MVA	12.2	10.8	37.2	70.1	728
Non-emergency transfer	20.7	13.3	25.6	76.4	6,679
Overdose and psychiatric	12.4	12.3	29.8	66.0	1,076
Seizure and unconsciousness	16.9	12.5	31.0	70.4	1,376
EMS Total	**17.2**	**12.7**	**29.4**	**71.9**	**19,260**
Fire & Other Total	**17.5**	**15.2**	**31.5**	**74.1**	**240**
Total	**17.2**	**12.7**	**29.5**	**72.0**	**19,500**

Note: Average unit deployed time per run is lower than average call duration for some call types because call duration is based on the longest deployed time of any of the units responding to the same call, which may include an engine or ladder. Total deployed time is greater than the combination of on-scene, transport, and hospital wait times as it includes turnout, initial travel, and hospital return times.

Observations:

- The average time spent on-scene for a transport EMS call was 17.2 minutes.
- The average travel time from the scene of the EMS call to the hospital was 12.7 minutes.
- The average deployed time spent on transport EMS calls was 71.9 minutes.
- The average deployed time at the hospital was 29.4 minutes, which accounts for approximately 41 percent of the average total deployed time for a transport EMS call.

Transport Destination

The following table shows the number of transport runs broken out by destination.

TABLE 7-25: Transport Runs by Destination in 2019

Type of Destination	Destination	Runs	Percentage
Hospital	Valley Baptist Med Center - Brownsville	6,911	35.4
	Valley Regional Medical Center	6,289	32.3
	Solara Hospital-Brownsville	525	2.7
	South Texas Rehab Hospital	408	2.1
	Valley Baptist Medical Center - Harlingen	395	2.0
	Harlingen Medical Center	17	0.1
	Doctors Hospital At Renaissance	1	0.0
	Total	**14,546**	**74.6**
Nursing Facility	Brownsville Nursing & Rehab	816	4.2
	Spanish Meadows Nursing Home	315	1.6
	The Rio At Fox Hollow	234	1.2
	Ebony Lake Nursing Home	196	1.0
	Valley Grande Manor	194	1.0
	Alta Vista Nursing Home	125	0.6
	Sunshine Haven	39	0.2
	Other	25	0.1
	Total	**1,944**	**10.0**
Residence	Residence	**1,533**	**7.9**
Dialysis Center	Fresenius Kidney Care	360	1.8
	FMC Hemodialysis	315	1.6
	South Price Dialysis Center	120	0.6
	Davitas Dialysis Center	16	0.1
	Brownsville Kidney Center	14	0.1
	Total	**825**	**4.2**
Doctors Office	Doctors Office	**558**	**2.9**
Other	Other	**66**	**0.3**
Treatment Facility	South Texas Cancer Center	**28**	**0.1**
Total		**19,500**	**100.0**

ATTACHMENT I: 2019 & 2020 COMPARISON

In this analysis, we compare portions of the previous analysis with similar records for 2020. We compare calls by type, unit workload, agency's availability, response times, and transport workload.

Calls Volume by Year

Table 7-26 shows the number of calls for both 2019 and 2020. Figure 7-12 shows the monthly variation in the number of calls per day for both years. Similarly, Figure 7-13 illustrates the average number of calls per hour for both years.

TABLE 7-26: Calls by Type and Year

Call Type	2019		2020	
	Total Calls	Pct. Calls	Total Calls	Pct. Calls
Breathing difficulty	1,092	3.8	1,198	4.4
Cardiac and stroke	953	3.3	902	3.3
Fall and injury	1,627	5.7	1,336	4.9
Illness and other	8,856	30.9	12,962	47.5
MVA	1,584	5.5	1,209	4.4
Non-emergency transfer	7,318	25.5	2,318	8.5
Overdose and psychiatric	1,470	5.1	995	3.6
Seizure and unconsciousness	1,713	6.0	1,916	7.0
EMS Total	**24,613**	**85.8**	**22,836**	**83.7**
False alarm	1,020	3.6	1,011	3.7
Good intent	215	0.7	275	1.0
Hazard	411	1.4	355	1.3
Outside fire	271	0.9	329	1.2
Public service	1,167	4.1	1,435	5.3
Structure fire	151	0.5	170	0.6
Fire Total	**3,235**	**11.3**	**3,575**	**13.1**
Canceled	768	2.7	791	2.9
Aid given	62	0.2	67	0.2
Total	**28,678**	**100.0**	**27,269**	**100.0**

Observations:

- EMS call volume decreased 7 percent from 24,613 in 2019 to 22,836 in 2020.
- Non-emergency transfer calls decreased 68 percent from 7,318 in 2019 to 2,318 in 2020.
- Illness and other calls increased 46 percent from 8,856 in 2019 to 12,962 in 2020.
- Fire call volume increased 11 percent from 3,235 in 2019 to 3,575 in 2020.
- Outside and structure fire calls combined increased 18 percent from 422 in 2019 to 499 in 2020.

FIGURE 7-13: Average Calls by Month and Year

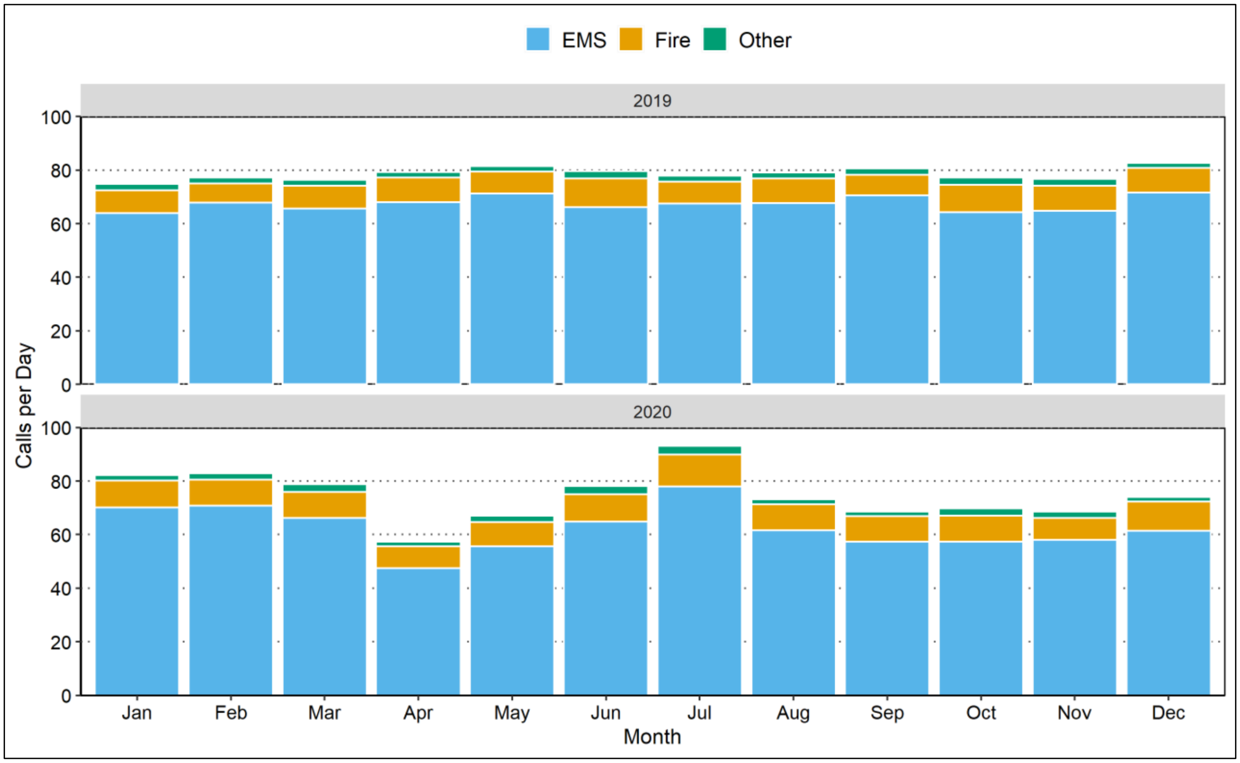
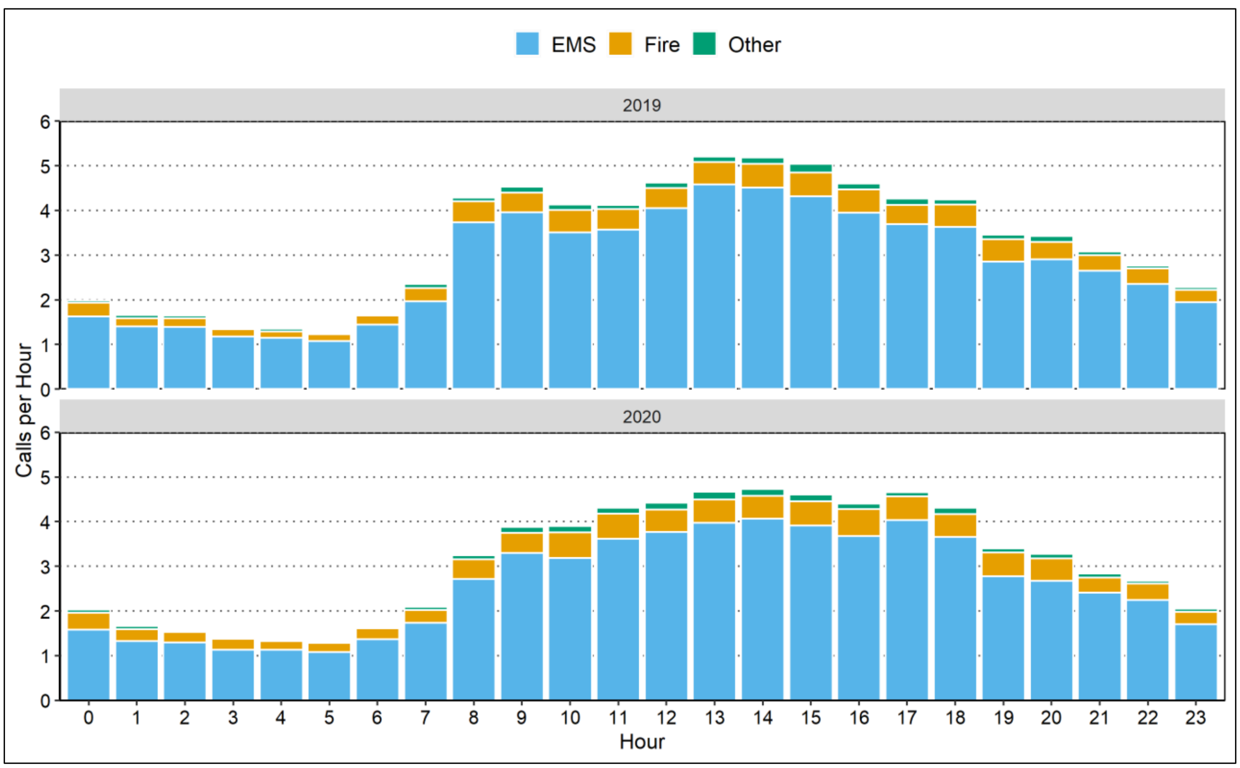


FIGURE 7-14: Average Calls by Hour of Day and Year



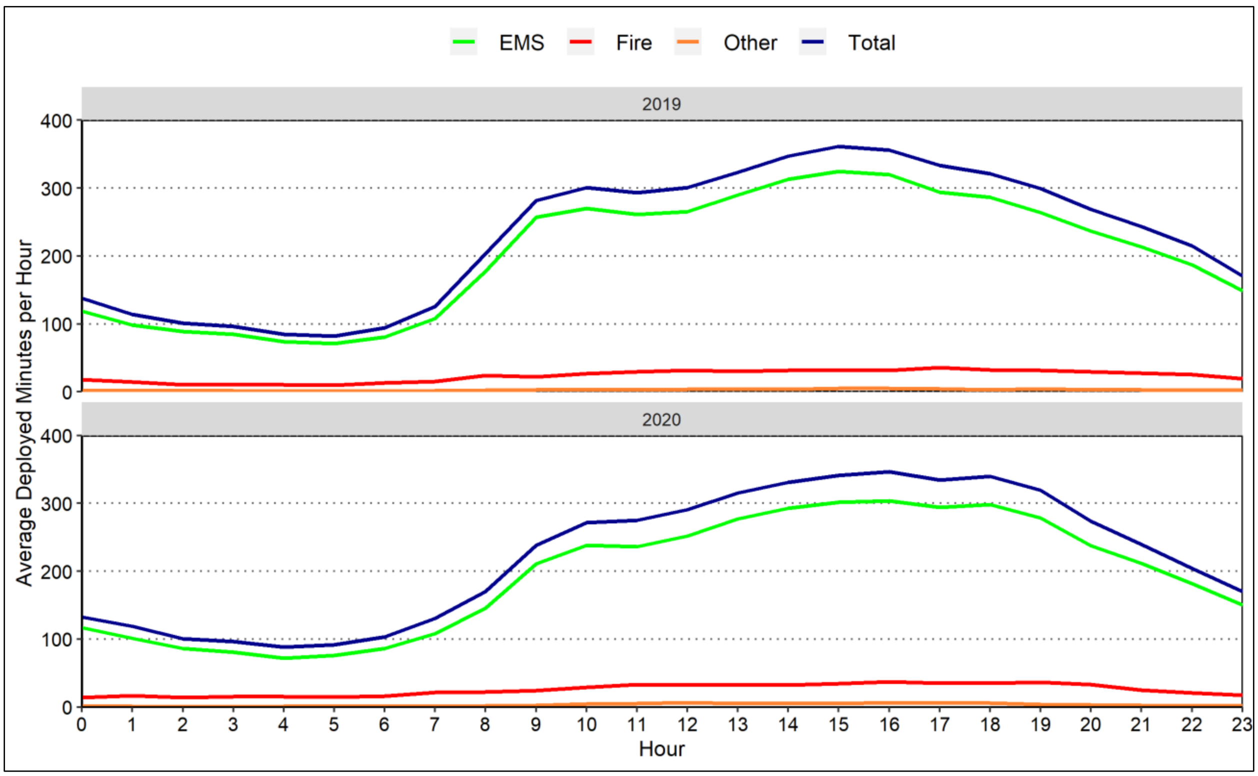
Workload by Year

Table 7-27 compares the call volume, annual runs, and workload by location in 2019 and 2020. Figure 7-15 compares the average deployed minutes by the hour of the day in 2019 and 2020. Table 7-28 compares the annual runs and workload by BFD station and unit in two years.

Table 7-27: Annual Workload by District and Year

District	2019			2020		
	Calls	Runs	Hours	Calls	Runs	Hours
Brownsville	27,108	35,200	31,101.0	25,041	32,364	29,531.3
Cameron County	1,283	1,800	1,692.8	1,918	2,689	2,493.0
Rancho Viejo	127	242	193.8	124	206	193.7
Olmito	89	133	111.8	116	157	126.3
Harlingen	33	41	45.5	43	47	60.0
Other	38	58	42.9	27	52	84.9
Total	**28,678**	**37,474**	**33,187.8**	**27,269**	**35,515**	**32,489.1**

FIGURE 7-15: Average Deployed Minutes by Hour of Day in 2019 and 2020



Observations:

- Runs to ETJ areas in Cameron County increased 49 percent from 1,800 in 2019 to 2,689 in 2020.
- Work hours to ETJ areas in Cameron County increased 47 percent from 1,692.8 hours in 2019 to 2,493.0 hours in 2020.

TABLE 7-28: Annual Workload by Station, Unit, and Year

Station	Unit	Unit Type	2019		2020	
			Total Hours	Total Runs	Total Hours	Total Runs
1	FB	Brush truck	135.8	98	148.5	115
	FE1	Engine	712.6	1,267	714.3	1,212
	M1	ALS unit	3,347.0	3,512	2,814.7	2,769
	Scout1	COVID quick resp.	0.0	0	178.0	302
	Truck1	Ladder truck 105’	24.5	24	126.4	104
	Other	Other	44.9	65	115.6	193
	Total		**4,264.7**	**4,966**	**4,097.4**	**4,695**
2	FE2	Engine	596.4	1,031	588.7	980
	Other	Other	9.1	2	351.6	314
	Total		**605.5**	**1,033**	**940.4**	**1,294**
3	FE3	Engine	869.2	1,395	967.1	1,666
	M3	ALS unit	3,245.9	3,168	2,906.8	2,820
	Other	Other	1.5	2	1.0	4
	Total		**4,116.6**	**4,565**	**3,874.9**	**4,490**
4	FE4	Engine	785.4	1,398	861.0	1,479
	M4	ALS unit	3,717.7	3,628	3,320.7	2,981
	Total		**4,503.1**	**5,026**	**4,181.7**	**4,460**
5	FR1	ARFF	114.8	142	120.9	137
	FR2	ARFF	31.5	50	36.3	46
	M5	ALS unit	0.0	0	107.1	86
	Total		**146.3**	**192**	**264.3**	**269**
6	FE6	Engine	993.8	1,608	1,003.0	1,623
	M6	ALS unit	3,587.5	3,873	3,546.5	3,577
	Total		**4,581.2**	**5,481**	**4,549.5**	**5,200**
7	FE7	Engine	603.8	1,040	653.1	1,076
	M7	ALS unit	3,418.1	3,503	2,959.2	2,895
	Total		**4,021.9**	**4,543**	**3,612.3**	**3,971**
8	FE8	Engine	890.5	1,260	916.2	1,280
	M8	ALS unit	3,042.6	3,194	2,772.2	2,866
	Total		**3,933.1**	**4,454**	**3,688.4**	**4,146**
9	FE9	Engine	985.3	1,512	1,023.2	1,566
	FHR	Heavy rescue	210.8	304	226.0	300
	M9	ALS unit	3,919.0	3,861	3,643.0	3,325
	TU1	BLS unit	1,716.2	1,452	863.0	688
	Other	Other	46.6	41	63.3	49
	Total		**6,877.9**	**7,170**	**5,818.5**	**5,928**
10	M10	ALS unit	**137.5**	**44**	**1,461.7**	**1,062**
Total			**33,187.8**	**37,474**	**32,489.1**	**35,515**

Agency's Availability by Year

Tables 7-29 and 7-30 compare the availability of each BFD station's fire and EMS apparatus to respond to calls within the station's first due fire and EMS service zones in both years. We focused on calls where a unit eventually arrived and ignores calls where no unit arrived.

TABLE 7-29: Availability of BFD Station's Fire Suppression Units to Respond to Fire Calls by Year

Fire Zone	2019				2020			
	Fire Calls in Area	Percent			Fire Calls in Area	Percent		
		Responded	Arrived	First		Responded	Arrived	First
F1	1,179	73.0	71.2	70.6	1,033	75.6	73.9	73.4
F2	413	84.5	82.6	81.8	468	85.3	82.7	82.5
F3	1,154	86.2	85.2	85.0	1,425	85.7	84.0	83.3
F4	976	80.7	78.2	77.5	1,064	82.3	79.4	78.3
F6	1,221	82.9	80.7	79.9	1,209	84.1	82.5	81.6
F7	700	88.9	86.1	84.6	786	88.2	83.8	83.0
F8	1,046	83.3	81.3	79.3	1,095	80.5	78.5	77.7
F9	1,240	83.6	81.5	81.0	1,216	85.3	83.5	82.5
Total	**7,929**	**82.4**	**80.4**	**79.6**	**8,296**	**83.2**	**81.0**	**80.2**

Note: For each station, we counted the number of fire calls occurring within its fire zone. Then, we counted the number of fire calls to where at least one fire suppression unit arrived. Next, we focused on the fire suppression units from the first due station to see if any of them responded, arrived, or arrived first.

TABLE 7-30: Availability of BFD Station's EMS Units to Respond to EMS Calls by Year

EMS Zone	2019				2020			
	EMS Calls in Area	Percent			EMS Calls in Area	Percent		
		Responded	Arrived	First		Responded	Arrived	First
M1	2,288	64.4	63.4	63.3	1,640	64.5	63.4	63.0
M3	2,787	62.3	61.7	61.5	2,570	62.3	61.5	61.4
M4	3,868	47.8	46.0	45.8	3,755	47.7	45.8	45.4
M6	3,836	57.0	55.6	55.3	3,912	57.0	55.4	55.2
M7	1,780	64.5	63.5	63.4	1,543	65.1	64.0	63.7
M8	1,983	68.9	67.7	67.4	1,919	67.7	67.1	67.0
M9	5,824	60.4	58.5	58.2	4,776	55.3	53.4	53.0
Total	**22,366**	**59.3**	**58.0**	**57.8**	**20,115**	**57.7**	**56.2**	**55.9**

Note: For each station, we counted the number of EMS calls occurring within its EMS zone. Then, we counted the number of EMS calls to where at least one medic unit arrived. Next, we focused on the medic units from the first due station to see if any of them responded, arrived, or arrived first.

Response Time by Year

Tables 7-31 and 7-3232 compare the average and 90th percentile response times by call type in 2019 and 2020. Figure 16 shows the average response time by the time of day and year.

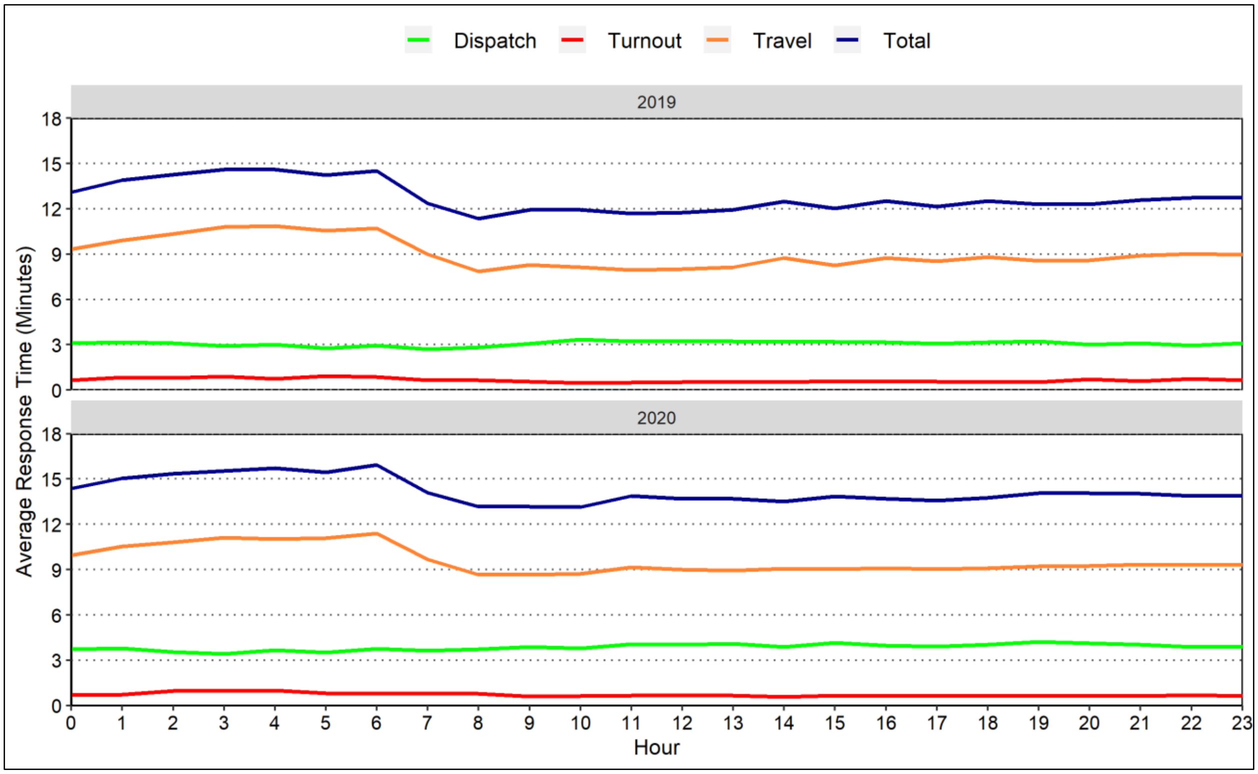
TABLE 7-31: Average Response Time of First Arriving Unit, by Call Type and Year

Call Type	2019					2020				
	Minutes				Calls	Minutes				Calls
	Dispatch	Turnout	Travel	Total		Dispatch	Turnout	Travel	Total	
Breathing difficulty	2.7	0.6	8.8	12.2	995	4.1	0.8	9.5	14.3	1,030
Cardiac and stroke	3.0	0.7	8.4	12.0	868	3.7	0.7	9.0	13.4	810
Fall and injury	3.5	0.6	8.7	12.8	1,377	4.1	0.7	9.1	13.9	1,086
Illness and other	3.0	0.6	9.1	12.7	7,334	4.0	0.7	9.8	14.5	7,380
MVA	3.3	0.7	6.5	10.5	531	3.4	0.7	7.3	11.4	414
Overdose and psychiatric	3.8	0.7	9.3	13.8	918	4.3	0.7	10.0	14.9	678
Seizure and Unconsciousness	2.9	0.6	8.5	12.0	1,393	3.7	0.7	8.9	13.3	1,153
EMS Total	**3.1**	**0.6**	**8.9**	**12.6**	**13,416**	**3.9**	**0.7**	**9.5**	**14.1**	**12,551**
False alarm	2.9	0.7	8.4	12.0	601	3.1	0.6	8.9	12.6	562
Good intent	3.1	0.7	7.1	11.0	99	3.5	0.7	8.3	12.4	112
Hazard	3.2	0.6	8.3	12.1	165	3.1	0.6	8.2	11.9	161
Outside fire	2.4	0.5	7.4	10.3	118	2.5	0.6	8.0	11.0	148
Public service	4.8	0.6	8.3	13.8	296	6.0	0.7	9.1	15.8	302
Structure fire	2.3	0.5	6.9	9.7	92	2.9	0.6	5.6	9.1	103
Fire Total	**3.3**	**0.6**	**8.1**	**12.0**	**1,371**	**3.7**	**0.6**	**8.5**	**12.8**	**1,388**
Total	**3.1**	**0.6**	**8.8**	**12.5**	**14,787**	**3.9**	**0.7**	**9.4**	**14.0**	**13,939**

TABLE 7-32: 90th Percentile Response Time of First Arriving Unit, by Call Type and Year

Call Type	2019					2020				
	Minutes				Calls	Minutes				Calls
	Dispatch	Turnout	Travel	Total		Dispatch	Turnout	Travel	Total	
Breathing difficulty	4.4	1.0	13.9	17.6	995	7.4	1.2	14.8	21.0	1,030
Cardiac and stroke	4.8	1.1	13.3	17.4	868	6.5	1.1	14.0	19.6	810
Fall and injury	6.0	1.0	14.2	19.6	1,377	7.3	1.2	14.2	20.4	1,086
Illness and other	5.0	0.9	14.1	18.4	7,334	6.8	1.1	15.3	21.2	7,380
MVA	5.5	1.2	11.3	16.2	531	5.6	1.2	12.8	17.2	414
Overdose and psychiatric	6.8	1.0	14.7	21.5	918	7.7	1.1	15.9	22.3	678
Seizure and Unconsciousness	5.1	1.0	13.6	17.7	1,393	6.2	1.2	13.4	19.1	1,153
EMS Total	**5.1**	**1.0**	**13.9**	**18.4**	**13,416**	**6.8**	**1.1**	**14.9**	**20.8**	**12,551**
False alarm	5.3	1.1	12.7	17.2	601	5.2	1.2	13.8	18.1	562
Good intent	5.0	1.2	11.0	16.3	99	5.8	1.3	12.8	18.0	112
Hazard	5.3	1.1	13.9	19.1	165	5.8	1.1	13.0	17.9	161
Outside fire	4.1	1.0	12.6	16.1	118	4.2	1.1	14.4	17.7	148
Public service	11.2	1.1	14.1	22.7	296	14.0	1.2	14.8	24.6	302
Structure fire	3.5	1.0	10.3	13.0	92	5.2	1.3	8.6	12.6	103
Fire Total	**5.8**	**1.1**	**12.8**	**18.5**	**1,371**	**6.8**	**1.2**	**13.6**	**19.5**	**1,388**
Total	**5.2**	**1.0**	**13.9**	**18.4**	**14,787**	**6.8**	**1.1**	**14.8**	**20.7**	**13,939**

FIGURE 7-16: Average Response Time of First Arriving Unit, by Hour of Day and Year



Transport by Year

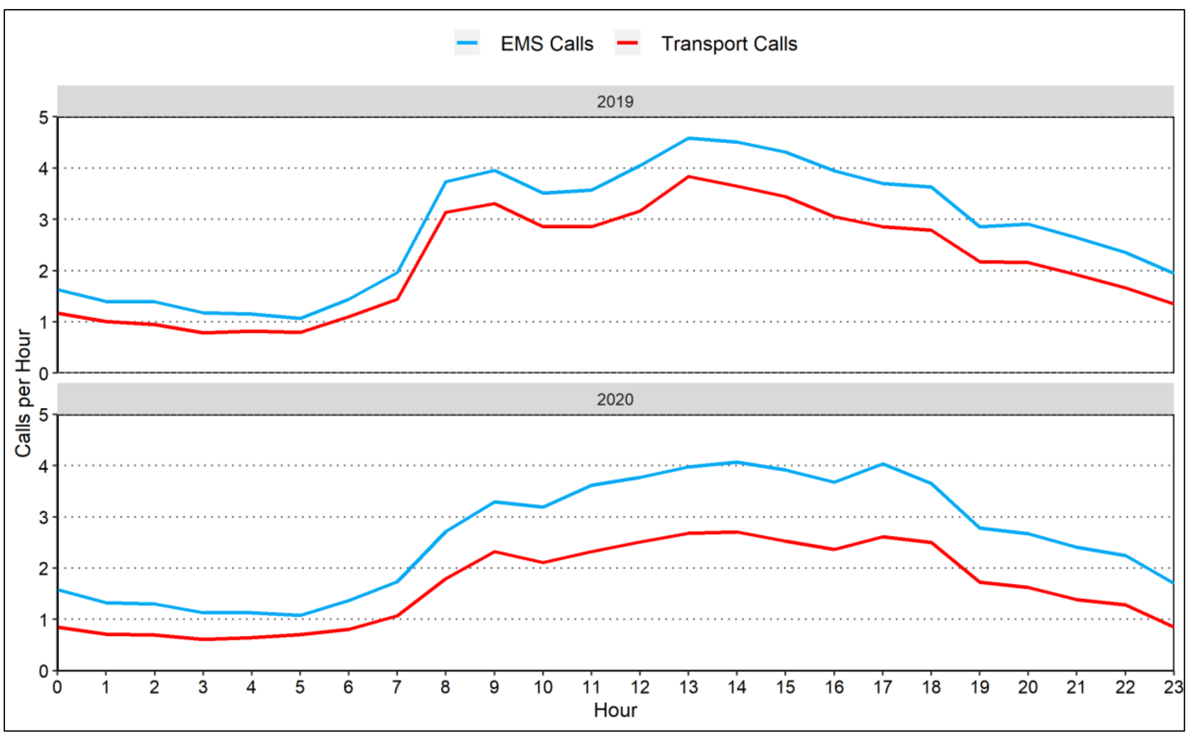
Table 7-33 compares the transport calls and workload in 2019 and 2020. Figure 7-17 compares the average number of EMS and transport EMS calls received each hour of the day in two years.

TABLE 7-33: Transport Calls and Workload by Call Type and Year

Call Type	2019			2020		
	Calls	Runs	Average Call Duration (Minutes)	Calls	Runs	Average Call Duration (Minutes)
Breathing difficulty	930	933	70.6	909	913	84.4
Cardiac and stroke	814	817	74.7	667	671	83.7
Fall and injury	1,251	1,263	74.1	890	896	79.4
Illness and other	6,354	6,388	71.9	8,144	8,180	84.4
MVA	633	728	84.6	357	417	89.0
Non-emergency transfer	6,656	6,679	78.9	1,506	1,514	85.6
OD	1,071	1,076	68.0	575	577	74.7
Seizure and UNC	1,373	1,376	72.1	1,378	1,385	84.1
EMS Total	**19,082**	**19,260**	**74.8**	**14,426**	**14,553**	**83.9**
Fire & Other Total	**236**	**240**	**84.2**	**226**	**225**	**94.1**
Total	**19,318**	**19,500**	**74.9**	**14,652**	**14,778**	**84.0**

Note: OD= Overdose and psychiatric; UNC=Unconsciousness.

FIGURE 7-17: Average Transport Calls by Hour and Year



ATTACHMENT II: ADDITIONAL PERSONNEL

The following table illustrates the workload of the additional personnel of BFD in both 2019 and 2020. These additional units include chief officer cars, the fire marshal, fire inspectors, an EMS captain, and EMS supervisors.

TABLE 7-34: Workload of Administrative Units by Year

Unit ID	Type	2019		2020	
		Annual Hours	Annual Runs	Annual Hours	Annual Runs
F100	Chief Officer Car	25.8	15	25.6	16
F101	Chief Officer Car	19.7	14	38.3	18
F102	Chief Officer Car	9.4	8	9.5	6
F103	Chief Officer Car	258.7	342	253.8	294
F151	Fire Marshal	97.4	94	15.78	8
F152	Fire Inspector/Investigator	0.2	2	0.0	0
F153	Fire Inspector/Investigator	18.0	12	16.5	14
F154	Fire Inspector/Investigator	45.6	42	38.6	34
F155	Fire Inspector/Investigator	26.0	29	26.1	26
U111	Chief Car	0.9	1	0.7	1
U112	EMS Captain	3.8	14	5.6	4
U113	EMS Supervisor	320.4	649	286.7	502
U121	Chief Car	0.04	1	0.0	0
U122	EMS Captain	14.34	2	0.0	0
U123	EMS Supervisor	0.0	0	0.0	1
U125	EMS Supervisor	0.0	0	0.2	1
Total		**840.3**	**1,225**	**717.1**	**923**

ATTACHMENT III: FIRE LOSS

Table 7-35 presents the number of outside and structure fires, broken out by levels of fire loss and year. Table 7-36 shows the amount of property and content loss for outside and structure fires inside the Brownsville fire district over the two-year period.

TABLE 7-35: Total Fire Loss Above and Below $25,000 by Year

Call Type	2019				2020			
	No Loss	Under $25,000	Above $25,000	Total	No Loss	Under $25,000	Above $25,000	Total
Outside fire	266	5	0	271	258	62	9	329
Structure fire	130	11	10	151	115	35	20	170
Total	**396**	**16**	**10**	**422**	**373**	**97**	**29**	**499**

TABLE 7-36: Content and Property Loss, Structure and Outside Fires by Year

Call Type	2019				2020			
	Property Loss		Content Loss		Property Loss		Content Loss	
	Loss Value	Calls	Loss Value	Calls	Loss Value	Calls	Loss Value	Calls
Outside fire	$54,500	5	$0	0	$983,200	70	$126,899	46
Structure fire	$1,448,000	16	$129,000	17	$2,592,400	48	$1,082,445	45
Total	**$1,502,500**	**21**	**$129,000**	**17**	**$3,575,600**	**118**	**$1,209,344**	**91**

Note: The table includes only fire calls with a recorded loss greater than 0.

ATTACHMENT IV: ACTIONS TAKEN

TABLE 7-37: Actions Taken by Year for Structure and Outside Fire Calls

Action Taken	2019		2020	
	Outside Fire Calls	Structure Fire Calls	Outside Fire Calls	Structure Fire Calls
Action taken, other	0	0	19	9
Assistance, other	3	0	6	2
Contain fire (wildland)	0	0	3	1
Control fire (wildland)	2	0	5	0
Control traffic	1	1	0	0
Emergency medical services, other	0	0	1	2
Enforce codes	0	0	0	1
Establish safe area	0	1	1	3
Extinguishment by fire service personnel	32	13	27	13
Fire control or extinguishment, other	168	98	217	100
Fires, rescues & hazardous conditions, other	0	0	4	4
Forcible entry	0	3	0	3
Hazardous condition, other	0	0	1	1
Information, investigation & enforcement	7	5	7	8
Investigate	31	25	25	21
Investigate fire out on arrival	14	10	17	9
Manage prescribed fire (wildland)	0	0	1	1
Notify other agencies.	0	1	2	0
Provide apparatus	0	0	1	0
Provide basic life support (BLS)	0	1	0	1
Provide first aid & check for injuries	1	0	0	1
Provide manpower	1	0	0	0
Remove hazard	3	1	1	1
Salvage & overhaul	6	25	8	20
Search	0	1	2	9
Shut down system	1	3	0	1
Standby	3	2	3	0
Transport person	0	0	0	1
Ventilate	3	13	2	14

Note: Totals are higher than the total number of structure and outside fire calls because some calls recorded multiple actions taken.

- END -