CENTER FOR PUBLIC SAFETY MANAGEMENT, LLC

FIRE DEPARTMENT ANALYSIS REPORT

El Mirage, Arizona

Final Report-February 2022

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 103-year old, nonprofit professional association of local government administrators and managers, with approximately 13,000 members located in 32 countries.

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. EXECUTIVE SUMMARY

The Center for Public Safety Management LLC (CPSM) was contracted by the City of El Mirage, Arizona, to complete an independent analysis of the city's fire department, evaluate its current operational efficiency, and identify future fire service needs for strategic planning purposes. The principal focal points of the CPSM analysis as outlined in the city's Scope of Work include:

- Evaluate the El Mirage Fire Department (EMFD) as related to its ability to provide service currently and meet the future needs of the City of El Mirage and its citizens per 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*, and EMFD's ability to meet the operational guidelines of the Intergovernmental Agreement for the Regional Metropolitan Phoenix Fire Service Automatic Aid.
- Evaluate the current primary Public Safety Answering Point (PSAP)—which is the City of Tolleson Police Department Dispatch Center—to determine contractual requirements and current performance in answering incoming E-911 emergency and non-emergency fire service-related calls, the time taken to receive calls, and the time taken to transfer calls to the secondary PSAP (Phoenix Fire Department's Regional Dispatch Center) for dispatch of EMFD units.
- Review the 2017 Public Protection Classification Report conducted by ISO; compare the report to current service levels of the EMFD to determine if improvements can be developed to enhance the city's ISO rating.
- Analyze historical data from the past five years from the EMFD record management systems, Phoenix Fire Department's Regional Dispatch Center, ISO, and other available sources. *The Fire Chief agreed to a three-year analysis of response and unit workload due to data collection delays and issues.*
- Evaluate operational and administrative staffing, fleet, facilities, service area characteristics, response to specialized incidents, fire prevention/community risk reduction components, training and education, emergency deployment capabilities, response time components, and community risk analysis.
- Utilize GIS mapping tools to analyze response performance of the department to primary response areas from its station using existing street and roadway networks.

The EMFD is responsible for providing services that include fire suppression, first response emergency medical services, community risk reduction, and response to disasters both natural and man-made. These services are provided from one station located in the north-central area of the city. Response is currently made through two engine companies and one Battalion Chief. A low-acuity response unit is planned for re-implementation sometime in early 2022; the unit will respond to low-acuity medical calls on a limited schedule, that is, during the peak workload times of the day.

The EMFD is fortunate that it is signatory to a robust automatic aid system. The *Regional Metropolitan Phoenix Fire Service Automatic Aid System* is an intergovernmental system of fire departments in the Phoenix metro area, led by the Phoenix Fire Department, in which there are essentially no jurisdictional boundaries for deploying fire, medical, technical rescue, hazardous materials, and other specialty equipment and staffing assets to an emergency. As well, the system strives for standardization among participating departments of operational policies and

procedures, training and education, facilities, dispatching services, and staffing. This system significantly benefits smaller departments such as the EMFD which do not have technical rescue and hazardous materials assets, ladder companies, or the capabilities to assemble an Effective Response Force in accordance with the NFPA 1710 standard.

A significant component of this report is an All-Hazard Risk Assessment of the Community. The All-Hazard Risk Assessment contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The service demands of the community are many for the EMFD and include EMS first response, fire, and low acuity fire calls. The response district is made up primarily single-family dwellings, which represent a low hazard; however, there are business, commercial, multifamily residences, and other target hazards that fall into higher classes.

The All-Hazard Risk Assessment of the Community also contemplates projected growth in the community (population and building), which will impact the EMFD's ability in the future to respond to and mitigate emergencies from its current single station location. In this report CPSM makes planning recommendations that include alternatives for new services based on the planned growth of large footprint and other industrial/commercial buildings in the southern area of the city; these recommendations include the addition of a fully staffed ladder truck and a second station.

CPSM also evaluated the resiliency of the EMFD, using the Center for Public Safety Excellence's Standard of Cover literature. Because of the regional auto aid system, the EMFD's resiliency is not stressed when both engine companies are committed to an incident.

In our evaluation of the Tolleson 911-dispatch center, we found that as the Primary Public Safety Answering Point (PSAP) for fire and EMS incidents in El Mirage, the Tolleson 911-dispatch center does not meet the NFPA 1710 standard regarding call transfer time. This standard stipulates the call for service once received in Tolleson shall be transferred to the emergency communications center (Phoenix Fire Department Regional Dispatch Center) in ≤ 30 seconds 95 percent of the time. The Tolleson 911-dispatch center did not meet this standard during the 2.5 year analysis of data they made available to CPSM. The three-year average was 70.9-percent achievement of the benchmark.

The response time and staffing components discussion of this report are designed to examine the current level of service provided by the EMFD compared to national best practices, specifically NFPA 1710. NFPA standards are national consensus standards and not mandates or the law. These standards are based on evolving technology and identified industry needs and provide strict guidance that has a focus on firefighter and community safety. Many cities and countries strive to achieve these standards to the extent possible without adversely impacting the financial health of the community.

A composite profile of EMFD response times for 2018, 2019, and 2020 is featured in the following table.

Key response time parameters established for dispatch time and the first arriving engine in NFPA 1710 at the 90th percentile are as follows:

- Event processed and units dispatched less than or equal to 64 seconds 90 percent of the time.
- 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.
- Travel time for EMS incidents is less than or equal to 240 seconds for the first arriving engine company with automatic external defibrillator (AED) or higher level capability.

TABLE 1-1: 90th Percentile Response Time of First Arriving EMFD Unit, 2018–2020

Call Type	Dispatch	Turnout	Travel	Total Response Time
2018				
EMS Total	90 secs.	96 sec.	348 secs.	474 secs.
Fire Total	126 secs.	96 sec.	378 secs.	516 secs.
2019				
EMS Total	96 secs.	96 secs.	336 secs.	480 secs.
Fire Total	132 secs.	102 secs.	396 secs.	564 secs.
2020				
EMS Total	108 secs.	102 secs.	324 secs.	462 secs.
Fire Total	132 secs.	108 secs.	348 secs.	510 secs.

Key takeaways from the information presented in this table and our analysis are:

- Dispatch times for EMS incidents over the three-year study period do not meet the NFPA standard. *This aspect of response is out of the control of the EMFD.*
- Dispatch times for fire incidents over the three-year study period do not meet the NFPA standard. This is due partly to the time it takes to prepare the CAD system with multiple units from multiple stations, using automatic aid and closest unit response prior to dispatching the call. *This aspect of response is out of the control of the EMFD.*
- Turnout times for EMS incidents over the three-year study period do not meet the NFPA standard. *This aspect of response is within the control of the EMFD and when an issue was identified in 2020, corrective actions were implemented per AC Richardson.*
- Turnout times for fire incidents over the three-year study period do not meet the NFPA standard. *This aspect of response is within the control of the EMFD and when an issue was identified in 2020, corrective actions were implemented per AC Richardson.*
- Travel times to EMS incidents over the three-year study period do not meet the NFPA standard. 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. *Other than station location(s), this aspect of response is out of the control of the EMFD.*
- Travel times to fire incidents over the three-year study period do not meet the NFPA standard. 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. *Other than station location(s), this aspect of response is out of the control of the EMFD.*

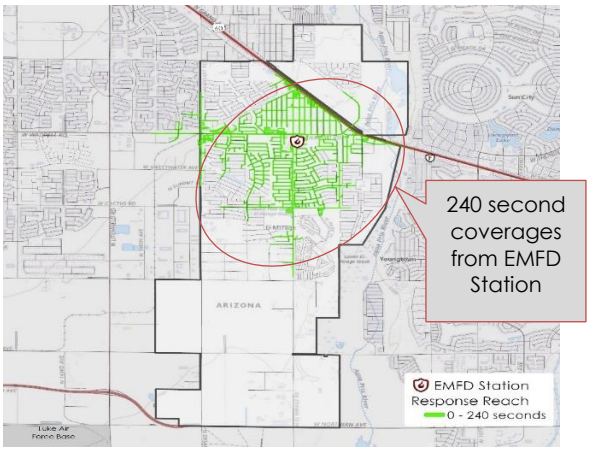
CPSM used GIS mapping to develop an analysis that benchmarks response from the EMFD fire station against NFPA response time standards. Included in this analysis is response coverage data of EMFD first-arriving engines in El Mirage, measured against an arrival of 240 seconds; the arrival of the second fire suppression unit (engine or ladder) at 360 seconds; and the arrival of the initial alarm assignment (Effective Response Force) at 480 seconds. The results of this analysis are illustrated in the following figures.

- Response coverage at 240 seconds (first arriving engine) as benchmarked against the NFPA 1710 standard is contained to the northeast and north central portion of the city. This matters

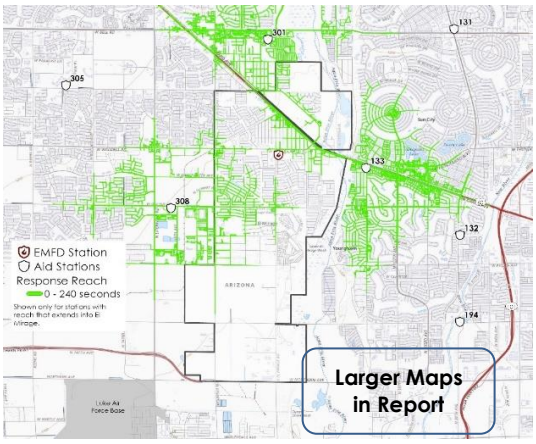
when both EMFD units are committed to calls or delayed in response when out of position. Auto Aid Stations 301, 308, and 133 also assist in covering gaps that EMFD Station 121 cannot meet regarding the 240 seconds response time (NFPA standard).

FIGURE 1-1: Response Coverage at 240 Seconds

240 Seconds EMFD Station Only



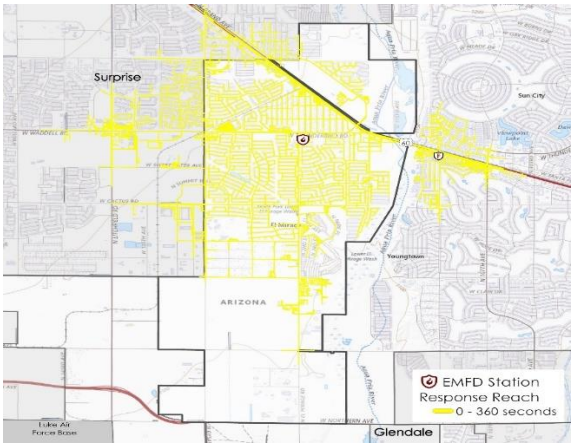
240 Seconds Auto Aid Stations Only



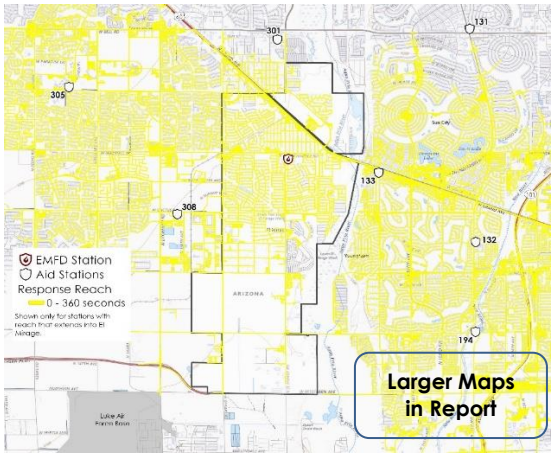
- The NFPA 1710 standard for the arrival of the second due fire unit (engine or ladder) to arrive on scene is 360 seconds. The EMFD deploys two engines from one station. If one EMFD engine is tied up on a call, automatic aid companies will count towards meeting this standard. Analysis of this figure shows the majority of the built-upon area of the city is covered at the 360 second benchmark.

FIGURE 1-2: Response Coverage at 360 Seconds

360 Seconds EMFD Station Only



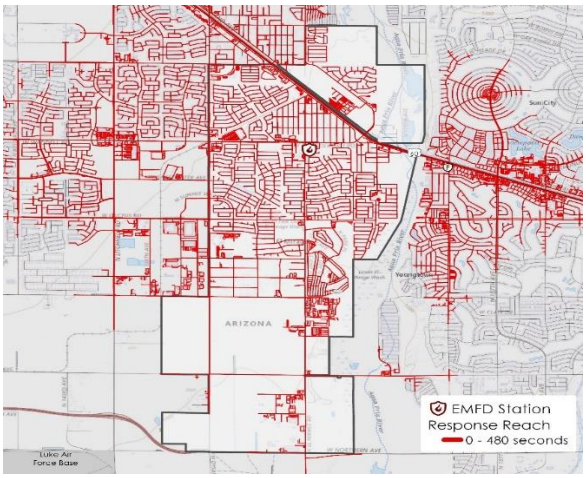
360 Seconds Auto Aid Stations Only



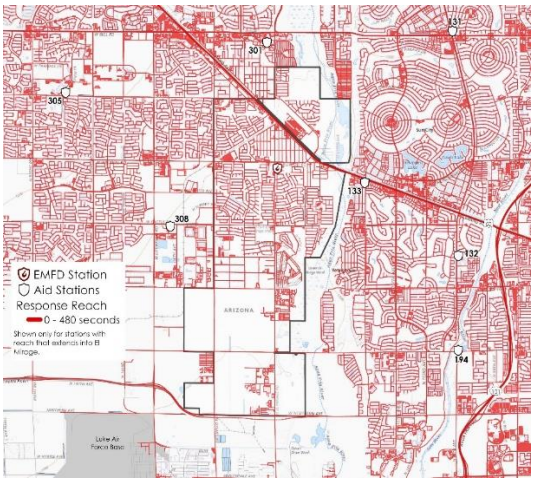
- The NFPA 1710 standard for assembling the initial first alarm assignment on scene for low/medium hazards is 480 seconds. This standard links to the incident critical tasking and the assembly of an Effective Response Force for the incident. The city is covered at the 480 seconds benchmark by the El Mirage fire station and the auto aid stations.

FIGURE 1-3: Response Coverage at 480 Seconds

480 Seconds EMFD Station Only



480 Seconds Auto Aid Stations Only



In summation, a comprehensive risk assessment, analysis of deployable assets, and response times are critical aspects of a fire department's operation. These analyses will assist the EMFD in quantifying the risks that it faces, and the EMFD will be better equipped to determine if the current response resources are sufficiently outfitted and positioned. The factors that drive the service needs are examined in this report and are linked to discussions regarding the assembling of an Effective Response Force and contemplating the response capabilities needed to address existing and future risks, which encompasses the component of critical tasks needed to be performed on the fireground.

This report contains a series of observations and recommendations provided by CPSM that are intended to help the EMFD continue to deliver services more efficiently and effectively. Most importantly is the discussion in the conclusion section of the report in which CPSM contemplates service delivery in terms of additional assets (ladder company), a second fire station, and improvements in the community risk reduction function and the primary PSAP provided by the City of Tolleson.

Recommendations and considerations for continuous improvement of services are presented next. 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.

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RECOMMENDATIONS

1. CPSM recommends the EMFD establish a formal staffing factor that can be used to assist in the process for managing current and future staffing vacancies created by scheduled and unscheduled leave.
2. CPSM recommends the Captain position assigned to the Fire Prevention/Community Risk Reduction function be titled Fire Marshal to be consistent with regional and industry norms. This position should also be charged with the responsibility of managing the fire inspection, plans review, fire investigation, and public education programs. This position should also take the lead on program design for Community Risk Reduction programs and performance measures focused on reducing the risk of fire and improving citizen and firefighter safety.
3. CPSM recommends that the city reexamine the agreement with the City of Tolleson for Public Safety Answering Point (PSAP) services, and move to update this agreement to include:
    - The timely release when requested by the City of El Mirage of 911 call receipt and transfer data times to the Phoenix Fire Department Regional Dispatch Center;
    - The definition of EMFD as a PSAP customer;
    - Establishment of call transfer times that align with current 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,* related to primary PSAP call processing and transfer times to the secondary PSAP (30 seconds or less 95 percent of the time);
    - CPSM further recommends this agreement be reviewed on an annual basis and updated as necessary, specifically when the NFPA 1710 standards change regarding primary PSAP call processing and transfer times to the secondary PSAP.
4. CPSM recommends that the EMFD address the deficiencies in the most recent ISO report as reviewed in this analysis. The Emergency Communications Center deficiencies should include discussions with the Tolleson 911 Dispatch Center and its current capabilities, and how the call transfer method to Phoenix can be improved. CPSM further recommends that an EMFD representative be present in the Tolleson 911 Dispatch Center and the Phoenix Fire Department Regional Dispatch Center during the next ISO evaluation for the purpose of segregating deficiencies in each center to gain a better understanding of what improvements need to be made and to what center.
5. The city should begin planning <u>now</u> for added fire staffing and ladder company service to serve known and future planned commercial and industrial building growth in the southern area of the city and to augment current service delivery in the northern half of the city. This staffing should be linked to a second fire station in the southern part of the city that should house an engine company and a ladder company. The city has two alternatives to staff this station.
    - Alternative A: Move E122 to the second station and implement a ladder company as a new service. This will include the purchase of a ladder truck and the addition of 12 personnel (3 Captains, 3 engineers, 6 firefighters). In this alternative, E121 stays in service at the current station and LA121 remains in service as currently planned.
    - Alternative B: Keep Engines 121 and 122 at the current station and implement an engine company and a ladder company at the second station as new services. This will include the purchase of an engine apparatus and a ladder truck and the addition of 24 personnel

(6 Captains, 6 engineers, 12 firefighters). In this alternative, LA121 stays in service at the current station as currently planned or the positions are converted to the fill the new engine company and LA121 is placed out of service.

- The second fire station should be planned for operational use as described above (engine and ladder company), and for certain administrative functions to relieve the space needs at the current fire stations, as identified by staff. Because of the potential close proximity to City Hall, the second station may include the Fire Chief's office and his immediate operational and administrative staff, as well as a large meeting room for city and public use that can double as a more permanent Emergency Operations Center.

6. As the department continues to expand operationally and administratively, and will in the future, CPSM identified a space issue at the current EMFD facility. Hampering expansion efforts is the minimal footprint available to expand the current facility. This said, and if the city does not move to construct a second fire station, CPSM recommends as a planning objective (one- to three-year planning period) the city and department retain an engineering firm/consultant to conduct a comprehensive review of the EMFD facility to determine the necessity for improvements/facility footprint expansion in the next three to five years, and what, if any land footprint is available for such an expansion. Included in this plan should be a budgetary and funding plan that focuses on size/space for crew accommodations and EMFD operations (programmatic, administrative, training, emergency management) and apparatus storage.

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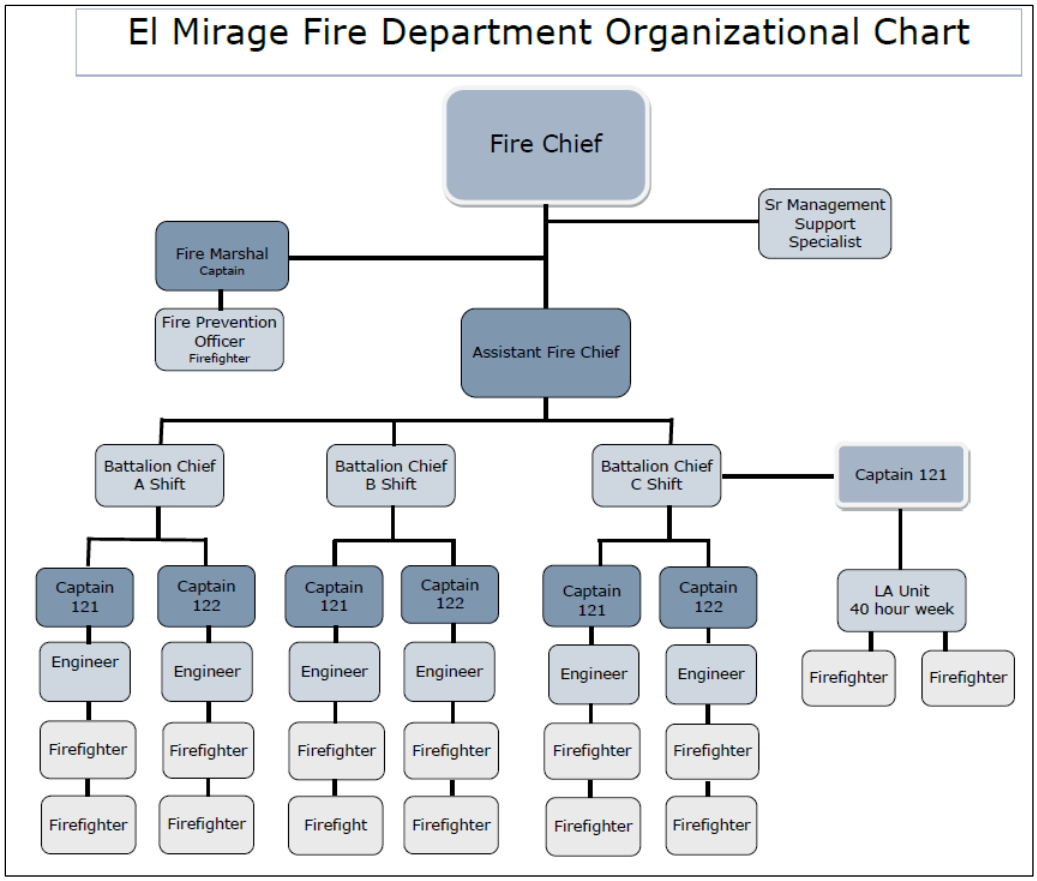
SECTION 2. AGENCY REVIEW AND CHARACTERISTICS

The El Mirage Fire Department (EMFD) is responsible for providing emergency services from two primary divisions that include Operations (primarily fire suppression, and first response emergency medical services) and Community Risk Reduction (fire code enforcement, fire prevention and development plans review, and public education). Other programs administered through these primary divisions include a department health and safety program, professional development programs, community education to include CPR and First Aid classes, car-seat installation, maintenance of Automatic External Defibrillators in city buildings, emergency management, and hazardous materials and technical rescue initial level response. ***These services represent best practices/best program practices for fire service agencies.***

The EMFD is led by a Fire Chief. This position (department-head level) serves as a member of the City Manager's cabinet. The organizational structure includes senior, middle manager, and program manager-level positions (Assistant Fire Chief, Battalion Chiefs), first-line supervisors (Captain level), engineers (apparatus driver-operator), firefighters, and civilian support staff. The largest contingent of personnel in the organization are company-level officers, engineers, and firefighters. Figure 2-1 illustrates the EMFD's organizational as provided by the department.

FIGURE 2-1: EMFD Organizational Chart



The EMFD provides emergency services from one station located in the north-central section of the city. Response is primarily made through two engine companies, one shift command vehicle, and various other operational support vehicles available as needed. The EMFD operates with three operational shifts. The operational shift schedule is 48 hours on and 96 hours off. In early 2022, the EMFD will re-implement a light duty response vehicle to respond to low-acuity EMS incidents.

The low-acuity response asset is emerging nationally as fire and EMS departments search for more contemporary methods to meet the evolving changes of the community. Access to care is a main driver of EMS ground transport use whereby users of the EMS system use the local hospital emergency department as their primary care physician, thus consuming the time of EMS ground transport units on lower acuity calls for service. To meet this demand, fire and EMS departments are implementing mobile integrated health assets to respond to lower acuity calls for service, some staffed with nurses and/or nurse practitioners and/or mental health providers. The goal is to keep Advanced Life Support (ALS) EMS ground transport units available for the higher acuity responses where EMTs and Paramedics are most needed in emergency situations. ***This is an emerging national best practice.***

In addition to in-city mitigation of fire and emergency service incidents, the EMFD provides and receives mutual/automatic aid from neighboring/contiguous jurisdictions as a signatory member of the *Regional Metropolitan Phoenix Fire Service Automatic Aid System*, ***a national best practice***. This is codified as well in Chapter 34.31 of the city's code of ordinances. In addition to this agreement, the EMFD is also signatory to a staffing agreement with the Arizona Fire and Medical Authority whereby participating jurisdictions can share available staffing through assignment by the sharing jurisdiction. Remuneration for staffing services is completed by the receiving jurisdiction back to the sharing jurisdiction.

The City of El Mirage is structured under the council-manager form of government. The City Council acts as the legislative and policy-making body of the city and appoints a City Manager who serves as the administrative head of the city government under the direction of the Council.[1] Chapter 34.20 of the city's code of ordinances establishes the fire department with Chapter 34.23 establishing the duties of the Fire Chief. Under the code of ordinances, the Fire Chief is appointed by the City Manager with the consent of the City Council and serves as the head of the department. All powers and duties of the fire department are outlined and codified in Chapter 34 of the city code.

EMERGENCY MEDICAL SERVICES

The EMFD responds to EMS incidents as a first responder agency (Tier 1). EMFD engine companies have appropriately trained staff (including Paramedic-level) on duty on each apparatus to render pre-transport emergency care to those requiring such care.

(EMS) ground transportation is provided in El Mirage by a private ambulance service, American Medical Response (AMR). The current agreement between the city and AMR was implemented on March 1, 2016, and was for an initial three-year period with three one-year extensions. The agreement is currently in its last one-year extension, which is set to sunset on February 28, 2022. The agreement stipulates service and staffing levels, response time parameters (to include liquidated damages for failure to meet agreed upon response times), alternative care alternatives, equipment specifications, dispatch and communication center fees, personnel

1. El Mirage Code of Ordinances, Chapter 30.20(E)

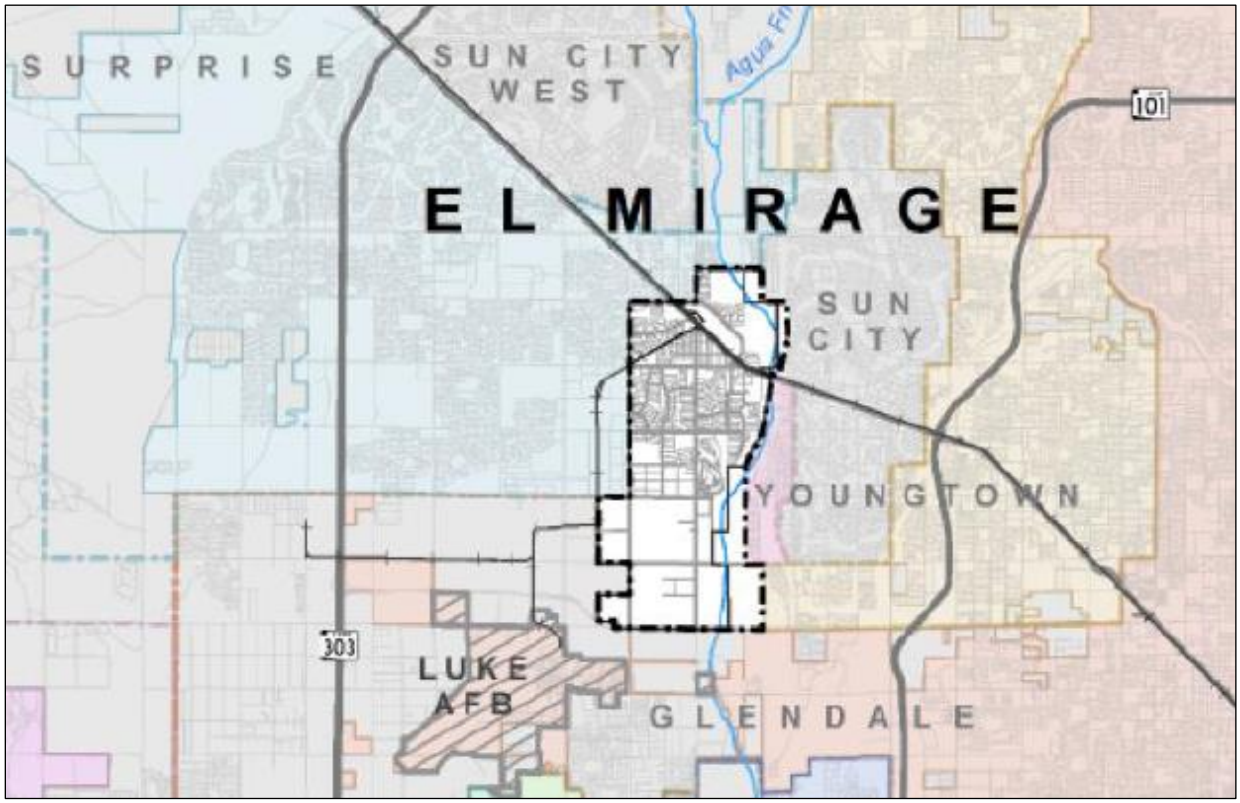
expectations, and other performance and management aspects typically found in this type of agreement with a private ground transport entity.

SERVICE AREA

The City of El Mirage is located in Maricopa County, Arizona, and positioned west of the City of Phoenix. El Mirage is considered to be in the metro Phoenix area of the county. The city boundaries encompass an area of about 10 square miles. The city is bordered on the east, southeast, and northeast by the Aqua Fria River. Contiguous jurisdictions by land include the City of Surprise to the north, northwest, and west; the City of Glendale to the southeast; unincorporated Maricopa County to the southwest and south; and via bridge (Grand Ave.-US Route 60) over the Aqua Fria River, Sun City and Youngtown. Luke Air Force Base is southwest of the city.

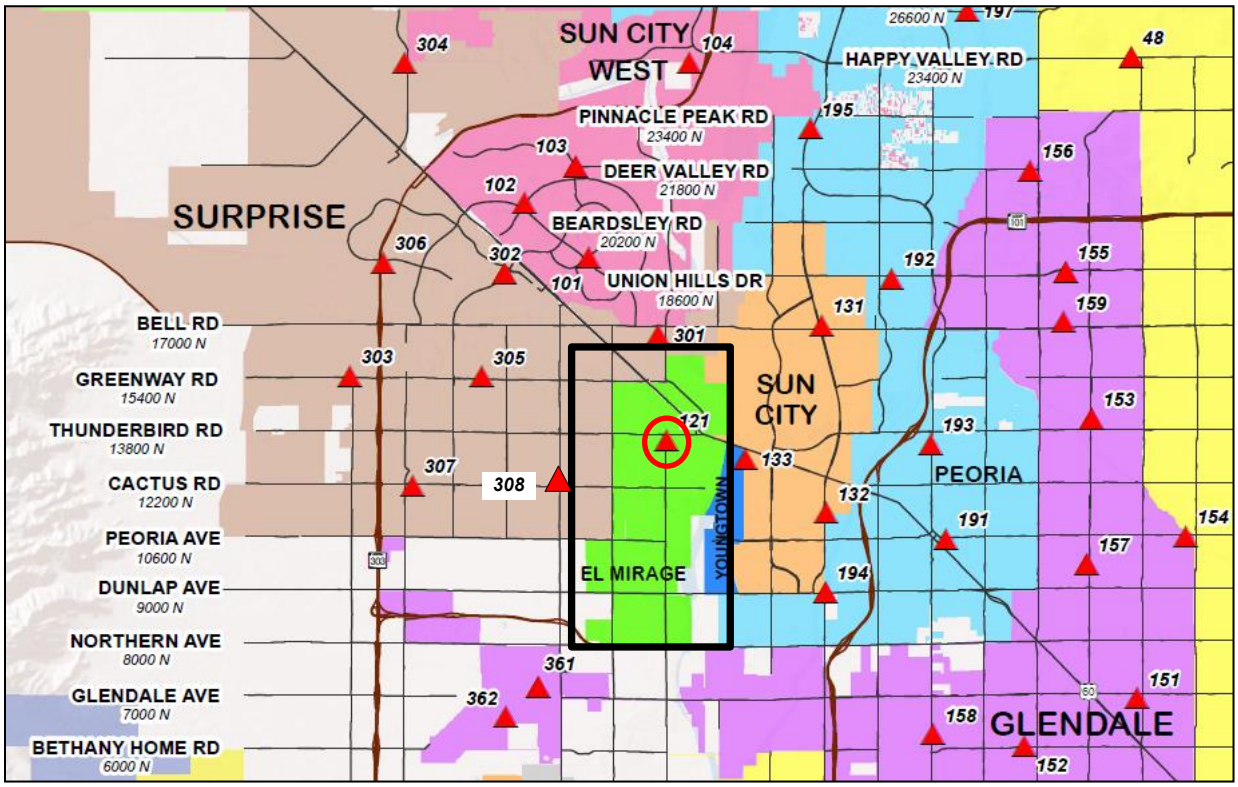
The following figure illustrates the municipal boundaries of the city in which the EMFD responds.

FIGURE 2-2: El Mirage Jurisdictional Boundaries



The next figure shows the City of El Mirage and EMFD station location and those jurisdictions most likely to provide automatic aid to and receive automatic aid from EMFD.

FIGURE 2-3: Automatic Aid Map with the EMFD Station Location



EMFD BUDGET

The EMFD operating budget for the current and two most recent fiscal years is outlined in the following table; the figures shown are general fund budget allocations, as the EMFD is a general fund (GF) department. Revenues for this fund come from sales tax (approximately 30 percent of the FY 2022 GF revenues), property taxes, state shared revenues, licenses and permits, fees, and transfers.[2] In FY 2021, personnel services (payroll expenditures to include salary, benefits, and pension costs) made up 55.2 percent of the general fund budget in El Mirage. This is not uncommon nationally, since general fund departments and activities are typically service-oriented departments and costs are heavily weighted by staffing and personnel costs (salary, benefits, pension costs).[3] The FY 2021-22 GF budget for the city is $34.14 million, with public safety (police and fire operations) making up a significant portion of General Fund expenditures.[4]

TABLE 2-1: EMFD Budget, FY 2020 through FY 2022

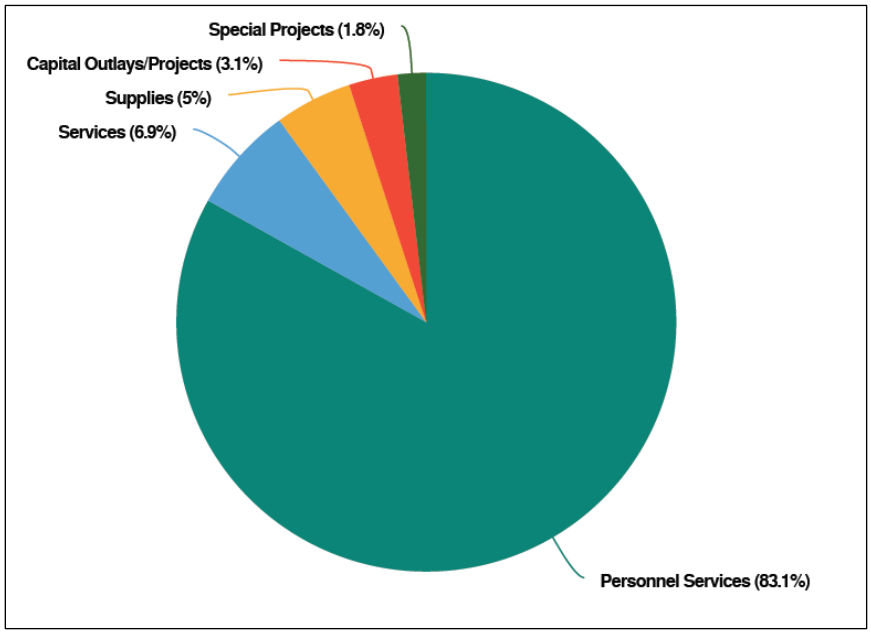
FY 2020 Actual	FY 2021 Budgeted	FY 2022 Budgeted
$3,692,484	$4,506,500	$4,859,500

Traditionally, and like every other career fire department in the nation, the EMFD's budget is primarily consumed in personnel costs. This includes salary, benefit, and retirement costs; overtime; and worker's compensation. The EMFD personnel services budget area consistently

2. Annual Budget for the Fiscal Year FY 21-22, City of El Mirage, AZ.
3. Ibid.
4. Ibid.

represents approximately 80-plus percent of the total budget. The next largest budget areas are supplies and services, which support the operation and maintenance of facilities and equipment, automotive operational/repair costs and replacement, maintenance and operations of equipment, professional development, and information technology. The next figure illustrates a breakdown of the EMFD budget.

FIGURE 2-4: EMFD Expense Breakdown[5]



The EMFD budget does include certain line items for other expenditures; in the current year budget these are:

- Special Projects: $89,500.
- Capital Equipment Purchase: $17,000.
- Buildings and Improvements: $136,000.

Capital Outlay

In addition to funding the fire department through the GF, the city has an aggressive Capital Improvement Program (CIP) from which the EMFD also receives funding. In El Mirage, a capital project/expense is generally defined as having a cost greater than $5,000 and a useful life of more than a year. In the five-year CIP budget, the EMFD has three projects included as follows:

- Thermal Imaging Camera FY22, $17,000.
- Parking Structure FY22, $136,000 (storage of reserve apparatus/ EMFD fleet).
- Engine Replacement FY23, $700,000.

The city has received American Rescue Plan Act funds and has apportioned a certain amount to the EMFD to fund positions through fiscal year 2024 to staff a low acuity response unit as described above.

5. Annual Budget for the Fiscal Year FY 21-22, City of El Mirage, AZ.

In November 2021, when CPSM met with the Fire Chief and staff, the Fire Chief discussed the current overtime quandary the department is experiencing. The FY 22 budgeted overtime for firefighters, engineers, and Captains collectively is $240,000. As of January 1, 2022 the department had spent $227,086 in overtime, and this is projected to accrue to $350,000 by fiscal year end per the Chief. Overtime is used to maintain minimum staffing of four on each engine (eight per shift) to meet staffing criteria of the regional automatic aid agreement. Shift staffing vacancies occur daily due to scheduled and unscheduled leave.

Scheduled and unscheduled leave are governed through *Standard Operating Guidline #100.08, Leave Management.* The EMFD operates with a constant staffing model. This means there are no added personnel assigned to a shift to fill vacancies created by scheduled or unscheduled leave. This model then, consistently requires overtime to maintain minimum staffing levels and thus must be budgeted for on an annual basis.

The Fire Chief is developing a proposal to assist in covering scheduled and unscheduled leave and reducing overtime through the hiring of additional personnel (one firefighter per shift). The Fire Chief estimates this annualized cost to be $279,750. While this is one method to reduce overtime, it does have an impact on the budget that is more permanent than overtime. The addition of personnel also will, over time, increase the amount of on-shift personnel that will be utilizing scheduled and unscheduled leave. Therefore, barring unforeseen circumstances, overtime funding will still be needed, but potentially not at the amount projected in the current budget.

It is not atypical for fire departments to staff shifts with additional personnel to cover scheduled and unscheduled leave. In some departments this is done on a large scale, such as one additional firefighter per engine per shift. These personnel are utilized to cover both short- and longer-term vacancies, thus reducing overtime expenses.

To determine the number of additional personnel needed to cover vacated positions due to leave, a staffing factor should be established. The following calculations show how this would apply to the EMFD.

The EMFD employs twenty-four full time staffing positions assigned to one of three platoons to staff the two engines. Each platoon is scheduled on a 48-hour shift (8 per shift). Each platoon works approximately five 48-hour shifts per month (10 working days). The standard rotation is 48 hours on and 96 hours off. No additional positions exist to maintain minimum staffing of eight per shift due to employee absences resulting from scheduled or unscheduled leave. Under this staffing model, when an employee on a shift is off because of scheduled or unscheduled leave, the vacant position(s) are filled through overtime. This staffing method is considered "constant staffing" and requires overtime to staff vacant full-time positions to maintain minimum staffing.

Through the development of a staffing factor, the EMFD can better plan the fiscal impacts of maintaining minimum staffing through overtime funding or adding additional staff to be utilized to fill vacancies.

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Staffing factor calculation: **staffing factor** $= \frac{\text{hours per year per employee}}{E}$

$$E = P - A$$

E = the number of effective hours per employee per year or hours scheduled
P = the number of paid hours per employee per year
A = the average number of hours of paid absences per year per employee

The EMFD utilizes twenty-four full-time career positions assigned to shift operations. As reported by the EMFD, for a one year period (January 1-December 31, 2021) the number of paid hours each employee was scheduled to work was 2,912 hours (3,003 for payroll purposes). This totals 69,888 hours for the twenty-four employees. During this same period, shift operations personnel assigned to the two engines aggregately utilized 9,270 hours of leave (personal, vacation, sick, medical, FMLA, bereavement etc.). Utilizing the staffing factor formula above:[6]

P = 2,912
A = 386 (average of 9,270/24)
P – A = 2,526
E = 2,526

staffing factor $= \frac{2912}{2{,}526} = 1.15$

Therefore, it would take <u>one</u> full-time and 0.15 of a full-time employee to fill each position per 48-hour hour shift, or aggregately 1.20 (0.15 x 8) of a full-time equivalent employee per 48-hour shift to better manage the financial aspect of minimum staffing of eight per shift (firefighters, engineers, Captains). To achieve the additional 1.20 aggregate staffing factor per shift, the department can either add additional staffing each shift with one FTE position or continue to use overtime budgeted at 1.20 FTE per shift, or a combination of both.

By utilizing a staffing factor formula, the EMFD can better manage how to fund additional personnel to staff vacant positions created by leave (scheduled and unscheduled) is funded. Additionally, this can better assist the EMFD in determining a more accurate overtime budget or developing future budgetary alternatives for additional FTE staffing to fill vacancies caused by scheduled and unscheduled leave to reduce overtime costs.

CAPITAL ASSETS

Facilities

Fire facilities must be designed and constructed to accommodate both current and forecasted 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

6. Ammons, D., Tools for Decision Making,2nd edition, (Washington, DC: CQ Press, 2009), 229-230.

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. Commercial grade furnishings, fixtures, and equipment selection should provide longevity to the around-the-clock occupancy inherent 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.

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 EMFD operates out of one facility located in the north/central area of the city. This station houses two engine crews and a command officer around-the-clock, 365 days a year; fire administrative offices; a training room that also serves as the city's Emergency Operations Center (EOC); and in the near future a low acuity response unit. The EMFD station, at 14,600

square feet, serves as the main operational center for the department (11,300 square feet for fire operations), and the administration offices and training/EOC room (3,300 square feet total).

The station was constructed in 2012, and, according to staff, one full apparatus bay and other ancillary, storage, and living spaces were eliminated from initial design. The current station does not provide adequate spaces for all necessary operations and personnel (hence the request for an exterior parking structure to provide cover for apparatus in the FY22 CIP budget). Space needs include climate controlled storage; office space for the fire prevention officer with an area for plan reviews that will accommodate a large desk/drafting table; expanded training area; and a more permanent Emergency Operations Center (EOC).

Fleet

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

The EMFD currently operates a fleet of operational response apparatus as shown in the following table.

TABLE 2-2: EMFD Fleet

Apparatus Type	Year In Service	Operational Assignment
Engine: Pierce Velocity	2006	Reserve
Engine: Ferrara Inferno	2008	Front-Line
Engine: Pierce Impel	2016	Front-Line
Brush Truck: Ford F550	2006	Front-Line
Battalion Vehicle: Ford F350	2019	Front-Line
EMS Low Acuity: Dodge 3500	2012	Front-Line

The EMFD also has an assortment of command and staff vehicles.

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 EMFD 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 for heavy fire apparatus is currently contracted out to a regional vendor. The vendor utilizes Emergency Vehicle Technician (EVT) certified mechanics, ***which is a best practice.***

Replacement of fire-rescue response vehicles is a necessary, albeit expensive, element of fire department budgeting that should reflect 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 for future capital outlay 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 emergency services within the community, as well those "sharing the road" with these responders.

The EMFD follows the NFPA recommendations for apparatus replacement, which are ten years for front-line service and five years in reserve service. At the fifteen-year mark, the EMFD budgets in the CIP to replace the apparatus so as not to extend the service life beyond much beyond fifteen years, ***a best practice.*** As noted above, the 2006 engine apparatus is due to be replaced in the FY 23 CIP budget. Staff vehicles are replaced based on age, mileage, and review of maintenance costs.

TRAINING 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 are necessary functions 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, but 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)[7] regulations dictate that minimum training must be completed on an annual basis, covering 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 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 EMFD has a robust and comprehensive training program and there exists a dedicated effort focused on a wide array of training activities.

The EMFD does not have a stand-alone training unit. Incumbent training is developed and implemented at the Senior Staff, Battalion Chief, and Captain level. For consistency, the Assistant Chief monitors training for company level staff. The department hires only fire- and EMS-certified prospective employees. Minimum hiring requirements are Firefighter Level I and II in accordance with NFPA 1001 training standards, and Emergency Medical Care Technician, or Paramedic in accordance with Arizona Department of Health Services and state statutes.

The EMFD has an incumbent training program for fire, EMS, and technical responses that includes, but is certainly not limited to:

- Firefighter: 192 hours of company training, 18 hours of facility training (multicompany training), 6 hours of Hazardous Material Training.
- Engineer: 192 hours of company training, 12 hours of driver training, 18 hours of facility training (multicompany training), 6 hours of Hazardous Material Training.
- Captain: 192 hours of company training, 12 hours of officer training, 18 hours of facility training (multicompany training), 6 hours of Hazardous Material Training.

7. The Arizona Division of Occupational Safety and Health (ADOSH) has adopted federal OSHA standards and incorporates them by reference into the Arizona State Plan, which covers state and local government employees.

- Battalion Chiefs are required to attend Battalion Chief/Deputy Chief training held by the Phoenix Fire Department on a quarterly basis. This training covers a wide variety of pertinent position training to include incident command and incident command center training, special operations, leadership topics, regional response operating guidelines, building construction topics, and fireground safety to name a few.
- All personnel are required to meet minimum continuing education hours to maintain their EMT or Paramedic Certification in accordance with Arizona Department of Health Services and state statutes.

The station officer conducts company-level training either at the station or various locations in the city, depending on the training topic. Multicompany training (facility training) is conducted at the Glendale Regional Public Safety Training Center (GRPSTC). Quarterly MCS training is conducted by Battalion Chiefs. This is a benefit to being a participant in the regional auto aid agreement.

The EMFD utilizes Vector Solutions (formerly Target Solutions) as a didactic/virtual platform for department training. Vector Solutions offers a robust course catalog system for fire and EMS training (among other disciplines in need of continuing education) that can be utilized to meet all federal, state, and local public safety training mandates. Its inventory is comprised of more than 450 hours of fire department training, as well as 250 hours of accredited EMS training.[8] Training personnel (and really any officer or member so authorized) can post training and information materials online for personnel to reference. The training schedule is posted prominently on Vector Solutions and accessible to all personnel. Vector Solutions also provides the platform for managing all training records and reports. The use of this program helps 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. The EMFD is one of more than 7,000 public agencies utilizing Vector Solutions.[9]

Standard Operating Procedure (SOP) #6.1 addresses the training requirements for members of the department (primarily those assigned to fire operations). This policy is a robust and well-laid-out policy that guides the ongoing training of the EMFD. Captains (company officers) are responsible to ensure staff assigned to their company/shift receive the required training as outlined in the policy. This policy includes:

- A requirement of 20 hours of fire suppression training per month (two hours per shift).
- Multicompany drills: four per year (two night/two day), three hours per drill.
- Single company drills: four per year, three hours per drill.
- Minimum Company Standards (MCS).
  - Each shift Captain will be responsible for the ongoing management of MCS for their respective shifts.
  - A Chief Officer will annually evaluate crews. Any Company performing below standards will be given a date On which they will be retested.
- Annual and required OSHA training.
- Driver and Operator: Three half-day sessions per year in accordance with NFPA 1002.

8. Online Fire Department Training & Performance Solutions (vectorsolutions.com)
9. Ibid.

- Pre-Fire Planning Inspections: The EMFD includes pre-fire planning inspections in its training regimens, ***a best practice and ISO-FSRS grading component***. Each company/shift is required to visit/inspect each commercial, industrial, institutional, and similar type buildings (which are target hazards) twice each year. The EMFD allows a portion of the time required to perform pre-fire inspection to be considered.
- Hazardous Materials Training: All operational personnel (emergency responders) must complete four hours per year.
- Probationary Employee Training (Firefighter, Engineer, Captain): Employees on probation must complete ten hours of training in their respective rank as outlined in the training SOP.
- EMS Training: EMTs–24-hours of continuing education over a 24-month period; Paramedics–60 hours of continuing education over a 24-month period.

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 the Phoenix metro area, 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 professional development increases the positive professional perception of the organization and can help to demonstrate a commitment to continued excellence. The city and EMFD supports professional development beyond the metro area as described and, per the Chief, the department participates in these opportunities, ***which is a best practice.***

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 impacts 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; the EMFD does this 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, and 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 function in the EMFD is provided by a Captain on special assignment. In addition to the Captain, the office is staffed with a fire prevention officer (firefighter level). Together these two positions administer the fire code inspection, fire investigation, development plan reviews, and public education mission of the department. The Community Risk Reduction office works closely with the city's Development Services Office concerning matters of new development plan reviews and fire code enforcement when building code issues are identified.

At the time of this analysis the City of El Mirage and EMFD were utilizing the following fire and building codes:

- The International Fire Code, 2012 edition.
- The International Building Code, 2012 edition.

The city also utilizes the following building-related codes:

- The International Residential Code.
- International Fuel Gas Code.
- International Energy Conservation Code.
- The International Existing Building Code.
- International Green Construction Code (voluntary).
- International Mechanical Code.
- The International Property Maintenance Code.
- National Electric Code.
- International Plumbing Code.
- International Mechanical Code.

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.

Fire inspections can also identify violations and lead to 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. This, of course, improves community and business relationships.

The EMFD has an active public fire education program, which is a vital component of an overall Community Risk Reduction program, particularly in the residential areas of the city. This effort is very commendable and results in time and resources well spent. A significant percentage 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 impacts on preventing fires and subsequently reducing the accompanying loss of life, injuries, and property damage through adjusting people's attitudes and behaviors regarding fires and fire safety. EMFD public education includes community CPR training, Reading Across America program, coffee with a firefighter, infant car seat installations, station tours, and in-school fire education programs.

The investigation of the cause and origin of fires is also an important part of a comprehensive fire prevention system. Determining the cause of fires can help with future prevention efforts. EMFD Battalion Chiefs and Captains initiate 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, the Captain assigned to Community Risk Reduction responds to perform an in-depth investigation.

The Fire Marshal's Office completed the following work in 2019 and 2020.

TABLE 2-3: Community Risk Reduction Office Activity

Year	Fire/Compliance Inspections	Plan Review	Fire Investigations	Pub Ed
2019	408	0	18	107
2020	513	0	6	59

Prior to 2021, the EMFD did not participate in the fire protection function of plans review. This function was completed by the Building Safety Official. The current Fire Chief has implemented this program at the fire department level (in partnership with the Building Safety Department), which is plan review of fire protection systems and certain construction elements, water flow requirements, ingress for fire apparatus, fire lanes, and other applicable fire building safety codes. ***This is a best practice.***

The city has an approved permit and fee schedule that includes inspection and permitting fees, as well as certain operational fees for the Fire Prevention/Community Risk Reduction function of the EMFD. Fees for these activities are not uncommon in municipal fire departments across the country. Operational permit fees include the issuance of a permit and premises inspection of processes, storage, and production of products that are flammable, combustible, or otherwise hazardous and/or create life safety and building safety hazards. Permit fees also apply to operations of, and equipment involved in, the conduct of certain businesses either stationary or mobile. Inspection fees include those for businesses and group homes.

The fee schedule also includes a fee/charge for service for repeat premise fire alarm activations where the EMFD responds. This fee is triggered/escalated after the second, fifth, and ninth alarm activations, and is meant to hold the occupant accountable to ensure the system is always functioning properly, reduce manual/false activations, and encourage compliance with known system malfunctions and false manual activations. ***This is a best practice.***

Lastly, there are several miscellaneous fees to include EMS standby for events, fire watch standby (links to fire alarm system malfunction issues), and report fees to name a few.

SECTION 3. ALL-HAZARDS RISK ASSESSMENT OF THE COMMUNITY

POPULATION AND COMMUNITY GROWTH

The 2020 decennial census indicated the population of El Mirage is 35,805 (U.S. Census Bureau). This is a 12.6 percent increase from the 2010 decennial population of 31,797. As the area of the city is about 10 square miles, the population density based on the Census Bureau population data is approximately 3,171/square mile.[10]

In terms of fire and EMS risk, the age and socio-economic profiles of the 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 zones 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:[11]

- 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).
- 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 El Mirage the following age and socioeconomic factors are considered when assessing and determining risk for fire and EMS preparedness and response:[12]

- Children under the age of five represent 8.1 percent of the population.
- Persons under the age of 18 represent 30.9 percent of the population.
- Persons over the age of 65 represent 9.1 percent of the population.

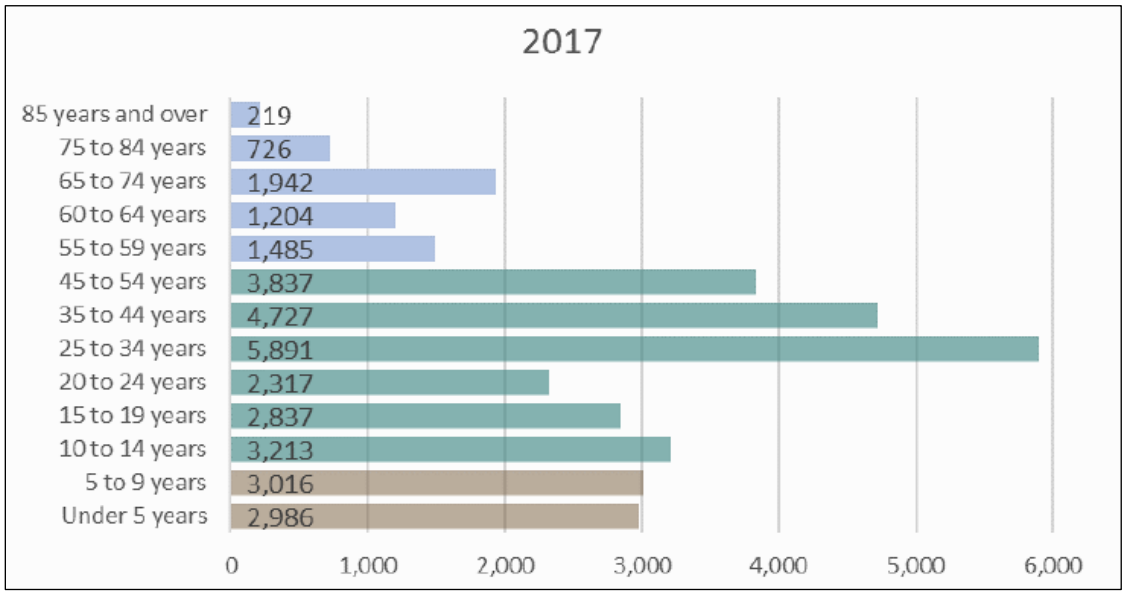
10. U.S. Census Bureau Quick Facts, El Mirage, Arizona
11. M. Ahrens, "Home Fire Victims by Age and Gender", Quincy, MA: NFPA, 2018.
12. https://www.census.gov/quickfacts/elmiragecityarizona

- Female persons represent 49.5 percent of the population.
- There are 3.35 persons per household in El Mirage.
- The median household income in 2019 dollars is $58,216.
- Persons living in poverty make up 15.3 percent of the population.
- Black or African-American alone represents the 9.6 percent of the population. The remaining percentage of population by race includes White alone at 74.8 percent, American Indian or Alaska Native alone at 1.1 percent, Asian alone at 1.7 percent, two or more races at 4.2 percent, and Hispanic or Latino at 47.2 percent.

It is estimated he city's population will increase to 38,200 in 2040 and 41,800 in 2050. The April 2020 decennial census numbers exceeded previously projected 2020 population growth.[13]

The next figure illustrates population by age for the city, as outlined in the city's 2020 General Plan.

FIGURE 3-1: El Mirage Age Comparison (2017 data)



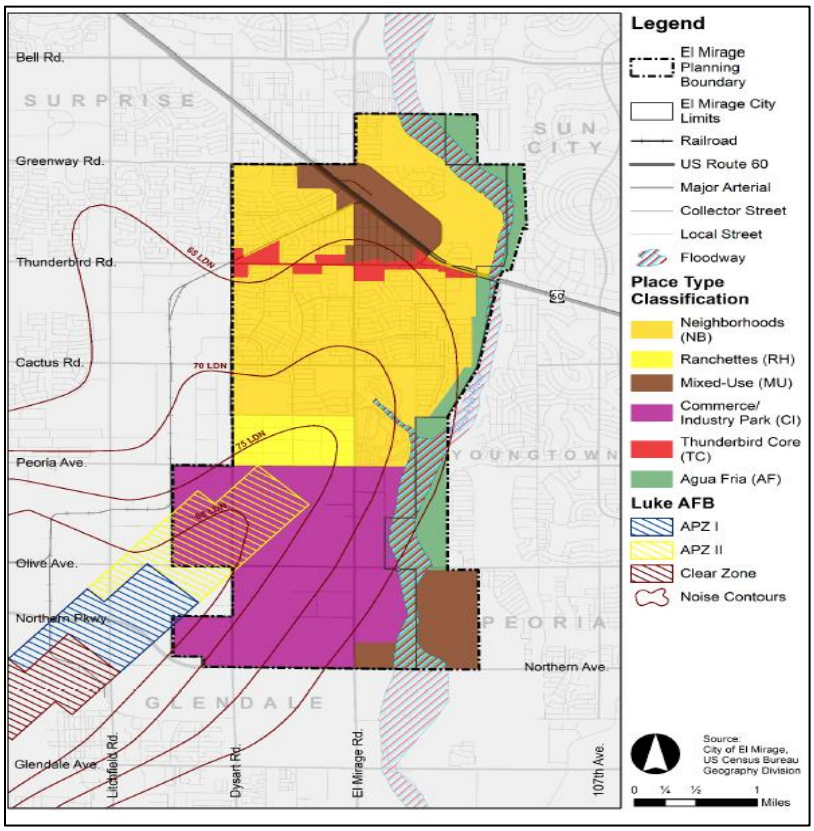
El Mirage is poised for extensive industrial growth in the southern area of the city. This growth is planned to be large footprint commercial/industrial buildings utilized for manufacturing and warehousing/distribution of goods. Further residential growth will be limited to in-fill in the area zoned for ranchettes in the west central area of the city and on the remaining acreage zoned residential in the central and northern areas of the city.

Manufacturing and warehousing growth in the southern portion of the city will pose additional fire and EMS risks to the EMFD due to the footprint size of the buildings, the height of some rooflines (fire extension potential), and an around-the-clock workforce. According to city officials, ***there is a potential for more than 20 million square feet of building footprint and a total new workforce of 10,000 employees (1,500 to 2,000 on a shift at one time) in less than ten years.***

13. 2020 El Mirage General Plan

The next two figures illustrate the projected growth in El Mirage.

FIGURE 3-2: El Mirage Future Land Use Plan



El Mirage and Automatic Aid Fire Stations

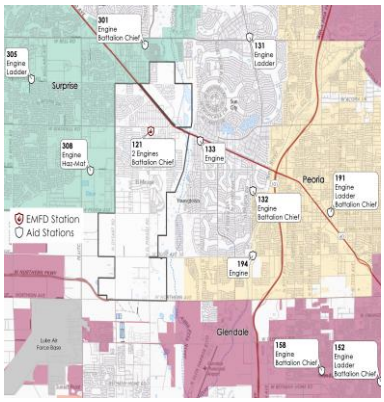


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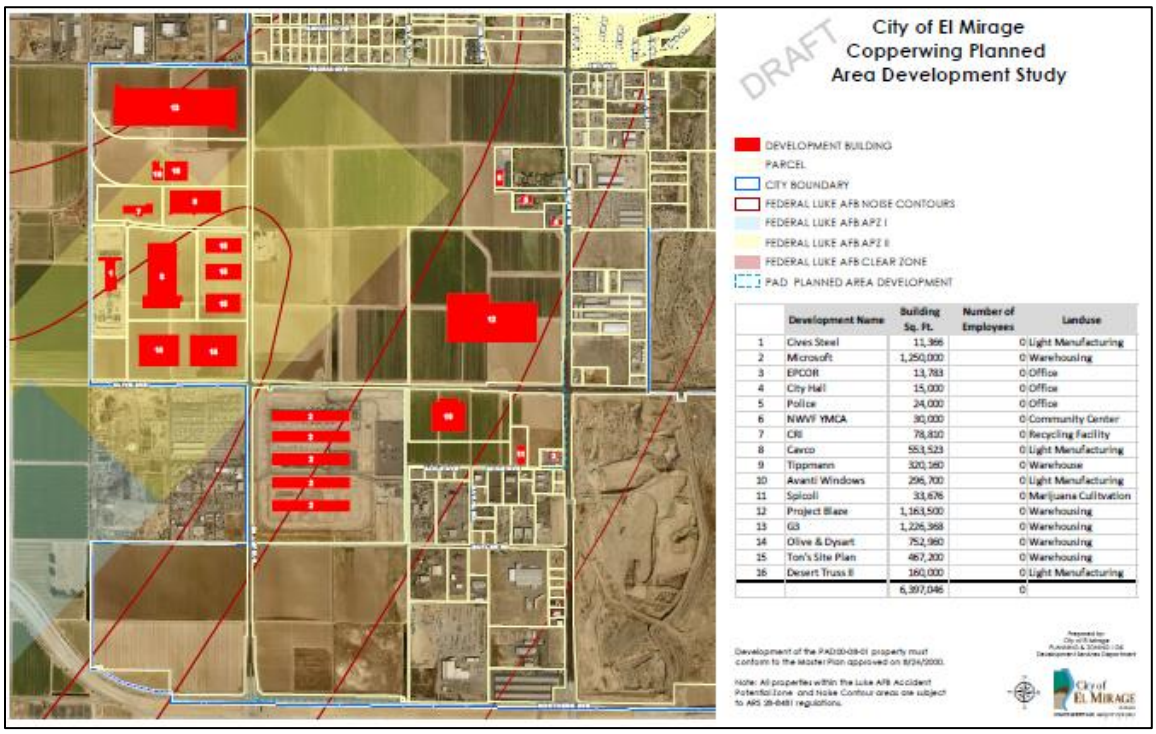
FIGURE 3-3: El Mirage Planned Future Land Use, Southern Area



	Development Name	Building Sq. Ft.	Number of Employees	Landuse
1	Cives Steel	11,366	0	Light Manufacturing
2	Microsoft	1,250,000	0	Warehousing
3	EPCOR	13,783	0	Office
4	City Hall	15,000	0	Office
5	Police	24,000	0	Office
6	NWVF YMCA	30,000	0	Community Center
7	CRI	78,810	0	Recycling Facility
8	Cavco	553,523	0	Light Manufacturing
9	Tippmann	320,160	0	Warehouse
10	Avanti Windows	296,700	0	Light Manufacturing
11	Spicoli	33,676	0	Marijuana Cultivation
12	Project Blaze	1,163,500	0	Warehousing
13	G3	1,226,368	0	Warehousing
14	Olive & Dysart	752,960	0	Warehousing
15	Ton's Site Plan	467,200	0	Warehousing
16	Desert Truss II	160,000	0	Light Manufacturing
		6,397,046	0	

ENVIRONMENTAL FACTORS

The City of El Mirage 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 Maricopa County Emergency Management Department, are:[14]

- Dust storms or haboobs, produced from thunderstorms, straight winds, or tornadoes. These storms are unpredictable and create visibility and health issues.
- Extreme heat.
- Localized flooding from heavy rains over a short period of time.
- Flash flooding from local or distant mountainous areas, with flood waters moving quickly through normally dry washes and riverbeds.
- Monsoon storms, which bring heavy rains, lightning, intense winds, and flooding.
- Wildfires in the wildland/urban interface areas.
- Drought.
- Earth fissures and landslides created by the removal or depletion of groundwater and the excessive use of surface water.
- Earthquakes. Although rare, since 1850 Arizona has experienced 20 earthquakes with magnitudes of 5.0 or higher.

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

14. Maricopa County Emergency Management

In addition to the county's environmental risk assessment, the EMFD has conducted a hazard and vulnerability study utilizing historical data of events that have occurred in the city. The EMFD utilized the Federal Emergency Management Agency (FEMA) Threat Hazard Identification and Risk Assessment (THIRA) model to complete this assessment. This modeling uses the following components, which when scored against known risks provide an environmental profile for a community. The components include: probability and magnitude of the event; expected warning time before event, expected duration of the event, and calculated risk priority index (CPRI). The scoring then determines the level of environmental risk as either Low, Medium, or High, which are further defined as:

High - 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.

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

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

TABLE 3-1: El Mirage Environmental Hazard Profile

Hazard Profile Summary for Emergency Operations Plan						
Hazard	**Probability**	**Magnitude**	**Warning Time**	**Duration**	**CPRI[15]**	**Planning Significance**
Dam Failure	2	2	4	2	2.3	***Moderate***
Earthquake	1	1	1	1	1	***Low***
Fire	4	3	4	3	3.6	***High***
Extreme Heat	4	3	1	4	3.25	***High***
Flooding/Flash Flooding/Tropical Storm	4	3	1	3	3.15	***High***
Thunderstorm/High Wind	4	3	1	4	3.25	***High***
Tornado	1	2	1	1	1.3	***Low***
Power Outage	3	3	4	2	3.05	***High***
Wildfire	2	2	3	1	2.05	***Moderate***
Subsidence	2	2	1	1	1.75	***Low***
Drought	4	3	1	4	3.25	***High***
Hazardous Materials Incident (HAZMAT)	3	2	4	2	2.75	***Moderate***
Fissure	1	1	1	2	1.1	***Low***
Landslide/Mudslide	1	1	1	1	1	***Low***
Pandemic Event	2	3	3	3	2.55	***Moderate***
Levee Failure/Breach	1	1	1	1	1	***Low***

15. Calculated Risk Priority Index, Arizona Department of Emergency Management

BUILDING AND TARGET HAZARDS

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 and then classifying 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.[16]

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

Multifamily buildings and apartments also exist in El Mirage. Typical construction includes non-fire resistive, wood frame with one-hour fire rating, and protected combustible. Some 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.

The strip mall inventory consists of non-fire resistive, fire resistive (one-hour fire rating), and protected combustible construction (one-hour fire rating). The commercial/industrial structure building inventory is ordinary (block/brick) construction, wood frame with composite siding, and masonry non-combustible.

El Mirage has the following building types:

- Single-family homes, 3,162 total (highest total building count).
- Multifamily homes (seven total with two mulitstory under construction).
- Manufactured homes (included in single-family total).
- Apartment buildings (three total with two 2-story and one 3-story).
- Professional business (more than 300 business/office occupancies in single or shared buildings).
- Commercial and industrial buildings.
- Strip malls (nine, none over one floor level).
- Assisted living/long-term care buildings/homes (multiple facilities and homes in the city).

16. Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: National Fire Protection Association, 2008), 12.

- Public education structures (4-elementary schools, 1-middle school, 1-high school).
- Public government buildings (more than one floor level and single floor level buildings).

In terms of identifying target hazards, consideration must be given to the activities that take place (public assembly, life safety vulnerability, manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped etc.), and other specific aspects related to the construction of the structure.

El Mirage has a variety of target hazards that include:

- Educational/school/public assembly target hazards (life safety).
- Mercantile/business/industrial (life safety, hazardous storage and or processes).
- Long-term and assisted care target hazards (life safety, vulnerable population).
- Government business target hazards (life safety, continuity of operations).
- Private business target hazards (life safety).

The city has a mix of low- and medium-risk structures that make up much of the target hazard risk. High-hazard building risks are noted in this section as well. These include assisted/long-term care facilities, residential structures housing a vulnerable population, public assembly structures when occupied, and those that have hazardous materials used in processes or that are stored in copious quantities.

Larger footprint buildings, as are projected to be constructed in the city, will pose additional building risks to the EMFD in terms of a large footprint; mass storage of commodities; and waterflow 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.

TRANSPORTATION FACTORS

The road network in EL Mirage is typical of cities in the region and across the country. In El Mirage this includes arterial streets, which carry high volumes of traffic (the city's 2020 General Plan also classifies these street types as major thoroughfares, Grand Ave. for example); major/minor arterials that move traffic from one end of the city to the other such as El Mirage Road; collector streets, which provide connection to arterial roads and local street networks as well as residential and commercial land uses; and local streets, which provide a direct road network to property and move traffic through neighborhoods and business communities. According to the city's 2020 General Plan, the city has 125 miles of streets.

Valley Metro (Valley Metro Regional Public Transportation Authority) operates a fixed bus route in the city along Thunderbird Road. This route has two stops on Thunderbird Road and provides service in the city Monday through Friday. Both inbound (A.M. service) and outbound (P.M. service) traverse a route along Thunderbird Road and Dysart Road in the city. One stop at

Thunderbird Road and 129th St. (Walmart) includes a park-and-ride lot. 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 tractor-trailer and other commercial vehicles traverse the roadways of El Mirage 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.

The city also makes available to the public pathways for bicycle traffic. These include designated bike lanes, sidewalks, and shared lanes. Any bike facility that shares a portion of the road or that intersects with a road poses a risk for accident.

FIGURE 3-4: Valley Metro Bus Route 571

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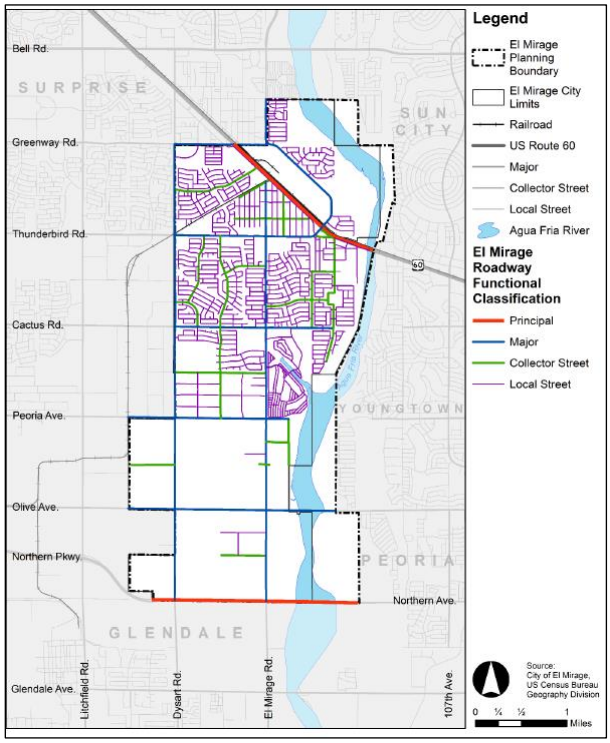
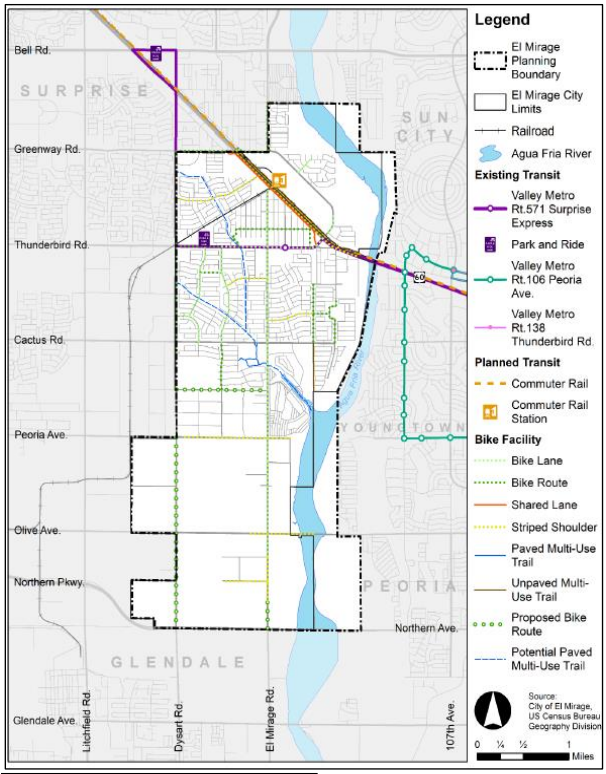
The next figures illustrate the road network and transit plan for the city.

FIGURE 3-5: El Mirage Road Network and Transportation Plan





Map Source: El Mirage 2020 General Plan

Active railroad lines are also present in the city. Burlington Northern Santa Fe (BNSF) operates the primary active rail line. Currently the main commodity that travels through El Mirage is automobiles on car carriers, which poses minimum commodity risk. There is an active rail yard in the northeast portion of the city that is used as freight car switching and storage (BNSF Automotive Facility).

Because a BNSF main line runs into and through El Mirage, other freight passes through the city on this line en route to and from Phoenix. This includes intermodal freight cars carrying various freight commodities including containerized consumer goods. While not all these commodities 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 they do exist, posing transportation accident risks.

The next figures illustrate the BNSF automotive and intermodal track maps.

FIGURE 3-6: BNSF Rail Line in El Mirage

Automotive Carriers

Intermodal Freight Carriers

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FIRE AND FIRE-RELATED RISK

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

TABLE 3-2: Fire Call Types

Call Type	Number of Calls			Calls per Day		
	2018	2019	2020	2018	2019	2020
False alarm	85	102	85	0.2	0.3	0.2
Good intent	12	19	21	0.0	0.1	0.1
Hazard	29	16	26	0.1	0.0	0.1
Outside fire	46	47	72	0.1	0.1	0.2
Public service	112	84	77	0.3	0.2	0.2
Structure fire	39	34	27	0.1	0.1	0.1
Fire Total	**323**	**302**	**308**	**0.9**	**0.8**	**0.8**

Key takeaways from the data in this table are:

- Fire calls for 2018 totaled 323. This was 8 percent of all calls, which also included EMS, canceled, and auto aid given. Fire calls averaged 0.9 calls per day.
- Fire calls for 2019 totaled 302. This was 8 percent of all calls, which also included EMS, canceled, and auto aid given. Fire calls averaged 0.8 calls per day.
- Fire calls for 2020 totaled 308. This was 7 percent of all calls, which also included EMS, canceled, and auto aid given. Fire calls averaged 0.8 calls per day.
- Fire calls decreased 7 percent from 323 in 2018 to 302 in 2019 and then remained at about the same level in 2020.
- The number of outside fire calls was nearly identical in 2018 and 2019 and then increased 53 percent from 2019 (to 72) in 2020.
- Structure fire calls decreased 13 percent from 39 in 2018 to 34 in 2019 and then decreased another 21 percent from 34 in 2019 to 27 in 2020.

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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 over the three-year study period.

TABLE 3-3: EMS Call Types

Call Type	Number of Calls			Calls per Day		
	2018	2019	2020	2018	2019	2020
Breathing difficulty	210	255	323	0.6	0.7	0.9
Cardiac and stroke	235	244	268	0.6	0.7	0.7
Fall and injury	555	463	601	1.5	1.3	1.6
Illness and other	671	718	876	1.8	2.0	2.4
MVA	154	112	143	0.4	0.3	0.4
OD	72	76	84	0.2	0.2	0.2
Seizure and UNC	271	291	297	0.7	0.8	0.8
EMS Total	**2,168**	**2,159**	**2,592**	**5.9**	**5.9**	**7.1**

Key takeaways from the data in this table are:

- EMS calls for 2018 totaled 2,168. This was 55 percent of all calls, which also included fire, canceled, and auto aid given. EMS calls averaged 5.9 calls per day.
- EMS calls for 2019 totaled 2,159. This was again 55 percent of all calls, which also included fire, canceled, and auto aid given. EMS calls averaged 5.9 calls per day.
- EMS calls for 2020 totaled 2,592. This was 57 percent of all calls, which included fire, canceled, and auto aid given. EMS calls averaged 7.1 calls per day.
- The number of EMS calls in 2018 and 2019 was about the same and then increased 20 percent from 2,159 in 2019 to 2,592 in 2020.
- Illness and other calls increased 7 percent from 671 in 2018 to 718 in 2019 and 22 percent from 718 in 2019 to 876 in 2020.

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

- 3,933 calls for service in 2018, which included 1,353 auto aid responses.
  - An average of 10.8 calls per day.
- 3,902 calls for service in 2019, which included 1,331 auto aid responses.
  - An average of 10.7 calls per day.
- 4,550 calls for service in 2020, which included 1,514 auto aid responses.
  - An average of 12.4 calls per day.

FIRE AND EMS INCIDENT DEMAND

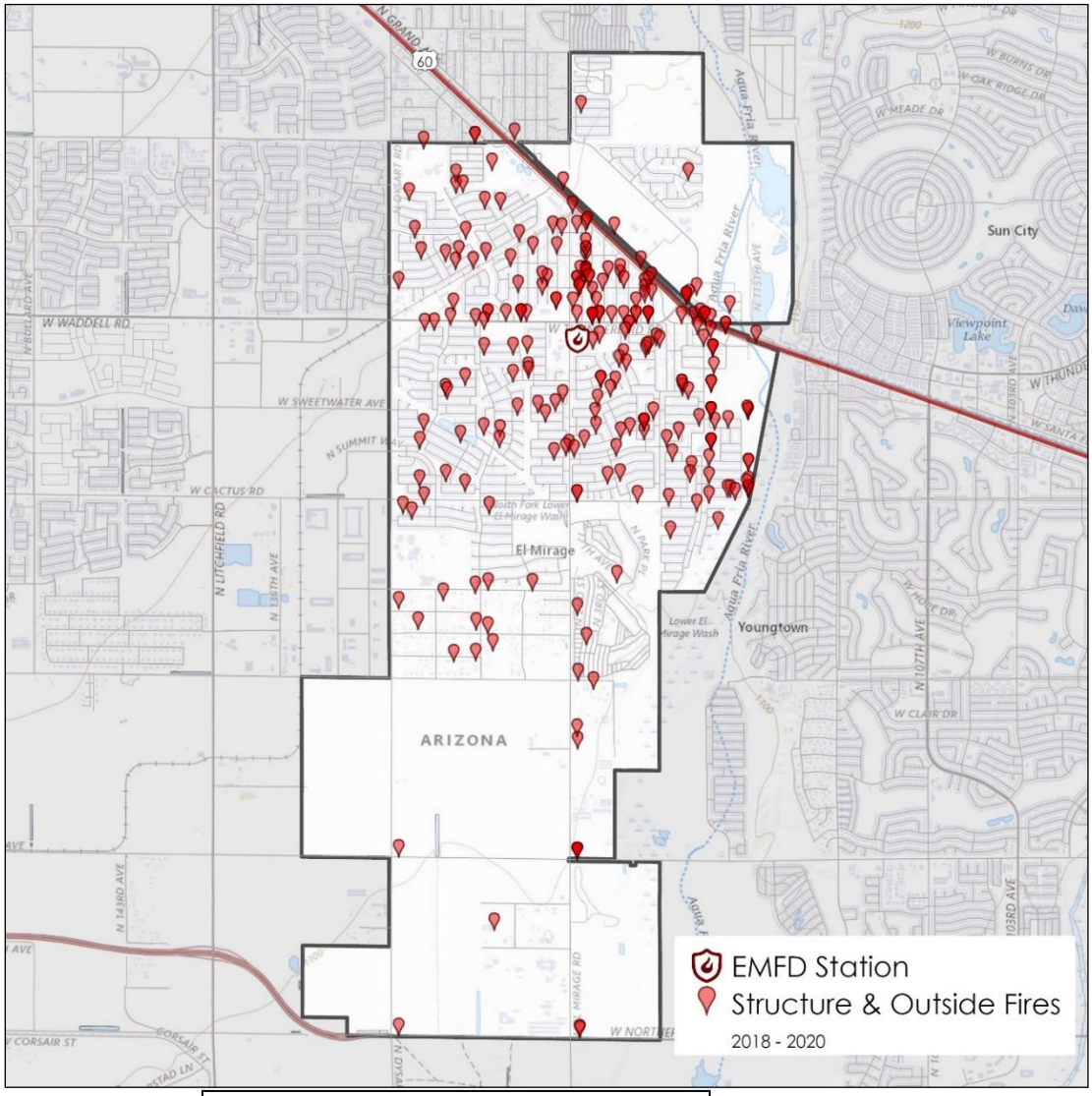
The fire and EMS risk in terms of numbers and types of incidents is important when analyzing a community's risk, as outlined above. Analyzing where the fire and EMS incidents occur, and the demand density of fire and EMS incidents, helps to determine adequate fire management zone resource assignment and deployment. **For the EMFD, the entire city serves as the fire management zone as there is but one fire station.**

The following figures illustrate fire and EMS demand in the EMFD fire management zone. These include fire incidents (structural and outside fires); other types of fire-related incidents such as good intent and public service calls, which are calls for service such as smoke scares (no fire), wires down, lock outs, water leaks, etc., false alarms (typically fire alarms); and EMS incident demand that includes all EMS incidents, breathing difficulty and cardiac related, and motor vehicle accidents. All demand maps are the aggregate of all calls in 2018 through 2020, which is the data analysis study period.

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

- Structure/outside fire-related incidents are concentrated to the north of West Cactus Rd., with the highest concentration north, east, and northeast of the fire station.
- Public Service, Good Intent and Hazard (non-fire) incidents follow the same general demand pattern as structure and outside fires, which is a concentration to the north of West Cactus Rd., with the highest concentration north, and northeast of the fire station.
- Fire/false alarm incidents are concentrated to the west of El Mirage Road between West Cactus and Greenway Roads.
- EMS incident demand is most concentrated between West Catus Rd. north to North Grand Ave., with the highest concentration along West Thunderbird Rd. and El Mirage Rd. There is also a high concentration of incidents on W. Cinnabar Ave. and El Mirage Rd.
- Motor Vehicle Accidents have a high concentration at several intersections in the south, central, and north areas of the city as illustrated in the demand map. The highest concentration is at the following intersections:
    - West Thunderbird Rd. and NW Grand Ave.
    - West Thunderbird Rd. and Dysart Rd.
    - El Mirage Rd. and West Cactus Rd.
    - N. Dysart Rd. and Olive Ave.
    - N. Dysart Rd. and West Northern Ave.
    - El Mirage Rd. and West Northern Ave.

FIGURE 3-7: Fire Incident Demand (Structure and Outside Fires), 2018–2020



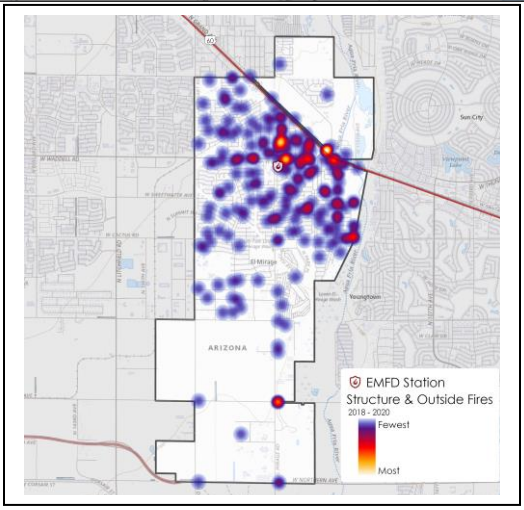
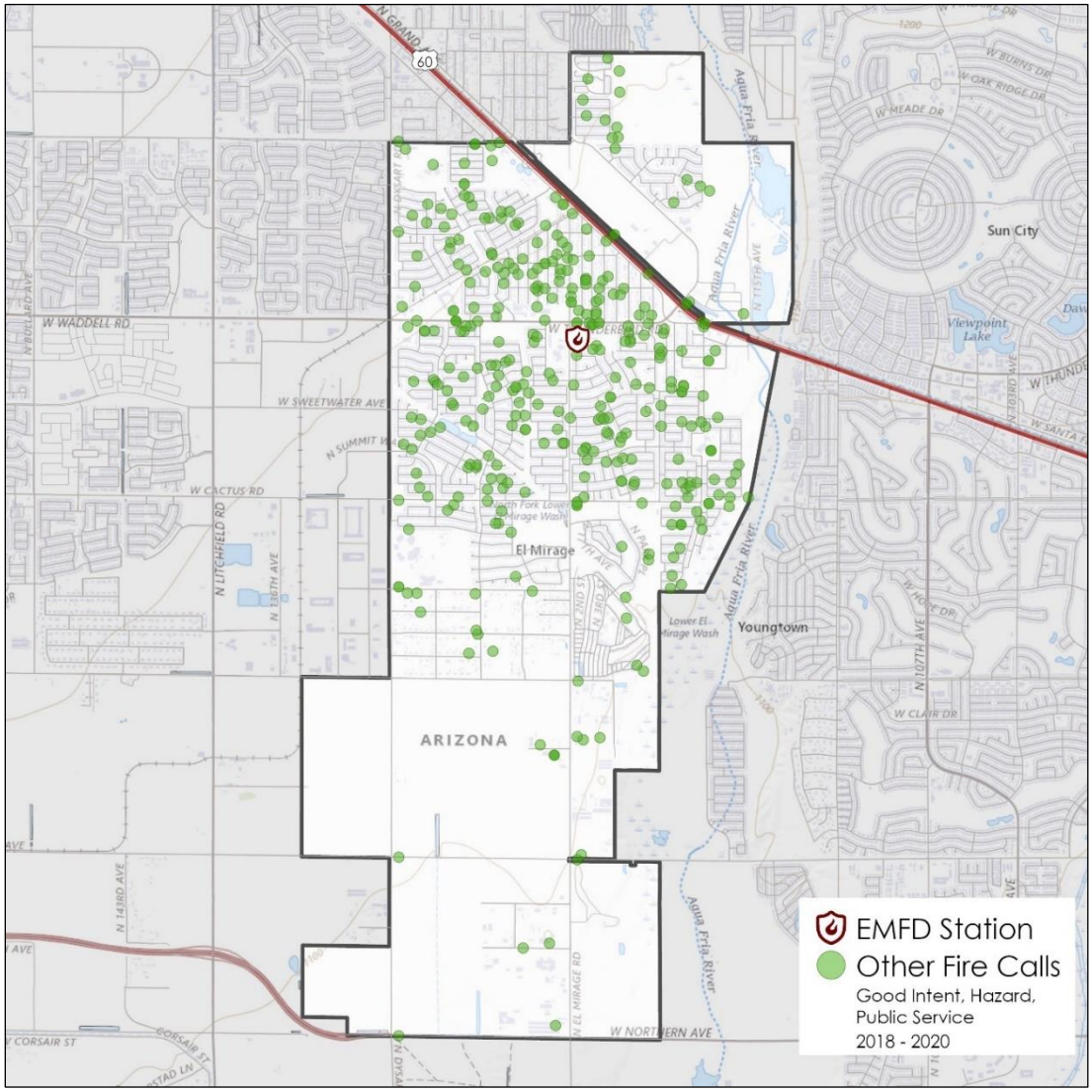


FIGURE 3-8: Public Service, Good Intent, Hazard Incident Demand, 2018–2020



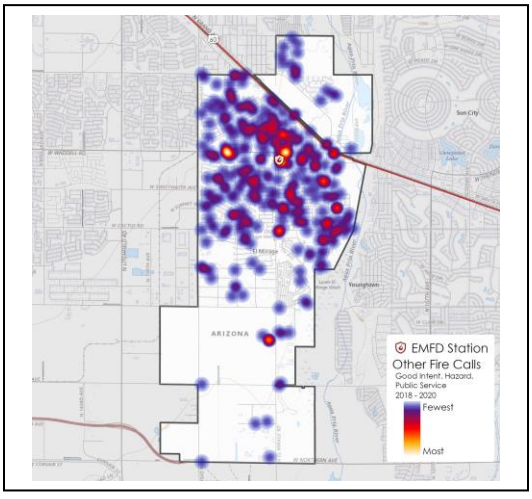
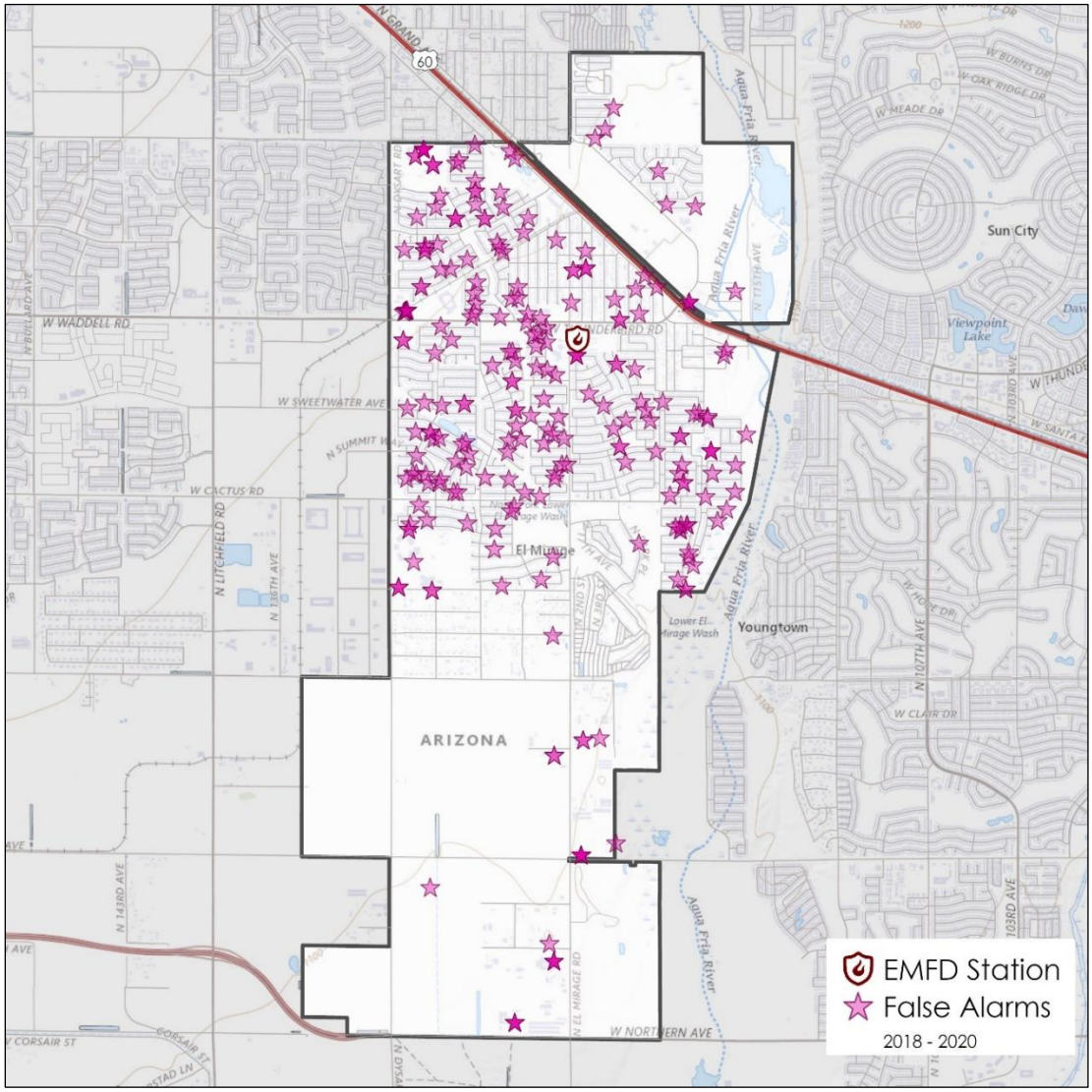


FIGURE 3-9: False Alarm Incident Demand, 2018–2020



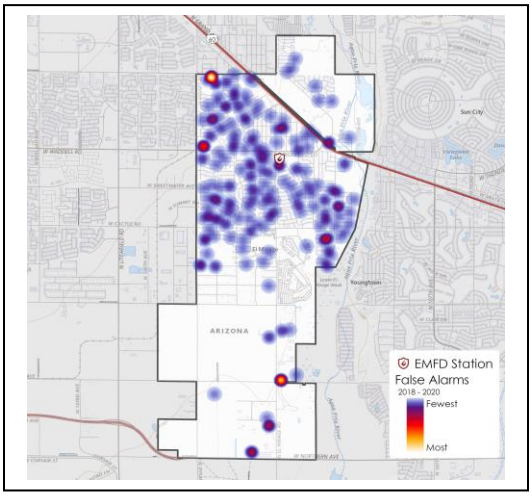
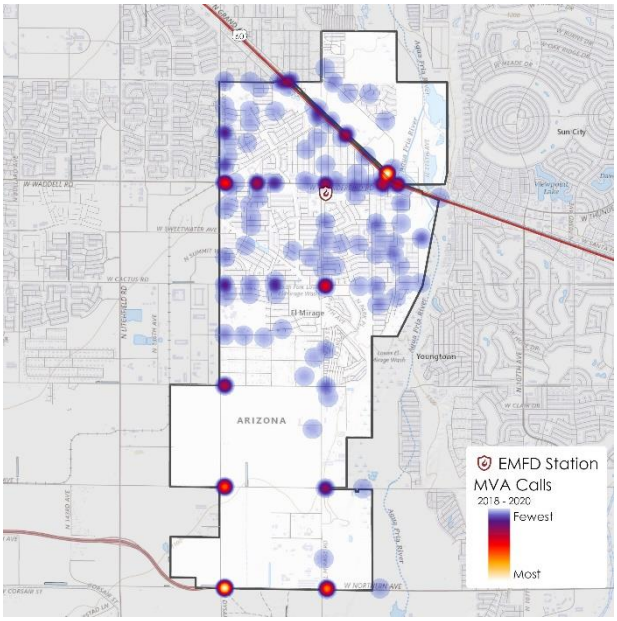
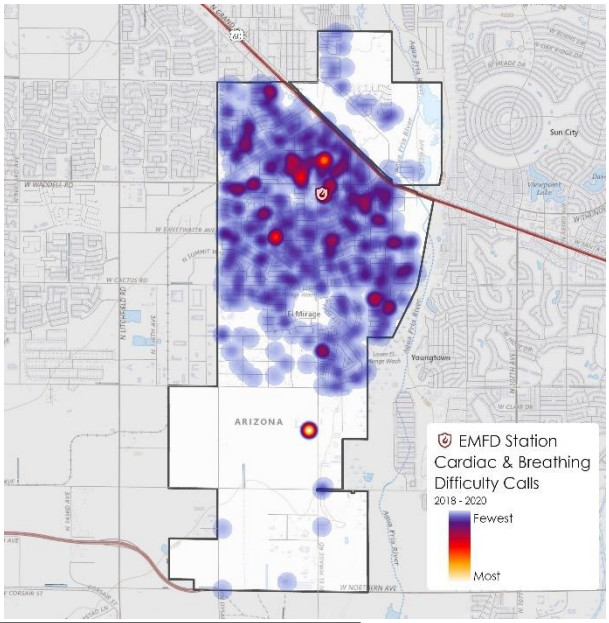


FIGURE 3-10: EMS Incident Demand, 2018–2020

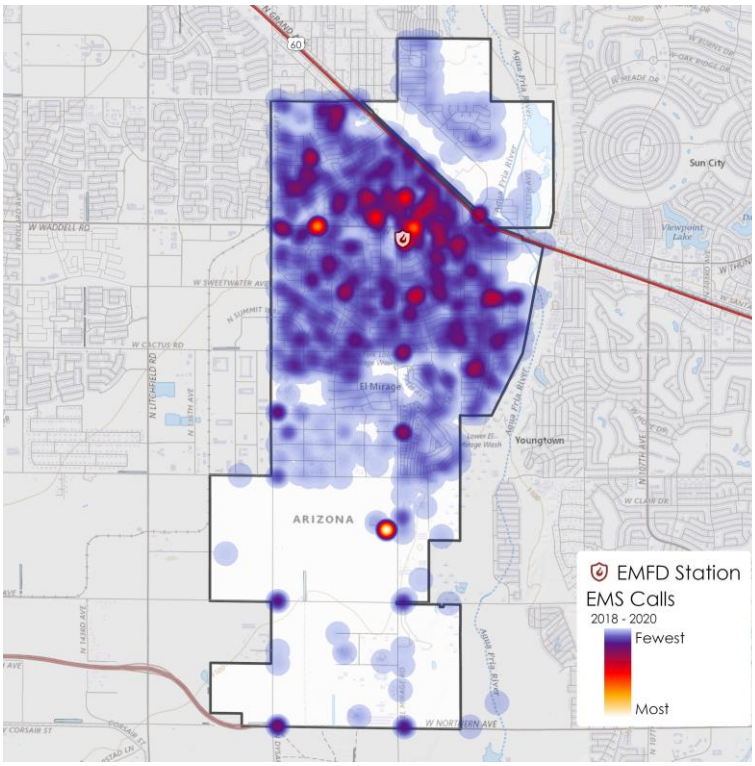
Motor Vehicle Accidents



Cardiac and Breathing Difficulty



All EMS Calls



ISO 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 the Public Protection Classification (PPC). 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 (1 to 10).

A Class 1 (highest classification/lowest numerical score) 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.[17]

The lower number indicates a more favorable rating which potentially translates into lower insurance premiums for the business owner and homeowner. Such a classification makes the community more attractive from an insurance risk perspective. How the PPC for each community affects business and homeowners can be complicated because each insurance underwriter is free to utilize the information as they deem appropriate. Overall, 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 El Mirage has an ISO rating of ***Class 02/2X, the second highest rating achievable***. This rating became effective in June 2018. The final rating included the following credit by category:

- **Emergency Communications**: 7.01 earned credit points/10.00 credit points available.
- **Fire Department**: 37.47 earned credit points/50.00 credit points available.
- **Water Supply:** 35.85 earned credit points/40.00 credit points available.
- **Community Risk Reduction** (Fire Prevention/Inspection, Public Education, and Fire Investigation activities): 4.68 earned credit points/5.50 credit points available.

Overall, the community PPC rating yielded 82.07 earned credit points/105.50 credit points available. There was a 2.94 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.**

17. El Mirage ISO PPC report; November 2019.

The following figures illustrate the dispersion of PPC ratings across the United States and in Arizona.

FIGURE 3-11: PPC Ratings in the United States[18]

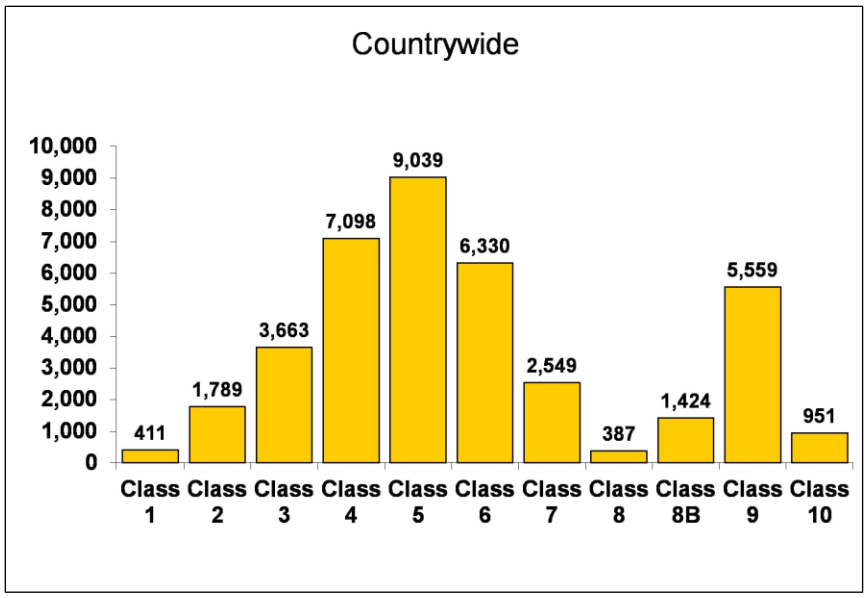
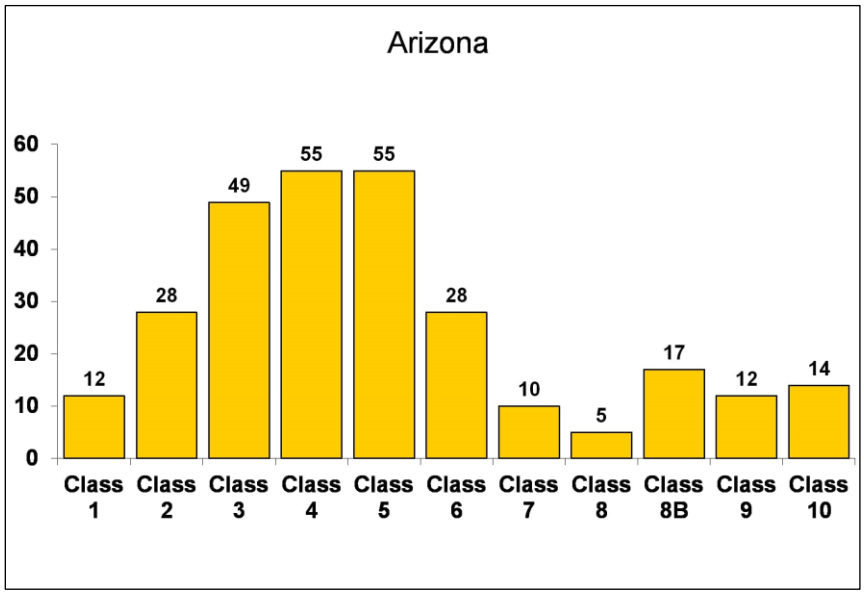


FIGURE 3-12: PPC Ratings in the United States[19]

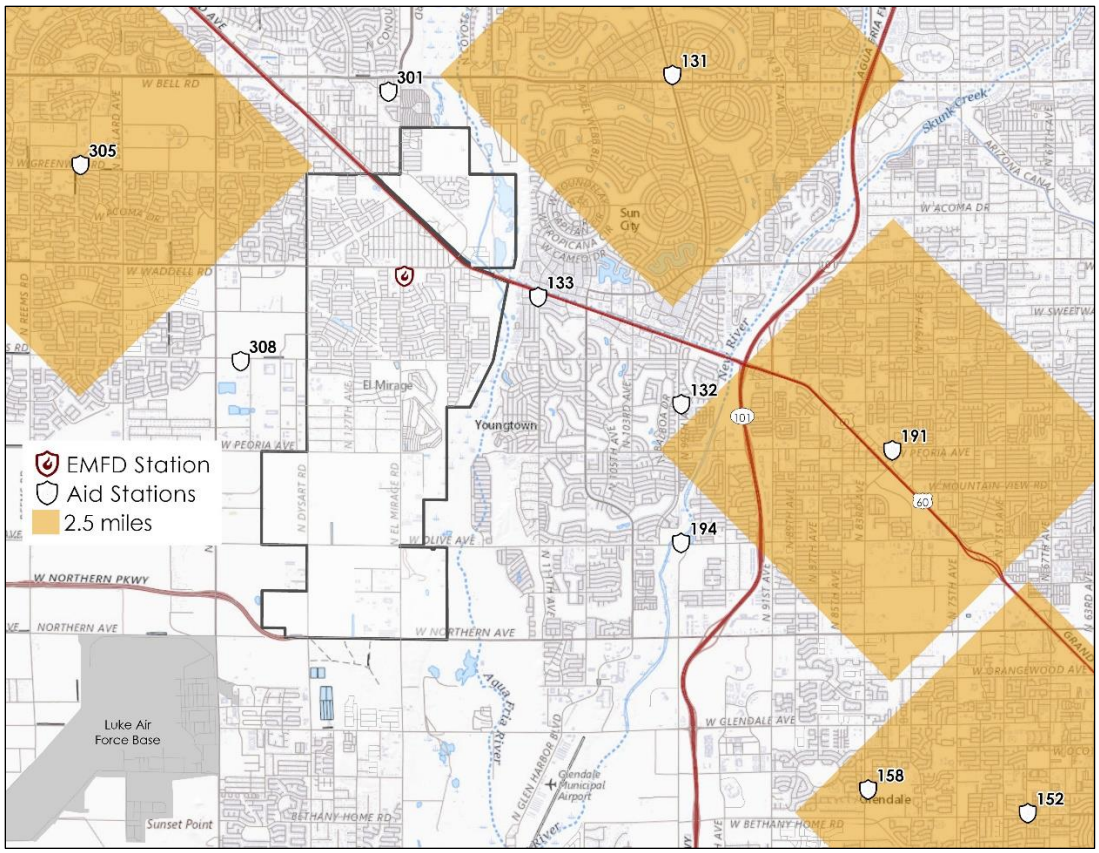


18. https://www.isomitigation.com/ppc/program-works/facts-and-figures-about-ppc-codes-around-the-country/
19. Ibid.

Areas of scoring that should be reviewed further by the city and the EMFD include:

- Emergency Communications
  - Credit for Emergency Reporting: 1.50/3.0.
    - This section contemplates the technology present in the PSAP to identify caller location [Automatic Location Identification (ALI)] when the caller is utilizing wireless and voice over internet (VoIP) communication, the computer-aided dispatch (CAD) system management system and interoperability features, and if the CAD has a fully integrated CAD/GIS management system with automatic vehicle location (AVL) integrated with a CAD system providing dispatch assignments.
- Fire Department
  - Credit of Ladder Service: 1.53/4.0
    - The ISO review recognizes one ladder company in service for the city (provided by automatic aid). According to the Fire Suppression Rating Schedule (FSRS), ladder companies are needed to provide fire suppression services to areas to meet NFPA 1710 criteria or within 2.5 miles of the number of buildings with a Needed Fire Flow over 3,500 gpm or 3 stories or more in height, or the method of operation. Automatic Aid is credited in this section. The next figure illustrates the ladder company 2.5-mile radius and response coverage in El Mirage.

FIGURE 3-13: Ladder Company Coverage in El Mirage



- Credit for Deployment Analysis: 5.03/10.0
  - 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.
- Credit for Company Personnel: 10.63/15
  - This section contemplates the average number of on-duty personnel available to respond to fire calls, and links to deployment of companies for the built-upon areas of the city (1.5 miles for engines and 2.5 miles for ladders). Automatic Aid is credited in this section. The FSRS recognizes 17.00 on-duty personnel.

- Water Supply
  - 5.40/7.0
    - This item contemplates fire hydrant inspection frequency in the city, and the completeness of the inspections, to include documentation.

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:[20]

- Public fire departments responded to 1,318,500 fires in 2018, virtually the same as the previous year.
- Every 24 seconds, a fire department in the United States responds to a fire somewhere in the nation. 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 three-year period of 2018 to 2020, the EMFD reported the community loss information in the following table as recorded from incidents to which department responded. The three-year trend of property loss and content loss is broken out by EMFD response protocols, namely single engine response, and three engines/one ladder response, which are the typical responses for

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

structural fires per the regional auto aid guidelines. Overall, the losses are shown in the table are moderate.

TABLE 3-4: Content and Property Loss, Structure and Outside Fires, 2018–2020

Response Type	Call Type	Property Loss			Content Loss		
		2018	2019	2020	2018	2019	2020
1 Engine	Outside fire	$54,500	$11,000	$54,088	$2,000	$1,700	$5,000
	Structure fire	0	$500	0	0	0	0
3-1 Assignment	Outside fire	$94,000	0	8,000	$70,500	0	1,000
	Structure fire	$372,125	$128,795	$435,638	$33,850	$103,700	$222,766
Other	Outside fire	0	0	0	0	0	0
	Structure fire	0	$610,000	0	$100	$77,000	0
Total		**$520,625**	**$750,295**	**$497,726**	**$106,450**	**$182,400**	**$228,766**

AUTOMATIC AID

The EMFD is a member of the robust *Regional Metropolitan Phoenix Fire Service Automatic Aid System*. In this system, the Phoenix Fire Department Regional Dispatch Center provides fire and emergency medical dispatching services for twenty-six agencies covering 2,000 square miles of service area.[21] The Phoenix Fire Department is the lead agency in this system and develops operational and staffing guidelines with member agency input.

An example of automatic aid in El Mirage would include engines and ladder companies and a Battalion Chief from surrounding jurisdictions to fill out the response matrix for a structural fire in a single-family dwelling is as follows:

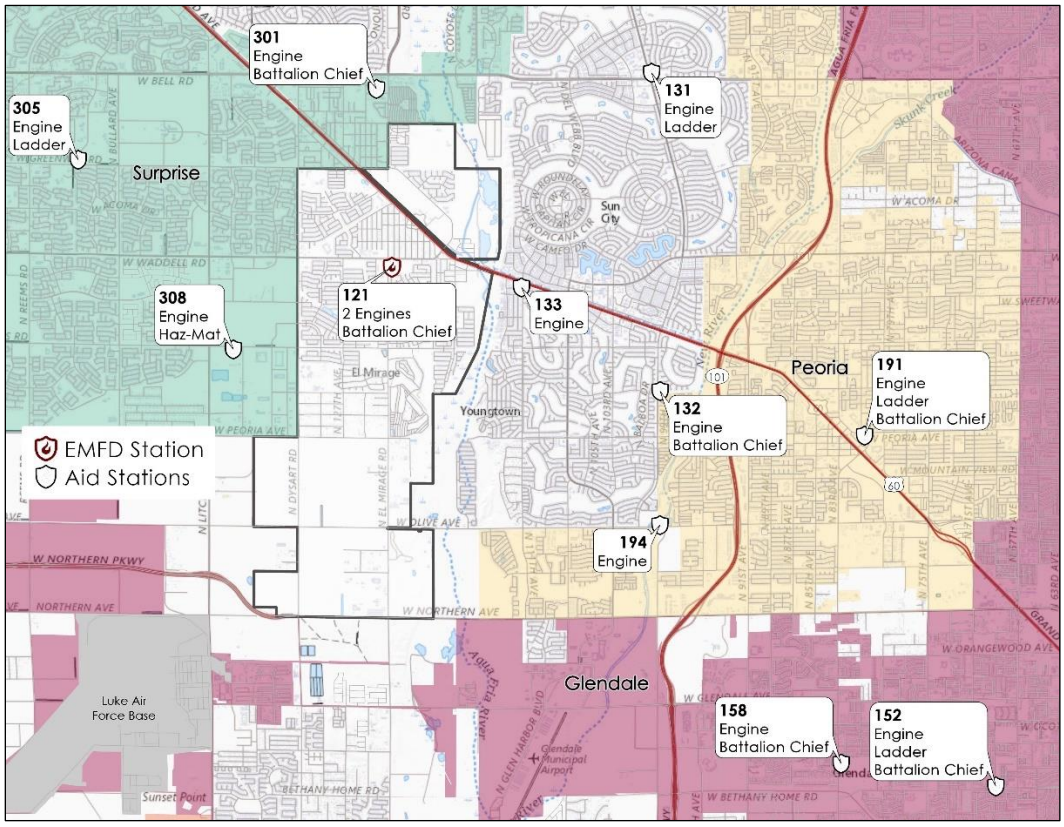
- Initial dispatch 3-1 assignment.
  - Three engines.
    - El Mirage has two engines in service; one engine from neighboring jurisdiction will respond.
  - One ladder truck.
    - El Mirage has no ladder truck; one ladder from neighboring jurisdiction will respond.
  - Two Battalion Chiefs.
  - El Mirage has one Battalion Chief in service; one Battalion Chief from neighboring jurisdiction will respond.

    Note: The EMFD Battalion Chief is not staffed on a consistent basis due to daily staffing. Additionally, the EMFD Battalion Chief is not dispatched as a standalone Incident Commander on fire calls due to the absence of a responding Safety Officer. This affects the number of units dispatched as the EMFD Battalion Chief unit is not counted in the overall response by the Computer Aided Dispatch (CAD) system.

  The next figure illustrates stations and units most likely to respond into El Mirage on an automatic aid assignment.

21. Fire Regional Dispatch Center (phoenix.gov)

FIGURE 3-14: El Mirage Automatic Aid Companies Most Likely to Respond



The next figure illustrates 240 seconds response capability of automatic aid units responding into El Mirage as a first arriving engine company (NFPA 1710 Standard). Coverage as benchmarked against the NFPA 1710 standard is contained to the northeast and northeast portion of the city. This matters if both EMFD units are committed to calls or are delayed in response. Stations 301, 308, and 133 also assist in covering gaps that EMFD Station 121 cannot meet regarding the 240 seconds response time (NFPA standard).

Figure 3-16 illustrates automatic aid coverage at the 360 second benchmark. This benchmark is the stated time in NFPA 1710 for the second due fire unit (engine or ladder) to arrive on scene. The EMFD deploys two engines from one station. If one EMFD engine is committed on a call, automatic aid companies will count towards this standard. Analysis of this figure shows the majority of the built-upon area of the city is covered at the 360 second benchmark.

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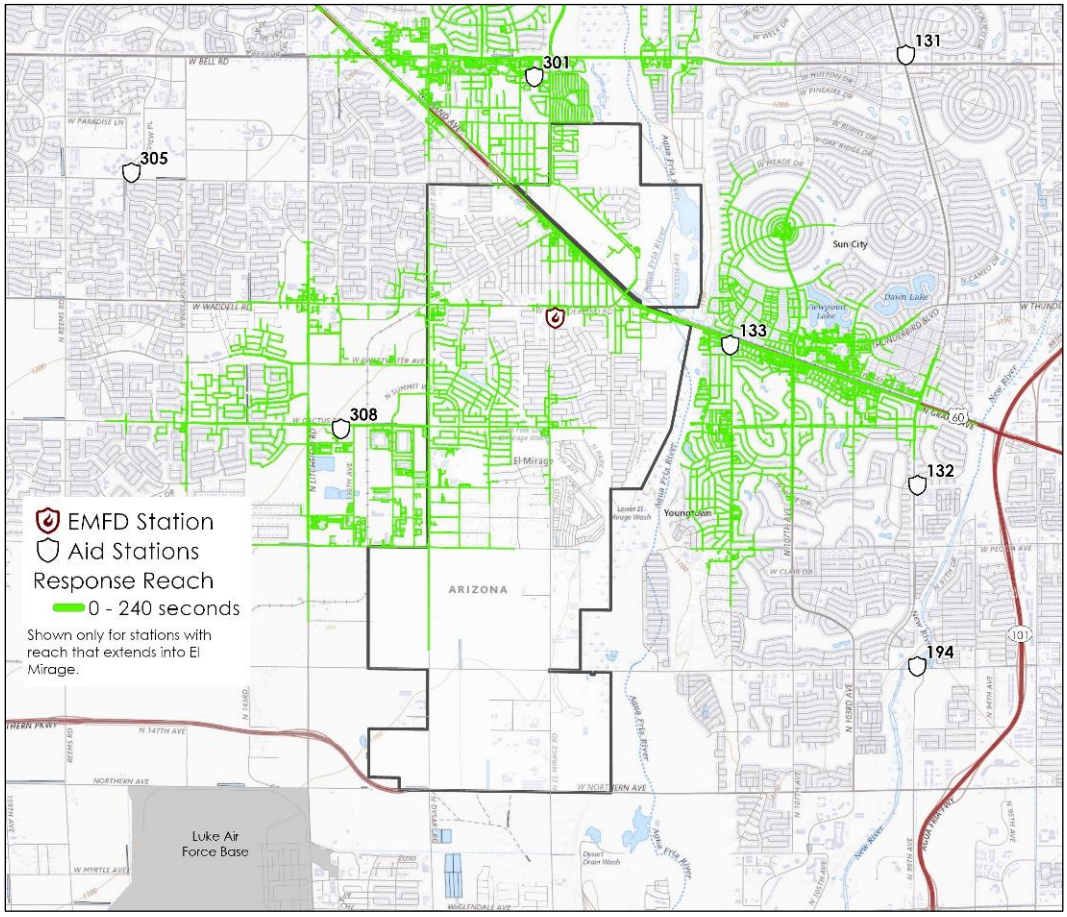
FIGURE 3-15: Automatic Aid Companies Benchmarked at 240 Seconds



EMFD Station
240 Second Coverage

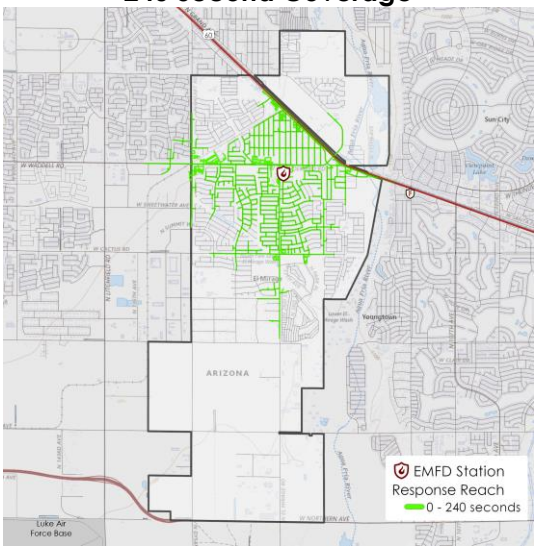
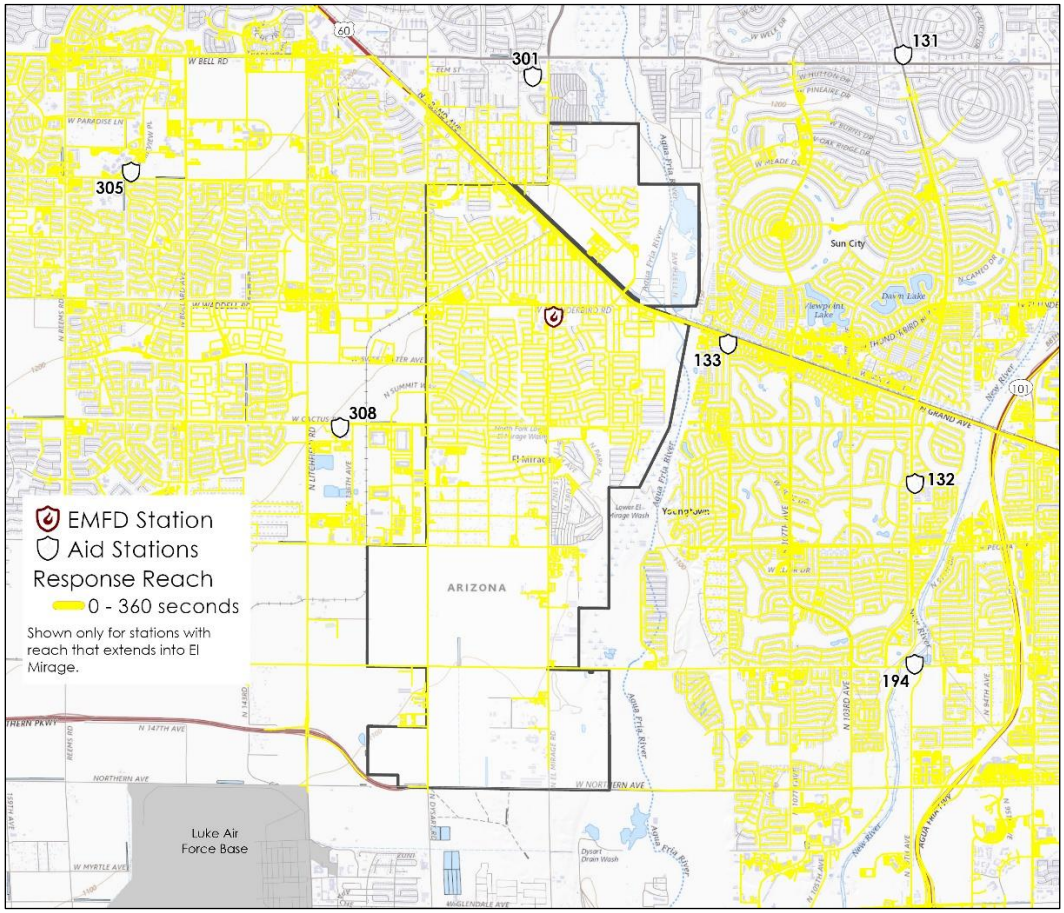
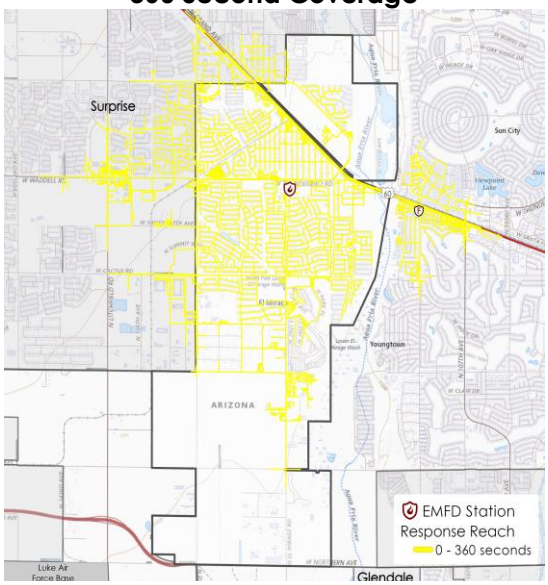


FIGURE 3-16: Automatic Aid Companies Benchmarked at 360 Seconds

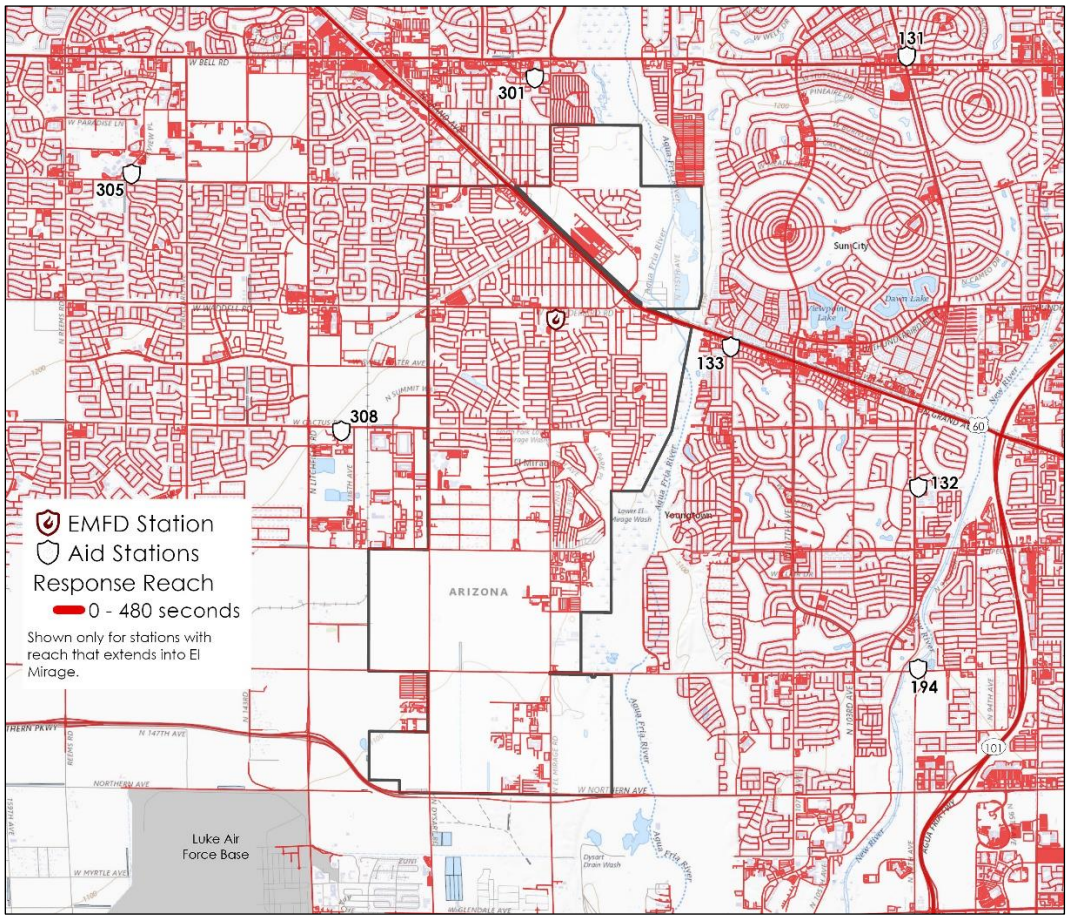


EMFD Station
360 Second Coverage



The next figure illustrates automatic aid coverage at the 480 second benchmark. This benchmark is the stated time in NFPA 1710 for the deployment of a first alarm assignment at a fire incident (low/medium hazards). Analysis of this figure shows the city is covered by EMFD and automatic aid stations at the 480 second benchmark.

FIGURE 3-17: Automatic Aid Companies Benchmarked at 480 Seconds



The next two tables show the total responses that EL Mirage provided to auto aid communities and the total responses of auto aid communities into El Mirage.

TABLE 3-5: EMFD Responses to Location Outside El Mirage, by Jurisdiction

Location	Total Annual Calls			Total Annual Hours		
	2018	2019	2020	2018	2019	2020
Surprise	693	680	764	284.1	319.3	399.6
Sun City	382	384	405	125.4	142.2	128.9
Youngtown	207	195	241	87.3	89.3	95.1
Peoria	29	34	39	8.4	7.9	16.5
Glendale	20	13	25	10.0	9.4	19.4
Other	22	25	40	20.0	17.6	55.8
Total	**1,353**	**1,331**	**1,514**	**535.2**	**585.7**	**715.3**

TABLE 3-6: Auto Aid by Agency Responses into El Mirage

Agency	Unit	Unit Type	Total Runs			Total Hours		
			2018	2019	2020	2018	2019	2020
SUR	BC301	BC	39	33	37	13.2	20.2	16.8
	E301	Engine	359	297	273	136.2	108.2	116.4
	E305	Engine	23	11	2	7.7	4.7	0.8
	L305	Aerial truck	35	44	26	4.3	6.9	3.4
	LT305	Ladder tender	68	72	55	25.4	29.2	20.0
	Other	Other	130	135	66	72.8	94.3	50.6
	Total		**654**	**592**	**477**	**259.7**	**263.4**	**216.3**
SUN	BC131	BC	9	5	9	4.6	5.6	1.4
	E131	Engine	6	6	NA	1.4	5.8	NA
	E132	Engine	55	30	17	19.5	12.6	7.8
	E133	Engine	328	329	186	122.2	121.9	69.3
	L131	Aerial truck	7	12	17	1.5	7.4	4.6
	LT131	Ladder tender	10	7	11	3.3	0.8	1.5
	Other	Other	1	3	4	0.7	2.7	0.7
	Total		**416**	**392**	**244**	**153.2**	**156.7**	**85.2**
GLN	BC152	BC	6	2	7	1.6	0.3	3.5
	E158	Engine	0	2	1	0.0	0.5	0.0
	Other	Other	41	55	30	27.2	42.5	19.2
	Total		**47**	**59**	**38**	**28.8**	**43.4**	**22.7**
PEO	BC191	BC	7	5	4	1.5	2.6	2.3
	E191	Engine	1	5	1	0.3	2.5	0.3
	E194	Engine	36	33	22	13.3	16.7	10.5
	L191	Aerial truck	7	6	4	2.8	1.1	1.4
	LT191	Ladder tender	7	7	4	0.7	1.3	0.0
	Other	Other	16	16	12	3.5	12.1	4.3
	Total		**74**	**72**	**47**	**22.2**	**36.3**	**18.8**
NCO	**Total**		**65**	**62**	**71**	**14.4**	**32.7**	**25.9**
LAB	**Total**		**73**	**101**	**68**	**18.5**	**23.1**	**23.0**
PHX	**Total**		**29**	**32**	**35**	**4.9**	**10.3**	**11.9**
AVO	**Total**		**14**	**13**	**15**	**5.1**	**3.2**	**4.2**
GDY	**Total**		**8**	**3**	**7**	**2.9**	**2.4**	**3.6**
RMF	**Total**		**7**	**4**	**9**	**5.7**	**2.0**	**2.3**
Total			**1,387**	**1,330**	**1,011**	**515.2**	**573.5**	**413.9**

Key takeaways from the auto aid response data tells us:

- In 2018 and 2019, the EMFD gave and received about the same amount of aid. In 2020 the EMFD responded outside of the city 503 times more than it received aid.
- Surpirise and Sun City received the most aid from EMFD and they provided the most aid to El Mirage.
- Surprise, Sun City, and Peoria provided ladder company service to El Mirage.

RESILIENCY

Resiliency as defined by the Center for Public Safety Excellence (CPSE) in the Fire and Emergency Service Self-Assessment Manual (FESSAM), 9th 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 EMFD through staffing and response protocol, and with EMFD 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 EMFD and through regional auto aid resources.

Restoration is managed by EMFD unit availability as simultaneous calls occur, the availability of regional auto aid resources, recall of staff to staff fire units during campaign events when warranted, and efficient work on incidents for a quick return to service.

The following tables and figure analyze EMFD resiliency. In this analysis, CPSM included all 13,663 calls that occurred inside and outside El Mirage in the three-year period. We did this because EMFD is part of the regional auto aid system, so responses outside of the city impact resiliency of the department to respond to calls inside of the city.

For the total calls in the three-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 2018 and 2019 and 8,784 hours in 2020 (leap year).

TABLE 3-7: Call Workload by EMFD Unit

Unit	Unit Type	Total Hours			Total Runs		
		2018	2019	2020	2018	2019	2020
BC121	BC	153.9	144.8	123.6	364	251	237
BR121	Brush Truck	23.1	21.7	73.9	21	22	95
E121	Engine	1,251.8	1,357.0	1,242.8	3,191	2,924	2,601
E122	Engine	5.3	246.7	836.7	18	542	1,776
LA121	Low acuity	373.1	263.0	169.7	860	537	269
Other	Other	14.4	29.3	45.4	26	26	31
Total		**1,821.7**	**2,062.4**	**2,492.1**	**4,480**	**4,302**	**5,009**

TABLE 3-8: Trend of Frequency of Overlapping Calls

Scenario	Number of Calls			Percent of All Calls		
	2018	2019	2020	2018	2019	2020
No overlap	3,372	3,064	3,297	76.9	70.1	67.2
Overlap with one call	878	1,049	1,340	20.0	24.0	27.3
Overlap with two calls	125	220	248	2.8	5.0	5.1
Overlap with three calls	9	39	18	0.2	0.9	0.4
Overlap with four calls	2	1	1	0.0	0.0	0.0

TABLE 3-9: Trend of Frequency Distribution of the Number of Calls

Calls in an Hour	2018		2019		2020	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0	5,373	61.3	5,423	61.9	5,143	58.5
1	2,569	29.3	2,475	28.3	2,613	29.7
2	660	7.5	721	8.2	828	9.4
3	135	1.5	114	1.3	168	1.9
4+	23	0.3	27	0.3	32	0.4
Total	**8,760**	**100.0**	**8,760**	**100.0**	**8,784**	**100.0**

TABLE 3-10: Station Availability to Respond to Calls

Year	Calls in District	EMFD Responded	Percent Responded	EMFD Arrived	Percent Arrived	EMFD First	Percent First
2018	2,968	2,527	85.1	2,511	84.6	2,405	81.0
2019	2,957	2,508	84.8	2,491	84.2	2,229	75.4
2020	3,316	2,975	89.7	2,966	89.4	2,843	85.7
3-Year Average	**9,241**	**8,010**	**86.7**	**7,968**	**86.2**	**7,447**	**80.9**

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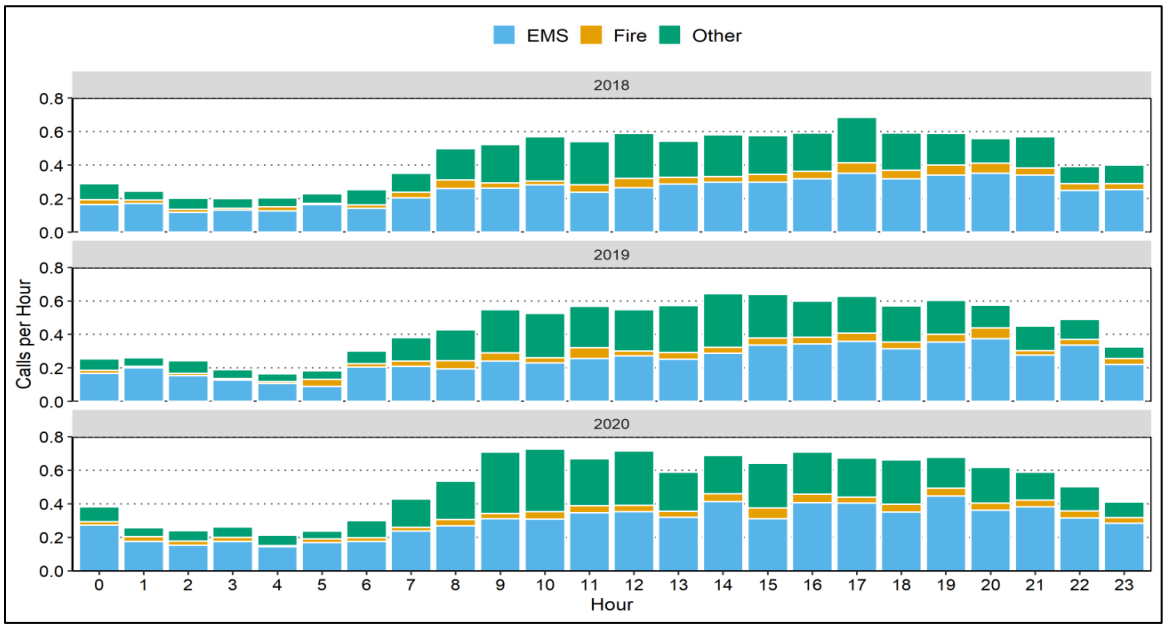
FIGURE 3-18: Calls by Hour of Day



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

- The peak call time is consistently between 8:00 am and 9:00 p.m./10:00 p.m.
- In 2018, during 23 hours (0.3 percent of all hours), four or more calls occurred; in other words, along with auto aid departments, EMFD responded to four or more calls in an hour roughly once every 16 days.

  The highest number of calls to occur in an hour was four, which happened 23 times.

- In 2019, during 27 hours (0.3 percent of all hours), four or more calls occurred; in other words, along with auto aid departments, EMFD responded to four or more calls in an hour roughly once every 14 days.

  The highest number of calls to occur in an hour was six, which happened once.

- In 2020, during 32 hours (0.4 percent of all hours), four or more calls occurred; in other words, along with auto aid departments, EMFD responded to four or more calls in an hour roughly once every 11 days.

  The highest number of calls to occur in an hour was five, which happened 3 times.

- During the three-year period, the availability of EMFD to respond to calls in its fire district was highest in 2020, and lowest in 2019.
  - In 2020, the percent EMFD was available to respond to calls in the city was 89.7 percent; it arrived in the city on a call 89.4 percent of the time and arrived first to calls in the city 85.7 percent of the time.
  - In 2019, the percent EMFD was available to respond to calls in the city was 84.8 percent; it arrived in the city on a call 84.2 percent of the time and arrived first to calls in the city 75.4 percent of the time.

- In 2018, the percent EMFD was available to respond to calls in the city was 85.1 percent; it arrived in the city on a call 84.6 percent of the time and arrived first to calls in the city 81 percent of the time.

Over the three-year incident analysis period, 41 percent of the time there are overlapping calls for service in the city. On average, 87 percent of the time, a first due EMFD unit was available to respond to a call in its first due fire management zone and arrived first 81 percent of the time.

Because the EMFD participates in a regional auto aid agreement and should continue to do so because of the resources available to the city through this agreement, there are cases where auto aid companies may arrive first, depending on the location of these resources to the call, and the location of the EMFD units. There are cases also where a single EMFD engine is on a call and the second EMFD engine is available to respond and does. There are also cases where one or more EMFD engines are out of the city on auto aid calls and another call comes in for El Mirage, and an auto aid unit or units respond. This is the advantage of the Phoenix Regional Automatic Aid System, which is ***a national best practice.***

FIGURE 3-19: EMFD Low Acutiy Response Unit

Another resiliency element the EMFD has built in is the implementation of a Low Acuity Response Unit (LA121). This unit (Figure 3-19) responds to low acuity EMS calls for service, which account for a sizable percentage of EMS calls to which the EMFD responds in the city.

EMFD's low acuity unit LA121 responded to 860 calls in 2018, 537 calls in 2019, and 269 calls in 2020. LA121 responded with one EMFD engine on 149 of 860 calls in 2018, 75 of 537 calls in 2019, and 30 of 269 calls in 2020. LA121 did respond to fire incidents as well, when available, as added staffing to assist in the assembling of an Effective Response Force.

LA121 was staffed with one Paramedic and one EMT when in service in 2018, 2019, and 2020. In 2019, the EMFD placed Engine 122 in service, creating the dual engine response metric now in place. When Engine 122 went into service, LA121 was taken out of service on a full-time basis and the full-time staffing was transferred to Engine 122. LA121 was then staffed only when Engine 122 staffing dropped below the required four persons. This action can be seen in Table 3-7 with the decreasing number of calls LA121 responded to in 2019 (537) and 2020 (269) as compared to 2018 (860). Going forward in 2022, the city is dedicating American Rescue Plan Act (ARPA) funds to staff the unit on a part-time basis.

Unit LA121 made the second most runs and had the second-highest total annual deployed hours in 2018, the third most runs and the second-highest total annual deployed hours in 2019, and then the third most runs and the third-highest total annual deployed hours in 2020.

The EMFD has resiliency in its deployment model largely due to the robust regional automatic aid system it takes part in and with LA121 (when in service) to reduce workload on engine companies, which keeps these units available to respond to fire-related incidents within the city.

RISK CATEGORIZATION

A comprehensive risk assessment is a critical aspect of creating A Standards of Cover and can assist the EMFD 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 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 EMFD, the city, and public research, CPSM and the EMFD 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 EMFD's service area.

Risk is often categorized in three ways: consequence of the event on the community, the probability the event will occur in the community, and the impact on the fire department. The following three tables look at the probability of the event occurring (Table3-11) which ranges from unlikely to frequent; consequence to the community (Table 3-12), which is categorized as ranging from insignificant to catastrophic; and the impact to the organization (Table 3-13), which ranges from insignificant to catastrophic.

TABLE 3-11: 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 3-12: 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

TABLE 3-13: Impact on EMFD

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

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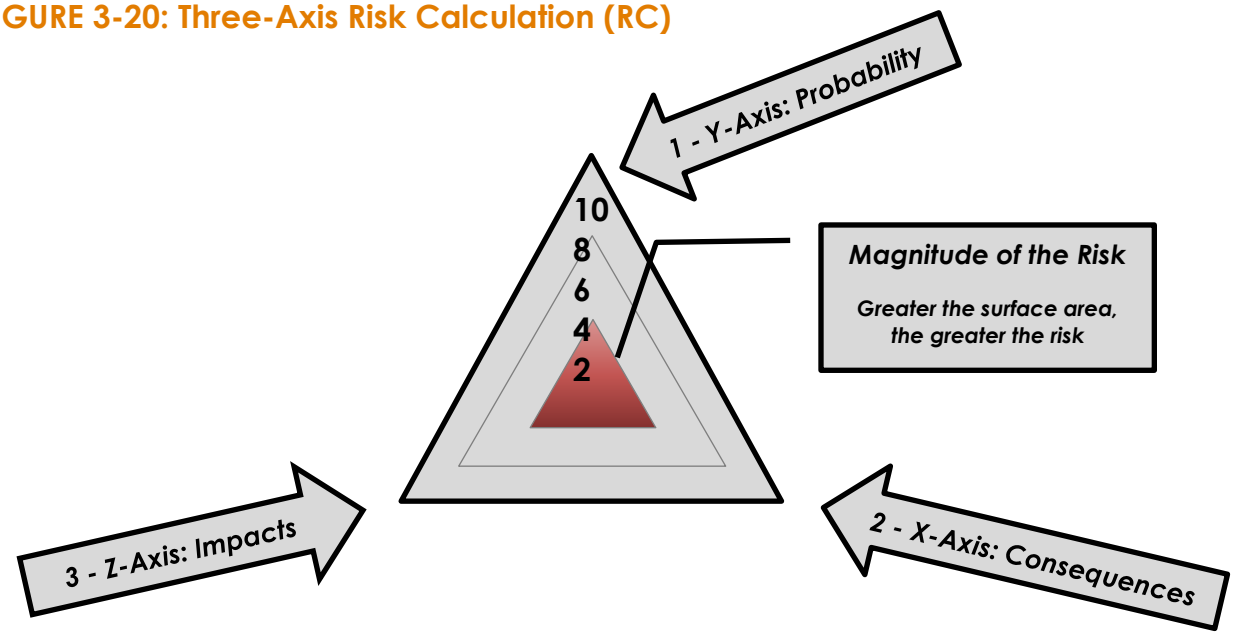
This section also contains an analysis of the various risks considered in the city. In this analysis, information presented and reviewed in this section (All-Hazards Risk Assessment of the Community) have been considered. Risk is categorized as Low, Moderate, High, or Special.

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 EMFD.

FIGURE 3-20: Three-Axis Risk Calculation (RC)



The following factors/hazards were identified and considered:

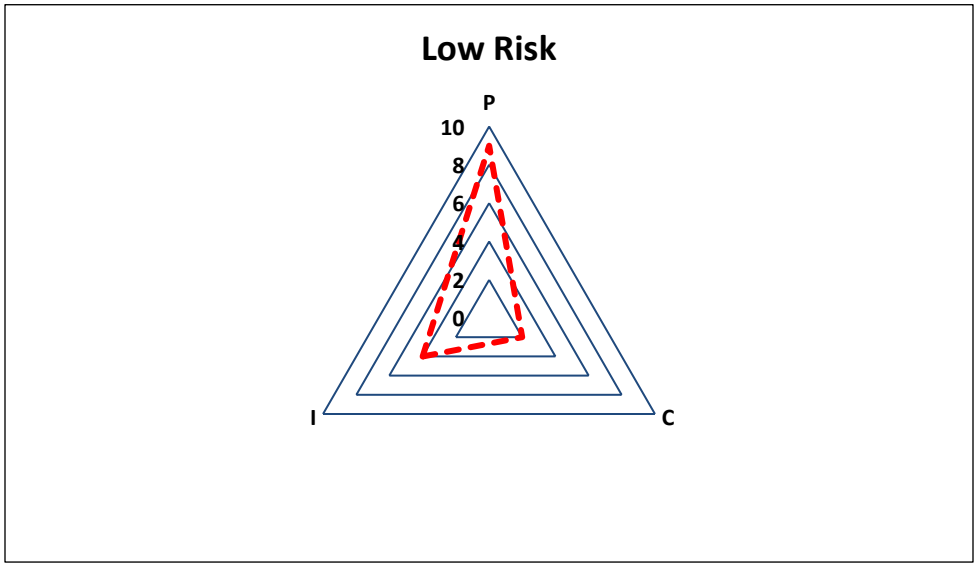
- **Demographic factors** such as age, socio-economic, vulnerability.
- **Natural hazards** such as flooding, snow and ice events, wind events, wild land fires.
- **Man-made hazards** such as rail lines, roads and intersections, target hazards.
- **Structural/building risks**.
- **Fire and EMS incident 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 EMFD's ability to deliver emergency services, which includes automatic aid capabilities as well. The list is not all inclusive but includes categories most common or that may present to the city and the EMFD.

Low Risk

- Automatic fire/false alarms.
- Low acuity BLS EMS Incidents.
- Low-risk environmental event.
- Motor vehicle accident (MVA).
- 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 3-21: Low Risk



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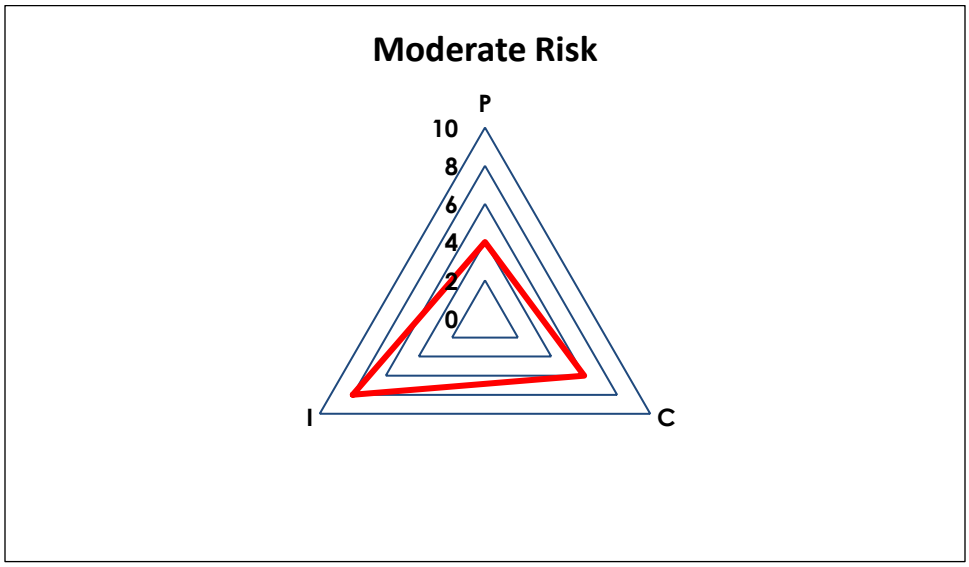
Moderate Risk

- 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.
- MVA 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 3-22: Moderate Risk



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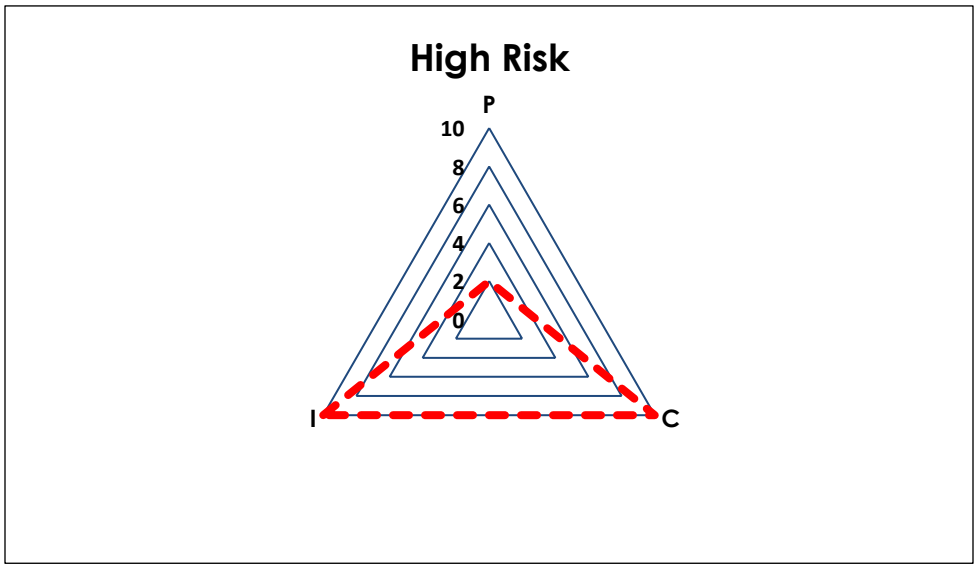
High Risk

- 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 that creates widespread flooding, heavy snow, heavy winds, building damage, and/or life-safety exposure.

FIGURE 3-23: High Risk



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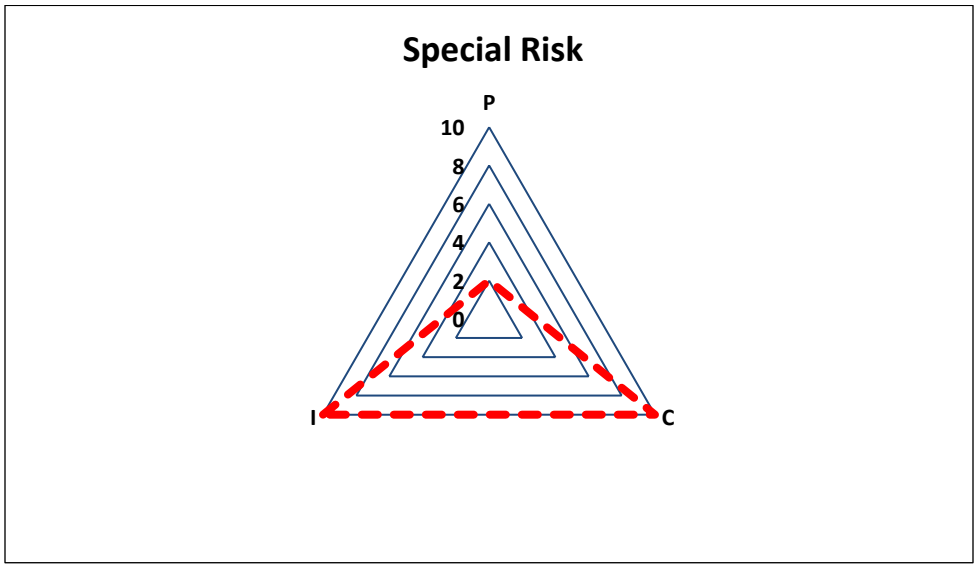
Special Risk

- 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.

FIGURE 3-24: Special Risk



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SECTION 4. STAFFING, DEPLOYMENT, AND PERFORMANCE

PRIMARY PUBLIC SAFETY ANSWERING POINT ANALYSIS

The City of El Mirage uses the Tolleson Police 911-Dispatch Center as its primary Public Safety Answering Point (PSAP) for fire and EMS calls for service. As the primary PSAP, the Tolleson 911-Dispact Center identifies the nature of the caller's situation (fire or EMS) and then transfers the caller by phone to the secondary PSAP, which is the Phoenix Fire Department Regional Dispatch Center (PFDRDC). The PFDRDC also serves as the Fire and EMS Emergency Communications Center for the EMFD.

At the PFDRDC, the call-taker receives the call by phone from Tolleson and 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 a case and sends it to a fire/EMS dispatcher (if not that position when receiving the call) for dispatching of the incident to the proper unit(s). The PFDRDC supplies continuous updates to the responding units about caller updated information, or information provided in the computer-aided dispatch (CAD) records management system.

Receiving an event from a primary PSAP through a telephone or CAD-to-CAD system is not uncommon. Transfers (PSAP-to-PSAP by telephone) do, however, have an impact on event processing times as these transfers add time to the initial reporting of the incident.

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 and 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)). Because the PFDRDC is a secondary PSAP, the event is received by phone a second time, adding time to the overall incident time measurements, and this runs the risk of a transfer/connection mishap and dropped call.

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 EMFD, this includes a primary PSAP (Tolleson) and secondary PSAP (Phoenix), 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. Included in the benchmarks are the following components:

Call answering time: The call arrives at the secondary PSAP and communications center (PFDRDC) 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.

Alarm processing time: Event processing times at the PFDRDC 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.*

NFPA 1710 identifies call arrival at the primary PSAP (Tolleson) call transfer time as well. **The standard for the Tolleson dispatch center is:**

- NFPA 1710 (4.1.2.3.1) for call answering time is ≤ 15 seconds 95 percent of the time and ≤ 40 seconds 99 percent of the time.
- NFPA 1710 Standard (4.1.2.3.2) for transferring a call from a Primary PSAP (Tolleson) to a secondary PSAP (Phoenix) is ≤ 30 seconds 95 percent of the time.

CPSM made numerous requests for transfer time data from Tolleson. CPSM requested data from Tolleson for 2018, 2019, and 2021 and received PSAP data for the period of July 11, 2019, through December 31, 2021. The next set of tables describes answering time and call transfer time for this period.

TABLE 4-1: Call Answering Time* Tolleson PSAP

Year	Percent at ≤ 15 Seconds	Percent at ≤ 40 Seconds	Call Count
2019	98.2	100.0	1,307
2020	98.9	99.9	3,475
2021	99.0	99.9	3,683
Total	**98.8**	**99.9**	**8,465**

Note: *Standard is ≤ 15 seconds 95 percent of the time and ≤ 40 seconds 99 percent of the time.

TABLE 4-2: Call Transfer Time* from Tolleson to Phoenix

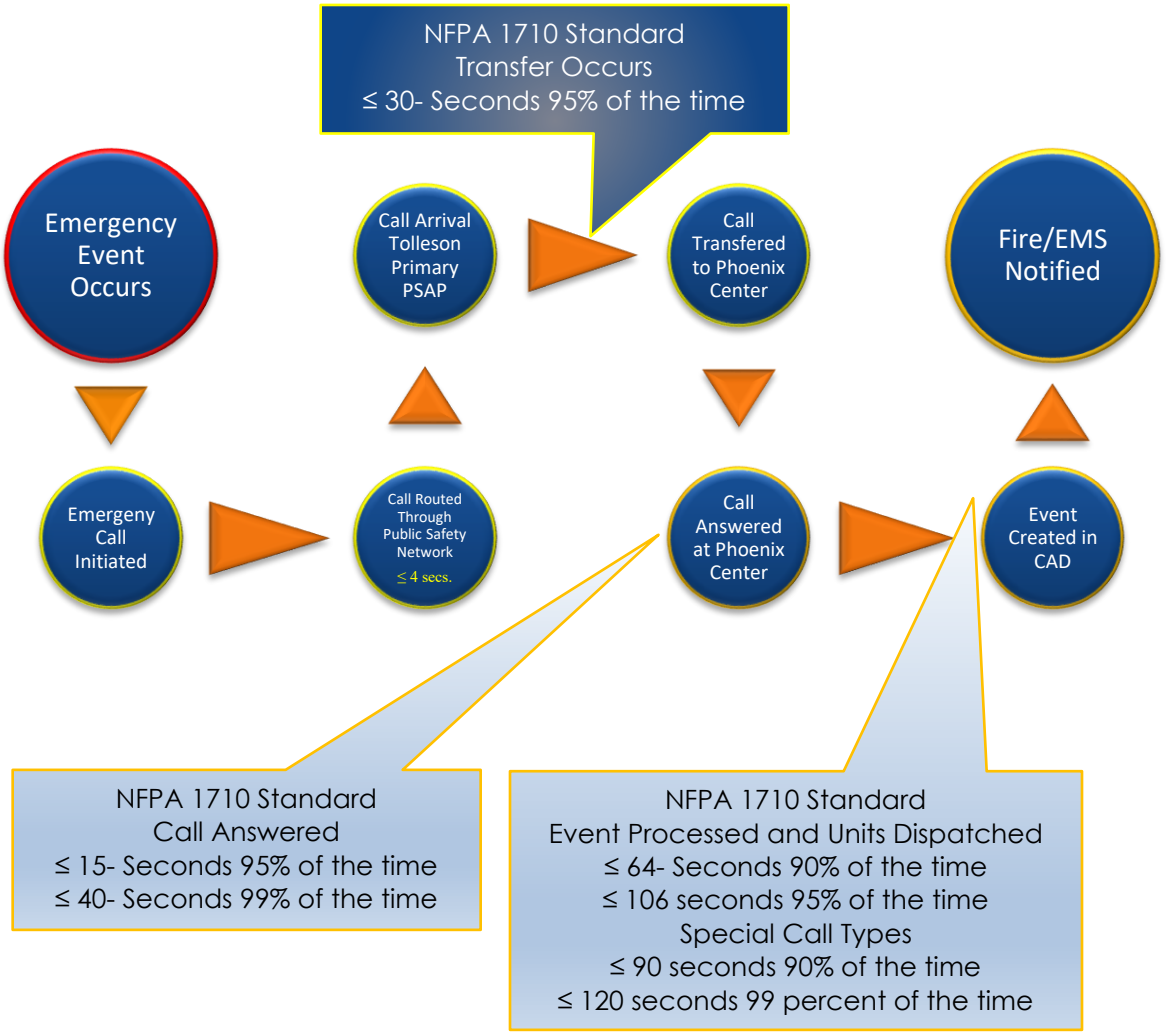
Year	Percent at ≤ 30 Seconds	Call Count
2019	66.4	1,307
2020	71.7	3,475
2021	71.8	3,683
Total	**70.9**	**8,465**

Note: *Standard is ≤ 30 seconds 95 percent of the time.

Based on review of the data provided and described above, it can be seen that Tolleson 911 Dispatch meets the call answering time standard but **does not** meet the standard benchmark for call transfer time.

The next figure illustrates the event timeline when the primary PSAP such as Tolleson-911 Dispatch is other than the communications center, which is PFDRDC.

FIGURE 4-1: Event Timeline for 911 Call Receipt, Transfer, and Processing



The City of El Mirage and the City of Tolleson implemented an intergovernmental agreement in July 2016 for Tolleson to provide E-911 and non-emergency call answering services, dispatch the El Mirage Police Department (EMPD), and host and provide administration of the police records management system for the EMPD. The agreement had a one-year initial term with automatic ten-year renewals. While the agreement allows access by the EMPD to the RMS, the agreement does not have a provision where the Tolleson 911 Dispatch Center is bound to share 911 call processing times with the EMFD. Lastly, the EMFD is not listed in the agreement as a user agency to the E-911 and non-emergency call answering services.

STAFFING AND DEPLOYMENT

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 setbacks 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 many of the older home stock a community. 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.

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.

In addition to metrics, fire and EMS staffing is also 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 11 critical factors that drive various levels and models from which fire and EMS departments staff and deploy. These factors are:

All-Hazard Risk Assessment of the Community: A fire department collects and organizes risk evaluation information about community risk (population and demographics; environmental; transportation; fire and EMS call demand and call types), and individual property types. The all-hazard community risk and community assessment is used to evaluate the community. With regard to individual property types, the assessment is used to measure all property and the risk associated with that property and then segregate the property as either a high-, medium-, or low-hazard risk depending on factors such as the life and building content hazard, the potential fire flow, and the 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 Socioeconomics 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, socio-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, such as the increased use of hospital emergency departments by uninsured or underinsured patients, who rely on emergency services for their primary and emergency care and utilize pre-hospital 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 staffing and apparatus considerations. Higher population centers with increased demand and risk require greater 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, State OSH 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 that require 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 a 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, and in some cases intensify the spread of fire.

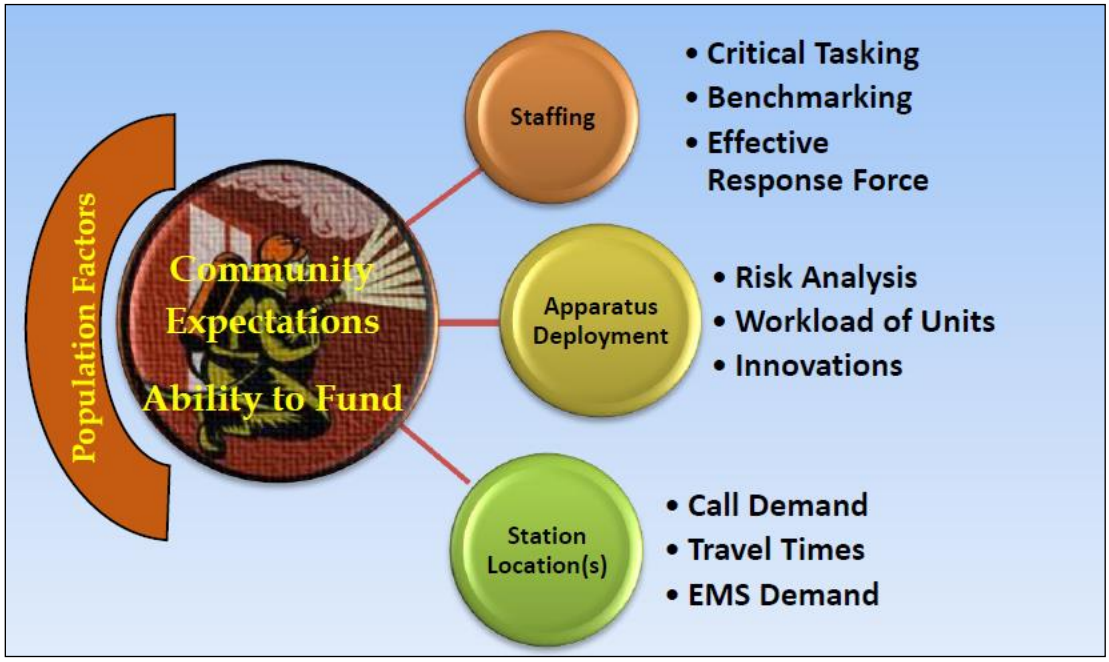
Innovations in Staffing and Deployable Apparatus: The fire department's ability and willingness to develop and deploy innovative apparatus (combining two apparatus functions into one to maximize available staffing, as an example). Deploying quick response vehicles (light vehicles equipped with medical equipment and some light fire suppression capabilities) on those lower acuity 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.

These factors are further illustrated in the following figure.

FIGURE 4-2: Fire Department Staffing Diagram



While each component presents its own metrics of data, consensus opinion, and/or discussion points, aggregately they form the foundation for informed decision-making that is 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.

NFPA 1710

National Fire Protection Association (NFPA) standards are consensus standards and 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 outlines organization and deployment of operations by career, and primarily career fire and rescue organizations.[22] It serves as a benchmark to measure staffing and deployment of resources to 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.[23]

22. 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 Arizona. It is a valuable resource for establishing and measuring performance objectives for the City of El Mirage but should not be the only determining factor when making local decisions about the city's fire services.
23. NFPA, Origin and Development of the NFPA 1710, 1710-1

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:[24]

- 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.[25] 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.[26] 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 that consecutively, and can efficiently assemble an effective response force for each risk the department 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, and 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 Arizona Division of Occupational Safety and Health (ADOSH) State Plan applies to state and local government employers. Federal OSHA covers the issues not covered by the Arizona State Plan. The federal rule (29 CFR 1910.134(g)(4)) applies to the EMFD.

The EMFD responds to structural fires with eight on-duty fire staff and a command officer (Battalion Chief). Also dispatched are an additional eight fire staff and command officer (Battalion Chief) through automatic aid. Under this response model, the EMFD 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).

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;

24. NFPA 1710, 5.2.1.1, 5.2.2.2
25. NFPA 1710, 5.2.3.1.1; 5.2.3.2.1
26. 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

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

(iii) All employees engaged in interior structural firefighting use SCBAs.[27]

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.*[28]

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.*[29]

In order to meet CFR 1910.134(g)(4), and NFPA 1500, the EMFD 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 Initial Rapid Intervention Team (IRIT), while attack lines are charged, and a continuous water supply is established.

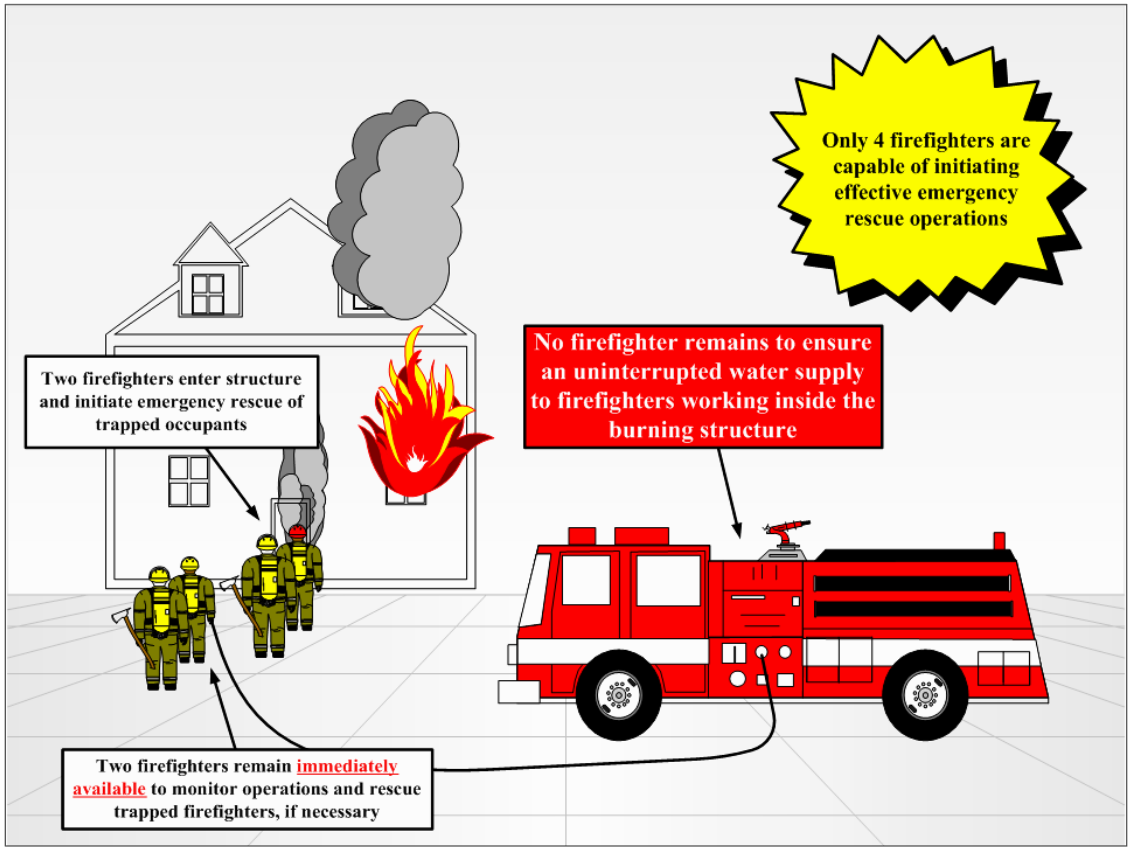
However, NFPA 1500 allows for fewer than four personnel under specific circumstances. It states, *Initial attack operations shall be organized to ensure that if on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with fewer than four personnel*.[30]

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.[31]

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.

27. CFR 1910.134 (g) 4
28. NFPA 1500, 2018, 8.8.2.
29. NFPA 1500, 2018, 8.8.2.5.
30. NFPA 1500, 2018 8.8.2.10.
31. CFR 190.134, (g).

FIGURE 4-3: Two-In/Two-Out Interior Firefighting Model*



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EMFD STAFFING MODEL

The EMFD has three operational shifts, A, B, and C. Each of the shifts is staffed with four firefighters, two engineers, two captains (company officer), and one Battalion Chief (shift commander), for an on-duty operational response force of nine personnel.

The following table details the positions for each shift.

TABLE 4-3: EMFD Shift Matrix

A Shift (48 on 96 off)	B Shift (48 on 96 off)	C Shift (48 on 96 off)
■ **E121**: 1 Captain ■ 1 Engineer ■ 2 Firefighters	■ **E121**: 1 Captain ■ 1 Engineer ■ 2 Firefighters	■ **E121**: 1 Captain ■ 1 Engineer ■ 2 Firefighters
■ **E122**: 1 Captain ■ 1 Engineer ■ 2 Firefighters	■ **E122**: 1 Captain ■ 1 Engineer ■ 2 Firefighters	■ **E122**: 1 Captain ■ 1 Engineer ■ 2 Firefighters
■ **LA121:** 1 Paramedic/FF ■ 1 EMT/FF ■ ***Early 2022 using ARPA Funding 4 days/week-10 hours/day***	■ **LA121:** 1 Paramedic/FF ■ 1 EMT/FF ■ ***Early 2022 using ARPA Funding 4 days/week-10 hours/day***	■ **LA121:** 1 Paramedic/FF ■ 1 EMT/FF ■ ***Early 2022 using ARPA Funding 4 days/week-10 hours/day***
■ **BC121:** 1 Battalion Chief	■ **BC121:** 1 Battalion Chief	■ **BC121:** 1 Battalion Chief

The table above depicts minimum staffing levels for the department. As discussed above, the EMFD does not have extra personnel to fill in for scheduled and unscheduled leave. The EMFD, like many fire departments across the country, staffs through the constant-staffing level model, meaning that on each shift there is minimum number of staffed positions to be filled. In the case of the EMFD that number is nine each shift, or eleven (five days a week) with the addition of the Low Acuity Unit in early 2022. When a position is vacated by scheduled or unscheduled leave, and because it represents minimum staffing, the position is backfilled by overtime staffing.

As discussed above, and as will be discussed further in the next sections, ***the EMFD relies heavily on regional automatic aid for emergency responses requiring more than two engines and one command officer in the city, and when both EMFD engines are tied up on a call either in or out of the city, for responses in El Mirage***.

Effective Response Force and Critical Tasking

Critical tasks are those activities that must be conducted on time 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 needed to effectively control and mitigate a fire or other emergency. 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 initial response personnel may manage secondary support functions 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 tasking assignment will provide adequate resources to immediately begin bringing the incident under control.

The specific number of people required to perform all the critical tasks associated with an identified risk or incident type is referred to as an Effective Response Force (ERF). The goal is to deliver an ERF within a prescribed period. NFPA 1710 provides the benchmarks for effective response forces.

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 EMFD is benchmarked against this standard for the building types existing in El Mirage. This discussion will cover single-family dwelling buildings, open-air strip mall buildings, and apartment buildings as outlined in the NFPA standard. As mentioned already in this report, the EMFD relies on automatic aid to assemble an Effective Response Force.

Single-Family Dwelling: NFPA 1710, 5.2.4.1

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 figure illustrates this, and the subsequent table outlines the critical task matrix.

FIGURE 4-4: Effective Response Force for Single-Family Dwelling Fire

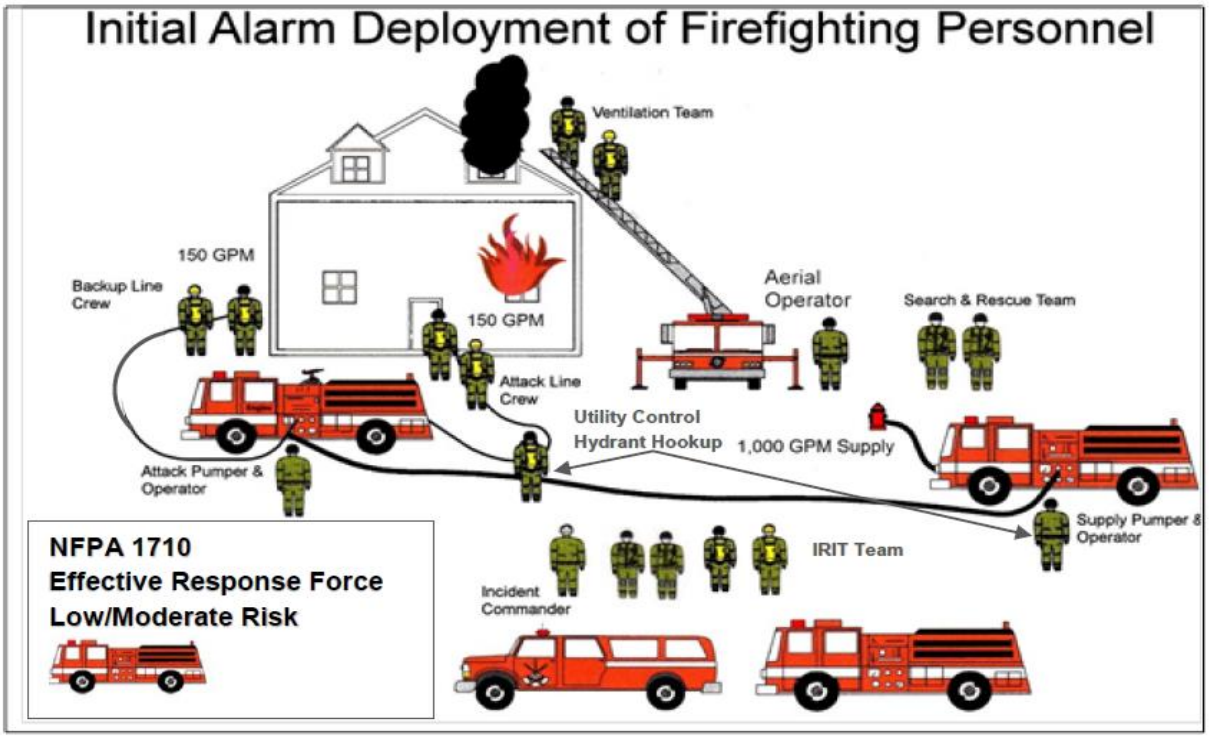

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TABLE 4-4: Effective Response Force for Single-Family Dwelling Fire

Critical Tasks	Personnel
Incident Command	1
Continuous Water Supply	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 IRIC (Initial Rapid Intervention Crew)	4
Total Effective Response Force	16 (17 If aerial is used)

The following table outlines how the EMFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for a single-family dwelling fire. EMFD units are highlighted.

TABLE 4-5: EMFD Effective Response Force for Single-Family Dwelling Fire

Apparatus	Personnel
EMFD Battalion Chief	1
Auto Aid Battalion Chief	1
EMFD Engine	4
EMFD Engine	4
Auto Aid Engine	4
Auto Aid Ladder	4
Total EMFD ERF	**18**

As a single responding agency, EMFD does not meet the minimum benchmarks of NFPA 1710 for an Effective Response Force for single-family dwelling fires. With regional automatic aid, the EMFD does meet this benchmark. ***NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard.***[32]

Open-Air Strip Mall, NFPA 5.4.2

The initial full alarm assignment (ERF) to a structural fire in 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.

32. NFPA 1710. 5.2.1.3

TABLE 4-6: Effective Response Force for Open-Air Strip Mall Fire

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	2
Fire Attack via Two Handlines	6
Hydrant Hook Up - Forcible Entry - Utilities	3
Primary Search and Rescue	4
Ground Ladders and Ventilation	4
Aerial Operator if Aerial is Used	1
Establishment of IRIC (Initial Rapid Intervention Crew)	4
Medical Care Team	2
Total Effective Response Force	**27 (28 If aerial is used)**

The following table outlines how the EMFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for an open-air strip mall and commercial building fires. EMFD units are highlighted.

TABLE 4-7: EMFD Effective Response Force for Open-Air Strip Mall/Commercial Fire

Apparatus	Personnel
EMFD Battalion Chief	1
Auto Aid Battalion Chief	1
EMFD Engine	4
EMFD Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Ladder	4
Auto Aid Ladder	4
Total EMFD ERF	**34**

As a single responding agency, EMFD does not meet the minimum benchmarks of NFPA 1710 for an Effective Response Force for an open-air strip mall fire. With regional automatic aid, the EMFD does meet this benchmark. ***NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard.***[33]

Apartment Building

The initial full alarm assignment (ERF) to a structural fire in 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). The following table outlines the critical tasking matrix for this type of building fire.

33. NFPA 1710. 5.2.1.3

TABLE 4-8: Effective Response Force for Apartment Building Fire

Critical Tasks	Personnel
Incident Command	2
Continuous Water Supply	2
Fire Attack via Two Handlines	6
Hydrant Hook Up - Forcible Entry - Utilities	3
Primary Search and Rescue	4
Ground Ladders and Ventilation	4
Aerial Operator if Aerial is Used	1
Establishment of IRIC (Initial Rapid Intervention Crew	4
Medical Care Team	2
Total Effective Response Force	**27 (28 If aerial is used)**

The following table outlines how the EMFD assembles staffing and deployable resources as measured against NFPA 1710 benchmarking for an effective response force for an apartment building or other multi-unit housing type building fire. EMFD units are highlighted.

TABLE 4-9: EMFD Effective Response Force for Apartment Building Fire

Apparatus	Personnel
EMFD Battalion Chief	1
Auto Aid Battalion Chief	1
EMFD Engine	4
EMFD Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Engine	4
Auto Aid Ladder	4
Auto Aid Ladder	4
Total EMFD ERF	**34**

As a single responding agency, EMFD does not meet the minimum benchmarks of NFPA 1710 for an Effective Response Force for an apartment building fire. With regional automatic aid, the EMFD does meet this benchmark. ***NFPA 1710 permits fire departments to use established automatic aid and mutual aid agreements to comply with section 5.2 of this standard.***[34]

High-Rise, NFPA 1710 5.2.4.4

The initial full alarm assignment to a fire in a building where the highest floor is greater than 75 feet above the lowest level of fire department vehicle access must provide for a minimum of 42 members (43 if the building is equipped with a fire pump). ***El Mirage does not have a building where the highest floor is greater than 75 feet above the lowest level, therefore this part of the***

34. NFPA 1710. 5.2.1.3

standard is not examined here; however, through auto aid the number of personnel can be assembled.

Overall, the EMFD cannot, as a single fire department, meet the NFPA 1710 standards regarding the assembling of an ERF for a fire in a single-family dwelling, open-air strip mall/commercial building, or apartment building. The EMFD can and does meet the standard as a signatory agency to the Phoenix Regional Automatic Aid System agreement, and the regular automatic aid received in the city as described herein.

EMFD RESPONSE TIMES

Response times are typically the primary measurement for evaluating fire and EMS services. Response times are 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. Moreover, 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 certain cardiac and respiratory emergencies, full drownings, high-risk 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.

A crucial 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 fire detection process can be extended. The same holds true for EMS incidents. Many medical emergencies are often thought to be something minor by the patient, treated with home remedies, and the true emergency goes undetected until signs and symptoms are more severe. When the fire-EMS department responds, they often find these patients in acute states. Fires that go undetected and are allowed to expand in size become more destructive, are difficult to extinguish, and require more resources for longer periods of time.

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

Dispatch time (alarm processing 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 types of resources to dispatch. ***Turnout time*** is when the emergency response units are notified of the incident and ends when travel time begins. ***Travel Time*** is the difference between the time the unit is en route and arrival on scene. ***Response time*** is the total time elapsed between receiving a call to arriving on scene.

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*.

For this study, and unless otherwise indicated, response times and travel times measure the first arriving unit only. The primary focus of this section is the dispatch and response time of the first arriving units for calls responded to with lights and sirens.

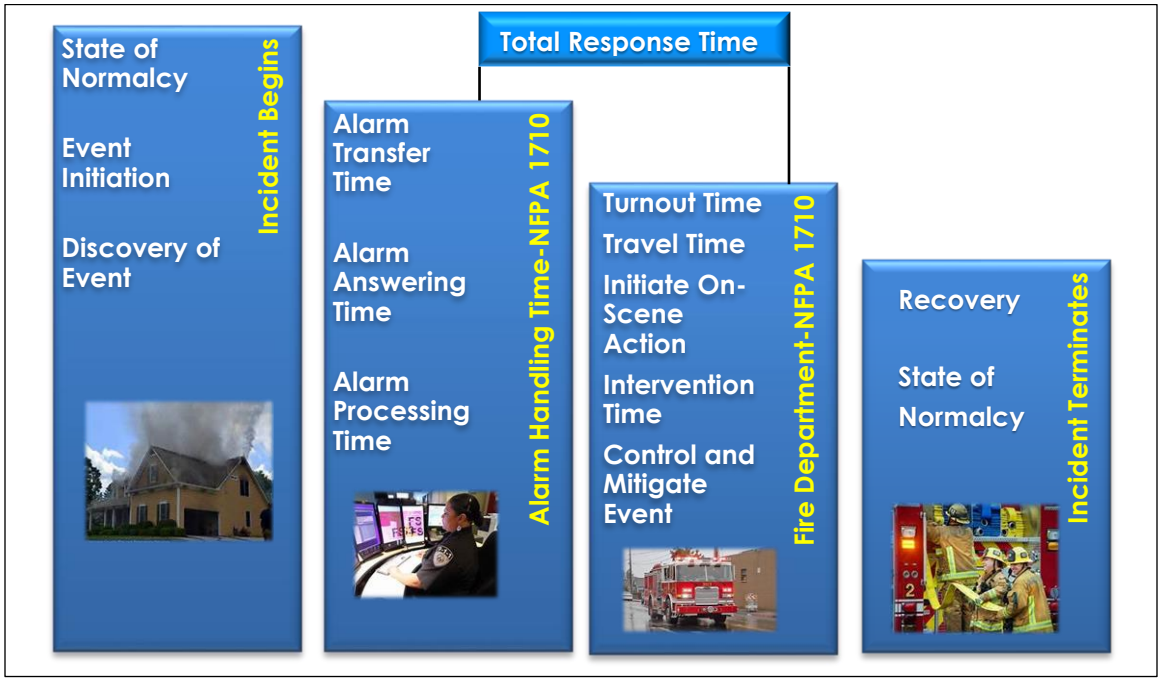
Dispatch time (alarm answering time, transfer time from Tolleson to Phoenix, and Phoenix call processing time) has been discussed at length in a preceding section.

The next segment of response time is **turnout time**, an aspect of response which is controlled by the responding fire department. NFPA 1710 states that turnout time should be less than or equal to 80 seconds (1.33 minutes) for fire and special operations 90 percent of the time and 60 seconds (1.0 minute) for EMS responses. Again, 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 and for the second due engine less than or equal to 360 seconds 90 percent of the time. The standard further states the initial first alarm assignment should be assembled on scene in 480 seconds, 90 percent of the time for low/medium hazards, and 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 defibrillator (AED) 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.

The following figure provides an overview of the fire department incident cascade of events.

FIGURE 4-5: Incident Cascade of Events



Regarding response times for fire incidents, the criterion is linked to the concept of "flashover." This is the state 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 at 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. 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.

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's travel times are established for two primary reasons: (1) the fire propagation curve, where flashover occurs (property loss, firefighter and public life safety), and (2) sudden cardiac arrest, where brain damage and permanent brain death occurs in four to six minutes.

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.[36] 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.

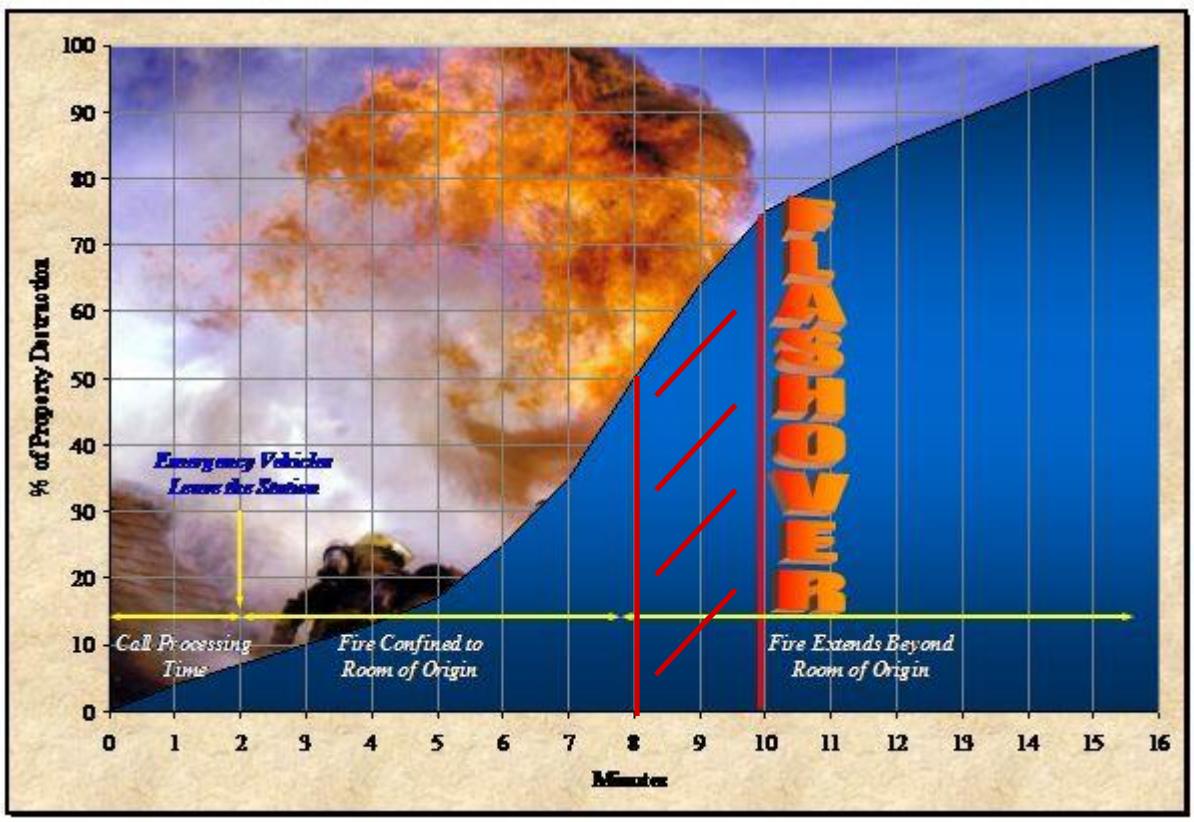
Regarding the risk of flashover, the authors of an IAFF report conclude:

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 ten 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.[37]

The following figure illustrates the time progression of a fire from inception through flashover and full involvement of the structure if the fire is left unchecked. Flashover occurs at eight to ten minutes (***or less depending on fuel***), allowing the fire to extend beyond the room of origin. Typically, if firefighting crews arrive, set up, and begin fire extinguishment prior to flashover, the fire is contained to the room of origin.

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

FIGURE 4-6: Fire Growth from Inception to Flashover[38]



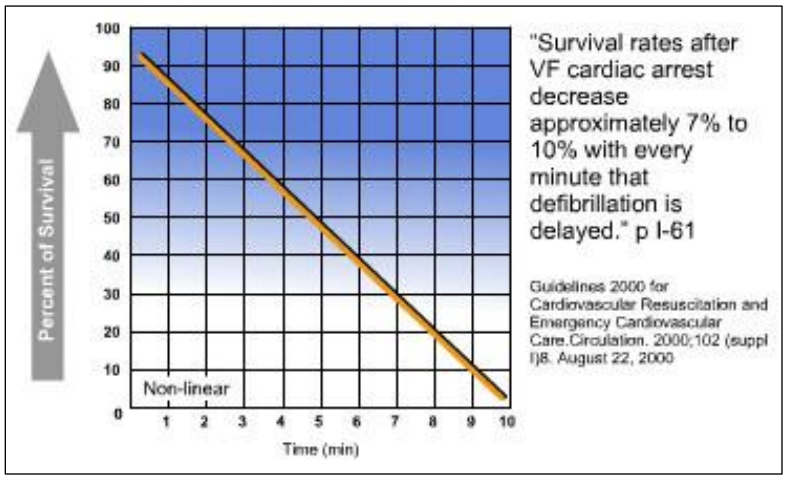
EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 as a response time benchmarking document, the focus for EMS is and should be directed to the evidence-based research relationship between clinical outcomes and response times. Much of the current research suggests response times have reduced 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, high acuity medical and pediatric emergencies; cardiac and respiratory arrest; and certain high-risk obstetrical emergencies to name a few. Each requires 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 at the 90th percentile. An advanced life support (ALS) unit should arrive on scene within eight minutes travel time at the 90th percentile, 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."

38. Source: https://www.slideserve.com/tavon/the-international-society-of-fire-service-instructors

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.

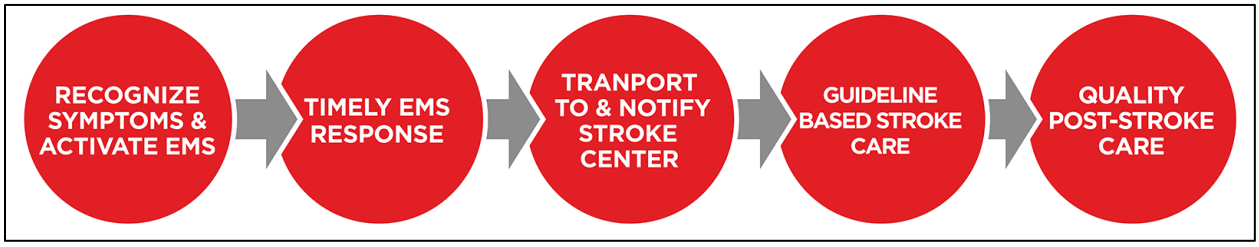
FIGURE 4-7: Cardiac Arrest Survival Probability by Minute



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. 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, stroke, or ingestion of a toxic substance.[39] 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 4-8: Cerebrovascular Emergency (Stroke) Chain of Survival



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

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

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequencies of these types of calls are infrequent as compared to the routine, low-priority EMS incident responses. In some cases, these dire emergencies often make up a low percent of all EMS calls.[40] 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. Further, only 10 percent of victims who suffer cardiac arrest outside of the hospital survive.[41]

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 4-9: Sudden Cardiac Arrest Chain of Survival

From: "Out of Hospital Chain of Survival," https://cpr.heart.org/en/resources/cpr-facts-and-stats/out-of-hospital-chain-of-survival

ASSESSING THE FIRE MANAGEMENT ZONE

Travel time is key to understanding how fire and EMS station location influences a community's aggregate response time performance. 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 manmade barriers, and response routes that can create response-time problems.[42] 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 EMFD responds from one station and receives automatic aid from surrounding jurisdictions, most of which are contiguous. This section expands on the earlier discussion on travel times and depicts how travel times of 240, 360, and 480 seconds look when

40. www.firehouse.com/apparatus/article/10545016/operations-back-to-basics-true-emergency-and-due-regard
41. American Heart Association. *Latest Statistics on Cardiac Arrest Reveal Little Progress*. 2019
42. 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.

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 travel time bleeds of 240 seconds, 360 seconds, and 480 seconds using the existing street network from the current EMFD station. CPSM also mapped the travel time projections from that primary auto aid stations that may respond into El Mirage either first due when both El Mirage engines are tied up, or on an initial fire response and by proximity to the call may arrive first.

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.

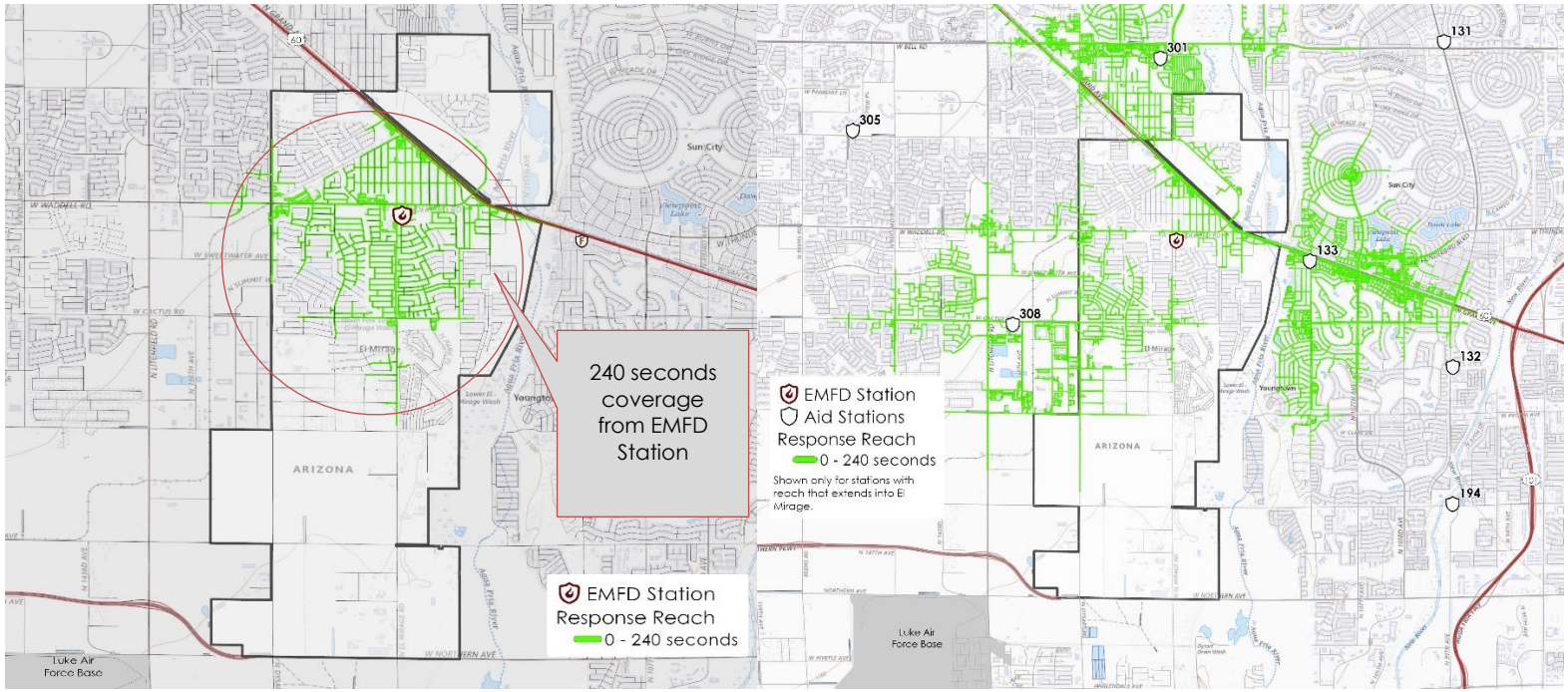
It is important to understand that measuring and analyzing response times and response time coverage are measurements of performance. When we discussed community risk above, we identified that the EMFD like most other fire departments in the nation is an all-hazards response agency. While different regions of the country respond to different environmental risks, the remaining hazards that 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 whether supplied by the fire department or a combination of a city's fire department and automatic aid. Managing fire department response capabilities to the identified community's risk focuses on three components which are:

- Having a full understanding of the total risk in the community and how each risk 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 a trained 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 following figure looks at the travel time projection at 240 seconds from the EMFD station and the primary auto aid stations that respond into El Mirage. From this mapped projection we can see that the EMFD station can cover the central portion of the fire management zone but lacks coverage in the remainder of the zone (which in this case is the City of El Mirage). However, within the projected 240 seconds of travel time, auto aid stations cover the south central and southeast built-upon areas and the northeast area of the zone above the BNSF rail yard.

FIGURE 4-10: Travel Time of 240 Seconds from EMFD Station and Auto Aid Stations

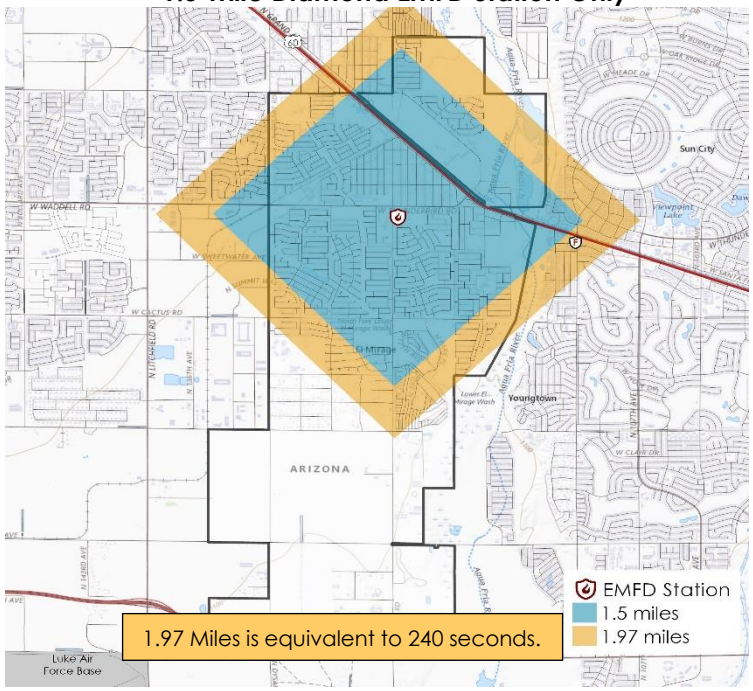
240 Seconds EMFD Station Only **240 Seconds Auto Aid Stations Only**



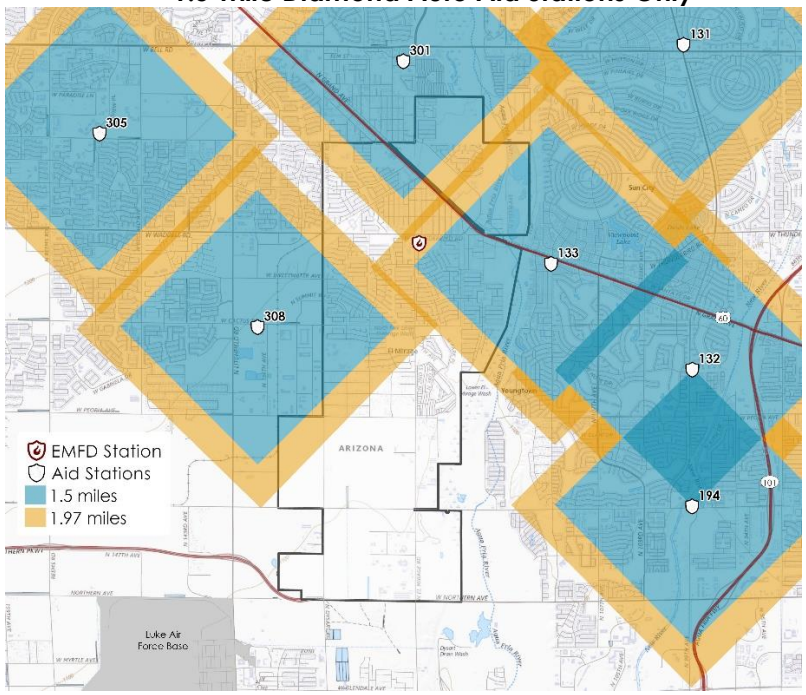
The next figure illustrates the 1.5-mile ISO-FSRS coverage diamonds for engine company response to built-upon areas of the city. In this figure the blue shade is the 1.5-mile ISO-FSRS grading criterion. The orange border represents 1.97 miles and is equivalent to 240 seconds of travel time. Coverage is similar to the previous figure but expands 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 coverage within 240 seconds to all of the fire management zone, the 240 seconds benchmark is at the 90th percentile, not the 100th percentile. Actual travel times for the EMFD are discussed later in this section.

FIGURE 4-11: ISO-FSRS 1.5-Mile Response Diamond for Engine Companies: EMFD and Auto Aid

1.5-Mile Diamond EMFD Station Only



1.5-Mile Diamond Auto Aid Stations Only

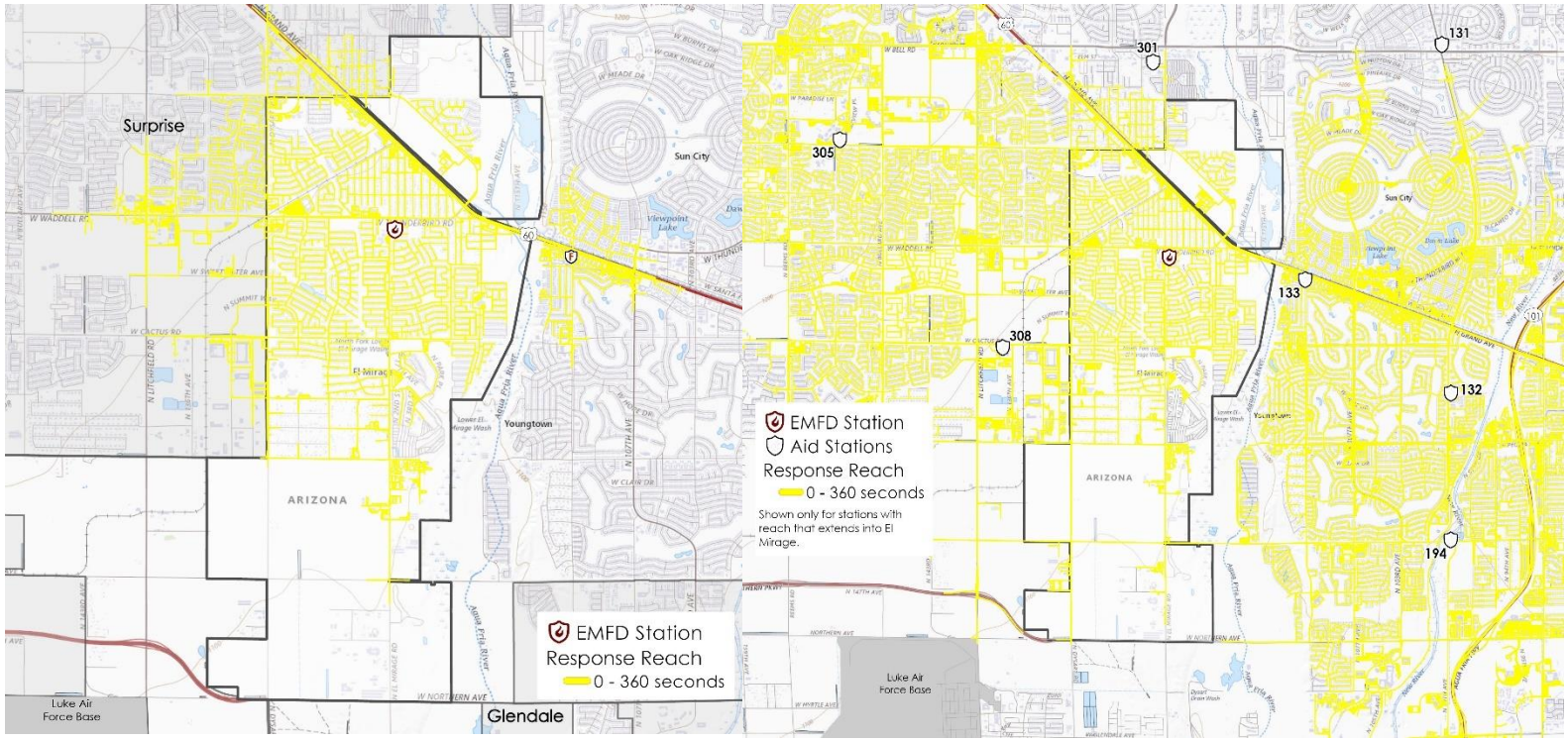


The next figure shows travel time projections at 360 seconds, which in the NFPA 1710 standard is the time benchmark for the second due engine to arrive on the scene in less than or equal to 360 seconds 90 percent of the time. This standard links to the two in-two out regulation from OSHA and NFPA 1500 standards, as well as the initial critical tasking and the early assembly of an Effective Response Force for the incident. This figure compares the 360-seconds response from the EMFD station and as well from the primary auto aid stations that respond into El Mirage. Keep in my that the El Mirage station has two engine companies that, if in the station at the same time, would satisfy this response time component of the NFPA 1710 standard.

This figure shows that almost all of the central and northern areas of the of the city are covered from the El Mirage fire station. The auto aid stations fill in the remaining sections of the city at the standard benchmark of the 90th percentile.

FIGURE 4-12: Travel Time of 360 Seconds from EMFD Station and Auto Aid Stations

360 Seconds EMFD Station Only **360 Seconds Auto Aid Stations Only**

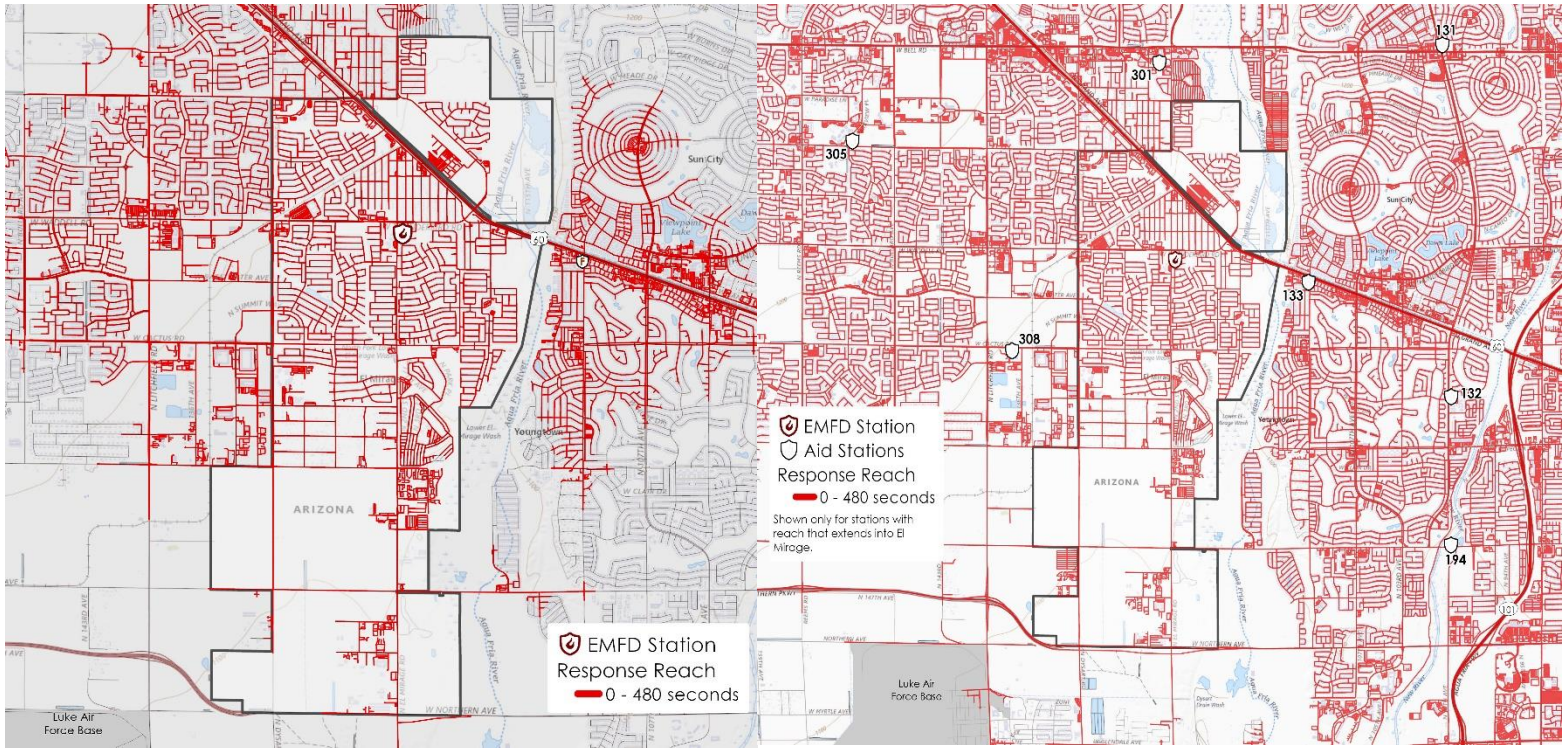


The next figure looks at the travel time bleeds of 480 seconds, which in the NFPA 1710 standard is the time benchmark for the assembly of the initial first alarm assignment on scene in 480 seconds or less 90-percent of the time for low/medium hazards. This standard links to the incident critical tasking and the assembly of an Effective Response Force for the incident. This figure shows the 480 seconds response bleed from the EMFD station and the primary auto aid stations that respond into El Mirage.

This figure shows us that the fire management zone (City of El Mirage) is covered with the El Mirage fire station and the auto aid stations at the standard benchmark of the 90th percentile.

FIGURE 4-13: Travel Time of 480 Seconds from EMFD Station and Auto Aid Stations

480 Seconds EMFD Station Only | **480 Seconds Auto Aid Stations Only**



The next set of tables analyzes the EMFD's turnout, travel, and total response times for 2018, 2019, and 2020. Also included are the Phoenix Fire Department Regional Dispatch Center's call processing times (dispatch time). In this analysis, calls with response mode "Code 3" (lights and sirens) and final call category "ALS" were identified as emergencies. We included all calls within the City of El Mirage to which at least one non-administrative unit responded. These responses only include EMFD units. The response time analysis also 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. Response times are analyzed here at the 90th percentile and benchmarked against the NFPA 1710 standard. Measuring first-due arriving fire units and secondary response units (for the total Effective Response Force, 360 seconds, and 480 seconds) to a fire incident provides constructive information for resource allocation decisions such as fire station location, type of apparatus deployed, and crew staffing levels.

TABLE 4-10: 90th Percentile Response Time of First Arriving Unit, by Call Type, 2018

Call Type	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.1	1.7	5.9	8.2	195
Cardiac and stroke	1.2	1.7	5.6	7.6	220
Fall and injury	1.6	1.4	5.8	7.8	492
Illness and other	1.6	1.5	5.7	7.9	595
MVA	1.4	1.4	6.6	7.9	122
Overdose and psychiatric	1.7	1.6	5.2	7.4	60
Seizure and unconsciousness	1.6	1.7	5.6	7.8	255
EMS Total	**1.5**	**1.6**	**5.8**	**7.9**	**1,939**
False alarm	2.3	1.8	6.3	9.1	81
Good intent	1.4	1.1	4.6	6.9	4
Hazard	1.8	2.2	5.7	7.2	14
Outside fire	1.8	1.6	5.6	8.1	42
Public service	1.9	1.4	7.0	9.6	15
Structure fire	1.5	1.4	4.6	6.6	32
Fire Total	**2.1**	**1.6**	**6.3**	**8.6**	**188**
Total	**1.6**	**1.6**	**5.8**	**8.0**	**2,127**

TABLE 4-11: 90th Percentile Response Time of First Arriving Unit, by Call Type, 2019

Call Type	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.3	1.8	5.8	7.7	190
Cardiac and stroke	1.6	1.6	5.3	7.1	188
Fall and injury	1.6	1.6	5.6	8.0	408
Illness and other	1.9	1.6	5.8	8.3	569
MVA	1.2	1.5	6.4	8.1	93
Overdose and psychiatric	1.4	1.6	4.9	6.9	62
Seizure and unconsciousness	1.4	1.5	5.4	7.3	239
EMS Total	**1.6**	**1.6**	**5.6**	**8.0**	**1,749**
False alarm	2.2	1.8	6.7	9.6	100
Good intent	1.8	1.5	5.3	8.4	6
Hazard	1.5	1.0	5.5	7.3	6
Outside fire	2.1	1.6	6.8	9.2	43
Public service	2.0	1.1	4.4	8.8	12
Structure fire	2.5	1.5	6.2	8.4	27
Fire Total	**2.2**	**1.7**	**6.6**	**9.4**	**194**
Total	**1.7**	**1.6**	**5.7**	**8.1**	**1,943**

TABLE 4-12: 90th Percentile Response Time First Arriving Unit, by Call Type, 2020

Call Type	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.8	1.8	5.2	7.6	307
Cardiac and stroke	1.6	1.7	5.0	7.1	238
Fall and injury	1.6	1.7	5.7	8.0	551
Illness and other	2.0	1.7	5.4	8.0	743
MVA	1.6	1.6	5.8	7.6	114
Overdose and psychiatric	1.9	1.8	4.6	7.2	77
Seizure and unconsciousness	1.5	1.6	5.2	7.4	275
EMS Total	**1.8**	**1.7**	**5.4**	**7.7**	**2,305**
False alarm	1.9	1.8	6.5	8.9	82
Good intent	1.2	1.0	3.8	5.6	2
Hazard	4.3	1.8	5.2	8.8	15
Outside fire	2.4	1.8	5.4	8.4	67
Public service	3.9	1.8	5.0	9.2	9
Structure fire	1.5	1.6	4.5	7.0	25
Fire Total	**2.2**	**1.8**	**5.8**	**8.5**	**200**
Total	**1.8**	**1.7**	**5.4**	**7.8**	**2,505**

TABLE 4-13: 90th Percentile Response Time of First Arriving Unit, Three-Year Comparison by Fire/EMS Annual Total in Seconds

Call Type	Dispatch	Turnout	Travel	Total Response Time
2018				
EMS Total	90 secs.	96 sec.	348 secs.	474 secs.
Fire Total	126 secs.	96 sec.	378 secs.	516 secs.
2019				
EMS Total	96 secs.	96 secs.	336 secs.	480 secs.
Fire Total	132 secs.	102 secs.	396 secs.	564 secs.
2020				
EMS Total	108 secs.	102 secs.	324 secs.	462 secs.
Fire Total	132 secs.	108 secs.	348 secs.	510 secs.

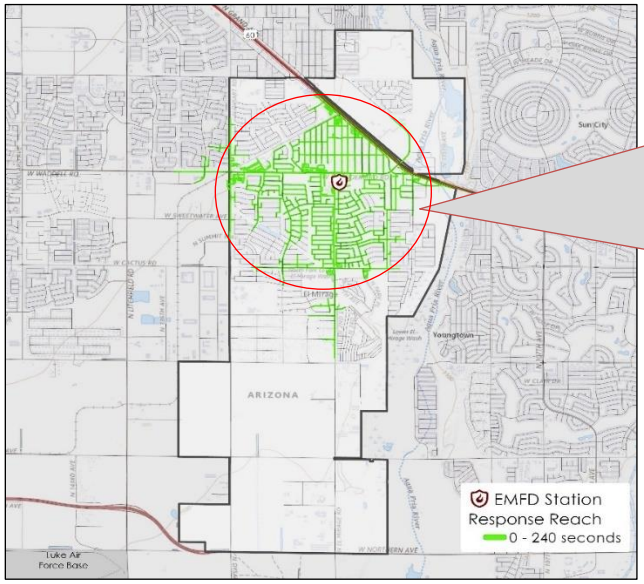
To summarize, the key response time parameters established for dispatch time and first arriving engine in NFPA 1710 at the 90th percentile are:

- Event processed and units dispatched less than or equal to 64 Seconds 90 percent of the time
- Turnout time shall be less than or equal to 60 seconds for EMS incidents.
- Turnout time for shall be less than or equal to 80 seconds for fire or specialized response incidents.
- 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.
- Travel time for EMS incidents is less than or equal to 240 seconds for the first arriving engine company equipped with an automatic external defibrillator (AED) or higher level capability.

In summary, the performance of the EMFD first arriving unit at the 90th percentile response times are:

- Dispatch times for EMS incidents over the three-year study period did not meet the NFPA standard. This aspect of response is out of the control of the EMFD.
- Dispatch times for fire incidents over the three-year study period did not meet the NFPA standard. This is due partly to the time it takes to prepare the CAD system with multiple units from multiple stations, using automatic aid and closest unit response prior to dispatching the call. This aspect of response is out of the control of the EMFD.
- Turnout times for EMS incidents over the three-year study period did not meet the NFPA standard. This aspect of response is in the control of the EMFD and when an issue was identified in 2020, corrective actions were implemented per AC Richardson.
- Turnout times for fire incidents over the three-year study period did not meet the NFPA standard. This aspect of response is in the control of the EMFD and when an issue was identified in 2020, corrective actions were implemented per AC Richardson.
- Travel times to EMS incidents over the three-year study period did not meet the NFPA standard. 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. Other than station location(s), this aspect of response is out of the control of the EMFD.
- Travel times to fire incidents over the three-year study period did not meet the NFPA standard. 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. Other than station location(s), this aspect of response is out of the control of the EMFD.

FIGURE 4-14: Travel Time of 240 Seconds from EMFD Station



240 seconds coverage is central to the current EMFD station—North of West Cactus Road to NW Grand Avenue.

The GIS data for streets includes speed limits for each street segment. Response reach was then calculated using reduced speed limits to account for traffic, intersections, and other obstacles. In addition, U-turns were allowed at intersections and dead-ends. In cases of reduced speed limits (local roads at 20 mph or less) there is no reduction in speed

SPECIALIZED RESPONSE CAPABILITIES

Specialized response capabilities include hazardous materials (Haz-Mat), high angle rope rescue, trench collapse, building collapse, complicated heavy auto extrication, elevated rescue with an aerial platform, and confined space rescue. The EMFD, although trained to certain specialized levels, does not have the response assets and capabilities to mitigate a complex specialized or technical rescue incident. This requires a properly trained and equipped response force. When needed, these assets are obtained through partnerships and agreements with surrounding automatic aid departments that have these resources already in place.

There is nothing in NFPA 1710, ISO-FSRS, or other national benchmarks that requires a fire department to deliver all of these services. What is included in the NFPA standard is *an organizational statement that 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.* As a signatory agency to the Regional Metropolitan Phoenix Fire Service Automatic Aid System agreement, the City of El Mirage and the EMFD have a declared organizational statement in the agreement as outlined in the NFPA 1710 standard, as such:

> *It is agreed that the scope of this Agreement includes automatic assistance in responding to fires, medical emergencies, medical emergencies, hazardous materials incidents, rescue and extrication situations, and other types of emergency incidents that are within the standard scope of services provided by the fire departments/districts in the Automatic Aid System.*

Large municipal fire departments build these assets into their day-to-day staffing and deployable resources. In some cases, separate companies are created and staffed to manage the Haz-Mat and technical rescue service deliverables. Some jurisdictions assign these functions to ladder companies to include auto extrication. In some communities, such as El Mirage where there is one station, the engine companies carry auto extrication equipment for light to medium extrication incidents and are trained in certain aspects of Haz-Mat and technical rescue incidents, albeit more as supportive assets in large-scale incidents.

CONCLUSION

The EMFD is entrusted with community emergency response responsibilities and assets, and the city recognizes the intrinsic services the department provides. This is evidenced by the city's forethought to have this analysis completed. On a day-to-day basis the EMFD responds to emergency and non-emergency calls for service in and outside of the city as a part of the vast automatic aid system in which it participates. The department has a relatively new Fire Chief who is enhancing services in the Community Risk Reduction function by leading the EMFD initiative to take part in new construction plans/review in coordination with the city's Building Safety Division. The Fire Chief is also re-implementing the Low-Acuity Response Unit to reduce the workload of the two primary engine companies, keeping these assets available for the higher acuity calls such as building fires, motor vehicle accidents, and emergency EMS calls. ***These initiatives are best practices.***

This report is comprised of a comprehensive analysis of the administrative and operational components of the EMFD and includes an all-hazards community risk analysis, benchmarking EMFD response against the NFPA 1710 standard and ISO-FSRS grading schedule; GIS mapping that illustrates call demand in the city, the extent of response time and coverage of the city; and a comprehensive data analysis of three years (2018, 2019, 2020) of fire and EMS call types, unit workload, department resiliency, and response times.

CPSM found the EMFD to be a well-managed, prepared, and capable department that delivers effective services to the extent of their current capabilities. The Fire Chief and his immediate staff were highly responsive to our requests for information and assisted in collecting data from outside sources given the circumstances.

Based on our analysis, CPSM did determine areas where improvements and/or enhancements to service can be made. These recommendations are as follows:

Recommendations:

7. CPSM recommends the EMFD establish a formal staffing factor that can be used to assist in the process for managing current and future staffing vacancies created by scheduled and unscheduled leave.
8. CPSM recommends the Captain position assigned to the Fire Prevention/Community Risk Reduction function be titled Fire Marshal to be consistent with regional and industry norms. This position should also be charged with the responsibility of managing the fire inspection, plans review, fire investigation, and public education programs. This position should also take the lead on program design for Community Risk Reduction programs and performance measures focused on reducing the risk of fire and improving citizen and firefighter safety.
9. CPSM recommends that the city reexamine the agreement with the City of Tolleson for Public Safety Answering Point (PSAP) services, and move to update this agreement to include:
    - The timely release when requested by the City of El Mirage of 911 call receipt and transfer data times to the Phoenix Fire Department Regional Dispatch Center;
    - The definition of EMFD as a PSAP customer;
    - Establishment of call transfer times that align with current 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,

related to primary PSAP call processing and transfer times to the secondary PSAP (30 seconds or less 95 percent of the time);

- CPSM further recommends this agreement be reviewed on an annual basis and updated as necessary, specifically when the NFPA 1710 standards change regarding primary PSAP call processing and transfer times to the secondary PSAP.

10. CPSM recommends that the EMFD address the deficiencies in the most recent ISO report as reviewed in this analysis. The Emergency Communications Center deficiencies should include discussions with the Tolleson 911 Dispatch Center and its current capabilities, and how the call transfer method to Phoenix can be improved. CPSM further recommends that an EMFD representative be present in the Tolleson 911 Dispatch Center and the Phoenix Fire Department Regional Dispatch Center during the next ISO evaluation for the purpose of segregating deficiencies in each center to gain a better understanding of what improvements need to be made and to what center.

After our analysis, CPSM also concludes:

Current operational staffing meets NFPA 1710 standards because of the EMFD's participation in the *Regional Metropolitan Phoenix Fire Service Automatic Aid System*. Removed from this system, the EMFD would not meet NFPA 1710 standards as the department does not deploy sufficient staffing resources to assemble an Effective Response Force (ERF) for low-, medium-, or high-hazard fire responses.

The city and the department do have to look to the future regarding staffing. Although the northern half of the city is mostly built upon, with some added growth planned, the southern half of the city is a prime area for commercial and industrial growth. This growth will drive call demand in a separate way with large footprint buildings that, depending on occupancy type, storage, and processes performed inside the building, will call for an Effective Response Force to at a minimum that of a medium hazard of 27 responders, 28 if an aerial is utilized. Although response would be augmented by auto aid companies, the southern area of the city is not as proximate to auto aid companies as is the northern area of the city.

Considering the planned growth in the southern part of the city and the type of commercial and industrial growth that likely will occur there, the current building risk found in the community, and the placement of auto aid ladder companies in relation to all parts of the city, the city and the EMFD need to plan for a staffed ladder truck/company. While this ladder company make-up is up to the Fire Chief, the city, and what is affordable, our view is that the optimum arrangement is a ladder truck capable of a minimum water flow of 1,000 gallons per minute from the tip of the ladder, and one that meets all NFPA 1901 safety and equipment standards. The ladder truck should be staffed appropriately to meet the *Regional Metropolitan Phoenix Fire Service Automatic Aid* agreement, that is, an officer, an engineer, and two firefighters. This recommendation would require adding twelve front-line positions and is something the city should begin to plan for.

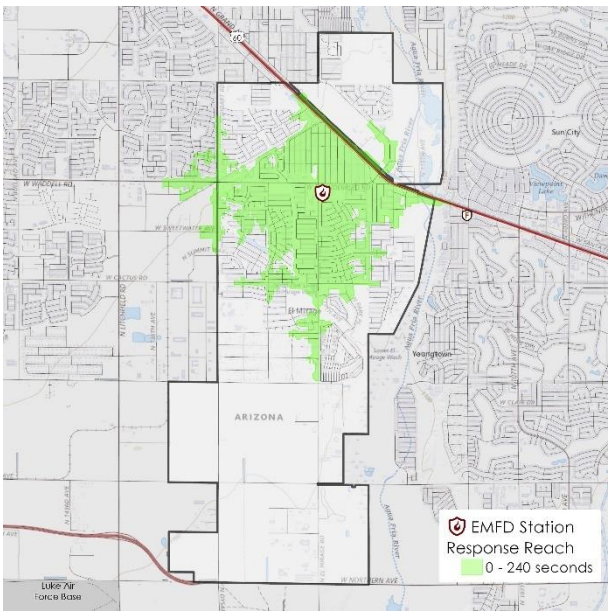
As was analyzed and discussed in the report, the current response time capabilities of the EMFD from the current station covers just the northern half of the city at the 240 second benchmark. Although the response times are not a serious gap in service at present, there is a gap south and east of the current fire station that is not covered by the EMFD station or auto aid stations. There is also a gap in service related to ladder company coverage, as discussed above.

One alternative to solve this gap in service is the construction of a second fire station in the southern area of the city and to deploy an engine and a ladder out of this station (this could be two new apparatus or a relocation of E122 and the implementation of a new ladder company;

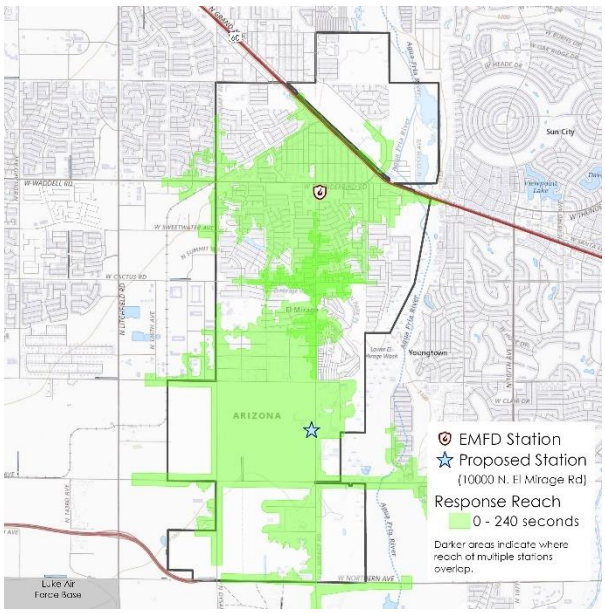
Station 121 would then deploy E121 and LA121). For planning purposes, CPSM chose a site near the City Hall complex and conducted a GIS analysis of ladder company coverage from this location and expansion of the 240 second first arriving engine company coverage. The next set of figures illustrate how the second station would close the NFPA 1710 standard for first arriving engine company coverage at 240 seconds, and what the addition of a ladder company will look like when added in with auto aid companies using the ISO-FSRS 2.5 mile diamond coverage for ladder companies. Areas perceived to be covered are not due to road access.

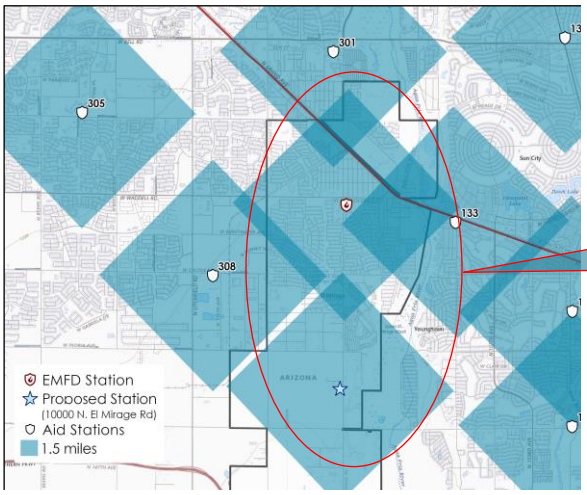
FIGURE 4-15: 240 Seconds Coverage, Current and Second EMFD Stations

240 Seconds Coverage: One EMFD Station



240 Seconds Coverage: Two EMFD Stations

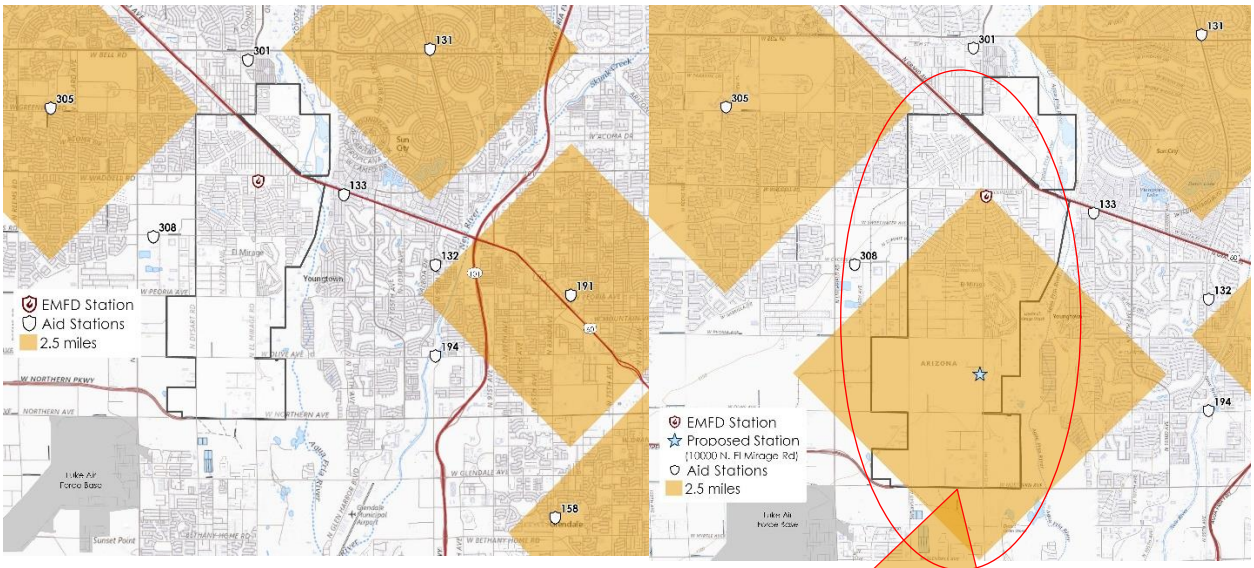




With addition of second station, ISO-FSRS Engine Company coverage is significantly enhanced.

FIGURE 4-16: Ladder Company Coverage with EMFD Ladder and Auto Aid Ladders

Current Auto Aid Ladder Company Coverage **Auto Aid and EMFD Ladder Coverage**



The addition of a ladder company closes the current ISO-FSRS ladder company gap in the city and covers the future industrial and commercial building growth in the southern area of the city.

Since the EMFD is signatory to the Regional Metropolitan Phoenix Fire Service Automatic Aid agreement, current assets, and any additional resources the city implements are and will be considered in the planned service expansion by neighboring communities. This, however, is the trade-off for the current and future assets that neighboring communities have and may place in service and that will respond into El Mirage. An example of the is the new Surprise Station 308. The addition of this station that houses an engine enhances the 240 seconds response standard for the first arriving engine company in the central-west part of El Mirage. In addition, this station houses Haz-Mat response assets, which are available to El Mirage promptly when needed.

In addition to recommendations already made in this report, CPSM recommends the following as planning recommendations to close current service gaps, enhance service for current fire and EMS demand, meet the NFPA 1710 standard, improve ISO-FSRS credits and potentially obtain a rating increase, and for future planned commercial and industrial growth in the southern part of the city.

11. The city should begin planning now for added fire staffing and ladder company service to serve known and future planned commercial and industrial building growth in the southern area of the city and to augment current service delivery in the northern half of the city. This staffing should be linked to a second fire station in the southern part of the city that should house an engine company and a ladder company. The city has two alternatives to staff this station.

- Alternative A: Move E122 to the second station and implement a ladder company as a new service. This will include the purchase of a ladder truck and the addition of 12 personnel (3 Captains, 3 engineers, 6 firefighters). In this alternative, E121 stays in service at the current station and LA121 remains in service as currently planned.
- Alternative B: Keep Engines 121 and 122 at the current station and implement an engine company and a ladder company at the second station as new services. This will include the purchase of an engine apparatus and a ladder truck and the addition of 24 personnel (6 Captains, 6 engineers, 12 firefighters). In this alternative, LA121 stays in service at the current station as currently planned or the positions are converted to the fill the new engine company and LA121 is placed out of service.
- The second fire station should be planned for operational use as described above (engine and ladder company), and for certain administrative functions to relieve the space needs at the current fire stations, as identified by staff. Because of the potential close proximity to City Hall, the second station may include the Fire Chief's office and his immediate operational and administrative staff, as well as a large meeting room for city and public use that can double as a more permanent Emergency Operations Center.

12. As the department continues to expand operationally and administratively, and will in the future, CPSM identified a space issue at the current EMFD facility. Hampering expansion efforts is the minimal footprint available to expand the current facility. This said, and if the city does not move to construct a second fire station, CPSM recommends as a planning objective (one- to three-year planning period) the city and department retain an engineering firm/consultant to conduct a comprehensive review of the EMFD facility to determine the necessity for improvements/facility footprint expansion in the next three to five years, and what, if any land footprint is available for such an expansion. Included in this plan should be a budgetary and funding plan that focuses on size/space for crew accommodations and EMFD operations (programmatic, administrative, training, emergency management) and apparatus storage.

END

SECTION 5. DATA ANALYSIS

This data analysis conducted for the El Mirage Fire Department examines all calls for service between January 1, 2018, and December 31, 2020, as recorded in the Phoenix Fire Regional Dispatch Center's computer-aided dispatch (CAD) system, along with National Fire Incident Reporting System (NFIRS) data obtained from multiple sources. The analysis results are primarily presented for 2019. The results of 2018 and 2020 are presented along with the corresponding 2019 results for comparison.

For this study CPSM intended to collect data for the five-year period of 2016 through 2020. In conversations with EMFD management, we determined that dispatch operations had changed over the last five years. In addition, NFIRS record keeping was upgraded during this period. For these reasons, it was mutually agreed that the most recent three years of data were more accurate and would form a sufficient basis for the study and for future planning.

This analysis is made up of four 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 El Mirage Fire Department is a multiservice fire department and a member of the Phoenix Regional Automatic Aid Consortium (PRAAC). It provides fire, rescue, and first responder emergency medical services to the City of El Mirage and surrounding communities. The EMFD operates out of Fire Station 121 and utilizes three Type 1 engines (two frontline engines and one reserve engine), one brush truck, one low acuity unit, one command unit (Battalion Chief), and six staff vehicles.

In 2018, EMFD responded to 3,933 calls, of which 55 percent were EMS calls. The total combined workload (deployed time) for EMFD units was 1,821.7 hours. The average response time was 5.8 minutes. The 90th percentile response time was 8.0 minutes.

In 2019, EMFD responded to 3,902 calls, of which 55 percent were EMS calls. The total combined workload (deployed time) for EMFD units was 2,062.4 hours. The average response time was 5.8 minutes. The 90th percentile response time was 8.1 minutes.

In 2020, EMFD responded to 4,550 calls, of which 57 percent were EMS calls. The total combined workload (deployed time) for EMFD units was 2,492.1 hours. The average response time was 5.8 minutes. The 90th percentile response time was 7.8 minutes.

METHODOLOGY

In this analysis, CPSM examines 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.

We linked the CAD and NFIRS data sets. Then, we classified the calls in a series of steps. We first used the NFIRS incident type to identify canceled calls and to assign EMS, motor vehicle accident (MVA), and fire category call types. EMS calls were then assigned detailed categories based on their detailed CAD incident call types.

The analysis was focused on all calls within the City of El Mirage and calls that EMFD responded to in the surrounding communities. We received records for 14,917 total calls that were made in 2018, 2019, and 2020. These recorded calls included 1,246 calls where only the ambulance provider AMR responded (and occurred beyond the city limits), which we removed. In addition, 8 calls involving only administrative units were not included in the analysis. However, the work associated with these calls is included in the analysis of additional personnel in Attachment VI.

The number of calls included in this analysis, distinguishing calls within El Mirage and by responding agencies, is summarized in the following table. From 2018 through 2020, EMFD responded to 66 percent of calls within the City of El Mirage.

TABLE 5-1: Studied Calls by Location, Responding Agency, and Year

Location	Responding Agency	2018	2019	2020	Total
Inside El Mirage	EMFD only	2,153	2,206	2,796	7,155
	EMFD and FD agencies	427	365	240	1,032
	EMFD Total	**2,580**	**2,571**	**3,036**	**8,187**
	Other FD agencies only	453	471	354	1,278
	Total	**3,033**	**3,042**	**3,390**	**9,465**
Outside El Mirage	EMFD responded	1,353	1,331	1,514	4,198
Total		**4,386**	**4,373**	**4,904**	**13,663**

Observations:

- Of all calls involving EMFD, 34 percent were outside El Mirage in 2018 and 2019, while 33 percent were outside El Mirage in 2020.
- Of all calls within El Mirage, outside agencies responded independently to 15 percent of calls in 2018 and 2019 and 10 percent of calls in 2020.

The primary analysis in the following sections focuses on the 12,385 calls where EMFD responded and excludes the 1,278 calls within El Mirage where other FD agencies responded exclusively. All calls outside El Mirage's Fire District were identified as aid given. The detailed call types of these aid given calls are presented in Attachment I. During the three year study period, other fire agencies provided automatic aid to EMFD for incidents that occurred inside El Mirage. They responded to 1,032 calls together with EMFD and 1,278 calls without a responding EMFD unit, respectively. Attachment II details the workload of other fire agencies.

AGGREGATE CALL TOTALS AND RUNS

From 2018 to 2020, EMFD responded to 12,385 non-administrative calls, of which, 8,187 occurred inside and 4,198 occurred outside the El Mirage Fire District, respectively. During the three years, there were 100 structure fire calls and 165 outside fire calls that occurred within the El Mirage Fire District.

Calls by Type

The following table shows the number of calls that EMFD responded to by call type, average calls per day, and the percentage of calls that fall into each call type category for the three years studied. The next two figures show the percentage of calls that fall into each EMS and fire type category for each year.

TABLE 5-2: Calls by Type and Year

Call Type	Number of Calls			Calls per Day			Call Percentage		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Breathing difficulty	210	255	323	0.6	0.7	0.9	5.3	6.5	7.1
Cardiac and stroke	235	244	268	0.6	0.7	0.7	6.0	6.3	5.9
Fall and injury	555	463	601	1.5	1.3	1.6	14.1	11.9	13.2
Illness and other	671	718	876	1.8	2.0	2.4	17.1	18.4	19.3
MVA	154	112	143	0.4	0.3	0.4	3.9	2.9	3.1
OD	72	76	84	0.2	0.2	0.2	1.8	1.9	1.8
Seizure and UNC	271	291	297	0.7	0.8	0.8	6.9	7.5	6.5
EMS Total	**2,168**	**2,159**	**2,592**	**5.9**	**5.9**	**7.1**	**55.1**	**55.3**	**57.0**
False alarm	85	102	85	0.2	0.3	0.2	2.2	2.6	1.9
Good intent	12	19	21	0.0	0.1	0.1	0.3	0.5	0.5
Hazard	29	16	26	0.1	0.0	0.1	0.7	0.4	0.6
Outside fire	46	47	72	0.1	0.1	0.2	1.2	1.2	1.6
Public service	112	84	77	0.3	0.2	0.2	2.8	2.2	1.7
Structure fire	39	34	27	0.1	0.1	0.1	1.0	0.9	0.6
Fire Total	**323**	**302**	**308**	**0.9**	**0.8**	**0.8**	**8.2**	**7.7**	**6.8**
Canceled	89	110	136	0.2	0.3	0.4	2.3	2.8	3.0
Aid given	1,353	1,331	1,514	3.7	3.6	4.1	34.4	34.1	33.3
Total	**3,933**	**3,902**	**4,550**	**10.8**	**10.7**	**12.4**	**100.0**	**100.0**	**100.0**

Note: OD= Overdose and psychiatric; UNC= unconsciousness. This table does not include calls where no EMFD unit responded. In other words, when compared with Table 5-1, 453 calls are excluded in 2018, 471 calls are excluded in 2019, and 354 calls are excluded in 2020.

FIGURE 5-1: EMS Calls by Type and Year

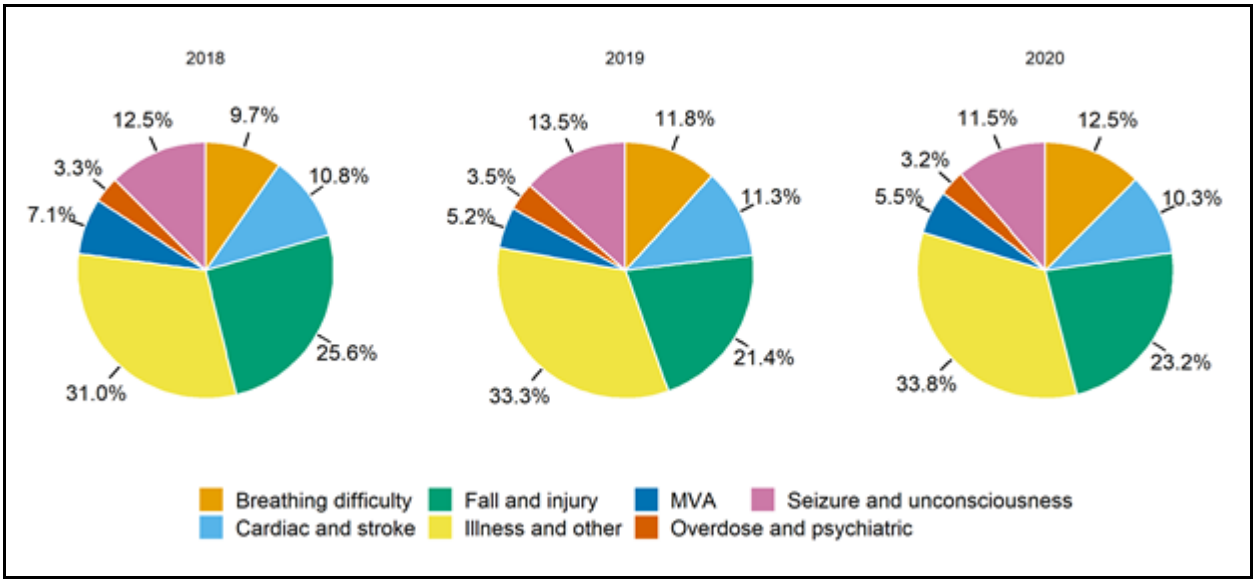
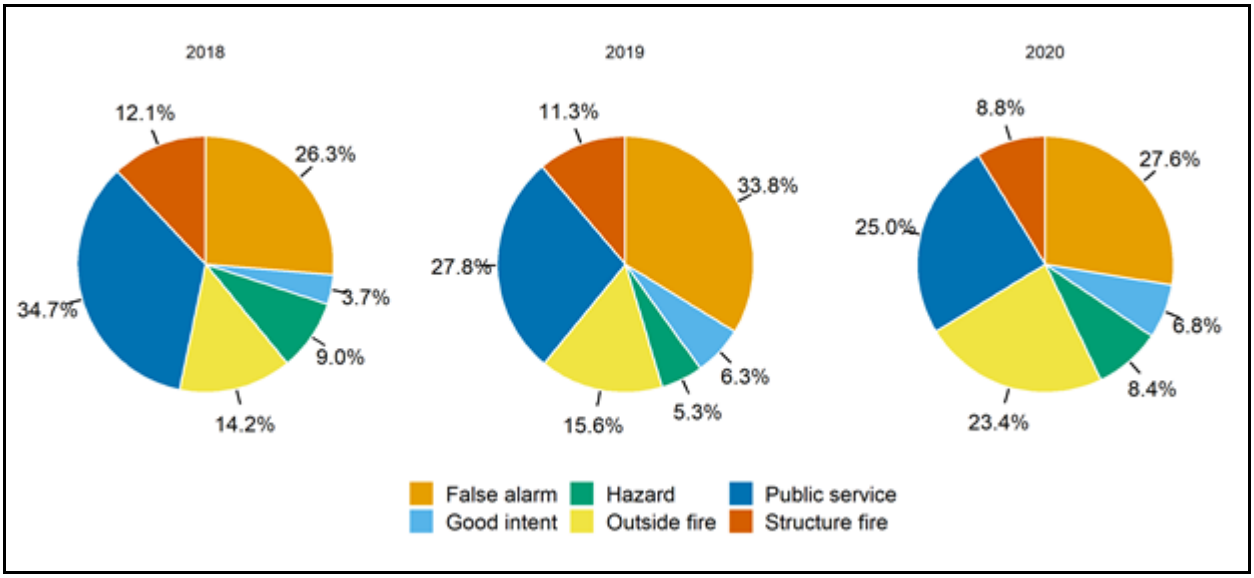


FIGURE 5-2: Fire Calls by Type and Year



Observations:

EMS

- EMS calls for 2018 totaled 2,168 (55 percent of all calls), an average of 5.9 calls per day.
- EMS calls for 2019 totaled 2,159 (55 percent of all calls), an average of 5.9 calls per day.
- EMS calls for 2020 totaled 2,592 (57 percent of all calls), an average of 7.1 calls per day.
- Total EMS calls in 2018 and 2019 were similar and then increased 20 percent from 2,159 in 2019 to 2,592 in 2020.
- Illness and other calls increased 7 percent from 671 in 2018 to 718 in 2019 and again by 22 percent to 876 in 2020.

Fire

- Fire calls for 2018 totaled 323 (8 percent of all calls), an average of 0.9 calls per day.
- Fire calls for 2019 totaled 302 (8 percent of all calls), an average of 0.8 calls per day.
- Fire calls for 2020 totaled 308 (7 percent of all calls), an average of 0.8 calls per day.
- Fire calls decreased 7 percent from 323 in 2018 to 302 in 2019 and then increased 2 percent to 308 in 2020.
- Outside fire calls increased 2 percent from 46 in 2018 to 47 in 2019 and then increased 53 percent from 47 in 2019 to 72 in 2020.
- Structure fire calls decreased 13 percent from 39 in 2018 to 34 in 2019 and then decreased 21 percent to 27 in 2020.

Calls by Type and Duration

For 2019 calls, 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 more than two hours. The 3-year trend of call duration by type is examined in the subsequent table.

TABLE 5-3: Calls by Type and Duration in 2019

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	More Than Two Hours	Total
Breathing difficulty	75	70	88	22	255
Cardiac and stroke	57	77	95	15	244
Fall and injury	227	94	120	22	463
Illness and other	215	210	228	65	718
MVA	56	28	23	5	112
Overdose and psychiatric	14	18	41	3	76
Seizure and unconsciousness	61	94	113	23	291
EMS Total	**705**	**591**	**708**	**155**	**2,159**
False alarm	93	8	1	0	102
Good intent	14	5	0	0	19
Hazard	9	4	2	1	16
Outside fire	31	8	7	1	47
Public service	70	8	5	1	84
Structure fire	12	7	7	8	34
Fire Total	**229**	**40**	**22**	**11**	**302**
Canceled	105	4	0	1	110
Aid given	965	263	92	11	1,331
Total	**2,004**	**898**	**822**	**178**	**3,902**

Observations:

EMS

- On average, there were 2.4 EMS calls per day that lasted more than one hour.
- A total of 1,296 EMS calls (60 percent) lasted less than one hour, 708 EMS calls (33 percent) lasted one to two hours, and 155 EMS calls (7 percent) lasted two or more hours.

Fire

- On average, there were 0.1 fire calls per day that lasted more than one hour.
- A total of 269 fire calls (89 percent) lasted less than one hour, 22 fire calls (7 percent) lasted one to two hours, and 11 fire calls (4 percent) lasted two or more hours.
- A total of 39 outside fire calls (83 percent) lasted less than one hour, 7 outside fire calls (15 percent) lasted one to two hours, and 1 outside fire call (2 percent) lasted two or more hours.
- A total of 19 structure fire calls (56 percent) lasted less than one hour, 7 structure fire calls (21 percent) lasted one to two hours, and 8 structure fire calls (24 percent) lasted two or more hours.

TABLE 5-4: Call Duration by Grand Call Type and Year

Year	Grand Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	More Than Two Hours	Total
2018	EMS	764	1,139	221	44	2,168
	Fire	241	50	24	8	323
	Other	1,124	282	31	5	1,442
	Total	**2,129**	**1,471**	**276**	**57**	**3,933**
2019	EMS	705	591	708	155	2,159
	Fire	229	40	22	11	302
	Other	1,070	267	92	12	1,441
	Total	**2,004**	**898**	**822**	**178**	**3,902**
2020	EMS	961	731	749	151	2,592
	Fire	230	48	17	13	308
	Other	1,235	304	87	24	1,650
	Total	**2,426**	**1,083**	**853**	**188**	**4,550**
Total		**6,559**	**3,452**	**1,951**	**423**	**12,385**

Observations:

Total

- In 2018, 9 percent of calls lasted more than one hour.
- In 2019, 26 percent of calls lasted more than one hour.
- In 2020, 23 percent of calls lasted more than one hour.
- For fire calls, the percentage of calls lasting more than one hour remained constant at 9 percent.
- For EMS calls, the percentage of calls lasting more than one hour went from 13 percent (2018), up to 40 percent (2019), and back down to 34 percent (2020).

EMS

- On average, there were 5.2, 3.6, and 4.6 EMS calls per day in 2018, 2019, and 2020, respectively, that lasted less than one hour. The number of EMS calls per day that lasted less than one hour decreased 32 percent in 2019 and then increased 31 percent in 2020.
- On average, there were 0.7, 2.4, and 2.5 EMS calls per day in 2018, 2019, and 2020 respectively, that lasted more than one hour. The number of EMS calls that lasted more than one hour per day increased 226 percent to 863 in 2019 and another 4 percent to 900 in 2020.

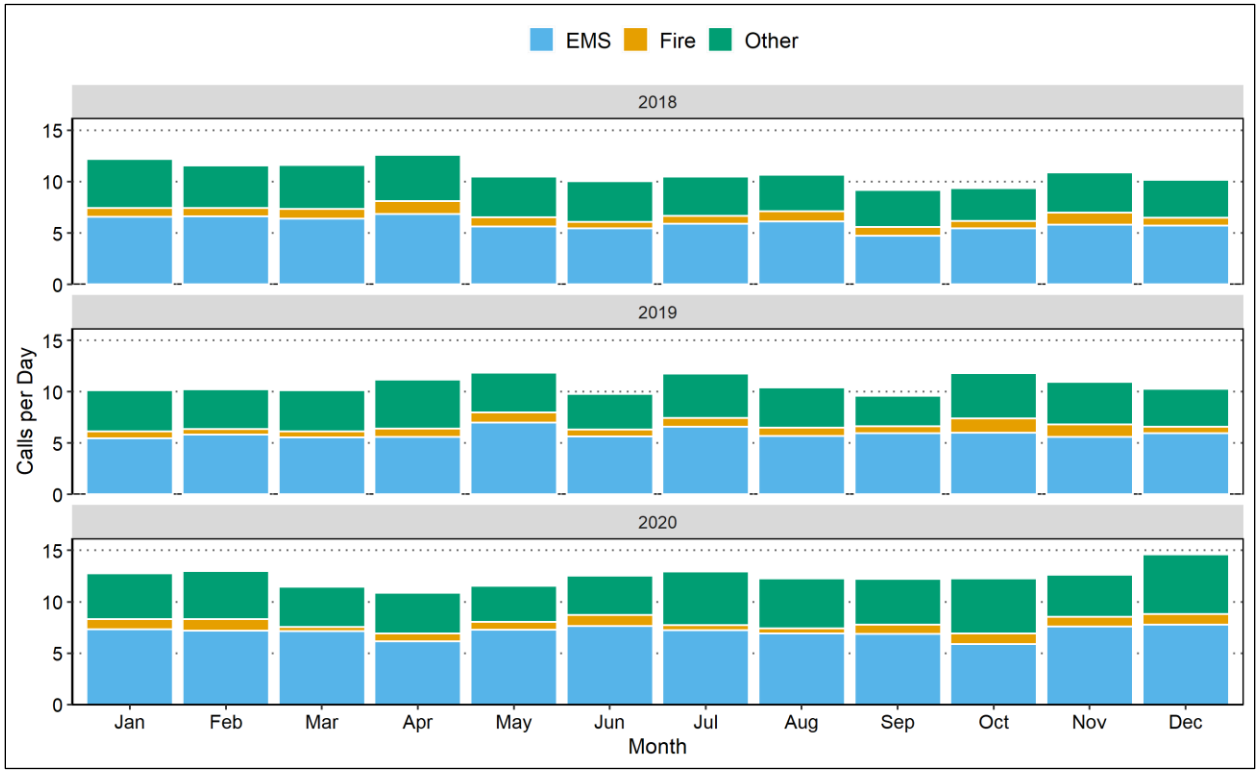
Fire

- On average, there were 0.8, 0.7, and 0.8 fire calls per day in 2018, 2019, and 2020, respectively, that lasted less than one hour.
- On average, there were 0.1 fire calls per day that lasted more than one hour each year.
- The duration of fire calls did not change significantly in the three years.

Average Calls by Month and Hour of Day

The following figure shows the monthly variation in the average daily number of calls handled by EMFD in three years. Similarly, the subsequent figure illustrates the average number of calls received each hour of the day over the three years.

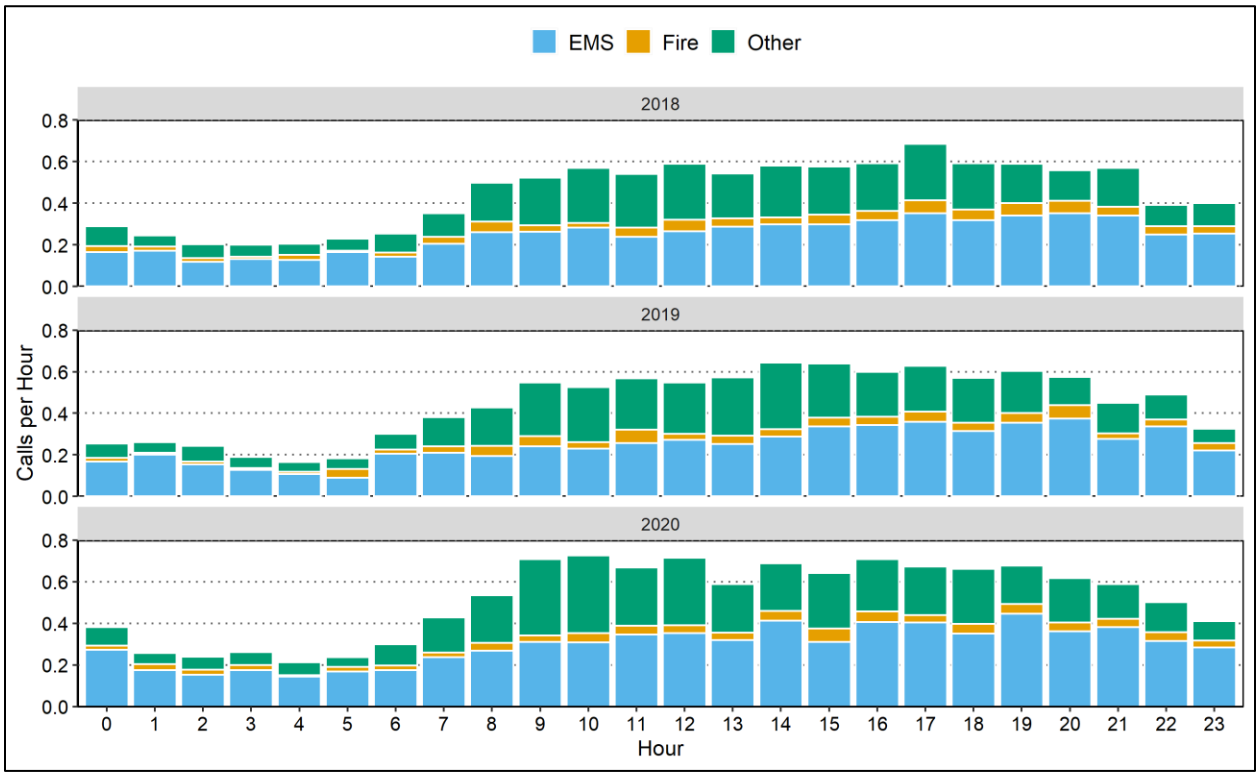
FIGURE 5-3: Average Calls by Month and Year



Observations:

- In 2018, the average call volume per day ranged from 9.2 in September to 12.6 in April.
- In 2019, the average call volume per day ranged from 9.6 in September to 11.8 in October.
- In 2020, the average call volume per day ranged from 10.9 in April to 14.6 in December.

FIGURE 5-4: Calls by Hour of Day and Year



Observations:

- In 2018, the average call volume per hour ranged from 0.2 between 3:00 a.m. and 4:00 a.m. to 0.7 between 5:00 p.m. and 6:00 p.m.
- In 2019, the average call volume per hour ranged from 0.2 between 4:00 a.m. and 5:00 a.m. to 0.6 between 2:00 p.m. and 3:00 p.m.
- In 2020, the average call volume per hour ranged from 0.2 between 4:00 a.m. and 5:00 a.m. to 0.7 between 10:00 a.m. and 11:00 a.m.

Units Arriving at Calls (EMFD Only)

The following table and two figures detail the number of calls with one, two, three, and four or more EMFD units arriving at a call, broken down by call type, for 2019. In this section, we limit ourselves to calls where a unit from EMFD arrives. For this reason, there are fewer calls in this table than in Table 5-2. Table 5-6 shows the number of arriving EMFD units by grand call type.

TABLE 5-5: Calls by Call Type and Number of Arriving EMFD Units in 2019

Call Type	Number of Units				Total Calls
	One	Two	Three	Four or More	
Breathing difficulty	242	11	0	0	253
Cardiac and stroke	235	9	0	0	244
Fall and injury	422	36	3	0	461
Illness and other	685	28	1	0	714
MVA	96	14	2	0	112
Overdose and psychiatric	69	6	0	0	75
Seizure and unconsciousness	283	5	0	0	288
EMS Total	**2,032**	**109**	**6**	**0**	**2,147**
False alarm	99	2	0	0	101
Good intent	15	4	0	0	19
Hazard	11	5	0	0	16
Outside fire	37	8	2	0	47
Public service	79	4	0	0	83
Structure fire	13	6	11	4	34
Fire Total	**254**	**29**	**13**	**4**	**300**
Canceled	44	0	0	0	44
Aid given	925	48	5	1	979
Total	**3,255**	**186**	**24**	**5**	**3,470**
Percentage	**93.8**	**5.4**	**0.7**	**0.1**	**100.0**

FIGURE 5-5: 2019 EMS Calls by Number of Arriving EMFD Units

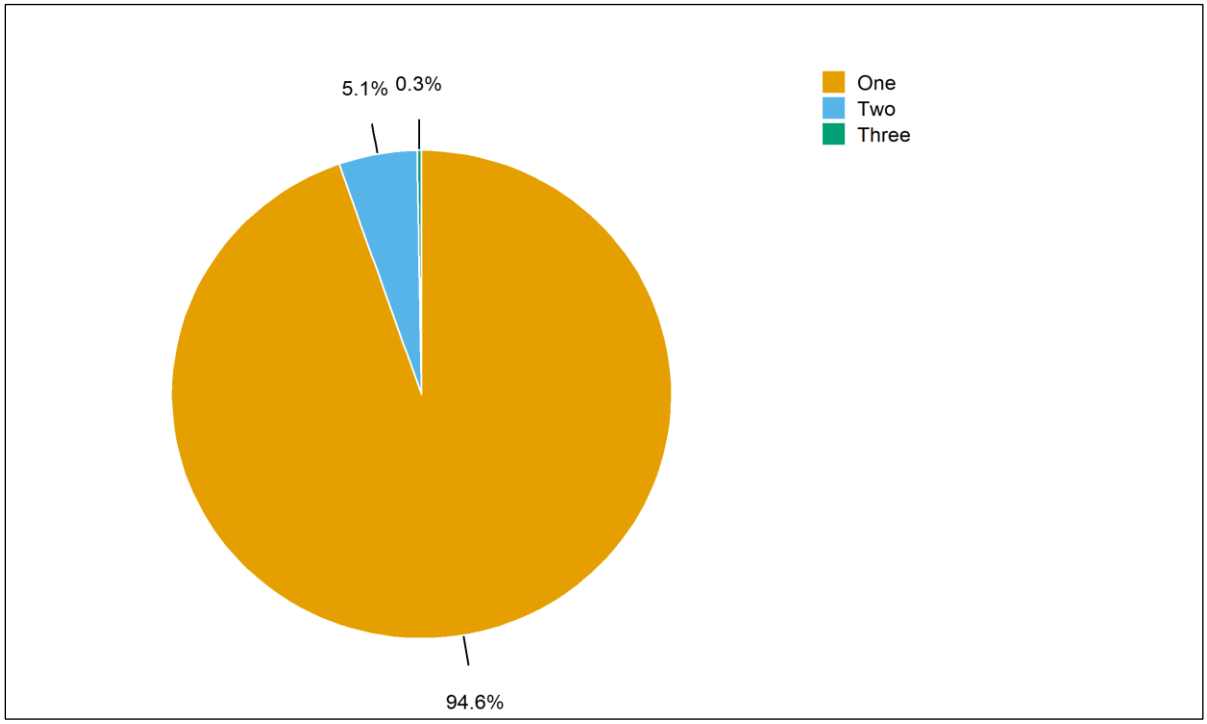
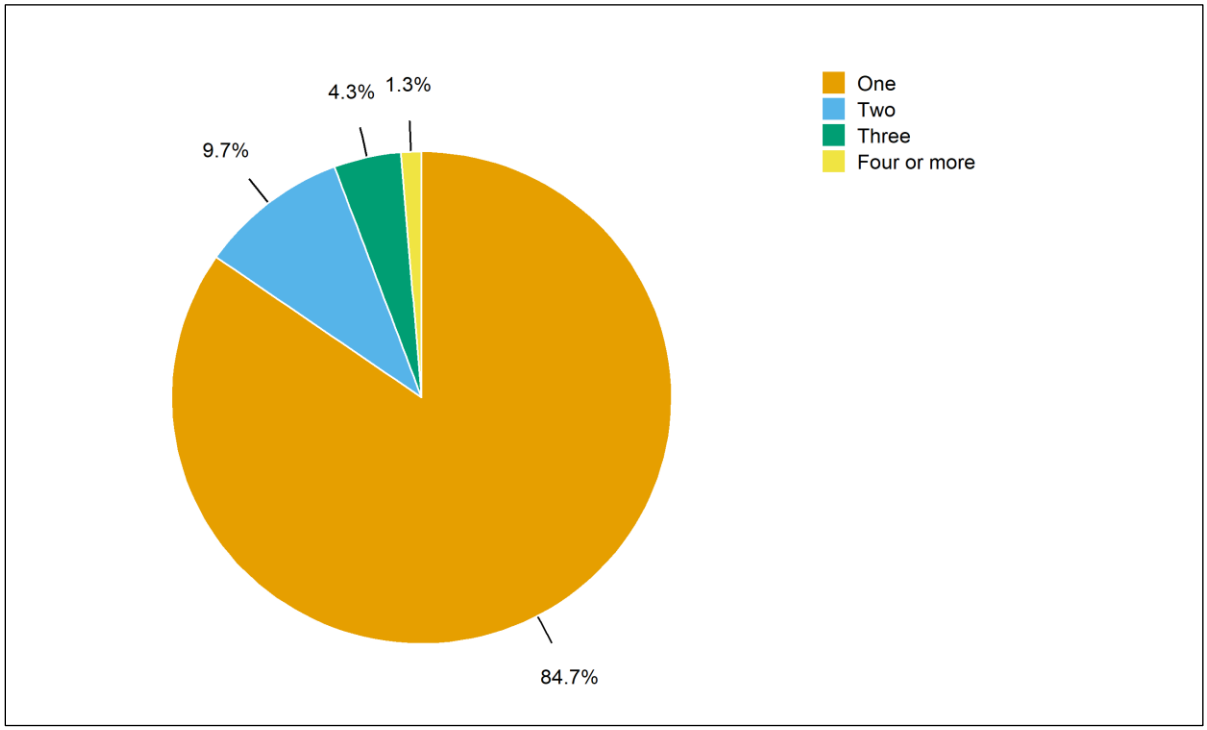


FIGURE 5-6: 2019 Fire Calls by Number of Arriving EMFD Units



Observations:

Overall

- On average, 1.1 units arrived at all calls; for 94 percent of calls, only one unit arrived.
- Overall, four or more units arrived at less than 1 percent of calls.

EMS

- On average, 1.1 units arrived per EMS call.
- For EMS calls, one unit arrived 95 percent of the time, two units arrived 5 percent of the time, and three units arrived less than 1 percent of the time.

Fire

- On average, 1.2 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 4 percent of the time, and four or more units arrived 1 percent of the time.
- For outside fire calls, three or more units arrived 4 percent of the time.
- For structure fire calls, three or more units arrived 44 percent of the time.

TABLE 5-6: Number of Arriving EMFD Units by Grand Call Type and Year

Year	Grand Call Type	One	Two	Three	Four or More	Total
2018	EMS	1,937	190	34	0	2,161
	Fire	265	37	13	3	318
	Other	1012	65	2	0	1,079
	Total	**3,214**	**292**	**49**	**3**	**3,558**
2019	EMS	2,032	109	6	0	2,147
	Fire	254	29	13	4	300
	Other	969	48	5	1	1,023
	Total	**3,255**	**186**	**24**	**5**	**3,470**
2020	EMS	2,500	77	9	0	2,586
	Fire	232	51	20	5	308
	Other	1,145	61	23	0	1,229
	Total	**3,877**	**189**	**52**	**5**	**4,123**
Total		**10,346**	**667**	**125**	**13**	**11,151**

Observations:

2018

- On average, 1.1 units arrived at all calls
- On average, 1.1 units arrived per EMS call.
- On average, 1.2 units arrived per fire call.
- For outside fire calls, three or more units arrived at 2 percent of calls.
- For structure fire calls, three or more units arrived at 26 percent of calls.

2019

- On average, 1.1 units arrived at all calls
- On average, 1.1 units arrived per EMS call.
- On average, 1.2 units arrived per fire call.
- For outside fire calls, three or more units arrived at 4 percent of calls.
- For structure fire calls, three or more units arrived at 44 percent of calls.

2020

- On average, 1.1 units arrived at all calls
- On average, 1.0 units arrived per EMS call.
- On average, 1.4 units arrived per fire call.
- For outside fire calls, three or more units arrived at 10 percent of calls.
- For structure fire calls, three or more units arrived at 48 percent of calls.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of EMFD's unit 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 (4,302) than calls (3,902) and the average deployed time per run varies from the total duration of calls.

Runs and Deployed Time – EMFD Units

Deployed time, also referred to as deployed hours, is the total deployment time of EMFD units deployed on all runs. Table 5-7 shows the total deployed time, both overall and broken down by type of run, for all EMFD units in 2019. Table 5-8 presents the same information for all years studied: 2018, 2019, and 2020. Table 5-9 and Figure 5-7 present the average deployed minutes by hour of day and year.

TABLE 5-7: Annual EMFD Runs and Deployed Time by Run Type, 2019

Run Type	Avg. Deployed Min. per Run	Total Annual Hours	Percent of Total Hours	Avg. Deployed Min. per Day	Total Annual Runs	Avg. Runs per Day
Breathing difficulty	30.6	138.7	6.7	22.8	272	0.7
Cardiac and stroke	31.6	139.4	6.8	22.9	265	0.7
Fall and injury	28.4	244.6	11.9	40.2	516	1.4
Illness and other	30.8	389.4	18.9	64.0	759	2.1
MVA	30.3	67.2	3.3	11.0	133	0.4
OD	33.0	47.9	2.3	7.9	87	0.2
Seizure and UNC	37.0	187.3	9.1	30.8	304	0.8
EMS Total	**31.2**	**1,214.5**	**58.9**	**199.6**	**2,336**	**6.4**
False alarm	15.0	26.7	1.3	4.4	107	0.3
Good intent	20.7	7.9	0.4	1.3	23	0.1
Hazard	45.6	16.7	0.8	2.7	22	0.1
Outside fire	33.5	36.3	1.8	6.0	65	0.2
Public service	22.4	34.3	1.7	5.6	92	0.3
Structure fire	77.9	125.9	6.1	20.7	97	0.3
Fire Total	**36.6**	**247.9**	**12.0**	**40.8**	**406**	**1.1**
Canceled	7.4	14.3	0.7	2.4	116	0.3
Aid given	24.3	585.6	28.4	96.3	1,444	4.0
Other total	**23.1**	**600.0**	**29.1**	**98.6**	**1,560**	**4.3**
Total	**28.8**	**2,062.4**	**100.0**	**339.0**	**4,302**	**11.8**

Note: OD=Overdose and psychiatric; UNC=Unconsciousness.

Observations:

Overall

- The total deployed time for 2019 was 2,062.4 hours. The daily average was 5.7 hours for all EMFD units combined.
- There were 4,302 runs, including 116 runs dispatched for canceled calls and 1,444 runs dispatched for aid given calls. The daily average was 11.8 runs.

EMS

- EMS runs accounted for 59 percent of the total workload.
- The average deployed time for EMS runs was 31.2 minutes. The deployed time for all EMS runs averaged 3.3 hours per day.

Fire

- Fire runs accounted for 12 percent of the total workload.
- The average deployed time for fire runs was 36.6 minutes. The deployed time for all fire runs averaged 40.8 minutes per day.
- There were 162 runs for structure and outside fire calls combined, with a total workload of 162.2 hours. This accounted for 8 percent of the total workload.
- The average deployed time for outside fire runs was 33.5 minutes per run, and the average deployed time for structure fire runs was 77.9 minutes per run.

TABLE 5-8: EMFD Runs and Deployed Time by Run Type and Year

Run Type	Total Annual Hours			Total Annual Runs		
	2018	2019	2020	2018	2019	2020
Breathing difficulty	94.7	138.7	183.5	227	272	336
Cardiac and stroke	108.4	139.4	174.0	250	265	275
Fall and injury	256.9	244.6	309.2	602	516	637
Illness and other	345.1	389.4	473.1	765	759	911
MVA	100.9	67.2	97.7	268	133	174
OD	37.2	47.9	57.9	85	87	91
Seizure and UNC	131.9	187.3	203.3	310	304	310
EMS Total	**1,075.2**	**1,214.5**	**1,498.6**	**2,507**	**2,336**	**2,734**
False alarm	20.4	26.7	23.4	89	107	89
Good intent	5.4	7.9	6.1	18	23	23
Hazard	19.0	16.7	23.5	41	22	39
Outside fire	30.3	36.3	65.4	59	65	129
Public service	50.6	34.3	34.8	129	92	91
Structure fire	75.9	125.9	101.3	88	97	80
Fire Total	**201.6**	**247.9**	**254.4**	**424**	**406**	**451**
Canceled	9.9	14.3	23.8	100	116	153
Aid given	535.1	585.6	715.2	1,449	1,444	1,671
Other total	**545.0**	**600.0**	**739.0**	**1,549**	**1,560**	**1,824**
Total	**1,821.7**	**2,062.4**	**2,492.1**	**4,480**	**4,302**	**5,009**

Note: OD= Overdose and psychiatric; UNC=Unconsciousness.

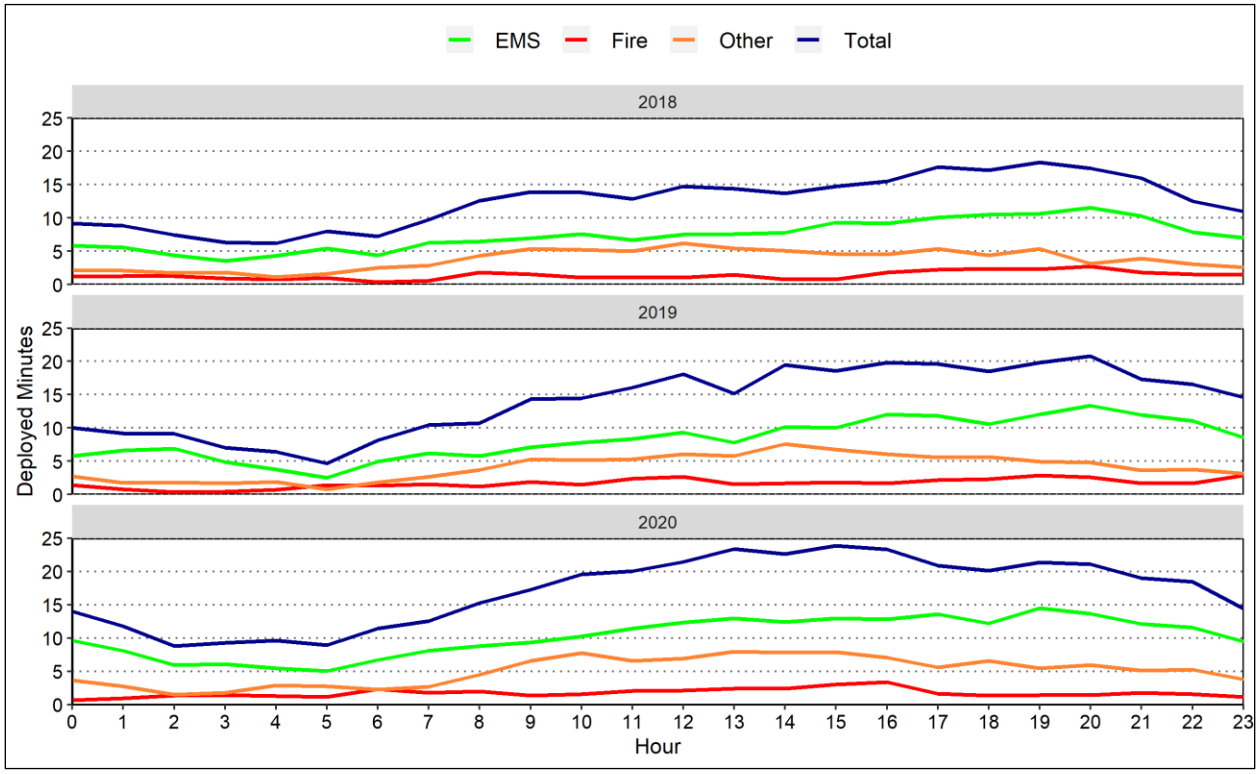
Observations:

- The total EMFD deployed time increased 13 percent from 1,821.7 hours in 2018 to 2,062.4 hours in 2019 and another 21 percent to 2,492.1 hours in 2020.
- The number of EMFD runs decreased 4 percent from 4,480 in 2018 to 4,302 in 2019 and then increased 16 percent to 5,009 in 2020.

TABLE 5-9: EMFD Deployed Minutes by Hour of Day, Grand Call Type, and Year

Hour	2018				2019				2020			
	EMS	FIRE	Other	Total	EMS	FIRE	Other	Total	EMS	FIRE	Other	Total
0	5.8	1.2	2.2	9.2	5.8	1.4	2.8	10.0	9.6	0.7	3.7	14.0
1	5.5	1.3	2.1	8.9	6.7	0.8	1.7	9.2	8.1	1.0	2.7	11.8
2	4.4	1.2	1.8	7.4	6.9	0.4	1.8	9.1	6.0	1.3	1.5	8.8
3	3.6	0.9	1.8	6.3	4.9	0.5	1.7	7.0	6.1	1.4	1.8	9.3
4	4.3	0.8	1.1	6.2	3.8	0.7	1.9	6.4	5.5	1.3	2.9	9.6
5	5.4	1.0	1.6	8.0	2.5	1.4	0.8	4.7	5.0	1.2	2.7	9.0
6	4.4	0.4	2.5	7.3	5.0	1.3	1.9	8.2	6.7	2.4	2.3	11.4
7	6.3	0.6	2.9	9.8	6.2	1.5	2.7	10.4	8.1	1.8	2.7	12.6
8	6.5	1.8	4.3	12.6	5.8	1.2	3.7	10.7	8.8	2.0	4.5	15.2
9	7.0	1.5	5.4	13.9	7.1	1.9	5.3	14.3	9.3	1.4	6.6	17.3
10	7.6	1.0	5.2	13.8	7.8	1.5	5.2	14.5	10.3	1.6	7.7	19.6
11	6.7	1.2	5.0	12.8	8.4	2.4	5.3	16.0	11.4	2.1	6.6	20.1
12	7.5	1.0	6.2	14.7	9.3	2.7	6.1	18.1	12.3	2.1	6.9	21.4
13	7.5	1.5	5.4	14.4	7.8	1.6	5.8	15.2	13.0	2.4	8.0	23.4
14	7.8	0.8	5.1	13.7	10.2	1.7	7.6	19.5	12.4	2.4	7.8	22.6
15	9.3	0.8	4.6	14.8	10.0	1.8	6.8	18.6	13.0	3.0	7.9	23.9
16	9.2	1.8	4.5	15.5	12.0	1.7	6.1	19.8	12.8	3.4	7.1	23.3
17	10.1	2.2	5.4	17.7	11.8	2.2	5.6	19.6	13.6	1.6	5.6	20.9
18	10.5	2.4	4.4	17.2	10.6	2.3	5.6	18.5	12.2	1.4	6.6	20.1
19	10.6	2.3	5.4	18.3	12.1	2.8	5.0	19.9	14.5	1.4	5.4	21.4
20	11.5	2.7	3.2	17.4	13.4	2.6	4.8	20.8	13.7	1.5	5.9	21.1
21	10.3	1.8	3.9	16.0	12.0	1.7	3.6	17.3	12.2	1.8	5.1	19.0
22	7.9	1.5	3.1	12.5	11.1	1.7	3.8	16.6	11.6	1.6	5.3	18.4
23	7.0	1.5	2.6	11.0	8.6	2.9	3.2	14.6	9.5	1.2	3.8	14.4
Daily Avg.	**176.7**	**33.2**	**89.6**	**299.5**	**199.6**	**40.8**	**98.6**	**339.0**	**246.3**	**41.8**	**121.5**	**409.7**

FIGURE 5-7: Average Deployed Minutes by Hour of Day



Observations:

- In 2018, the average deployed time peaked between 7:00 p.m. and 8:00 p.m., averaging 18.3 minutes.
- In 2018, the average deployed time was lowest between 4:00 a.m. and 5:00 a.m., averaging 6.2 minutes.
- In 2019, the average deployed time peaked between 8:00 p.m. and 9:00 p.m., averaging 20.8 minutes.
- In 2019, the average deployed time was lowest between 5:00 a.m. and 6:00 a.m., averaging 4.7 minutes.
- In 2020, the average deployed time peaked between 3:00 p.m. and 4:00 p.m., averaging 23.9 minutes.
- In 2020, the average deployed time was lowest between 2:00 a.m. and 3:00 a.m., averaging 8.8 minutes.

Workload by Unit

Table 5-10 provides a summary of each EMFD unit's workload for 2019. Tables 5-11 and 5-12 provide a more detailed view of workload, showing each unit's runs broken out by run type (Table 5-11) and its daily average deployed time by run type (Table 5-12). Table 5-13 examines the workload of each unit for all three years.

TABLE 5-10: Workload by EMFD Unit, 2019

Unit	Unit Type	Deployed Minutes per Run	Total Hours	Total Pct.	Deployed Minutes per Day	Total Runs	Runs per Day
BC121	BC	34.6	144.8	7.0	23.8	251	0.7
BR121	Brush Truck	59.1	21.7	1.1	3.6	22	0.1
E121	Engine	27.8	1,357.0	65.8	223.1	2,924	8.0
E122	Engine	27.3	246.7	12.0	40.6	542	1.5
LA121	Low acuity	29.4	263.0	12.8	43.2	537	1.5
Other	Other	67.5	29.3	1.4	4.8	26	0.1
Total		**28.8**	**2,062.4**	**100.0**	**339.0**	**4,302**	**11.8**

Note: Other includes a bike team, a threat liaison officer (TLO), and four fire investigator units.

TABLE 5-11: Total Runs by Run Type and EMFD Unit, 2019

Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Aid Given	Total
BC121	66	1	4	6	6	3	22	4	139	251
BR121	0	0	0	0	6	0	1	0	15	22
E121	1,512	82	18	14	41	58	32	79	1,088	2,924
E122	274	24	1	2	8	14	8	14	197	542
LA121	483	0	0	0	0	16	16	19	3	537
Other	1	0	0	0	4	1	18	0	2	26
Total	**2,336**	**107**	**23**	**22**	**65**	**92**	**97**	**116**	**1,444**	**4,302**

Note: See Table 5-10 for unit type.

TABLE 5-12: Average Deployed Minutes by Run Type and EMFD Unit, 2019

Unit	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Canceled	Aid Given	Total
BC121	5.2	0.1	0.4	1.1	0.7	0.3	5.1	0.0	10.9	23.8
BR121	0.0	0.0	0.0	0.0	1.0	0.0	0.4	0.0	2.2	3.6
E121	131.1	3.2	0.9	1.4	3.4	3.9	6.2	1.3	71.7	223.1
E122	24.4	1.1	0.0	0.3	0.6	0.6	2.1	0.2	11.3	40.6
LA121	39.0	0.0	0.0	0.0	0.0	0.7	2.7	0.8	0.1	43.2
Other	0.0	0.0	0.0	0.0	0.3	0.2	4.2	0.0	0.2	4.8
Total	**199.6**	**4.4**	**1.3**	**2.7**	**6.0**	**5.6**	**20.7**	**2.4**	**96.3**	**339.0**

Note: See Table 5-10 for unit type.

TABLE 5-13: Workload and Runs by EMFD Unit and Year

Unit	Unit Type	Total Hours			Total Runs		
		2018	2019	2020	2018	2019	2020
BC121	BC	153.9	144.8	123.6	364	251	237
BR121	Brush Truck	23.1	21.7	73.9	21	22	95
E121	Engine	1,251.8	1,357.0	1,242.8	3,191	2,924	2,601
E122	Engine	5.3	246.7	836.7	18	542	1,776
LA121	Low acuity	373.1	263.0	169.7	860	537	269
Other	Other	14.4	29.3	45.4	26	26	31
Total		**1,821.7**	**2,062.4**	**2,492.1**	**4,480**	**4,302**	**5,009**

Note: Other includes a bike team, a threat liaison officer (TLO), and four fire investigator units.

Observations:

- Unit E121 made the most runs and had the highest total annual deployed hours in each year.
  - The total deployed time increased 8 percent from 1,251.8 hours (or 3.4 hours per day) in 2018 to 1,357.0 hours (or 3.7 hours per day) in 2019 and then decreased 8 percent to 1,242.8 hours (or 3.4 hours per day) in 2020.
- Unit E122 made the second most runs and had the third-highest total annual deployed hours in 2019, and then the second most runs and the second-highest total annual deployed hours in 2020.
  - In 2018, unit E122 was only dispatched 18 times in the five days between April 16th and 20th (5.3 total deployed hours).
  - The total deployed time increased 239 percent from 246.7 hours (or 40.6 minutes per day) in 2019 to 836.7 hours (or 2.3 hours per day) in 2020.
- Unit LA121 made the second most runs and had the second-highest total annual deployed hours in 2018, the third most runs and the second-highest total annual deployed hours in 2019, and then the third most runs and the third-highest total annual deployed hours in 2020.
  - The total deployed time decreased 30 percent from 373.1 hours (or 61.3 minutes per day) in 2018 to 263.0.0 hours (or 43.2 minutes per day) in 2019 and further decreased 35 percent to 169.7 hours (or 27.9 minutes per day) in 2020.

ANALYSIS OF BUSIEST HOURS

In this analysis, we included all 13,663 calls that occurred inside and outside El Mirage in the three years studied. For all these calls, there is significant variability in the number of calls from hour to hour. 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 2018 and 2019 and the 8,784 hours in 2020. Table 5-14 shows the number of hours in each year in which there were zero to four or more calls during the hour. Table 5-15 shows the number of times a call overlapped with another call by year.

TABLE 5-14: Frequency Distribution of the Number of Calls, by Year

Calls in an Hour	2018		2019		2020	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0	5,373	61.3	5,423	61.9	5,143	58.5
1	2,569	29.3	2,475	28.3	2,613	29.7
2	660	7.5	721	8.2	828	9.4
3	135	1.5	114	1.3	168	1.9
4+	23	0.3	27	0.3	32	0.4
Total	**8,760**	**100.0**	**8,760**	**100.0**	**8,784**	**100.0**

Note: There were 365 days in 2018 and 2019 and 366 days in 2020.

TABLE 5-15: Frequency of Overlapping Calls, by Year

Scenario	Number of Calls			Percent of All Calls			Total Hours		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
No overlap	3,372	3,064	3,297	76.9	70.1	67.2	1,809.2	2,100.6	2,265.7
Overlap with one call	878	1,049	1,340	20.0	24.0	27.3	261.0	424.7	464.8
Overlap with two calls	125	220	248	2.8	5.0	5.1	19.3	60.3	51.9
Overlap with three calls	9	39	18	0.2	0.9	0.4	1.2	5.7	2.8
Overlap with four calls	2	1	1	0.0	0.0	0.0	0.1	0.3	0.0

Note: All calls within El Mirage are included. The column totals for the number of calls will match Table 5-1.

Table 5-16 focuses on EMFD's availability to respond to calls within its fire district. At the same time, it focuses on calls where at least one unit (EMFD, another FD agency, or ambulance) eventually arrived and ignores calls where no unit arrived. While there were 9,465 calls within El Mirage (See Table 5-1, the fifth row of the "Total" column), there were 224 calls without an arriving unit.

TABLE 5-16: EMFD Availability to Respond to Calls, by Year

Year	Calls in District	EMFD Responded	Percent Responded	EMFD Arrived	Percent Arrived	EMFD First	Percent First
2018	2,968	2,527	85.1	2,511	84.6	2,405	81.0
2019	2,957	2,508	84.8	2,491	84.2	2,229	75.4
2020	3,316	2,975	89.7	2,966	89.4	2,843	85.7
Total	**9,241**	**8,010**	**86.7**	**7,968**	**86.2**	**7,447**	**80.9**

Observations:

- In 2018, during 23 hours (0.3 percent of all hours), four or more calls occurred; in other words, including aid given calls within El Mirage, EMFD was responsible for four or more calls in an hour roughly once every 16 days.
  - The highest number of calls to occur in an hour was four, which happened 23 times.
- In 2019, during 27 hours (0.3 percent of all hours), four or more calls occurred; in other words, including aid given calls within El Mirage, EMFD was responsible for four or more calls in an hour roughly once every 14 days.
  - The highest number of calls to occur in an hour was six, which happened once.
- In 2020, during 32 hours (0.4 percent of all hours), four or more calls occurred; in other words, including aid given calls within El Mirage, EMFD was responsible for four or more calls in an hour roughly once every 11 days.
  - The highest number of calls to occur in an hour was five, which happened 3 times.
- During the three years, the availability of EMFD to respond to calls within its fire district was highest in 2020 and lowest in 2019.
  - In 2020, the percent of times that an EMFD unit responded, arrived, and arrived first to a call were 90, 89, and 86 percent, respectively.
  - In 2019, the percent of times that an EMFD unit responded, arrived, and arrived first to a call were 85, 84, and 75 percent, respectively.

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 this analysis, calls whose travel code was recorded as "code 3" were identified as emergencies. We included all calls within the City of El Mirage to which at least one non-administrative EMFD unit arrived. Units from non-EMFD agencies were not included. Also, calls with a total response time exceeding 30 minutes were excluded. In addition, non-emergency calls 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, starting with 12,385 calls in three years, we excluded 4,198 aid given calls (outside El Mirage), 335 canceled calls, 525 calls where no units recorded a valid on-scene time, six calls with a total response time exceeding 30 minutes, 256 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 490 non-emergency calls. As a result, in this section, a total of 6,575 calls are included in the analysis.

In this section, we conducted a detailed analysis for calls in 2019. We also included a shorter analysis of response times by year. Finally, we also examine the average response time to non-emergency calls.

Response Time by Type of Call

Table 5-17 breaks down the average dispatch, turnout, travel, and total response times by call type for all 2019 calls in El Mirage, and Table 5-18 does the same for 90th percentile response times. A 90th percentile means that 90 percent of calls had response times at or below that number. For example, Table 5-18 shows an overall 90th percentile response time of 8.1 minutes, which means that 90 percent of the time, a call had a response time of no more than 8.1 minutes. Figures 5-8 and 5-9 illustrate the same information.

TABLE 5-17: Average Response Time of First Arriving Unit, by Call Type, 2019

Call Type	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	0.8	1.0	3.7	5.5	190
Cardiac and stroke	0.9	0.9	3.6	5.5	188
Fall and injury	1.0	1.0	3.9	5.9	408
Illness and other	1.1	1.0	4.0	6.0	569
MVA	0.7	0.9	4.2	5.9	93
Overdose and psychiatric	0.8	0.9	3.4	5.1	62
Seizure and unconsciousness	0.9	0.9	3.6	5.4	239
EMS Total	**1.0**	**1.0**	**3.8**	**5.8**	**1,749**
False alarm	1.3	1.0	4.9	7.2	100
Good intent	1.2	1.2	3.1	5.4	6
Hazard	1.0	0.8	3.4	5.2	6
Outside fire	1.1	1.0	4.3	6.3	43
Public service	1.4	0.7	3.4	5.4	12
Structure fire	1.3	1.0	3.6	5.9	27
Fire Total	**1.2**	**1.0**	**4.4**	**6.6**	**194**
Total	**1.0**	**1.0**	**3.9**	**5.8**	**1,943**

FIGURE 5-8: Average Response Time of First Arriving Unit, by Call Type, 2019, EMS Calls

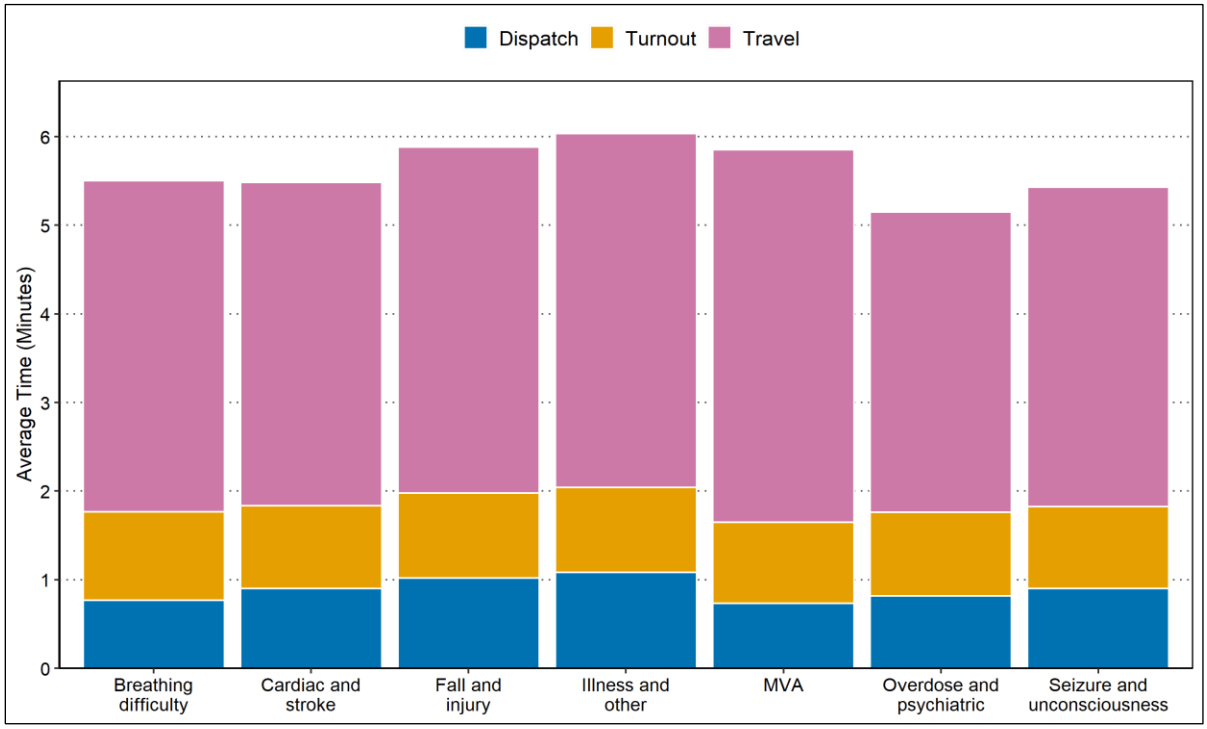


FIGURE 5-9: Average Response Time of First Arriving Unit, by Call Type, 2019, Fire Calls

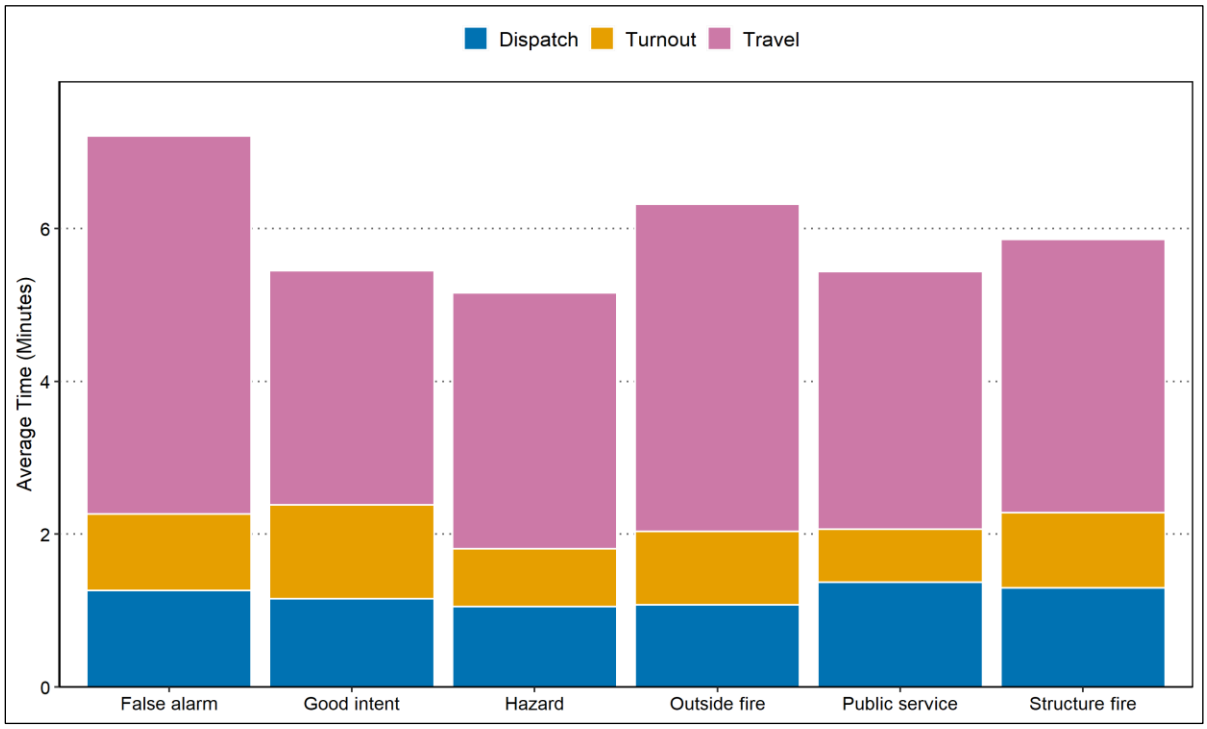


TABLE 5-18: 90th Percentile Response Time of First Arriving Unit, by Call Type, 2019

Call Type	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	1.3	1.8	5.8	7.7	190
Cardiac and stroke	1.6	1.6	5.3	7.1	188
Fall and injury	1.6	1.6	5.6	8.0	408
Illness and other	1.9	1.6	5.8	8.3	569
MVA	1.2	1.5	6.4	8.1	93
Overdose and psychiatric	1.4	1.6	4.9	6.9	62
Seizure and unconsciousness	1.4	1.5	5.4	7.3	239
EMS Total	**1.6**	**1.6**	**5.6**	**8.0**	**1,749**
False alarm	2.2	1.8	6.7	9.6	100
Good intent	1.8	1.5	5.3	8.4	6
Hazard	1.5	1.0	5.5	7.3	6
Outside fire	2.1	1.6	6.8	9.2	43
Public service	2.0	1.1	4.4	8.8	12
Structure fire	2.5	1.5	6.2	8.4	27
Fire Total	**2.2**	**1.7**	**6.6**	**9.4**	**194**
Total	**1.7**	**1.6**	**5.7**	**8.1**	**1,943**

Observations:

- The average dispatch time was 1.0 minutes.
- The average turnout time was 1.0 minutes.
- The average travel time was 3.9 minutes.
- The average total response time was 5.8 minutes.
- The average response time was 5.8 minutes for EMS calls and 6.6 minutes for fire calls.
- The average response time was 6.3 minutes for outside fires and 5.9 minutes for structure fires.
- The 90th percentile dispatch time was 1.7 minutes.
- The 90th percentile turnout time was 1.6 minutes.
- The 90th percentile travel time was 5.7 minutes.
- The 90th percentile total response time was 8.1 minutes.
- The 90th percentile response time was 8.0 minutes for EMS calls and 9.4 minutes for fire calls.
- The 90th percentile response time was 9.2 minutes for outside fires and 8.4 minutes for structure fires.

Table 5-19 shows the average response time by year and the time of day for calls in El Mirage. The table also shows 90th percentile response times. Figures 5-10 and 5-11 present the average and 90th percentile response times by year, respectively.

TABLE 5-19: Average and 90th Percentile Response Time of First Arriving Unit, by Hour of Day and Year

Hour	Average Response Time (Minutes)			90th Percentile Response Time (Minutes)			Number of Calls		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
0	6.9	6.1	6.3	9.2	8.1	8.6	65	52	90
1	6.7	6.5	7.0	8.4	9.2	8.7	63	57	67
2	7.2	6.9	7.1	9.7	9.0	9.5	44	50	55
3	7.0	6.9	7.0	9.1	8.8	9.0	47	40	58
4	7.1	7.2	7.2	9.3	9.8	10.5	49	38	49
5	6.9	6.9	6.7	8.7	8.9	8.1	59	37	64
6	6.5	6.8	6.7	8.3	9.1	8.5	51	62	61
7	6.0	6.4	6.2	7.9	9.1	8.0	75	63	83
8	5.2	6.4	5.8	7.3	9.5	7.4	94	66	97
9	5.4	5.6	5.6	7.7	7.7	8.0	83	88	110
10	5.9	5.6	5.7	7.9	7.6	8.0	90	76	112
11	5.1	5.4	5.7	6.8	6.9	7.2	84	93	125
12	5.2	5.6	5.5	7.7	8.3	7.4	94	90	127
13	5.2	5.4	5.5	7.3	7.2	7.5	97	85	111
14	5.3	5.5	5.6	7.5	7.7	7.6	104	96	139
15	5.8	5.5	5.4	8.1	7.3	7.4	114	111	113
6	5.4	5.4	5.3	7.6	7.4	6.8	109	110	147
17	5.5	5.4	5.2	7.9	7.0	7.2	123	121	140
18	5.4	5.6	5.4	7.0	7.4	7.3	116	102	120
19	5.5	5.6	5.4	7.6	7.4	7.2	124	119	152
20	5.7	5.8	5.4	7.6	8.0	7.0	130	124	121
21	5.4	5.7	5.6	7.2	7.8	7.5	122	93	146
22	6.1	6.0	6.0	8.8	7.8	7.8	91	100	115
23	6.1	6.2	6.1	8.2	8.3	7.9	99	70	103
Total	**5.8**	**5.8**	**5.8**	**8.0**	**8.1**	**7.8**	**2,127**	**1,943**	**2,505**

FIGURE 5-10: Average Response Time of First Arriving Unit, by Hour of Day and Year

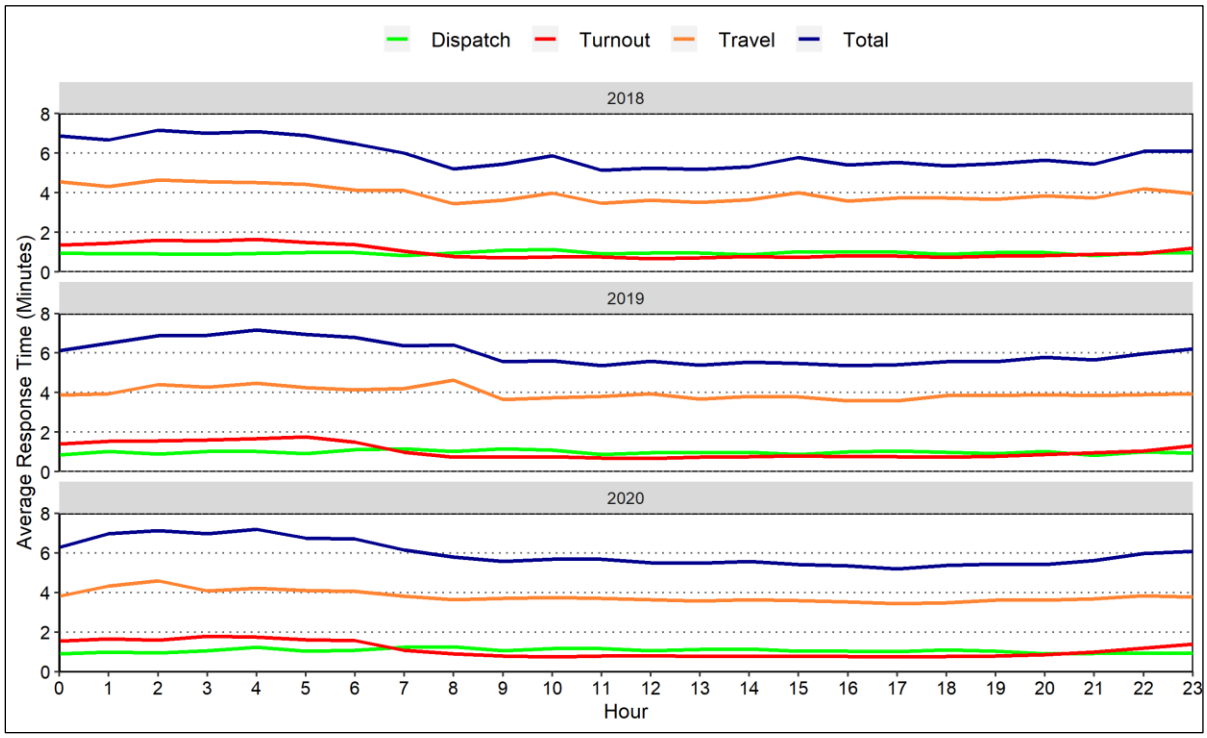
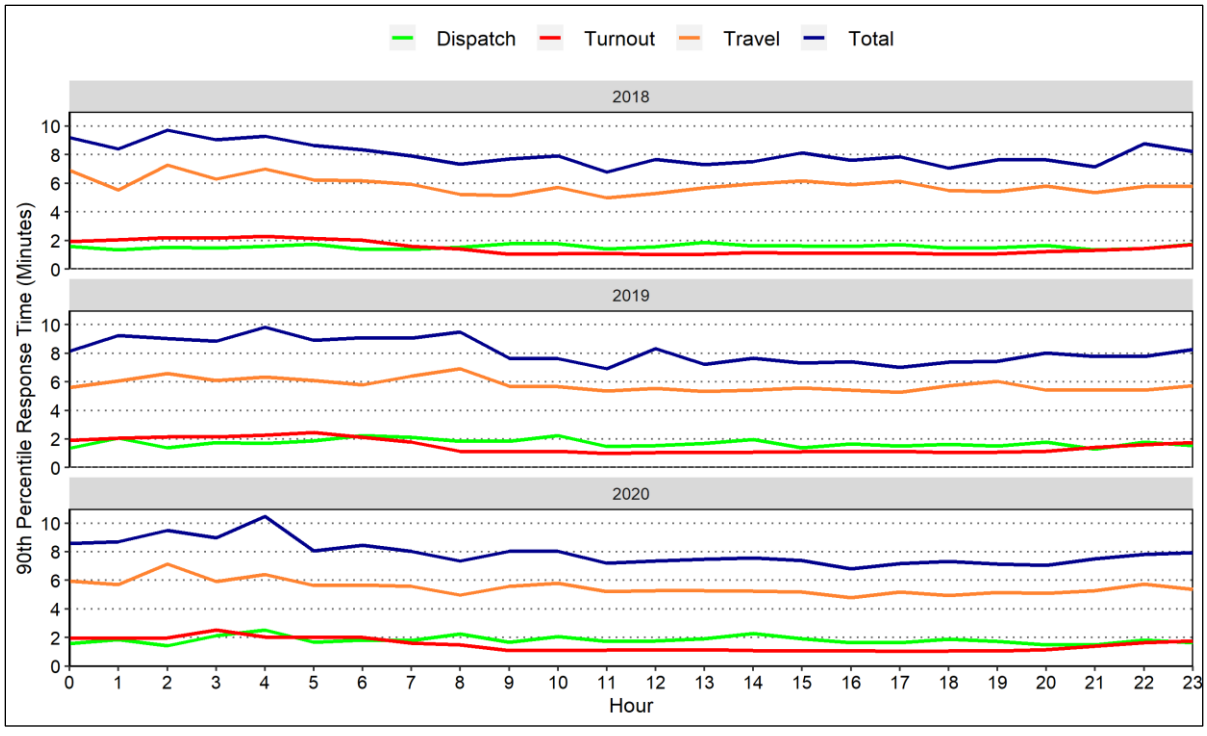


FIGURE 5-11: 90th Percentile Response Time of First Arriving Unit, by Hour of Day and Year



Observations:

- The 2018 average response time was between 5.1 minutes (11:00 a.m. to noon) and 7.2 minutes (2:00 a.m. to 3:00 a.m.).
- The 2019 average response time was between 5.4 minutes (4:00 p.m. to 5:00 p.m.) and 7.2 minutes (4:00 a.m. to 5:00 a.m.).
- The 2020 average response time was between 5.2 minutes (5:00 p.m. to 6:00 p.m.) and 7.2 minutes (4:00 a.m. to 5:00 a.m.).
- The 2018 90th percentile response time was between 6.8 minutes (11:00 a.m. to noon) and 9.7 minutes (2:00 a.m. to 3:00 a.m.).
- The 2019 90th percentile response time was between 6.9 minutes (11:00 a.m. to noon) and 9.8 minutes (4:00 a.m. to 5:00 a.m.).
- The 2020 90th percentile response time was between 6.8 minutes (11:00 a.m. to noon and 4:00 p.m. to 5:00 p.m.) and 10.5 minutes (4:00 a.m. to 5:00 a.m.).

Response Time Distribution By Year

Here, we present a more detailed look at how response times to calls are distributed. The cumulative distribution of total response time by year for the first arriving unit to EMS calls is shown in Figure 5-12. Table 5-20 shows the response times by year for the first arriving unit to EMS calls as a frequency distribution in whole-minute increments. Figure 5-13 and Table 5-21 show the same analysis 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 5-12, the 90th percentiles of 7.9, 8.0, and 7.7 minutes mean that 90 percent of EMS calls had a response time of 7.9, 8.0, and 7.7 minutes or less in 2018, 2019, and 2020, respectively. In Table 5-20, the cumulative percentages of 91.0, 90.5, and 92.2 mean that 91.0, 90.5 and 92.2 percent of EMS calls had a response time under 8 minutes in 2018, 2019, and 2020, respectively.

FIGURE 5-12: Cumulative Distribution of Response Time by Year, First Arriving Unit, EMS

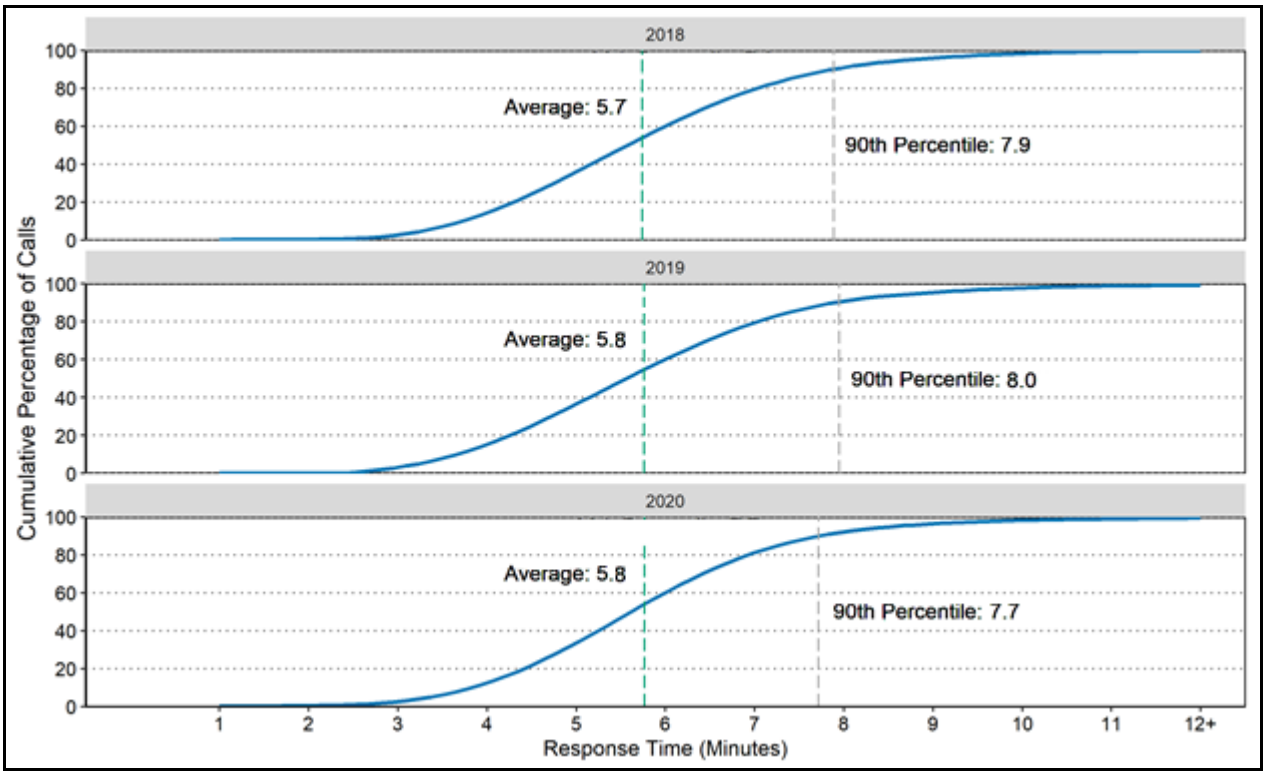


FIGURE 5-13: Cumulative Distribution of Response Time by Year, First Arriving Unit, Outside and Structure Fires

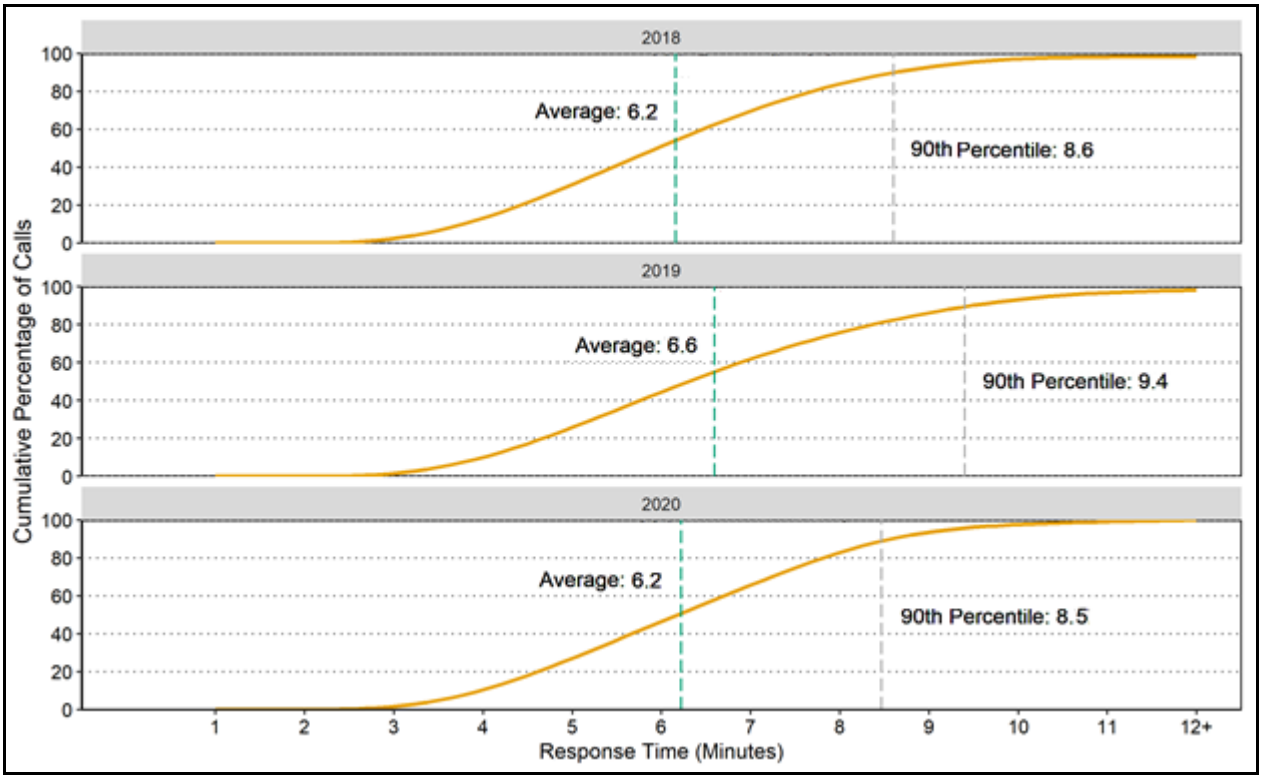


TABLE 5-20: Cumulative Distribution of Response Time by Year, First Arriving Unit, EMS

Response Time (minute)	Frequency			Cumulative Percentage		
	2018	2019	2020	2018	2019	2020
1	2	2	2	0.1	0.1	0.1
2	4	3	10	0.3	0.3	0.5
3	49	43	50	2.8	2.7	2.7
4	220	213	222	14.2	14.9	12.3
5	431	391	487	36.4	37.3	33.4
6	453	388	624	59.8	59.5	60.5
7	391	366	476	79.9	80.4	81.2
8	215	177	254	91.0	90.5	92.2
9	97	89	96	96.0	95.6	96.4
10	47	36	43	98.5	97.7	98.2
11	21	21	17	99.5	98.9	99.0
12	4	7	9	99.7	99.3	99.3
13	4	4	7	99.9	99.5	99.7
14	0	4	3	99.9	99.7	99.8
15+	1	5	5	100.0	100.0	100.0

TABLE 5-21: Cumulative Distribution of Response Time by Year, First Arriving Unit, Outside and Structure Fires

Response Time (minute)	Frequency			Cumulative Percentage		
	2018	2019	2020	2018	2019	2020
1	0	0	0	0.0	0.0	0.0
2	0	0	0	0.0	0.0	0.0
3	3	2	2	1.6	1.0	1.0
4	18	15	19	11.2	8.8	10.5
5	40	33	32	32.4	25.8	26.5
6	33	39	42	50.0	45.9	47.5
7	41	30	35	71.8	61.3	65.0
8	21	30	36	83.0	76.8	83.0
9	20	16	23	93.6	85.1	94.5
10	7	19	5	97.3	94.8	97.0
11	1	3	4	97.9	96.4	99.0
12+	4	7	2	100.0	100.0	100.0

Observations:

2018

- For 91 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 83 percent of structure and outside fire calls, the response time of the first arriving unit was less than 8 minutes.

2019

- For 91 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 77 percent of structure and outside fire calls, the response time of the first arriving unit was less than 8 minutes.

2020

- For 92 percent of EMS calls, the response time of the first arriving unit was less than 8 minutes.
- For 83 percent of structure and outside fire calls, the response time of the first arriving unit was less than 8 minutes.

Comparison of Emergency and Non-emergency Response Times

The following table compares the average and 90th percentile response times of the first arriving unit for both emergency and non-emergency calls by year.

TABLE 5-22: Trend of Average and 90th Percentile Response Times (Minutes) of First Arriving Unit, for Emergency and Non-emergency Calls

Type		Average			90th Percentile			Number of Calls		
		2018	2019	2020	2018	2019	2020	2018	2019	2020
Emergency	EMS	5.7	5.8	5.8	7.9	8.0	7.7	1,939	1,749	2,305
	Fire	6.2	6.6	6.2	8.6	9.4	8.5	188	194	200
	Total	**5.8**	**5.8**	**5.8**	**8.0**	**8.1**	**7.8**	**2,127**	**1,943**	**2,505**
Non-emergency	EMS	6.3	6.9	6.8	9.8	9.7	8.9	63	80	111
	Fire	7.2	7.5	6.9	10.8	11.6	9.9	82	79	75
	Total	**6.8**	**7.2**	**6.9**	**10.5**	**11.1**	**9.2**	**145**	**159**	**186**

Observations:

- The average response time to non-emergency EMS calls was 0.5, 1.1, and 1.0 minutes longer than the average response time for emergency EMS calls in 2018, 2019, and 2020, respectively.
- The average response time to non-emergency fire calls was 1.1, 0.9, and 0.7 minutes longer than the average response time for emergency fire calls in 2018, 2019, and 2020, respectively.

ATTACHMENT I: EMFD CALLS OUTSIDE EL MIRAGE

From 2018 to 2020, EMFD responded to 4,198 calls outside of its fire district. Of these, 214 were structure fire calls and 105 were outside fire calls.

EMFD Calls Outside El Mirage by Type

Table 5-23 shows the number of aid given calls outside El Mirage by call type and year. Figures 5-14 and 5-15 show the percentage of calls that fall into each EMS (Figure 5-14) and fire (Figure 5-15) type category by year.

TABLE 5-23: EMFD Calls Outside El Mirage, by Call Type and Year

Call Type	Number of Calls			Calls per Day			Call Percentage		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Breathing difficulty	116	87	92	0.3	0.2	0.3	8.6	6.5	6.1
Cardiac and stroke	109	88	81	0.3	0.2	0.2	8.1	6.6	5.4
Fall and injury	306	225	236	0.8	0.6	0.6	22.6	16.9	15.6
Illness and other	293	221	269	0.8	0.6	0.7	21.7	16.6	17.8
MVA	69	63	62	0.2	0.2	0.2	5.1	4.7	4.1
OD	20	19	11	0.1	0.1	0.0	1.5	1.4	0.7
Seizure and UNC	125	113	112	0.3	0.3	0.3	9.2	8.5	7.4
EMS Total	**1,038**	**816**	**863**	**2.8**	**2.2**	**2.4**	**76.7**	**61.3**	**57.0**
False alarm	55	62	58	0.2	0.2	0.2	4.1	4.7	3.8
Good intent	7	7	15	0.0	0.0	0.0	0.5	0.5	1.0
Hazard	29	21	18	0.1	0.1	0.0	2.1	1.6	1.2
Outside fire	22	32	51	0.1	0.1	0.1	1.6	2.4	3.4
Public service	48	22	24	0.1	0.1	0.1	3.5	1.7	1.6
Structure fire	88	81	45	0.2	0.2	0.1	6.5	6.1	3.0
Fire Total	**249**	**225**	**211**	**0.7**	**0.6**	**0.6**	**18.4**	**16.9**	**13.9**
Canceled	66	290	440	0.2	0.8	1.2	4.9	21.8	29.1
Total	**1,353**	**1,331**	**1,514**	**3.7**	**3.6**	**4.1**	**100.0**	**100.0**	**100.0**

Note: OD=Overdose and psychiatric; UNC=unconsciousness.

FIGURE 5-14: EMS Calls Outside El Mirage, by Type and Year

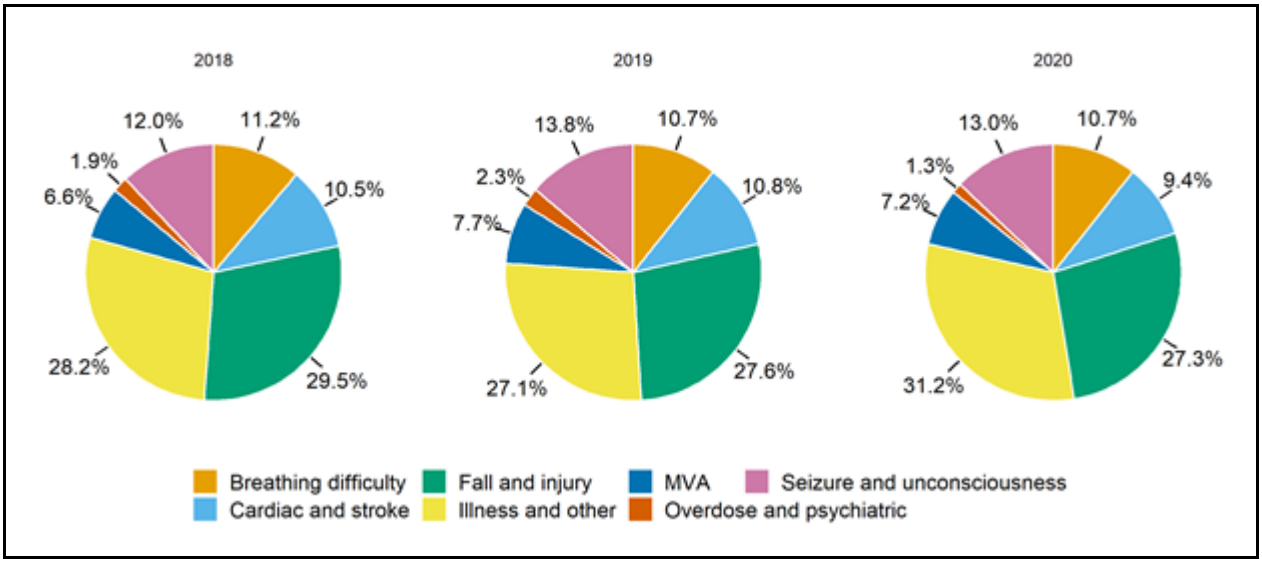
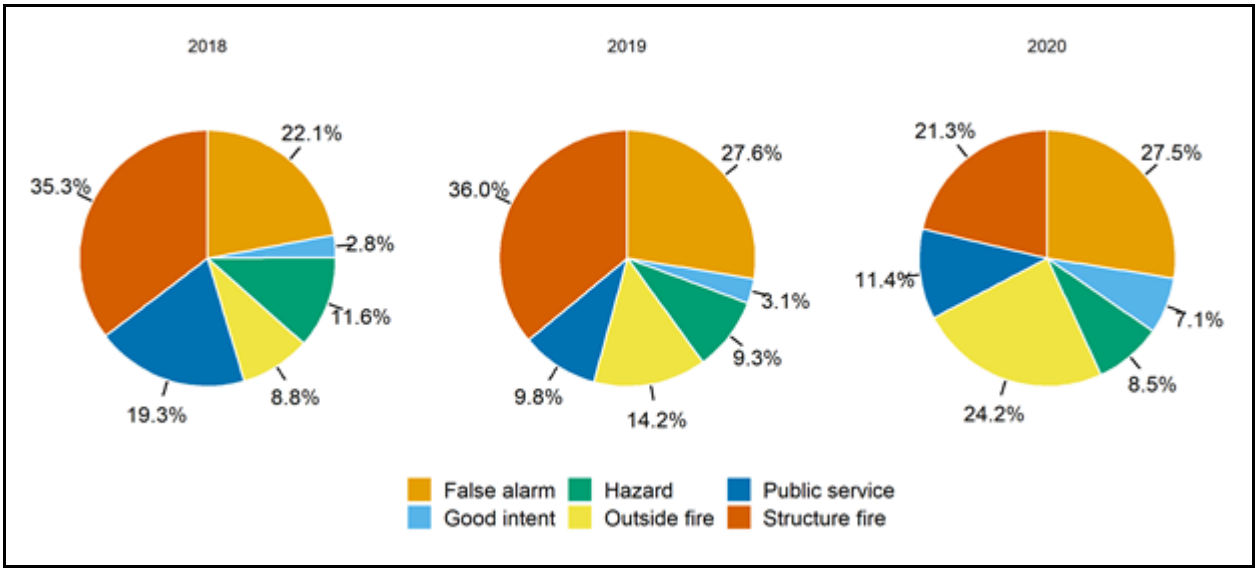


FIGURE 5-15: Fire Calls Outside El Mirage, by Type and Year



Observations:

- Outside fire calls increased 45 percent from 22 in 2018 to 32 in 2019 and then again increased 59 percent to 51 in 2020.
- Structure fire calls decreased 8 percent from 88 in 2018 to 81 in 2019 and then decreased 44 percent to 45 in 2020.

EMFD Workload by Location Outside El Mirage

For the three years studied, Table 5-24 examines the EMFD workload outside El Mirage by call location. Table 5-25 provides further detail on the trend of EMFD's workload associated with structure and outside fires, also broken down by call location.

TABLE 5-24: EMFD Workload and Runs Outside El Mirage, by Location and Year

Location	Total Annual Calls			Total Annual Runs			Total Annual Hours		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Surprise	693	680	764	738	725	825	284.1	319.3	399.6
Sun City	382	384	405	406	415	449	125.4	142.2	128.9
Youngtown	207	195	241	222	226	260	87.3	89.3	95.1
Peoria	29	34	39	34	35	51	8.4	7.9	16.5
Glendale	20	13	25	23	14	35	10.0	9.4	19.4
Other	22	25	40	26	29	51	20.0	17.6	55.8
Total	**1,353**	**1,331**	**1,514**	**1,449**	**1,444**	**1,671**	**535.2**	**585.7**	**715.3**

TABLE 5-25: Structure and Outside Fire EMFD Runs Outside El Mirage, by Location and Year

Location	Structure Fire Runs			Outside Fire Runs			Hours for Structure and Outside Fires		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Surprise	59	41	41	14	18	21	32.2	23.6	62.5
Sun City	38	43	22	6	4	35	24.6	29.0	29.7
Youngtown	19	19	15	8	28	6	18.8	32.2	21.5
Peoria	7	6	4	5	0	4	2.9	1.3	6.7
Glendale	5	4	0	0	0	7	5.9	3.9	8.3
Other	6	7	2	4	9	20	12.2	13.2	47.6
Total	**222**	**217**	**164**	**96**	**124**	**222**	**202.8**	**265.4**	**343.0**

ATTACHMENT II: WORKLOAD OF AID FD AGENCY

From 2018 to 2020, there were 2,310 calls in El Mirage where aid was received from surrounding FD agencies. Out of these calls, 1,032 calls involved a joint response with EMFD, and 1,278 calls involved a response by other agencies alone (See Table 5-1).

Calls Responded by Aid FD Agency, by Type

Table 5-26 shows the number of calls where aid was received by another agency, broken out by call type and year. The table also presents the annual runs and work hours for each type of call.

TABLE 5-26: Aid Received Workload by Type and Year, Inside El Mirage

Call Type	Total Annual Calls			Total Annual Runs			Total Annual Hours		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Breathing difficulty	78	77	52	91	87	55	31.9	29.1	20.5
Cardiac and stroke	63	65	43	71	69	48	23.7	23.9	15.8
Fall and injury	120	134	78	133	169	83	47.2	63.1	33.8
Illness and other	218	213	152	271	257	182	131.0	117.2	89.7
MVA	81	74	51	152	141	102	56.6	51.6	33.0
OD	24	28	17	26	31	25	6.8	8.6	7.3
Seizure and UNC	128	88	63	142	92	64	52.5	32.9	30.0
EMS Total	**712**	**679**	**456**	**886**	**846**	**559**	**349.6**	**326.3**	**230.0**
False alarm	39	32	24	55	37	32	12.9	9.1	7.3
Good intent	4	5	6	18	14	17	4.3	4.3	4.2
Hazard	22	10	11	67	25	54	16.7	11.1	22.5
Outside fire	16	19	22	61	55	83	25.9	33.4	19.4
Public service	34	23	19	45	31	31	13.7	8.2	10.3
Structure fire	26	25	20	221	257	165	88.9	173.5	95.9
Fire Total	**141**	**114**	**102**	**467**	**419**	**382**	**162.4**	**239.6**	**159.6**
Canceled	27	43	36	34	65	70	3.2	7.6	24.3
Total	**880**	**836**	**594**	**1,387**	**1,330**	**1,011**	**515.2**	**573.5**	**413.9**

Note: OD= Overdose and psychiatric; UNC=Unconsciousness.

Observations:

- Aid received workload increased 11 percent from 515.2 hours in 2018 to 573.5 hours in 2019 and then decreased 28 percent to 413.9 hours in 2020.

Workload by Aid FD Agency

The following table examines the workload of each aid FD agency's units over the three years studied.

TABLE 5-27: Aid Received by Unit, Agency, and Year

Agency	Unit	Unit Type	Total Runs			Total Hours		
			2018	2019	2020	2018	2019	2020
SUR	BC301	BC	39	33	37	13.2	20.2	16.8
	E301	Engine	359	297	273	136.2	108.2	116.4
	E305	Engine	23	11	2	7.7	4.7	0.8
	L305	Aerial truck	35	44	26	4.3	6.9	3.4
	LT305	Ladder tender	68	72	55	25.4	29.2	20.0
	Other	Other	130	135	66	72.8	94.3	50.6
	Total		**654**	**592**	**477**	**259.7**	**263.4**	**216.3**
SUN	BC131	BC	9	5	9	4.6	5.6	1.4
	E131	Engine	6	6	NA	1.4	5.8	NA
	E132	Engine	55	30	17	19.5	12.6	7.8
	E133	Engine	328	329	186	122.2	121.9	69.3
	L131	Aerial truck	7	12	17	1.5	7.4	4.6
	LT131	Ladder tender	10	7	11	3.3	0.8	1.5
	Other	Other	1	3	4	0.7	2.7	0.7
	Total		**416**	**392**	**244**	**153.2**	**156.7**	**85.2**
GLN	BC152	BC	6	2	7	1.6	0.3	3.5
	E158	Engine	0	2	1	0.0	0.5	0.0
	Other	Other	41	55	30	27.2	42.5	19.2
	Total		**47**	**59**	**38**	**28.8**	**43.4**	**22.7**
PEO	BC191	BC	7	5	4	1.5	2.6	2.3
	E191	Engine	1	5	1	0.3	2.5	0.3
	E194	Engine	36	33	22	13.3	16.7	10.5
	L191	Aerial truck	7	6	4	2.8	1.1	1.4
	LT191	Ladder tender	7	7	4	0.7	1.3	0.0
	Other	Other	16	16	12	3.5	12.1	4.3
	Total		**74**	**72**	**47**	**22.2**	**36.3**	**18.8**
NCO	**Total**		**65**	**62**	**71**	**14.4**	**32.7**	**25.9**
LAB	**Total**		**73**	**101**	**68**	**18.5**	**23.1**	**23.0**
PHX	**Total**		**29**	**32**	**35**	**4.9**	**10.3**	**11.9**
AVO	**Total**		**14**	**13**	**15**	**5.1**	**3.2**	**4.2**
GDY	**Total**		**8**	**3**	**7**	**2.9**	**2.4**	**3.6**
RMF	**Total**		**7**	**4**	**9**	**5.7**	**2.0**	**2.3**
Total			**1,387**	**1,330**	**1,011**	**515.2**	**573.5**	**413.9**

ATTACHMENT III: NUMBER OF ARRIVING UNITS, INSIDE EL MIRAGE, ALL AGENCIES

The following table presents the three-year trend for the total number of arriving units (including all fire departments and ambulance services) by grand call type. Here we only considered calls that occurred inside El Mirage and had an arriving unit (See Table 5-16).

TABLE 5-28: Number of Arriving Units by Grand Call Type and Year, All Agencies

Year	Type	Number of Arriving Units								Total
		One	Two	Three	4 / 5	6 / 7	8 / 9	10 / 11	≥ 12	
2018	EMS	581	1,649	226	59	10	8	0	0	2,533
	Fire	315	25	19	11	10	3	5	4	392
	Other	37	4	2	0	0	0	0	0	43
	Total	**933**	**1,678**	**247**	**70**	**20**	**11**	**5**	**4**	**2,968**
2019	EMS	604	1,741	151	37	4	2	0	0	2,539
	Fire	304	21	12	11	2	4	2	8	364
	Other	45	8	0	1	0	0	0	0	54
	Total	**953**	**1,770**	**163**	**49**	**6**	**6**	**2**	**8**	**2,957**
2020	EMS	870	1,881	105	15	6	1	0	0	2,878
	Fire	262	44	11	11	11	3	2	8	352
	Other	67	13	2	2	0	1	0	1	86
	Total	**1,199**	**1,938**	**118**	**28**	**17**	**5**	**2**	**9**	**3,316**
Total		**3,085**	**5,386**	**528**	**147**	**43**	**22**	**9**	**21**	**9,241**

Observations:

2018

- On average, 1.9 units arrived at all calls
- For outside fire calls, three or more units arrived at 16 percent of calls.
- For structure fire calls, three or more units arrived at 56 percent of calls.

2019

- On average, 1.8 units arrived at all calls
- For outside fire calls, three or more units arrived at 12 percent of calls.
- For structure fire calls, three or more units arrived at 54 percent of calls.

2020

- On average, 1.8 units arrived at all calls
- For outside fire calls, three or more units arrived at 13 percent of calls.
- For structure fire calls, three or more units arrived at 63 percent of calls.

ATTACHMENT IV: FIRE LOSS

Table 5-29 presents the number of outside and structure fires by year, broken out by levels of fire loss and EMFD response type (1 engine or 3-1 assignment). Table 5-30 shows the property loss and content loss, broken out by response type and year. Table 5-31 summarizes the way we distinguished response types based upon the response protocol recorded as the "final response text" and "final response type" in the provided CAD data.

TABLE 5-29: Total Fire Loss Above and Below $25,000, by Year and Response Type

Response Type	Call Type	No Loss			Under $25,000			$25,000 plus		
		2018	2019	2020	2018	2019	2020	2018	2019	2020
1 Engine	Outside fire	34	43	53	5	2	11	1	0	1
	Structure fire	17	12	9	0	1	0	0	0	0
3-1 Assignment	Outside fire	2	1	5	1	0	2	1	0	0
	Structure fire	12	9	2	6	6	10	3	3	6
Other	Outside fire	2	1	0	0	0	0	0	0	0
	Structure fire	0	0	0	1	0	0	0	3	0
Total		**67**	**66**	**69**	**13**	**9**	**23**	**5**	**6**	**7**

TABLE 5-30: Total Content and Property Loss, by Year, Structure and Outside Fires

Response Type	Call Type	Property Loss			Content Loss		
		2018	2019	2020	2018	2019	2020
1 Engine	Outside fire	$54,500	$11,000	$54,088	$2,000	$1,700	$5,000
	Structure fire	0	$500	0	0	0	0
3-1 Assignment	Outside fire	$94,000	0	$8,000	$70,500	0	$1,000
	Structure fire	$372,125	$128,795	$435,638	$33,850	$103,700	$222,766
Other	Outside fire	0	0	0	0	0	0
	Structure fire	0	$610,000	0	$100	$77,000	0
Total		**$520,625**	**$750,295**	**$497,726**	**$106,450**	**$182,400**	**$228,766**

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

TABLE 5-31: Dispatch Protocols and CAD Response Type Descriptions, Outside and Structure Fires

Dispatch Protocol	Final Response Text	Final Response Type	Number of Calls
1 Engine	1 ENGINE	1E	154
	1 ENGINE (EL MIRAGE)	1E-RL1	19
	1ENGINE, 1 BRUSH	BR1	14
	1 ENGINE, MANPOWER (PHOENIX)	0.1	2
3-1 Assignment	3-1 EL MIRAGE	3-1EL1	39
	3-1 EL MIRAGE	3-1EL2	2
	3-1 WF HAZMAT (EL MIRAGE)	WFHEL1	1
	3-1 WORKING FIRE (EL MIRAGE)	WF-EL1	24
	3-1 WORKING FIRE (EL MIRAGE)	WF-EL2	3
Other	2 ENGINE BRUSH	BR2	1
	ADVANCED LIFE SUPPORT, AMBULANCE	ALA	1
	ALS (EL MIRAGE)	ALAEL1	2
	FULL STRUCTURAL ASSIGNMENT, WORKING FIRE	SWF	3

ATTACHMENT V: RESPONSE OF LOW ACUITY UNIT

From 2018 to 2020, EMFD's low acuity unit LA121 made 860, 537, and 269 runs in service (see Table 5-13) and arrived at 799, 494, and 246 calls, respectively. For 149, 75, and 30 calls in each of three years, LA121 arrived with one EMFD engine. Unit LA121 never arrived with two EMFD engines. When all engines from both EMFD and other aid FD agencies are included, there are calls where LA121 arrived with more than one engine. Table 5-32 summarizes the number of engines (from all agencies) arriving at calls together with LA121.

TABLE 5-32: Low Acuity Unit Arrivals, by Number of Arriving Engines and Year

Number of Engines	2018		2019		2020	
	Calls	Pct. Calls	Calls	Pct. Calls	Calls	Pct. Calls
0	562	70.3	362	73.3	186	75.6
1	206	25.8	117	23.7	56	22.8
2	14	1.8	6	1.2	1	0.4
3	13	1.6	4	0.8	0	0.0
4 or more	4	0.5	5	1.0	3	1.2
Total	**799**	**100.0**	**494**	**100.0**	**246**	**100.0**

Note: We only considered calls where LA121 and a responding engine arrived.

TABLE 5-33: Workload of Administrative Units

Unit ID	Unit Type	Annual Hours			Annual Runs		
		2018	2019	2020	2018	2019	2020
C121	Chief Officer Car	17.0	0	0	6	0	0
C122	Chief Officer Car	5.8	35.9	32.4	5	12	8
C123	Chief Officer Car	17.6	39.5	14.7	9	10	7
Other *	Administrative Unit(s)	25.5	33.6	24.4	35	29	26

Note: *The "other" unit identifier summarizes the aid received workload of 32 administrative units from other FD agencies.

- END -